University of Southern Queensland

HOW SAFE ARE THE AUSTRALIAN AVIATION SAFETY REGULATIONS AND WHAT DOES "SAFETY" REALLY MEAN ANYWAY? HOW AVIATION ACCIDENTS CAN PROVIDE A REALITY-BASED CONCEPTION OF SAFETY AND WHY IT MATTERS

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ABSTRACT

In the last 20 years since the year 2001 Australian aviation safety regulations have increased from some 550,000 words to 1.8 million words. Yet in the same period, and despite civil aviation fleet hours remaining essentially unchanged, the number of Australian civilian aviation accidents has grown. This is somewhat surprising in light of the safety goal of the *Civil Aviation Act 1988* which is the prevention of accidents and incidents. What then has the more than threefold regulatory increase meaningfully accomplished in terms of the Act's conception of safety? The research responds with both critique and solution using an emergent, hermeneutic "methodology of methodologies" and a case study from the Administrative Appeals Tribunal of Australia (AATA). The critique phase employs a hermeneutic close-reading of aviation regulations to demonstrate that regulatory "liability-proofing" undermines the safety goals of the Act. The critique phase also shows how liability-proofing and consequent dynamics of over-regulation flourish when no compelling and consistently actionable "accident-proofing" conception of safety exists. In an attempt to better conceive just such a conception, the research moves to the solution phase where 50 years of Australian Transport Safety Bureau (ATSB) aviation investigations (1968-2021) are examined to meaningfully conceive a reality-based model called the Incident, Accident, and Safety Attribution (IASA) Model. The research then concludes by showing how the IASA model – as a "red rule safety" conception and so-called because it emerges from "written in blood" accidents – can usefully serve aviation regulators, managers, and practitioners by clarifying, emphasising, and standardising accident-proofing goals. It is hoped this can then moderate the current inclination towards regulatory excess and thus the safety goal of the *Civil Aviation Act 1988* can be better realised.

CERTIFICATION OF THESIS

I Adrian C. Park declare that the PhD Thesis entitled *How safe are the Australian aviation safety regulations and what does "safety" mean anyway?* is not more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes. The thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

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In the beginning was the Word…

DEDICATION

This work is dedicated to the many people who even now are designing, building, financing, managing, controlling, supporting, replenishing, flying, and regulating the many and varied aircraft that cross Australian skies. For those of you who are word-weary – and perhaps wonder if there is a better way – this research (with many more words about how there are too many regulatory words!) is for you. I hope the research serves to produce regulations that are neither too many nor too few and, above all, regulations and procedures that empower the best of aviation while disempowering the worst.

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ABBREVIATIONS

AATA	Administrative Appeals Tribunal Australia
AC	Advisory Circular
AAC	Airworthiness Advisory Circulars
AD	Airworthiness Directive
ADREP	ICAO Accident/Incident Data Reporting Program
AIP	Aeronautical Information Publication
AMC	Acceptable Means of Compliance
AOC	Air Operators Certificate
AOD	Alcohol and Other Drugs
AOPA	Australian Owners and Pilots Association
ASRS	Aviation Safety Reporting System
ATC	Air Traffic Control
ATPL	Australian Transport Pilots Licence
ATO	Approved Testing Officer
ATS	Air Traffic Services
ATSB	Australian Transport Safety Bureau
ATSO	Australian Technical Standard Orders
AWB	Airworthiness Bulletin
BASI	Bureau of Air Safety Investigations (prior to the ATSB)
B.C.E.	Before Common Era
CAA	Civil Aviation Authority (predecessor to CASA)
CAAP	Civil Aviation Advisory Publication
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CAS	Caution Advisory System
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
C.E.	Common Era
CEO	Chief Executive Officer
CFIT	Controlled Flight Into Terrain

CHIRP	Confidential Human Factors Incident Reporting Programme
DAMP	Drug and Alcohol Management Plan
DCA	Department of Civil Aviation
DOT	Department of Transport
EASA	European Aviation Safety Authority
EPIRB	Emergency Positioning Indicating Radio Beacon
FAA	Federal Aviation Administration (USA)
FDM	Flight Data Management
FMC	Flight Management Computer
FRMS	Fatigue Risk Management System
FSA	Flight Safety Australia
GA	General Aviation
GM	General Manager
HEIDI	Harmonisation of European Incident Definitions Initiative
HEMS	Helicopter Emergency Services
HF	Human Factors
HFACS	Human Factor Analysis and Classification System
HOFO	Head of Flying Operations
IASA	Incident, Accident, and Safety Attribution Model
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
ISO	International Standards Organisation
LTE	Loss of Tail Rotor Effectiveness
MOC	Management of Change
MOS	Manual of Standards
NPRM	Notice of Proposed Rule Making
NTSB	National Transportation Safety Board (USA)
NVG	Night Vision Goggles

ODP	Off Duty Period
OEI	One Engine Inoperative
OEM	Original Equipment Manufacturer
PDF	Portable Document Format
PPE	Personal Protective Equipment
QMS	Quality Management System
QRH	Quick Reference Handbook
RAAus	Recreational Aviation Australia
RFM	Rotary Flight Manual
RPT	Regular Public Transport
SARPS	Standards and Recommended Practices (from ICAO)
SIMMS	ATSB Accident and Incident Taxonomy System
SM ICG	Safety Management International Collaboration Group
SMS	Safety Management System
SOP	Standard Operating Procedure
SSP	State Safety Program
TEM	Threat and Error Management
UTC	Universal Time Coordinate

CHAPTER 1: INTRODUCTION

Rule books are paper - they will not cushion a sudden meeting of stone and metal.

~ Ernest K. Gann

1.1 What Does "Safety" Really Mean Anyway?

"Safety" is a pivotal word in Australian aviation regulations. It is the middle name of the regulations – the Civil Aviation *Safety* Regulations – and the middle name of the regulator: the Civil Aviation *Safety* Authority (CASA). Safety is also the mandate of the *Civil Aviation Act 1988* which stipulates regulations are "for maintaining, enhancing and promoting the safety of civil aviation with a focus on the prevention of accidents and incidents" (p. 11). Thus, so critical is the word "safety", if the word ceased to exist so too would the very identity, mandate, and fundamental meaningfulness of the regulations themselves. From the outset then, effectively actioning aviation safety regulations means effectively understanding what safety is in the first place. This prompts an obvious but important question: What, within the regulations, does safety really mean anyway? To put it another way, how can one know whether the regulations are safe by nature as well as by name?

This is potentially a provocative question, but it is worth considering in the light of an appeal heard at the Administrative Appeals Tribunal Australia (AATA) some ten years ago (and examined more fully throughout the research). The 2011 appeal was entitled *Avtex Air Services Pty Ltd and Civil Aviation Safety Authority* ("Avtex Air Appeal"). In it, the AATA had to decide, using the safety regulations, how to meaningfully assess whether Avtex Air (who also traded as "Airtex Air" and "Skymaster") was a "serious and imminent risk to air safety" (Avtex Air Appeal, 2011, p. 9). This was because CASA had, based on safety concerns, decided to ground the Bankstown-based charter company.

A key incident examined by the AATA involved *Civil Aviation Regulations 1988* (CAR) and whether the interpretation endorsed by Avtex Air was safe according to the stipulations of CAR 238 (p. 212). An Avtex-Air pilot at Cooma had postponed an intended flight to Bankstown because icing conditions were forecast and CAR 238 had seemed quite clear – no certified anti-ice or de-ice equipment, no flight into icing. His managers however had quite a different idea of what made CAR 238 meaningfully safe and it did not involve cancelling the flight. This was made clear when the Chief Pilot and the Chief Executive Officer (CEO) called a meeting to re-educate the company pilots as to the "proper" meaning of CAR 238. The Chief Pilot told them forecast icing conditions were not necessarily a "no go" and to "think outside the box" – CAR 238 did not, in fact, mean they had to ground the aircraft. Instead, the pilots were told they could "have a look" and if they were "picking up too much ice" they could simply "turn around and come back". The CEO then backed the Chief Pilot saying this was all perfectly legal (*Avtex Air Appeal*, 2011, p. 59).

Considerable consternation was the result for some of the pilots who strongly felt management's interpretation of the safety regulation was anything but safe. One pilot responded by quoting CAR 238 verbatim to the managers expressing his concern that the regulation did not allow one to "have a look". For the pilot, the only meaningfully safe thing to do was to cancel such flights. However, the Chief Pilot denied the pilot's conception of safety was valid and proceeded to release a written pilot's guide reiterating, amongst other things, CAR 238 meant one could indeed have a look (*Avtex Air Appeal*, 2011, p. 60).

Since 2011 when these events occurred, CAR 238 has become a new *Civil Aviation Safety Regulation* (CASR) in the form of CASR Part 91.710 (2022, p. 519). Significantly CASR 91.710 increases the word-count of the legacy CAR 238 by some 62 percent and yet, as will be seen in later chapters, this increase has not clarified the point of contention. In fact, the new regulation indicates one can indeed "have a look" after all. This is evident in Part 91.710 where it states one must "change the aircraft's flight path to try and avoid the icing conditions" (CASR, 2022, p. 519). This implies one has taken off in the first place and contradicts the AATA Senior Member who was quite clear when he specifically stated "have a look" was in breach of the regulations (*Avtex Air Appeal*, 2011, p. 61). Hence, despite the same black print on the regulatory page, with the same apparent safety requirements, and despite some ten years of regulatory reform since the AATA appeal, the very action the tribunal explicitly stated was unsafe is now deemed safe by the safety regulations. All this leads to the key question of the thesis: why such different conceptions of safety from the very same regulation and what does safety really mean anyway?

1.2 The Purpose of the Research

The purpose of the research is to investigate the implications of safety-meaningfulness in Australia's aviation safety regulations. In the first half of the thesis, the research critiques regulatory conceptions of safety both at the Avtex Air appeal and across the regulations more broadly. It proposes misconceptions arise not only because of regulatory-textual characteristics, but because safety as a concept is fraught with problematic inconsistencies that are never adequately addressed within the regulations themselves.

The second half of the thesis engages with this lack of meaningfulness in regulatory safety by providing a solution. The solution is a curation and conceptualisation of various incident and accident attributes from 391 ATSB investigations (1968-2021) thematised into ten key safety meaning-makers. These attributes, also called "red rules" for reasons explained below, form the reality-based Incident, Accident and Safety Attribution (IASA) model. The IASA model is then used to draw various conclusions as to why regulatory conceptions of safety are problematic and how the model might prove to be a more meaningful, a more compelling and a more actionable conception of safety in the service of accident prevention.

1.3 The Scope of the Research

The scope of the research encompasses aviation safety regulations and the aviation safety regulator within Australia only. A detailed analysis of regulations and regulators outside of civil aviation, or outside of Australia, is not possible within the size constraints of a doctoral thesis. With that said, there are strong indications the problems articulated in this thesis are not just localised to Australian civil aviation. For example, Rae et al. (2018) observes that "safety clutter" is the accumulation of "procedures, documents, roles, and activities" that do not contribute to operational safety (p. 194). This conclusion was based on studies of Woolworths and an Australian Energy company. Elsewhere, Winston (2013) points out transportation regulations in the United States proliferate and yet "the effect of government policy on transportation safety has not been empirically determined" (p. 803). Also in the United States, and in the aftermath of the recent Boeing 737 Max accidents, Weisman and Van Doren (2020) warn of the tendency to "overregulate air safety" (p. 6) and that "there is a real risk of reflexive over-regulation that costs more lives than it saves" (p. 9).

In Europe, Zimmermann (2007) notes a regulatory paradox: "excessively used, procedures and regulations might actually degrade system safety" (p. 5). Elsewhere in Europe, Beyers and Arras (2020) critique the European Union for its regulatory policies because they are written without adequately consulting the diversity of stakeholders which leads to a "highly tenacious" relevance of these regulations (p. 573). At the same time, a study of the Norwegian coastal fishing industry (Størkersen et al., 2020) describes "over-proceduralisation, safety clutter, bureaucratic overload, and procedures not in the service of safety" (p. 1). Meanwhile, in Southeast Asia, Chen (2015), critiques the tendency of Singapore and many other countries to overregulate drone usage and asks an important question: "how can such tools be regulated in a way that is proportionate and sensible?" (p. 1).

All these examples point to problems with the meaningfulness of safety and of safety regulations beyond Australia and the Australian regulator. With this in mind, it is anticipated that future research (see Chapter 10) may take the thesis methodology of this work and apply it to aviation contexts outside of Australia.

1.4 Four Key Research Questions

The issue of the meaningfulness of safety in the regulations leads to four key research questions. First, what makes something meaningful in the first place? This is an important question because, as already illustrated at Avtex Air, that which makes safety meaningful to one party will not necessarily make it so to another.

To explore this question, the research leverages off a discipline called hermeneutics. Literature, philosophy, law, education, and psychology, amongst others, all use hermeneutics to understand the nature of meaning. "Hermeneutics" derives from the Greek verb hermēneuein – generally translated "to interpret," – and is itself derived from the name of the Greek god Hermes who delivered divine messages (Palmer, 1969, p. 348). Significantly, the role of Hermes was not to merely deliver messages from the gods, it was to take that which was unintelligible to human understanding and make it comprehensible; that is, his role was to "make meaning". In the same way, hermeneutics is used in this research to analyse the nature of meaning-making as it relates to the concept of safety.

Admittedly, hermeneutics and aviation rarely appear in the same sentence with exceptions e.g., Ferroff et al. (2012), Garst, (2009), Jennings (1990) and Myrden et al. (2011) but given aviation's dependence on words this should not continue to be the case – particularly since, as will be seen, hermeneutics is underutilised in analysing aviation safety. This leads to the second key research question: how is meaningfulness conveyed textually? This is important because the governing goal of the *Civil Aviation Act 1988* – to establish a regulatory framework for safety (p. 11) – is textually rendered as are its 1.8 million words (and growing) of textually rendered regulations. Thus, the ability of regulations to achieve their safety goals depends almost completely on the textuality of those regulations and, if these textual influences are not understood, it is unlikely the influences on safety-meaningfulness will be understood.

This naturally leads to the third research question: how well do the textual characteristics of the regulations meaningfully convey their own safety requirements? This is important to consider because a basic hermeneutic truth is no text, not even a regulatory text, conveys meaning in a neutral way (Palmer, 1969, p. 943). The textual characteristics that mediate meaning can also – sometimes subtly, sometimes obviously – shape that meaning in unintended ways. This question has particular poignancy when one considers, as will be seen, the aviation accident rate over the last 20 years has not decreased despite a 242% increase in safety regulations – from 545,814 words in the year 2000 to 1,864,532 in 2021 (and still growing). This includes not only the growth of the already mentioned *Civil Aviation Act 1988*, *Civil Aviation Safety Regulations 1998* and *Civil Aviation Regulations 1988* but also the *Civil Aviation Orders* (2004) and the *Manuals of Standards* (2016). To put this word-count in perspective these core regulations (known, respectively, in their abbreviated forms as the Act, CASRs, CARs, CAOs and the MOS suite) are, at 1.8 million words, three times the size of Tolstoy's massive tome (1869) *War and Peace* (which is some 587,000 words). Thus, regulations are not just one *War and Peace,* they are three.

This leads to the fourth and perhaps the most challenging question: if, as already indicated by the introduction to Avtex Air, safety means different things to different people, how might safety be more objectively, compellingly, and actionably conceptualised for regulatory readers and writers? This is important because hermeneutics presents the idea that texts interact with a reader's already-existing understanding – a "preunderstanding" – that then shapes the final meaning and application of the text (Gadamer, 2013; Thiselton, 2009 etc.). Thus, if different readers have different preunderstandings of safety, these preunderstandings will likely legitimise (or delegitimise) different applications of the same regulatory content. The research seeks to address this by proposing the IASA model as a shared and meaningful concept of safety that can better standardise the preunderstandings of regulatory readers and writers. The IASA model is detailed in the second half of the thesis.

1.5 Outline of the Thesis

The thesis is an exegesis of safety. It is structured in two phases around the four research questions and employs a hermeneutic close-reading that is reality based, iterative and emergent.

The methodology is hermeneutic because it draws from key hermeneutic principles and relies upon a theory called the hermeneutic circle to structure the close-reading. It is reality-based because it integrates a study of aviation accidents at the granular and generalised level. At the granular level, the Avtex Air case is employed, while the generalised level utilises the curation of 391 accident investigations in the ATSB's investigative database.

The methodology is also iterative and emergent because of the way the close-reading iterates back and forth from hermeneutic principles to the case study and the ATSB database to draw out emergent findings. This enables the emergence and application of the ten incident and accident attributes (the ten red rules) in the IASA model. The structure of the thesis is illustrated by Figure 1.1 below.

Figure 1.1

Overview of the Thesis

Figure 1.1 above illustrates the thesis with the two phases and the ten chapters of the research in their overall methodological context. The inner and outer circles illustrate the iterative nature of the research as well as the role of the hermeneutic circle in the methodology (see Chapter 3 for a full description).

Figure 1.1 also shows how the outer circle begins with Chapter 2 by providing a literature review of indicative research into the meaningfulness of safety. Chapter 2 examines the ways in which safety is variously denoted in aviation. From there, the review moves to various writings discussing the effectiveness of regulations in expressing safety and safety-related goals. Finally, the review examines the scope of hermeneutics in previous works of aviation safety. The conclusion is drawn that the unique perspective of a hermeneutic approach is under-utilised.

Chapter 3 provides the methodological detail of the hermeneutic close-reading and its reality-based, iterative, and emergent characteristics. It also provides commentary on the challenges and limitations posed by this hermeneutic approach as well as its distinctive features.

Chapter 4 explores hermeneutic ideas of meaningfulness by utilising a summative canon specially formulated for this thesis (see Appendices A and B). This canon is used to distil and explain key hermeneutic principles that are employed throughout the thesis. It does this in a methodological pattern (the middle circle of Figure 1.1) that repeats (iterates) in subsequent chapters as key scenes from Avtex Air and the AATA are examined. This is followed by deeper application and analysis which produce emergent findings that, in turn, shape the examinations of subsequent chapters.

Chapters 5 and 6 explore hermeneutically, via the continued close-reading, the textual content and context of CAR 238 as it is employed at the AATA and Avtex Air. The close-reading traces out the content and context implications of CAR 238 as CAR 238 evolves via the regulatory reform program into CASR Part 91.710. The close-reading then expands to a broader comparison of regulatory characteristics against the Act's self-stated textual goals of concision, clarity and appropriateness (1988, p. 14). The conclusion is drawn that a number of regulatory-textual characteristics hinder the ability of the safety legislation to successfully convey a compelling conception of safety.

Having completed the critical phase of the research (Phase 1), and having identified the problems with regulatory conceptions of safety, the research moves to the solution-driven phase (Phase 2). In Chapters 7-9, the ATSB investigative database is used to derive the ten incident and accident attributes from 391 incidents and accidents over the period 1968-2021 (the period covered by the publicly available and digitised ATSB investigative database). These incident and accident attributes lead hermeneutically to the safety attributes which together are comprehensively formulated to construct the IASA model. The IASA model, being reality-based, proposes a solution to the problems of regulatory conceptions of safety by providing a more compelling and actionable meaningfulness of safety than that currently evident in the regulations.

Finally, Chapter 10 summarises the key findings and makes accompanying recommendations for the aviation industry, the aviation regulator and for future research. In this concluding chapter, the research attempts to, like hermeneutics, take a totalising perspective of meaning-making, aviation safety and aviation regulations. Thus, a field, not just a focus, of research is produced that can be usefully applied to future aviation safety research.

1.6 Explanation of Terms and Why Introductory Chapter Quotes are Used

1.6.1 Meaning-making, Mattering, and Red Rule Safety

"Meaning-making" is used throughout the research to connote the idea it involves the active coherence of textual dynamics, cultural influences, institutional influences, and readerly experience that fuse to bring about significance (Chapter 4). This idea of significance, or to put it another way, "what matters", is hermeneutic and ties into recent sociological work (Reece et al., 2021) exploring the ways in which "mattering" drives "actions and consequence" (p. 228). Something really matters when it is obvious it has driven action and consequence – it has, to put it simply, "had an impact" (Reece et al., p. 229). Thus, if regulatory safety – or any concept of safety – is to be compellingly meaningful; it must be obvious it *matters*. This means any of the actions required by the regulations, in the name of safety, must clearly have a positive consequence on safety if regulations are to be meaningful to the regulatory reader.

Conversely, if the reader sees regulatory demands that apparently do not matter, that is, do not have a safety impact, it is likely such a regulation will be meaningless and uncompelling to the reader. Therefore, any time the term meaning-making is used in the research it is indicating consequentially that which matters tangibly and actionably to reality-based safety. This eventually leads to Chapter 8 where reality-based safety – what matters – is connected in a meaning-making way to that which self-evidently emerges from the consequences of ATSB incidents and accidents. This is conceptualised as the ten attributes of the IASA model which are also referred to, from time to time, as the ten red rules – or collectively as "red rule safety".

Red rule safety is used as a term in the research to distinguish the IASA model as a reality-based, essentialist conception of safety. This is in distinction to "safetyism (see below), "fussy law" (Section 6.7.3), and "liability-proofing" (Section 6.7) which are non-accident-proofing "safety" concepts identified by the research. The red rule safety concept is modified from the idea of "red rules" cited in health care literature; for example, Jones and O'Conner (2016), who describe red rules as "associated with acts that have the highest level of risk to patient or employee safety if not performed exactly each and every time" (p. 132).

In aviation, red rules have been identified by Kern as having profound meaning-making power because, as Kern (2009) explains, they are "written in blood" (p. 87). Kern's metaphor of blood colloquially refers to the fact red rules emerge as lessons learnt from fatalities and hull losses. Rules in red therefore codify the wisdom necessary to prevent the recurrence of similar tragedies by prioritising themselves over what Kern (2009) calls the congesting "rules in brown" – colloquially referred to as "butt-covering" rules (p. 87). In this situation, the "safety" rules may no longer be addressing the seriousness of accidents because they have been congested by safetyism, fussy law, and liability-proofing. Hence the need arises to delineate the concept of safety based on red-rules from safety concepts not necessarily conducive to accident prevention (as the research will show).

1.6.2 Meaning-making and Sense-making

The term "meaning-making" is used in the research to denote the idea that meaning is actively made not passively processed. Another term, "sense-making", from aviation research into fear-potentiated startle, (Martin et al., 2015, p. 100) and work from Weick (2012) on organisational factors was considered but ultimately rejected. This was because sense-making tends to connote an idea of "making sense" of one's sensory inputs to cohere the reality outside with the cognitive "reality" inside. While meaning-making involves sense-making, the former better connotes broader ideas of purpose and intent. A text, particularly an aviation safety text, is always written with a purpose meant to convey conviction and action. Sense-making may not require any purpose, conviction, or action, whereas meaning-making always does.

1.6.3 Meaning-maiming

"Meaning-maiming" is sometimes used within the thesis to draw attention to the fact the same textual mediums that make meaning can also maim meaning – where "maim" is used in its simple denotative sense "to make defective" (Chambers, 2014). The textual medium is never neutral. Thus, if a text is referred to as having both meaning-making and meaning-maiming characteristics, it is to signify the hermeneutic potential for both correct and defective interpretation in the text's non-neutrality.

1.6.4 Preknowingness instead of Pre-understanding

"Pre-understanding" is a term used in hermeneutics to describe the idea a reader approaches a text with a pre-existing framework of understanding which shapes the textual meaning-making that follows (see Chapter 4). Although pre-understanding is a well-used term in hermeneutic literature, a deliberate choice has been made in this research to change it to "preknowingness". There are three key reasons for this choice.

First, pre-understanding tends to connote a slight passivity in meaning-making – as Chambers (2014) puts it a "mental result of perceiving" – when in fact it is an active and convictive dynamic in a "felt" reality. Furthermore, as Gadamer (2013) points out, pre-understanding is a very real, very actualised "fusion" of previous experiences – it is, in fact, a "history" of experiences (p. 315). Preknowingness thus better conveys the idea of a non-passive knowingness in the internalised framework of a reader's understanding.

Second, pre-understanding can connote a sort of bias or presumption which, although in one sense partly true, does not connote the intended fullness of the term used in hermeneutics. The term points to far more than a presumption, a presupposition, or a bias: it points to a strongly felt and a strongly known reality. The conviction of this reality can be illustrated in the anecdote where someone asks a person who is permanently wearing blue-tinted glasses how they see the world. The intuitive answer is, of course, "blue" but the hermeneutic answer is the person is seeing the world as it *really* is. They are not consciously seeing the world in a blue-biased way, or in a blue-presumed way, they are just seeing the world with an ingrained, blue-tinted preknowingness.

Preknowingness is thus not only a fuller term but strongly connotes the conviction-bringing reality that is as substantial as, to adopt a colloquialism, "knowing that you know that you know that you know". To maintain this sense of ingrained reality, preknowingness is introduced and used throughout this research (as well as its variants "knowingness", "preknown" etc.).

Thirdly, preknowingness is a nod to, and a release from, the tension of the hermeneutic problem introduced in Chapter 4 and foreshadowed by the problem of subjectivity and safety-meaningfulness in Chapter 2. This is necessary because, as will be seen, the notion of pre-understanding too easily suggests an over-realised subjectivist frame. By using preknowingness as a term, the hope is that a healthy symmetry between the objective ("knowing") and the subjective ("preknowing") will be connoted. This respects a key goal of this research which is to draw usefully from both sides of the subjective-objective tension (see more in Section 4.4).

1.6.5 Safetyism and Unsafety

"Safetyism" is a term recently coined in the social sciences (Haidt & Lukianoff, 2018) and, amongst other things, refers to the way:

> Overreaction and overregulation are usually the work of people within bureaucratic structures. They know they can be held responsible for any problem that arises on their watch,

> especially if they took no action to prevent it, so they often adopt a defensive stance. In their minds, overreacting is better than underreacting, overregulating is better than underregulating, and caution is better than courage (p. 203).

"Safetyism" is thus useful shorthand for the bureaucratic tendency, in the name of safety, to overreact and overregulate. It signposts, as will be shown, the ways in which regulations can easily achieve bureaucratic goals while subverting safety goals (Dekker, 2014).

Another modification of the word safety in this thesis is the word "unsafety". Unsafety, as will be seen in Chapter 8, signposts the deconstructive strategy being used to make meaning of safety via its antithesis. A fuller explanation is available there.

1.6.6 Responsible and Response-able

"Responsible" has certain connotations in aviation safety regulations relating to regulatory duties. This is seen in regulations where "Responsible Managers" are delineated from the "Accountable Manager" (for example CASR Part 42.500, p. 320). The use of the word responsible therefore has certain litigious connotations which the research intends to avoid. Instead, responsible is sometimes rendered as "response-able" to indicate that, in the reality-based IASA model, responsible agents (see Chapters 7 and 8) are literally "able to respond". Since the term parallels the sound of the traditional rendering of "responsible" it still retains some of those connotations but with an emphasis on individual action which then flows meaningfully into the importance of agency in the IASA model.

The term response-able is also intended to complement the concept that meaningfulness is cemented when it is clearly actionable. This facet of meaningfulness emerges elsewhere in hermeneutic literature such as the works of Greenhough and Roe (2010) and Murris and Bozalek (2019). The application here is that one might conceptualise safety as something that can be defined (as will be seen in Chapter 2), but if it can't be actioned then, by default, it will not be response-enabled. Hence, in this research, the term response-able signposts to the reader that any successful conception of safety will be one that is compelling because it is clearly actionable.

1.6.7 Core Safety Regulations

"Core safety regulations" is used as a term throughout the research and refers to those already enunciated in Section 1.4 above; namely, the Act, CASRs, CARs, CAOs and the MOS. There are many other regulatory materials such as, in CASA's own words, "Airworthiness Directives (ADs), instruments, approvals, Australian Technical Standard Orders (ATSOs), authorisations, designations, determinations, directions, exemptions, instructions, permissions, permits, specifications and revocation notices" (CASA, 2021a, paras. 2-3). These other regulatory materials are considered non-core regulations for the purposes of this research.

1.6.8 Accidents, Serious Incidents, and Incidents

The terms "accident" and "incident" are used throughout the research and borrow from the ATSB's explanations of these terms which are as follows:

- **Accident**. An occurrence involving an aircraft where: a person dies or suffers serious injury; the aircraft is destroyed or is seriously damaged; any property is destroyed or seriously damaged.
- **Serious Incident**. An incident involving circumstances

indicating that an accident nearly occurred.

- **Incident**. An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation. (ATSB, 2021e, paras. 1-3)

1.6.9 Use of Introductory Chapter Quotes

It may be wondered why apparently random quotes from random sources appear at the start of each chapter. In their wide-ranging literary scope, and their sometimes slightly irreverent relevance to the chapters they introduce, the quotes signpost the fact that hermeneutic principles apply as equally to literature, as to philosophy, as to safety regulations as to *The Princess Bride*. This is because, despite the apparent randomness of the quotes, the introductory quotes are all meaning-generating texts operating with the same meaning-making textual dynamics. Additionally, insomuch as the quotes allude to the distilled wisdom of the ages, they are thus intended to self-evidently complement the ideas that follow each chapter's introduction.

1.7 Benefits of the Research

Bernstein (2011) states "we are 'thrown' into the world as beings who understand and interpret" which means "we must seek to understand understanding itself, in its rich, full, and complex dimensions" (p. 113). It stands to reason then, when we are "thrown into aviation", we ought to understand how we understand, and misunderstand, the safety of the aviation safety regulations. This research offers a meaningfulness of safety – the IASA model – that matters because it emerges from actual incidents and accidents. It is hoped this will enhance aviation safety by:

- Encouraging and emphasising, through the ten attributes and red rule safety, regulations and procedures that empower the best of humanity's safety practices while constraining the worst.
- Helpfully providing a means of legitimising safety-essential, regulations and safety indicators while, at the same time, mitigating the relentless accretion of regulations non-conducive to accident-prevention. This accretion, as will be demonstrated in the research, is creating significant problems for air safety.
- Equipping the aviation community with a higher degree of meaning-making self-awareness when dealing with aviation texts.
- Providing an additional investigative trajectory for aviation accidents and safety occurrences in Australia.
- Producing basic meaning-making content for current and additional subject areas of Human Factors training.

1.8 Conclusion to the Introduction

This research shows what happens when no shared and compellingly actionable concept of safety is widely employed. In summary, and as will be seen, it leads to the legalistic congestion of authentically safe regulations and their accident-proofing goals. In response, the research proposes a solution in the form of red rule safety as conceptualised in the IASA model. This is done in the hope that while the paper the rules are written on will not cushion the meeting of stone and steel, they might better empower the people trying to prevent such a meeting in first place.

CHAPTER 2: MEANINGFULNESS IN HERMENEUTICS, SAFETY AND REGULATIONS: A LITERATURE REVIEW

Our words matter. Our words have consequences…
We cannot just walk away from that…

~ Sidney Dekker

2.1 Introduction

2.1.1 Aim of the Chapter

The question asked in the introduction was why at Avtex Air were there such different conceptions of safety from the same regulation? This then led to several other questions: what makes safety meaningful in the first place, what really matters to safety, and how might a hermeneutic approach be useful? As will be seen, while a hermeneutic approach to these questions in aviation is relatively rare, questions as to the nature of safety itself are not, nor are questions of regulatory effectiveness. To understand then the value of a hermeneutic approach within the context of existing literature, and the different insights it might bring, the literature review proceeds in four stages.

First, since safety as a concept is so integral to the thesis, the literature review provides an overview of the ways in which safety is defined and conceptualised in general safety and broader aviation contexts. Second, having reviewed the definitional meaningfulness of safety, as well as some of its definitional problems, the review moves to an examination of safety in aviation academia. This includes efforts to explore the meaning-making dynamics of safety outside of hermeneutics. Third, since this thesis ultimately questions the effectiveness of regulations in facilitating a compelling vision of safety, the literature review examines key works relating more broadly to regulatory effectiveness. Finally, the literature review moves to an examination of hermeneutics in aviation safety. Here it is shown, in the main, hermeneutic approaches to aviation safety are underdeveloped. This is despite hermeneutics offering a unique perspective not necessarily offered by other contemporary approaches.

2.1.2 Outline of the Chapter

The outline of Chapter 2 is:

- Section 2.2 – Safety and definitional meaningfulness.
- Section 2.3 – The meaningfulness of safety in aviation academia.
- Section 2.4 – The effectiveness of regulatory safety.
- Section 2.5 – The meaningfulness of aviation safety in hermeneutic literature.
- Section 2.6 – Conclusion to the literature review.

2.2 Safety and Definitional Meaningfulness

Oxford provides denotative meaning to safety by defining it as "the condition of being protected from or unlikely to cause danger, risk, or injury" (Oxford University Press, 2015). This is replicated by other dictionaries with some small variations:

- "Freedom from danger or risk of injury" Collins (2015).
- "Freedom from danger" Chambers (2014).
- "The quality of insuring against hurt, injury, danger, or risk" Macquarie (2020).

Definitionally then, safety is a state where the likelihood of danger, risk or injury is reduced by some protective or causality-reducing mechanism or mechanisms. Hence, if one wants to be safe, one must identify the conditions of hurt, injury, danger, or risk and remove or protect against these in some way.

Dictionaries are not the only place safety is given meaning definitionally: Runciman (2006), on behalf of the Australian Council for Safety and Quality in Health Care, coordinated what became known as the "Shared Meanings" project. This project entailed various clinicians submitting preferred definitions for a variety of words to a website. Chief among them was the word safety. The resultant definition for safety was, very simply, "freedom from hazard" (Runciman, 2006, p. 42). This is well within the semantic camp of the various dictionary definitions and especially the Chambers definition "freedom from danger". Of course, given the lack of a difference, one might be forgiven in wondering why a dictionary definition was not used in the first place, thus saving the research effort; nonetheless, Runciman's effort shows that dictionaries are apparently quite good at expressing the general usage of a term.

Another offering from a definitional perspective comes from the World Health Organisation Collaborating Centre for Safety Promotion and Injury Prevention (Maurice et al., 2010). A total of 50 experts, two years' worth of research, and input from various municipality administrators established the definitional concept that safety is:

> A state in which hazards and conditions leading to physical, psychological, or material harm are controlled in order to preserve the health and well-being of individuals and the community. This state is not only related to the absence of

> intentional or unintentional injuries. It must also lead to a perception of being sheltered from danger (p. 2).

This definition of safety expands the dictionary meaning by adding physical, psychological, or material harm. It also introduces the idea safety is a subjective perception as well as an actual state.

It is with the idea of safety as a "perception" that the definitional meaningfulness of safety becomes more complex. Up to this point safety definitions have cohered with what most safety practitioners would see as the straightforward basics of risk management: the identification and mitigation of risk through protective or preventative measures (International Standards Organisation, 2018, p. 8). The International Civilian Aviation Organisation's (ICAO's) definition of safety certainly reflects this risk-management perspective of safety (2018). ICAO defines safety as "the state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level" (p. 2-1). ICAO's meaning of safety thus contours the meanings provided by the dictionaries albeit with greater precision regarding the protective or causality-reducing measures. For ICAO (2018) this is not just the generic application of "freedom" or "protection" from danger; rather, it is "the state in which risks are reduced and controlled to an acceptable level" (p. 2.1).

So far, all this would seem to be uncontroversial to most people infused with the current language and practices of modern safety management. Yet, as with many weighty concepts, and as already seen in the brief introduction to Avtex Air, safety meaning-making is often anything but straightforward. Several clues as to the complex reality of safety meaningfulness are evident in the disclaimer that appears in an early ICAO definition of safety

(2013). The earlier version's disclaimer states: "human activities or human-built systems cannot be guaranteed to be absolutely free from operational errors and their consequences" and furthermore "safety performance is often influenced by domestic and international norms and culture" (p. 2.1). This statement, and its implied gradation of risk, jars with the binary meaningfulness presented by the average dictionary and its "freedom from danger" denotation. One cannot be partially free. One is either, by definition (ironically enough) completely free or not. One cannot be partially insured from "hurt, injury, danger, or risk" to be "safe". Hence, because safety is not binarily one state or another, one must deal with the vagaries of the quantitative; that is, how much risk (or how little) equates to a "safe" state.

Furthermore, since both the earlier and more modern ICAO definitions attempt to establish safety as being an "acceptable level" of risk (2018, p. 2-1), and yet both use the term "acceptable" to do so, they are inherently prone to subjectivity and variability. This is because "acceptable" literally means "able to be agreed on or suitable" while "suitable", the underpinning term for acceptable, denotatively means "right or appropriate for a particular person, purpose, or situation" (Oxford University Press, 2015). An obvious problem arises: "right or appropriate" for one person, as already seen in the Avtex Air example, is not right or appropriate for another.

All this means the ICAO definition, although deferring to the apparently more sophisticated risk management term of "acceptable", offers no satisfyingly empirical clues as to how "acceptable" could be consistently quantified or qualified. Nor does it offer any suggestion on how safety itself could, as a term, escape its own variability.

The variability of safety becomes even more obvious, and more problematic, in ICAO's observation that safety is "often influenced by domestic and international norms and culture" (2018, p. 2.1). The statement appears almost as an afterthought to the definition of safety and thus significantly understates the profound power of norms and culture (as well as many other factors) to shape perceptions of what is normatively acceptable or not. The fact is "norms" and "culture" have weighty effects on the meaningfulness of safety as pointed out by many safety scholars (for example Bye & Lamvik, 2007; Henriqson et al., 2014; Reason, 1998; Watkins, 2013).

This all serves to demonstrate "objective" definitions of safety may appear to bring standardised meaning-making but the reality is such objectivity always enters the grid of personal subjectivity. In this ingrained subjectivity, as the rest of the research will show, not only are definitional words influenced by subjective dynamics but so too the interpretative "reality" of the very nature of safety in the first place. Thus, interpretative subjectivity is not easily assuaged by a few sentences of definitional words that are themselves prone to the same subjectivity as the word the definitional words attempt to define.

When it comes to definitions of safety and Australian aviation safety regulations, it is worth noting that, although regulations provide very many definitions, nowhere do they provide an authoritative definition of safety. The closest is in a Civil Aviation Advisory Publication (CAAP). In CAAP SMS-01 (CASA, 2018), safety is defined as: "the state in which the probability of harm to persons or of property damage is reduced to, and maintained at, a level which is as low as reasonably practical through a continuing process of hazard identification and risk management" (p. 9). Another CASA-associated, but non-authoritative, definition of safety is from Aleck (2008), head of CASA Legal Services Group, who defines safety as "the state or condition in which the risk of harm to people in the first instance, and then to property, is perceived by relevant actors to be at a level that is acceptable" (p. 2). These non-authoritative definitions closely resemble ICAO's definition which means they carry with them the same problem – how to objectively and consistently assess the somewhat subjective terms upon which the definitions rest e.g., "reasonable", "perceived", "acceptable" etc.

In any case, the CAAP definition is self-statedly an advisory publication while Aleck's definition is his own. This means, in the absence of a regulatory definition, the term "safety" in Australia's regulations falls under the general usage clause. The general usage clause is explained in the CASR amendment "How to Use CASRs" (2002) and states "ordinary dictionary words are not normally defined; they are assumed to take their ordinary dictionary meanings" (p. 10). Thus, in the main, safety is left to the dictionaries. This is peculiar since the word safety is so critical to the content and intent of regulations. Many other words of far less consequence are defined therein, so why not this meaning-essential word?

Bartsch (2019) notes this definitional absence of safety in Australian safety regulations citing a former head of the Federal Aviation Administration (FAA) who says, "without a sanctioned definition of safety, there can be no safety yardstick, no safety standard" (p. 694). One could argue the general usage clause provides the yardstick; that is, the sanctioned definition since CASRs, as seen above, stipulates any word not specifically defined must be defined by a dictionary. Even so, and even if the ICAO or CAAP definition became a definitional yardstick for the regulations, these definitions provide no reliable yardstick. This is because the

ICAO and CAAP yardsticks are dependent upon highly subjective words such as "appropriate", "acceptable" and "reasonable".

Having said that, safety regulations in Australia do provide vast lists of definitions. These are, by their inclusion, considered important enough to be legally clarified and standardised which again makes it significant that safety is not included. Perhaps this is because the meaning-making challenge already enunciated proves too formidable; namely, providing consistency for different readers with different ideas of what safety is in the first place. This is a challenge that should not be understated. It is, in fact, the heart of this research. Bartsch (2019) explains the essence of the problem (interestingly enough, for lawyers who will have to interpret safety in light of the Australian law): "safety, due to its nebulous nature, is a subjective experience" and "whether we like it or not, any assessment of safety will always be an estimate" (p. 695).

Thus, when it comes to the law, a key problem of meaning is that the subjectivity of safety linguistically stows itself away in the legally authoritative safety regulations with problematic effects. This is because safety in the regulations is defined by general usage (the dictionary) and thus all the meaning-making (and meaning-maiming) problems of definitional meaning discussed above apply – in short, the lack of a consistent non-subjective metric with which to compellingly reconcile perceived and differing interpretations. Thus, safety can be a legal word in a legalised act or regulation. It can even be the middle name of the regulations and the regulator but, when the regulations and the regulator rely upon safety (and its subjectivity), they rely upon a variable masquerading as a constant.

With this in mind, the literature review turns from safety definitions to academic works on the meaningfulness of safety. Here it is noted that while the regulations themselves do not address the subjectivity-problem in any depth, there is a significant amount of academic research that does, albeit with varying degrees of success.

2.3 The Meaningfulness of "Safety" in Aviation Academia

The problem of a normative standard to make something meaningfully safe is what births the various academic writings reviewed here with, perhaps unsurprisingly, Reason (1998) leading the way. In an early work, Reason highlights the fact that because accidents are relatively few, the preconditions for such accidents are conceptualised theoretically rather than experientially and this has important implications for the way safety is assessed. This is because "If people see nothing, they presume that nothing is happening, and that nothing will continue to happen if they continue to act as before" (p. 294).

Reason (1998) argues that because perceptions of safety are inextricably fused with a generally consistent experience of non-events, the successful recognition of the preconditions for an accident, and what must be done about it, are dependent upon "the beliefs, attitudes and values of its members regarding the pursuit of safety" (p. 294). These "beliefs, attitudes and values", what Reason defines as culture, must be supported by systematised data gathering (an informed culture) and by a shared knowledge as to where "the line between acceptable and unacceptable behaviour is clearly drawn (a just culture). Reason then overlays the famous "Swiss Cheese Model" over these conceptions of safety demonstrating how organisations have, amongst other things, various structural, regulatory, and training layers of protection against an accident. So influential is Reason's thinking that it has spawned such investigative methodologies as the "Human Factors Analysis and Classification System" (HFACS); the "Incident Cause Analysis Method" (ICAM): Shell's Tripod Beta and a variety of other methods relying on Root Cause Analyses (Reason et al., 2006, p. 9).

The importance of Reason's concepts cannot be understated but despite their pedigree they suffer from the same problem the simple dictionary definition of safety suffers from: subjectivity. The cultural aspects of safety – the beliefs, attitudes, and values of safety – are subjective attributes subjectively applied to the "root causes" and the latent safety failures of Reason's model. Thus, the lines between root causes and secondary causes, serious or non-serious errors, just or unjust actions etc., are often arbitrarily drawn. This is hinted at by Reason (2006) who wryly notes there is no notion of "root cause" in the Mark III Swiss Cheese Model and that "a 'root cause' is the contributing factor that you are working on when the money or the time runs out" (p. 9). This is not to say the model and its methodologies are non-useful but that they almost always, at some point or another, tend towards subjectivity when it comes to assessments of threat, risk, or danger.

An additional problem of the safety conceptualisations drawn from the Swiss Cheese Model is they appear uncannily coherent after an accident. This is despite the fact they are, pre-accident, weakly predictive, as Reason (2006) points out (p. 20). Additionally, because the models are overwhelmingly retrospective, they tend to focus forensically on what has gone wrong rather than on all the things that are going right in non-accidents. Admittedly this is not so much because of Reason's thought but rather how others have applied his thought. In a comprehensive assessment by Reason et al. (2006) of the Swiss cheese model, the point is made by his cowriter Hollnagel that its "enthusiastic use sometimes relied on interpretations of the model's semantics that went rather far beyond what was initially intended" (p. 2). Nonetheless, despite Reason's best intentions, the fact remains there has been a preoccupation with the consequential, post-accident explanatory power of the Swiss cheese model rather than, perhaps as Reason wanted, the pre-accident conditions. This can be seen in all the aforementioned tools – HFACS, ICAM etc. – which are designed for use *after* an accident or incident.

Rochin (2003) highlights one of the most significant problems with the negative fixation on hazard and risk as a conceptualisation of safety. Rochin notes that from the 1970s "modern societies have become almost obsessed with the question of risk and how to reduce or control it" (2003, p. 123). This has had the deleterious effect of there being "no real definition, observation, or social indicator called 'safety' independent of thinking about specific risks" (p. 124). Using a medical metaphor, Rochin shows how this is like seeing health as merely the "freedom from disease or other negative interventions" (p. 124), when in fact it includes the fullness of fitness, wellness, and personal meaning. Rochin then makes the point that safety-meaningfulness might be better served by making a distinction "between safety and something called 'safeness'" (p. 124). The safety-safeness distinction is necessary, Rochin notes, because safety is so laden with negativist connotations of risk it is hard to extricate it from the "freedom from disease" construct and move it to the "fitness and wellness" conception. This is another reason the term "red rule safety" is used throughout this thesis (see Section 1.6.1). It signposts the idea that, as will be seen, the IASA concept of safety – a red rule safety concept – is not merely focussed on risk mitigation ("disease") but on certain "fitness" attributes (the ten attributes in Chapter 8).

The implications of a safety-in-absence conception is covered comprehensively in the work of Hollnagel (2018) who compares conceptions of "what went wrong" with "what's going right" under the auspices of "Safety I" and "Safety II". Hollnagel (2018) shows that safety should be seen as the fullness of things that happen – not merely things that "haven't happened or are being prevented from happening" (p. 608). This is an important step for safety because it reframes safety into tangible actions – "work as done" rather than "work as imagined" (p. 608). However, it is notable the next logical step Hollnagel takes is less precise. This is because there are no consistently objective examples of "what must be going right" in the first place for safety to succeed. This is seen in Hollnagel's attempt to develop the Safety II idea into a model called the Functional Resonance Analysis Method (FRAM). While FRAM helpfully identifies the complexity of everyday organisational functions (Hollnagel, 2012), it does not clearly identify, in a compelling way, decisive safety-bringing actions. To be fair, this is probably because the utility of FRAM is in expressing safety-influencing functionalities rather than provisioning objective assessment tools of what safety is in the first place. Nonetheless, it is difficult to see how Hollnagel's work addresses the problem of safety-subjectivity despite the very helpful framing that results from Safety I and II concepts.

Perhaps unexpectedly, and with additional meaning-making implications for safety, an aviation industry that has intuitively embraced a style of Safety II is the insurance business. As Lin and Chang (2008) demonstrate in a study into aviation insurance premiums, the idea of risk as merely the absence of danger (or even the control of that danger) is not the only factor that determines the overall safety of an airline. Along with the performance of airlines, couched in terms of accident rates, the biggest factor affecting the cost of insurance was the loss of experienced crews. This is important finding because insurance companies have long recognised the challenge of assessing aviation risk in a context where catastrophic events occur at irregular intervals. Airlines "buy aviation insurance to transfer the cost of their potentially catastrophic daily risks" (p. 454), which means the insurance companies must effectively assess risk as more than just the absence of an accident. Thus, they seek to identify the fullness of accident-proofing conditions which, in the main, they see as crew experience closely followed by, amongst others, financial status, fleet profiles and movement rates. Safety is not therefore a low accident rate (the absence of disease) but the performative wellness of experience, profitability, and reliability. Lin and Chang's research is helpful because, as for Hollnagel, it refocuses meaning-making on factors beyond the lack of accidents. Nonetheless, in the sense of safety-as-fullness – as experience, profitability, and reliability – the same problem of subjectivity applies to Lin and Chang's work as it does in safety-as-absence meaning-making. How does one objectively assess what type of, and to what degree, experience, profitability, and reliability makes one company "safer" than another?

Further problems that arise from subjective conceptions of safety are discussed in Summerton and Berner's (2003) work. In a number of case studies, as well as reviews of broader literature, they demonstrate how conflict over safety ensues because of "varying perspectives and interests" and because risk is constructed in "highly different ways" (p. 2). Safety, in their observation, is very much a function of the "ongoing practices, situated experiences and socially embedded interactions among actors" (p. 3). Summerton and Berner show that practitioner analysis of risk (normally involving rule-of-thumb heuristics) is generally quite different to that used by economic and technical professionals. This produces an inadequate concept of safety especially if managers "are sloppy about such central matters as individual perception of risk" (p. 5). Again, the problem of subjectivity is highlighted: how can the meaningfulness of safety be understood, let alone managed, without accounting for individual perceptions of risk? Moreover, and perhaps more importantly, what happens if it is assumed individual perceptions of safety are the same as corporate conceptions when they are not?

Bye and Lamvik (2007) demonstrate what happens when one assumes risk and safety will be conceptualised the same way at the operational level as at the managerial level. In a review of Norwegian maritime accident statistics in the North Sea (which included a survey of 630 employees from 35 vessels), it was observed, despite clear knowledge of high fatality and injury rates "the workers themselves did not feel unsafe" (p. 1762). Bye and Lamvik (2007) give several explanations for this the foremost being that "subjective risk perception must be seen as a contextually dependent social construction" (p. 1762). This was especially evident in the workers themselves – workers who experienced precisely the same context and conditions in the North Sea and yet "less experienced employees felt relatively less safe" than experienced employees (p. 1762). Thus, even within the same context, with the same frontline conditions; profession, age and experience produced varied assessments of felt safety.

In another study of risk perception, in the context of offshore helicopter night operations, the findings were equally telling (Nascimento et al., 2012). The offshore helicopter industry is, arguably, the most scrutinised, proceduralised and regulated rotary wing industry in the world. The International Association of Oil and Gas Producers is "frequently commended for its aviation policies and standards, based on which member companies require advanced safety programs from contracted helicopter service providers" (Nascimento et al., 2012, p. 142). One could easily assume that safety in such a heavily scrutinised industry is conceptualised consistently considering the amount of scrutiny and regulation. Yet, the study went on to find, in a reversal of the Norwegian maritime study, much higher levels of concern from frontline crews regarding night-time operations than their managers. This was reflected in the "large number of hazard categories, codes and sections" and the comment that "concerted efforts by the different stakeholders in the offshore helicopter industry (i.e., a systemic approach to safety) are required to address the problems of unacceptably high accident rates" (Nascimento et al., 2012, p. 152). Once again, the perception of risk varies widely between stakeholders in the same industry. This was most obvious in the disparity between corporate and frontline perceptions, but again, as for the maritime Norwegian study (Bye & Lamvik, 2007), there was some variability between frontline operators. For example, 77% of operators indicated additional training would increase safety which meant 23% percent did not. Similarly, 29% of operators experienced "dread" at the thought of night-time operations which meant 71% did not and 40% of operators felt experience was a major safety concern whereas 60% did not (Nascimento et al., 2012, p. 150).

A similar difference between corporate and frontline safety perception is seen in Hart's study of offshore safety and corporate social responsibility. Hart (2013) points out "appropriate" perceptions of safety at the corporate level are not necessarily deemed appropriate at the worker level: "the assumption of a common interest between employer and employees ignores, at a theoretical level, the inherent inequality between capital and labour" (p. 522). Hart (2013) presses on the nub of the issue: the "common interest" underneath any semblance of shared employer/employee is not common at all. Instead, the interests of productional "safety", in the form of corporate profits and prestige, can easily displace an employee's personal and physical safety (p. 522). Moreover, further complicating the issue, and echoing Reason (2006, p. 294), the rarity of accidents means far more subjective and ultimately more imprecise, anticipations of risk are employed, and these anticipations are easily contested (even between, as seen previously, the workers themselves).

Körte (2003) expresses the same theme as Hart demonstrating the subjective bias of corporate perspectives that see the pilot as the safety problem since they are the source of "human unreliability" (p. 244). Korte's work usefully encourages an organisation's safety thinking to extend upstream of the cockpit; however, "the essence of risk and decision analysis" – the ability to "anticipate the situation as far as possible and to be able to express what a good decision should be" (2003, p. 244) – is once again inherently subjective. This subjectivity is seen in the working model given by Körte. The model provides an array of possible decisions and consequences in an offshore, vibration-induced helicopter emergency. Körte's model is comprehensive, but it does not account for the intrinsically variable risk-values different individuals might have in the same situation (see again, above, Summerton & Berner, 2003; Bye & Lamvik, 2007; Nascimento et al., 2012). The fact is the level of danger one feels about each malfunction in each context will vary from individual to individual which means so will the chosen actions.

There is also a problem with Körte's offshore helicopter example more broadly. Körte's scenario produces dozens of branches from dozens of inputs but the vibration emergency is just one of a multitude of emergencies that can occur. If the model was applied to all imaginable circumstances, the sheer array of decision-trees would soon become a vast forest so large as to be virtually unnavigable. While Korte's work is a noble effort, it is nonetheless a cautionary tale as to what happens when one tries to empircalise every decisional vagary of safety; namely, an overwhelming number of algorithmic branches and options that are functionally near useless in the real world. Hollnagel's FRAM (2012) can be similarly complex as can other models where complicated statistical data, standing in as a scientific insight, becomes functionally challenged (for example, Hubbard, 2008; Nascimento et al., 2012). Such conceptualisations of safety tend to render even more obscure many of the already obscured issues.

On the other hand, a counter argument is that such models are complex because safety is complex, but this understates the role of models which is to bring a simplifying schemata. As Reason (2017) points out, the best safety models have a simple and compelling internal logic that acts as an "explanatory engine" and the ultimate question to be asked of such models is a very practical one: "do they improve safety?" (p. 267). The answer must surely be no if the conceptualisation of safety – model, formula, or algorithm – is so complex it cannot practically adapt to the everyday world. In any case, the point of this review is not so much to critique attempts at empirically quantifying safety, but to point out such efforts result in differing conceptualisations of safety. These conceptualisations have certain meaning-making implications that are both helpful and unhelpful (as was seen above with Reason's own iconic Swiss Cheese Model).

There is still other research highlighting the implications of perceptual vagaries between stakeholders. For example, Green's work assessing the risk perceptions of flight instructors found 33%

did not consider flying to be a risky activity whereas, presumably, the rest admitted at least some degree of felt risk (2001, p. 2). This harkens back to Avtex Air where a percentage of pilots felt the risk around flight into forecast icing was significant enough to ground the aircraft whereas others did not. Green (2001) concludes, citing Slovic (1987), that "those who promote and regulate health and safety need to understand the ways in which people think about and respond to risk" (p. 2). This is a good point especially since people so obviously think about and respond to risk in markedly different ways. There is thus a great need for a meaningfulness of safety that can, amongst other things, be reflectively self-aware of its own subjectivity.

Merkert and Hensher (2013) show yet another discordant aspect of the meaningfulness of safety in their study of air transport contracts in Australia and Europe. In this work, the point is made that "issues around safety and maintenance of aircraft have been perceived by a large number of operators as more complete/successful than their degree of clarity when signing the contract" (p. 378). Thus, even with the same contractual words, the perceptions of safety are found to be quite different once the contract is applied in everyday operations. In another example of intersubjective ambiguity in the meaning-making of safety, Gilbey et al. (2016) describe the way in which under-reporting occurs when operators deem a non-consequential incident as not worthy of such reporting (p. 141). This is despite the fact the same error or non-compliance, when it does produce a negative consequence, is seen as report-worthy. Gilbey et al. (2016) surmise perceptions of threat are diluted when no tangible consequences emerge. They also surmise that an error or threat, initially perceived, changes in perceptual weight once time passes. In any case, once again the concept of safety is contingent upon non-static premises.

In like manner, but this time with pilot and Air Traffic Control (ATC) communications, a study by Mosier et al. (2013) of the American Aviation Safety Reporting System (ASRS) found communication conflicts often occur because of tonal changes. The tonal changes were a result of different risk perceptions between pilots and controllers (p. 215). A moderate tone from ATC traffic, as opposed to an elevated tone from taxiing or flying pilots, was because the pilots were reading more risk into the situation even though they were observing the same situation as ATC. These tones, underpinned by varying perceptions of risk, then promoted stress and conflict in ATC and pilot communications.

On another front, the bureaucratic front of regulatory and corporate safety governance, Dekker (2014) points out markedly different perceptions of safety occur when agents, bureaucratically displaced from the threats, are delegated the power to deal with such threats resulting in the "bureaucratization of safety" (p. 349). The displaced perception of those distant from the frontline context (the corporate managers, safety directors and regulators), leads to misguided assessments of risk and becomes self-defeating to frontline safety itself. Dekker (2014) is quite strong when he says, "the implementation of structures of bureaucratic accountability and systematic management of safety actually do it harm" (p. 354).

The bureaucratization of safety is perhaps nowhere more evident in the Australian aviation record than the response by CASA and the ATSB to the 2009 ditching of a Pel-Air medical flight. The aircraft crashed after several aborted landing attempts in marginal weather at Norfolk Island. The response became the focus of a report by the Senate Standing Committee on Rural and Regional Affairs and Transport (2013). The report found, amongst many other things, that the ATSB had not listened to stakeholder or expert opinion.

When it came to safety aspects, the investigation, was "not balanced and included scant coverage of contributing systemic factors such as organisational and regulatory issues, human factors and survivability aspects" (2013, p. xx). The fixation on piloting issues was surprising to the Senate. This was because the experts informing the enquiry had emphasised safety was contingent upon systemic factors far broader than mere piloting. And yet in the Pel-Air accident, safety was relegated to a different type of safety-meaningfulness – one resting solely upon the shoulders of the pilot in command.

Further, the Senate Standing Committee (2013) expressed their surprise that despite clear deficiencies from CASA in their surveillance of the organisational issues within Pel Air, only two "minor" safety findings were published by the ATSB. The Senate Standing Committee was concerned that such a serious accident could only have minor safety findings. The ATSB replied they were reticent to "over-use serious safety findings" (2013, p. 110). This quickly became another point of difference in safety-meaningfulness. The inquiry expressed their concerns this approach did not adequately facilitate the ATSB's oversight role. In reply, the ATSB argued their understated approach was, in fact, a safer approach because it allowed industry to respond on its own. This did not ease the alarm of the Senate who later stated they had significant "concerns with the ATSB's approach given the lack of ability to rigorously and transparently track actions taken in response to safety issues" (2013, p. 110) – the Senate were thus saying, in effect, the ATSB's conception of safety was unsafe.

What this again shows is that significant perceptual differences exist in conceptions of safety. The ATSB, unlike the Senate Standing Committee (2013) and its various industry experts, felt the safety issues were minor even though the night ditching nearly killed all the crew and passengers (p. xx). At the same time CASA did not for its own bureaucratic reasons deem the safety issues from their Pel Air audit "unsafe" enough to share with the ATSB as a part of the ATSB's investigation (Senate Standing Committee, 2013, p. xx). All of this raised serious concerns for the Senate yet, at the same time the Senate Standing Committee released its 26 recommendations aimed at addressing the serious failures of CASA and the ATSB, another report was released favourably proclaiming "Australia consistently maintains the lowest accident rates in most sectors" (Fernandes, 2014, p. 5). The inference was plain: safety, when measured purely by accident rates, meant Australia was performing favourably. This was quite the contrast with the Senate Standing Committee (2013) which had just strongly criticised CASA and the ATSB for their flawed assessments of safety in the Pel Air case.

If such radically different safety-outcomes ensue from the very authorities charged with safety, one can only imagine how much safety is subject to interpretative vagaries in industry operations. In any case, it is little wonder the Senate Standing Committee (2013) recorded they were "troubled by allegations that agencies whose role it is to protect and enhance aviation safety were acting in ways which could compromise that safety" (p. xxi) thus demonstrating to all the fickle nature of safety even at the regulatory levels.

The problem of an objectively compelling meaningfulness for the concept of safety also manifests itself in other ways. In academic literature, the fact "safety", can be so fickly inconsistent is often expressed in the need (and absence of) reliable (i.e., non-variable and consistent) safety performance indicators. Sorensen (2002) for example, explores the evolution of the term "safety culture", and explains that the concept of safety culture is problematic if it cannot be objectively measured in some way (p. 193). Gazica et al. (2018) likewise draw attention to the fact "there is a lack of published research on the relationship between safety climate and indicators of safety performance within the aviation industry" (p. 3). The lack of standardised safety-indicators is another manifestation of the problem of safety-meaningfulness. It highlights the problems of measuring safety in performative terms if it cannot, in the first instance, be consistently identified. Sorensen, along with others in their own ways (Henriqson et al., 2014; Watkins, 2013), identify a similar dynamic when they observe that while an abundance of research establishes "a relationship between safety culture (or its associated attributes) and safety of operations" (p. 194); very little, if any, research convincingly provides "identified and validated" performance indicators.

The subjectivity of safety also creates meaning-making issues in investigation taxonomies. A standardised taxonomy should, at least theoretically, consistently curate the variously identified hazards into some sort of meaning-making order that can then be used to identify concerning trends. The ATSB uses just such a taxonomy in the form of the Reason-derived HFACs model and the *SIIMS Occurrence Type Coding Manual* (2018). SIIMS codes and categories are expressed in, amongst others, the "operational" category (aircraft control, aircraft loading, communications etc.), the "technical" category (airframe, powerplant, systems) and the "environment" code (weather and wildlife). Apart from the issue of comprehensiveness versus useability, which is an issue for any taxonomy (see more in Section 9.5), the ATSB taxonomy seems to be straightforward. However, the same issues of safety-subjectivity emerge. This is because the term safety, with all its infused meaning-making issues, saturates the taxonomy.

Take, for example, the SIIMS (2018) explanation of how to differentiate between a *safety* factor and an occurrence type:

> In some cases, the same aspect of an occurrence can potentially be coded as either an Occurrence Type or as a Safety Factor. For example, occurrences involving weather fall into this category. The best way to approach this question is to remember that Occurrence Types describe "What" happened, while Safety Factors describe "How" and "Why" it happened. If weather is the main event, then code it as an Occurrence Type. If, however, weather is best thought of as an explanation as to how or why some other event occurred, then code the turbulence as a Safety Factor (p. 10).

Note how a "safety factor" is being conceptualised. It is not as the general-usage meaning ("freedom from danger") but rather as danger itself in the form of the turbulence threat. Thus, safety factor, as the ATSB codes it, is not really a safety factor at all (at least in terms of the average dictionary meaning) but something akin to a "threat factor". This is not to say most people, from context (see more in Chapter 6), can work out what is being said, but to emphasise safety is not as well semantically anchored as one might think – not even in a rather clinical taxonomy.

Another meaning-making point to note from the ATSB SIIMS taxonomy relates to the earlier discussion of Hollnagel's Safety I and II framework and how a Safety I perspective misses much of the meaning-making picture. The imbalance in safety meaningfulness can be seen in the ATSB taxonomy when turbulence is viewed from a Safety II perspective. Such a perspective would see the safety factors in the turbulence scenario construed meaningfully to such things as the engineering ruggedness of the aeroplane, the experience and expertise of the crew, and the turbulence mitigation procedures. Instead, only Safety I implications as "threat" factors are mentioned. This tends to ignore the myriad of factors going right to keep the aircraft safely aloft. Of course, none of this is meant to downplay the importance of the ATSB or their critical role in identifying Safety I threat factors. Rather, it is intended to illustrate the variable, and sometimes incongruent, ways safety can be conceptualised even in apparently empirical taxonomies.

As a summary to this section, what can be clearly seen is that the evaluation of safety is, as Hubbard (2008) points out, an assessment that is "an artificial distinction, an attribution, a human judgment – not an objective fact" (p. 466). Judgement is based upon memory, experience, cognitive context, and a myriad of other factors that are subjectively derived, meaning what one judges as safe can be judged by someone else as unsafe. The ingrained meaning-making variability in safety means every time the word is used, even in legal documents and official taxonomies, the documents and taxonomies inherit that variability. This raises serious implications for regulatory effectiveness heavily dependent upon a meaningfulness of safety that is consistent between regulatory writers and readers.

The next section provides a review of indicative literature examining the effectiveness of regulations. It does this in terms of the successful, or otherwise, legislation of safety and the ongoing challenge posed by safety-subjectivity. This is followed by an overview of hermeneutic approaches to safety-meaningfulness.

2.4 The Effectiveness of Regulatory "Safety"

The idea explored above that safety is a "contextually dependent social construction" (Bye & Lamvik, 2007, p. 1763) cannot be overstated. This is especially true when it comes to the regulatory meaningfulness of safety. Since safety and risk can be arbitrarily conceptualised because of subjective judgements, this means, at the very least, hard work must be done by the regulatory writers to establish safety as a meaningfully compelling and standardised concept. How effective then are safety regulations at regulating safety? In this section, a review of indicative literature analysing the effectiveness of aviation safety regulations in Australia is provided.

Before moving to the review of regulatory effectiveness, it is worth considering again the goal of the *Civil Aviation Act 1988*: "the main object of this Act is to establish a regulatory framework for maintaining, enhancing and promoting the safety of civil aviation, with particular emphasis on preventing aviation accidents and incidents" (p. 11). Safety is thus pivotal in the role of the regulations. It is also pivotal for CASA who is empowered with parliamentary authority (including enforcement) by the *Civil Aviation Act 1988* to facilitate "the safety of civil aviation" (p. 14). The terms "regulatory", "authority" and "enforcement" highlight the power the Act carries in civil aviation – a power intended to ensure the effectiveness of said regulator and regulations.

The obvious question from this is how effective then are the regulatory texts? A tempting response is to simply quote Australia's relatively low accident rate as expressed earlier by Fernandes (2014) but, as was seen, this report was released while the Senate Standing Committee on Rural and Regional Affairs and Transport (2013) was busy criticising the regulator and their regulations. This strongly indicates a low accident rate should not be used as the sole indicator of safety or regulatory effectiveness. A year after the Senate Standing Committee was released this seemed even more evident when another Senate inquiry, the Aviation Safety

Regulation Review (Forsyth et al., 2014), heavily criticised the regulations stating that "industry is frustrated with many new CASRs, viewing them as overly legalistic, difficult to understand, and focused on punitive outcomes" (p. 2). While there is much that could be said about this critique, the key point to note is regulatory effectiveness cannot simply be measured against low accident rates. If it could, two separate Senate inquiries, heavily critical of the effectiveness of the regulator and the regulations, would not appear concurrently with a report proclaiming Australia's low accident rate.

While accident rates are clearly problematic in terms of a useful metric to assess regulatory effectiveness, this does not stop accident rates regularly being employed as such. For example, Sabatini (2017), assessed the effectiveness of Australia's CASA-controlled State Safety Program (SSP) and concluded Australia has been largely successful in its safety program because the accident and fatality rate has remained largely stable (p. 10). Significantly, his sample period starts in 2003 and ends in 2014 which is again, approximately the time the two Senate inquiries discussed above were heavily criticising CASA's effectiveness in regulating aviation safety (Senate Standing Committee 2013; Forsyth et al., 2014). With Sabatini affirming the effectiveness of Australia's SSP, two separate Senate inquiries were strongly criticising it, demonstrating that conceptualising safety-success at the national level is as fraught with subjective incongruity as anywhere else.

On another note, it is worth highlighting Sabatini's work is also an example of how safety meaning-making is changed by basic statistical issues of categorisation and periodicity. A different sample to Sabatini's shows a slight increase in Australia's aviation accidents. This is expressed in Chapter 5 and includes Australia's total accident numbers (not just air transport) and expands the sample to a twenty-year window (2000-2019). This increase is concerning not only because of the obvious implications for those that want to use accident rates as an effectiveness-metric, but because the Act insists the emphasis for the regulator and its regulations must be on "preventing accidents and incidents" (p. 11). As already mentioned in Chapter 1, the regulatory word-count has increased 242% with no measurable decrease in accident rates which raises troubling questions relating to the overall effectiveness of this 242% increase. Much more will be said on this in Chapter 5 but for now, once again, it is clear measuring the success of the regulator and the regulations in terms of accident rates is problematic.

The troublesome correlation of accident rates with regulatory effectiveness is not just employed in Australia. Research by Finger and Piers (2005) into a higher than world-average accident rate led them to conclude there were, in the Swiss context, "significant regulatory and institutional deficiencies with direct implications for safety" (p. 20). Finger and Piers (2005) reached this conclusion by benchmarking Swiss accident rates against the rest of the world stating: "only benchmarking with other countries shows whether overall safety performance has or has not improved" (p. 23). This is problematic for two key reasons: first the accident data comes from an extremely small accident occurrence rate i.e., five Swiss accidents per million flights compared to four world-wide accidents per million flights (the last sample of the research). If one flips the data from an accident rate to a non-accident rate, the problem with equating such a rate to safety becomes apparent. Now the Swiss non-accident rate is 999,995 non-accidents per million flights compared to the world non-accident rate of 999,996; that is a Swiss non-accident percentage of 99.999995% compared to the world's 99.999996%. The fact one must go to the 6th decimal place to register a miniscule difference should be evidence enough of the questionable nature of drawing meaningful conclusions about regulatory effectiveness and safety.

The second problem, other than comparing exceedingly low rates with exceedingly low rates, is that no convincing causality between the regulations and the accident rate is provided by Finger and Piers. Nonetheless, Finger and Piers (2005) insist there is a regulatory problem in Switzerland because a "primary root cause" is "an absence of a national aviation safety policy and corresponding action plan, which would define clear targets in terms of safety performance" (p. 24). Not only is this conclusion flawed because of the lack of a credible connection to the regulatory deficiency (it is more root-correlation than root cause), it fails to account for the perennial problem of what metric could be compellingly applied to safety performance in the first place (i.e., beyond the problematic metric of accident rates). Furthermore, it is also flawed because, besides all of this, and as Bartsch (2019) notes, if one wants to seriously utilise extremely low accident rates as a sole measure of regulatory success "it should be remembered that a good safety record is a judgment of past performance but does not guarantee the future" (p. 743).

Of course, this has still not answered the question of what regulatory effectiveness can be measured against if not accident rates. This is especially important when, as shown in the previous parts of this literature review, the measurement of safety itself is so subjectively amorphous. One answer, which follows the work of Morrall (2003), is to treat safety as an economic attribute since safety is something to be valued by customers and comes at some financial cost (for example the cost of seatbelts versus no seatbelts). Under this construct, the effectiveness of a safety regulation can be comparatively cost-analysed before the law and after the law by attributing an actuarial cost to lives saved. Morrall (2003) did this with a variety of US Federal laws ranging from steering-column protection to seat cushion flammability to asbestos control and so on; thus providing a cost-benefit comparison as a measure of effectiveness for each law (p. 223). However, there are several problems for the work, self-stated by Morrall (2003), including, amongst others, the old problem of subjectivity in the assessment of risk both prior to the law and after the law; the inability to account for other factors that may bring fatality rates down (e.g., simply greater awareness), and the subjective nature of how much a life is worth (pp. 222-227).

Additionally, when it comes to aviation safety, the problems of a cost-benefit analysis are more serious because, as Moses and Savage (1990) point out, unlike automobile accidents, aviation accidents "occur so rarely and with such perceived randomness". This means, as the research expresses, "crashes have little long-term effect on consumer choices" (Moses & Savage, 1990, p. 172). Thus, when it comes to the Morrall approach in aviation, not only is it extremely difficult in aviation to obtain a significantly sized sample, but the all-essential perception of risk is diluted because of the infrequency of large-scale aviation accidents.

Another problem with treating safety like a consumer product, and the law as the boundaries for the "consumption" of that product, is highlighted by Moses and Savage (1990) who observe that unlike information on fares and frequencies, which can be easily obtained, "safety cannot be easily observed and interpreted by the consumer" (p. 171). A consumer cannot simply compare the effectiveness of various safety laws (as is the case with many other products and services). This is because there is the problem of the consumer knowing what it is that makes the product "good" and, if safety is the "product", how to measure safety in the first place.

A comprehensive assessment of regulatory effectiveness in Australia that moved beyond accident-rate correlatives was made by Dannatt (2002) who identified that the "effectiveness of a regulator's efforts to optimise the level of safety, in any of society's activities, are difficult to quantify with any single measure" (p. 199). With this as a starting point, Dannatt assessed several other potential measures of regulatory effectiveness beginning with economic optimisation. However, in like manner to Moses and Savage (1990), Dannatt (2002) identified several problems including the lack of metrics for risk reduction, the inability to assess indirect costs, and the inability to separate true effects from the "modifying effects of market discipline, insurance, and liability law" (p. 200).

Dannatt (2002) also examined the idea of measuring the effectiveness of CASA in terms of its own institutionalisation. In this approach, the metrics of organisational success were applied as a correlation to regulatory success. This too proved difficult because "there have been ongoing changes to the stated roles of the regulator and of its policies" and "the regulatory agency has been presented with different and sometimes conflicting objectives" (p. 169). Thus, with ever changing goals, subject to the sometimes fickle will of the parliament, it proved difficult to know what goals were being met and whether these were genuine safety goals in the first place. Additionally, and harkening forward to Dekker's "bureaucratisation of safety" (2014), Dannatt (2002) observed that because the regulator is a bureaucracy it is subject to the very real temptation of every bureaucracy, which is to "just muddle along", distracted by internal conflict, poor morale, inadequate financial resources, and with no 'culture' of achievement" (p. 192). In CASA's case, Dannatt (2002) cites several reports to this effect and evidently, judging by the institutional critiques of CASA already mentioned above from more recently, this has not changed (Forsyth et al., 2014; Senate Standing Committee, 2013; Australian Flying, 2020).

Seeing the inadequacies of the economic and institutional approach, Dannatt (2002) also examined the idea of utilising public interest objectives where it is up to the regulator "to enforce the supply of appropriate information to air travellers" so that travellers can determine their preferred level of risk (p. 170). In this approach, passengers are empowered to assess the downstream effectiveness of regulations (and a variety of other safety factors). However, in like manner to Moses and Savage's ideas on assessing safety performance (1990), this assumes the customer understands clearly "the relationship between regulatory effort and the safety outcome" (p. 172). This is a big assumption given the perspectival differences on safety performance from industry professionals already seen in this review and it is seriously doubtful the average passenger could accurately make such an assessment.

Ultimately, after examining other ways of reducing risk such as insurance, market discipline, liability law, and union power; Dannatt's (2002) main conclusion is regulatory effectiveness is curtailed because "the Act does not specify any preferred or required level of risk to be achieved". This, in turn, means that it is almost impossible to regulate system performance because there is no "desired system outcome" (p. 187). Furthermore, disappointment with the regulator's efforts is inevitable since the regulator and the public have different reference points and expect different outcomes from the regulations.

Another possible way of establishing regulatory effectiveness is by using enforcement strategies. Dannatt (2002) touches upon these strategies before concluding they are hammer when a scalpel is needed and, besides that, often miss the real threat (p. 201). Durkin's (2009) more comprehensive review concluded that CASA has an ambiguous role of being both safety educator and safety policeman which means the effectiveness of its enforcement is often subject to "regulator capture" (p. 344). This is when compliance is seen too much in terms of partnership with industry rather than as an authority over industry (pp. 344-346). While much more could be said here, the key point is both Dannatt and Durkin conclude that, as for other effectiveness measures, the effectiveness of regulatory enforcement on improving overall safety outcomes is questionable.

As a final part of reviewing regulatory effectiveness, it is worth considering CASA's move to "outcome or performance based" legislation. Yadav and Nikraz (2014) helpfully assess the perceived effectiveness of performance based regulations which are "focused on safety risks and safety outcomes" without overly prescriptive detail (p. 97). Yadav and Nikraz (2014) observe that CASA believes performance-based legislation should be, theoretically at least, more effective than prescriptive legislation because of three main reasons: first, it is potentially more cost effective (p. 102); second, it allows the aviation industry to manage its own safety risks as the frontline safety experts (p. 96); and third, it provides greater freedom for innovation in managing those risks (p. 97).

However, the research observes that there are several problems to consider. Firstly cost-effectiveness: Yadav and Nikraz (2014) rightly point out there is no empirical research that supports CASAs contention performance-based rules will be cheaper. Certainly, if one considers the performance-based Appendix 7 from CAO 48.1 (fatigue management legislation), it is highly questionable whether such legislation is truly cost effective. The legacy legislation, CAO

48.0, was only 7000 words: the new CAO 48.1 is some 100,000 words with all the requisite advisory and plain language words (CASA, 2019b). The cost in time of merely reading these extra words is certainly not effective when inspectors must read, assimilate, and enforce a myriad of rule sets from a myriad of companies. This occurs as various operators submit lengthy safety-cases and differing Fatigue Risk Management System (FRMS) manuals.

An additional problem relates to the objectivity, or otherwise, in assessing the performance of performance-based legislation. Aleck (2007) notes performance-based legislation will always be an optimised blend of prescriptive and outcome-based directives. Absolutely key to this optimisation is the need for objective, accurate, reliable, and empirically valid measurements of safety performance (p. 10). Furthermore, Aleck (2007) argues, performance-based legislation depends on both the regulator and the regulated to take responsibility for their conduct through "good judgement" and "professional expertise" (p. 3). Herein is a key problem: how does one objectively measure such performance to decide whether good judgment and professional expertise, so key to performance, is being utilised in the first place? Unsurprisingly, because of this problem, Yadav and Nikraz (2014) do not share CASA's optimism that performance-based legislation will more effectively facilitate safety since "it is hard to assess the performance outcomes, because there is no 'end-of-the-pipe' inspection possible" (p. 102). Additionally, if ambiguous performance standards are applied, "outcome-based regulations may jeopardize aviation safety" (p. 102) because of confusion as to whether authentic safety outcomes are being achieved in the first place.

Considering the myriad of research articles covered above regarding the difficulty of establishing a consistent conceptualisation of safety (and therefore safety performance), Yadav and Nikraz's (2014) conclusion is once again unsurprising. This is, of course, somewhat sobering because a consistent and measurable safety metric as stated in the research so far is extremely unlikely. What is more likely is a "loosely specified performance standard under the outcome-based regulations" that jeopardises aviation safety (p. 102). The obvious question from this is what assurance does anyone have that the safety performance standards will be any more clearly articulated under the new paradigm than the old? As Yadav and Nikraz (2014) note, the new paradigm "requires a smart regulatory system, which can manage the flight safety risks at an acceptable level" (p. 102). The inference is plain: a smart regulatory system is required for flight safety in a performance-based paradigm but clearly the authors do not believe one exists so "an outcome or performance-based regulatory framework for safety sensitive aviation activities may not be a suitable option" (Yadav & Nikraz, 2014, p. 102). Thus, performance-based legislation has the potential to be less effective at regulating safety because there is no agreed upon safety-performance standard, even as performance-based legislation, by its very definition, heavily depends on such a conception.

The literature review so far has examined the various academic and industry approaches to the question of safety meaningfulness and regulatory effectiveness. Hermeneutics, as will be seen, addresses the topic in its own unique way. Existing representative literature from hermeneutics, as it is applied to aviation safety, is examined below. This is with a view to introducing the uniqueness of a hermeneutic approach before employing it as an emergent and comprehensive methodology for the rest of the thesis.

2.5 The Meaningfulness of Aviation Safety in Hermeneutic Literature

There are a number of key academic examples where hermeneutic theory is applied to safety. While such examples are few, the ones that do exist are worth noting in terms of their relevance to the research and the unique benefits a hermeneutic approach can bring.

Taylor (1981) is one of the first to take a hermeneutic approach to the meaningfulness of safety and as such foreshadows several uniquely hermeneutic preoccupations. The first is that any analysis of safety misses something fundamental if it insists on purely mechanistic methodologies. Taylor (1981) further argues "certain aspects of human affairs cannot logically be analysed using mechanism as a basis, and this is (or will prove to be) a limitation of the applicability of human science" (p. 487). Moreover "it would be easy enough to control machine-like people in such a way that they would avoid accidents and diseases", but such a mechanistic approach comprehensively misses the importance of human attitudes, behaviours, and motivations (Taylor, 1981, p. 488).

Taylor's (1981) answer to the methodological limitation of mechanistic analyses, in particular its inability to account for "voluntary action", is to turn to hermeneutics because "the "hard core" of accidents seems to be due to the way that people conduct themselves, rather than to technically preventable factors" (p. 487). Hermeneutics provides the "missing link" (p. 489) between these factors. This is because a hermeneutic methodology, with its intersubjective perspective, tends to focus on the meaningfulness of actions and values that are "inaccessible to conventional science, but essential to consideration of risk and safety" (Taylor, 1981, p. 490). In particular, Taylor (1981) says hermeneutics sets itself apart because "the meanings of actions have to be interpreted in the light of the agents' motives, purposes, principles and beliefs, indeed from the whole social context in which the actions take place" (p. 492).

Motives, purposes, principles, and beliefs are not often seen as headings to accident investigations, but if one really wants to know why an accident occurs, hermeneutics insists they should be. As will be seen in later chapters, the factors fundamentally shaping how regulations, and safety itself, are made-meaning of, are profoundly non-mechanistic. Thus Llory (1997), referencing the work of Taylor, insists a paradigm-shift is required in the conceptualisation of safety – one which is decidedly hermeneutic. The "epistemological basis for a new approach to safety" is, Llory (1997) argues, "a safety centred on the collective, work-related perceptions and viewpoints of the operators" (p. 1156). In essence, Llory (1997) argues that the nature of knowingness itself (epistemology) must be based upon work-related perception, because this perception – shaped by motives, purposes, principles, and beliefs – is what will drive safety action (or inaction).

Interestingly, this bears close resemblance to Hollnagel's later renderings of the Safety II paradigm (2018) where a key feature is understanding the perceptual difference between "work as imagined" and "work as done". In essence, Hollnagel (2018), in a distinctly hermeneutic move, is inviting one to imagine how meanings from the same context are made in different ways (p. 655). In some ways it might be surprising to cite Hollnagel's work as hermeneutic, and admittedly nowhere is hermeneutics mentioned in *Safety I and Safety II,* yet the influence of hermeneutics is clear. This is evident in the fact that Hollnagel published several articles on hermeneutics early in his academic career, including *The Paradigm for Understanding in Hermeneutics* *and Cognition* (1978). Re and Macchi (2010) express as much when they trace Hollnagel's research path noting it evolves from early hermeneutic preoccupations (p. 81).

In another significant hermeneutic application to aviation safety, Garst's (2009) research of the "ontology of aviation safety", notes that "scholarly effort to explore the administrative and governance aspect of aviation safety", particularly in terms of the meaningfulness of safety, is lacking. This is because intellectual effort tends to be "devoted to the technical aspects of flying" (p. 2). Garst (2009) explains that because of this limited perspective, the "underlying mindset" of safety is relatively unexamined (p. 3). In essence, Garst (2009) draws the same conclusion as Taylor (1981) which is that a more totalising perspective is required. Garst (2009) then applies a hermeneutic methodology to assess the meaningfulness of safety as a widely utilised word in aviation demonstrating how safety is an "ontology" within the aviation community (p. 3). This ontology, which can be described as the entrenched belief about the essence and being of safety, drives the very thinking, behaviours, and attitudes of those creating policy and regulation. Garst (2009) identifies via his hermeneutic analysis of newspaper articles, FAA speeches and testimony, as well as selected books; that there is a "reified" view of safety at play in the aviation sector (p. 1). This reification is unhelpful to the cause of safety because it sees safety as binary i.e., "operations are either safe or unsafe" (p. 1).

This contrasts with the more complex (but realistic) view that safety exists in degrees. This, in turn, gives rise to an overly simplified (but influential) view of safety that does not substantively identify the many complex factors that make a system or an aircraft or a person safe. Garst (2009) identifies many reasons for this reification, but one of the biggest is that most people do not want to know ontologically whether something is "mostly" safe (safety by degree) – they simply want to know whether something is safe full-stop. Thus "legislators do not want a 'safer' system, they want to be able to tell their constituents that because of their thoughtful and diligent oversight they have a 'safe' system" (p. 97) but, as Garst points out, one can never comprehensively, and with one hundred percent certainty, state something is safe. Aviation, and in fact life in general, is far too complex with far too many uncertainties to truly make such a statement. Nonetheless, at least subsurface, such binary concepts exist and unknowingly wield their influence on policies and decision-making – and hermeneutics can bring this to light.

While Gast's (2009) work is useful in critiquing the dynamics of this reified usage of safety, Garst never offers a comprehensive view as to what an un-reified version of safety might look like. Even if an ontology of safety exists, one must still have some meaningfully reliable way of assessing to what degree something is safe enough to trust (or not). It does little ultimate good to critique the statement "your aircraft is now safe to board" with the observation this statement is reified, binary, and reductionistic. At some point, the statement must be indicative enough to take that fateful step into the cabin. The ultimate question is not whether such a statement is binary. Instead, the question is how to assess the reality of safety in a comprehensively meaningful way such that one can confidently step through that cabin door. Garst's only attempt in this regard is a tantalising nod to the fact "safety is complex, deep, and far reaching, and always involves the integration of a number of important considerations". Garst (2009) identifies four indicative core and non-binary meaning-making components of safety including "the operator (i.e., pilot or pilots), the equipment (i.e. aircraft involved), the operating procedures (i.e. company rule/procedures), and the operating environment (i.e. geography/weather)" (p. 5). However, these are not developed to any degree probably because his work is primarily to critique rather than to comprehensively provide an un-reified conception of safety (p. 6).

While Gast's (2009) work is intriguing and draws significant parallels to this research (by attempting a meaning-making analysis of safety) the work outlines the problems of safety-meaningfulness without developing a practical means that might assist operators to consistently and compellingly conceptualise safety in the first place. Nonetheless, Garst does helpfully identify the power of meaning-making within the word safety itself and the ways in which this power affects public policy and decision-making. It also provides an example of how hermeneutics can be helpfully applied to aviation safety to highlight previously unexamined aspects.

In another hermeneutic work applied to aviation, the question of whether human factors research is "folk modelling", or "strong science" is asked as well as whether an "epistemological self-confidence" is thus warranted or unwarranted (Dekker et al., 2010, p. 27). Whenever the word "epistemological" is wielded, one can be sure hermeneutics is not far behind, and such is the case in this work. The key preoccupation for Dekker et al. (2010) is why human factors has not achieved scientific "normality" through "objective, time, and observation-independent, and value-free" means that should have, by now, brought about "ever more powerful science" (p. 33). The answer, from hermeneutics, is that all science, even natural science, is to some degree, historically conditioned and human-constructed (p. 35). "Scientific" observations are made by self-reflecting, contextually constituted observers and this self-reflective, contextual constitution is not neutral. The same point is made in another hermeneutic work by Dekker and Nyce (2015) where, rather than "folk-modelling", "ontological alchemy" is used (p. 185). Regardless of terms, the hermeneutic observations made are important because they again raise the question as to what degree does self-reflection and contextual situatedness affect the meaningfulness of safety. Dekker and Nyce do not provide anything more quantitative than their qualitative observation, but the door is opened to further hermeneutic research – one which this current thesis intends to enter.

In a work closer to home Ferroff et al. (2012) argue the case for social constructionism in aviation safety and in so doing identify hermeneutics as one of many approaches that "could be useful in distilling insights from accident reports" (p. 5). Ferroff et al. (2012) observe there is a tendency for aviation research to become flawed when it attempts the "removal of the human element in the research process" (p. 1). The authors then observe that the complexity of "cultural, organisational and technical interrelationships" is a human construct and as such aviation research needs a cohering field of both quantitative and qualitative research to be realistically valid (p. 1). This is necessary because despite aviation's predilection for "numerically based metrics" those metrics cannot adequately reflect "enhanced data, especially in the areas of interpersonal relationships, human-machine interface, and risk assessment and mitigation" (p. 2). In short, Ferroff et al. (2012) argue for methodological approaches in aviation that account for both positivist and subjectivist approaches and see "social constructionism" as answering that call. In a social constructionist approach "observed phenomena are both objective and subjective, thus a relationship exists where meaning is dependent on experience" (p. 3).

Like the word "epistemology", when the words "subjective", "objective", "meaning" and "experience" are used, one can be sure hermeneutics is never far away. And so it is with the work of Ferroff et al (2012) where hermeneutics is presented as a key methodology in being able to cohere both subjectivist and objectivist concerns. In particular, Ferroff et al. (2012) argue hermeneutics is helpful because it distils "context from narrative by using known elements of the cultural and social environment surrounding the event or experience to which the narrative relates" (p. 5). This observation, despite being undeveloped since it is only intended as an introductory and summative idea, is of great relevance to the research at hand. This is because, as will be seen, this research itself takes the objective data of accident reports and metrics, as well as its more subjective narratives, and couples them with regulations in aviation experience (the Avtex Air case study). Thus, this current research is, in effect, an answer to the call to balance objectivist and subjectivist aims and use hermeneutics to distil insights "from accident reports" and "operational documentation" (Ferroff et al., 2012, p. 5.).

While the arguments of Ferroff et al. (2012) for the necessity of hermeneutics in safety are compelling, as are Taylor (1981) and Garst (2009) before them, it is significant that despite the passage of some forty years since Taylor's first foray into aviation hermeneutics, there is still no specific hermeneutic methodology applied in a comprehensive way to the meaningfulness of safety. Instead, Taylor and Garst, and subsequently Ferroff et al., provide some general ideas on how hermeneutics might be employed as an analytic tool, but never in way that usefully systematises hermeneutics and, for Taylor, the context is road-safety rather than air safety.

Having said that, there is another noteworthy application of hermeneutics to safety as seen in a comprehensive work from Morrison (2012) which employs "a qualitative method and phenomenological design" to explore, in a distinctly hermeneutic manner, "the ontology of practitioners" (p. 115). The intent of the work was to assess the applicability of aviation teamwork in a healthcare setting and, phenomenology, as a subset of hermeneutics, was used to achieve this goal. Morrison's (2012) approach led to a key finding that other methods would probably not have been able to uncover; namely, "learning in health care remains influenced by hierarchy and tradition, which in turn produces a flawed perspective of teamwork and leadership by some of those typically in leadership positions – physicians" (p. 115). While there is much that could be said here, the key point to note is that by opening epistemological, ontological, and even phenomenological doorways of investigation; a completely different set of questions to traditional research methodologies was birthed. In the same way this current thesis, as will be seen, initiates new aviation research trajectories in its hermeneutic approach.

Another significant article to do with safety and hermeneutics worth mentioning is a project applying hermeneutics to the confidential database set up for the United Kingdom railways by the University of Strathclyde (Wallace et al., 2003). The researchers used Ricoeur's hermeneutic arc as an analytical tool to identify textual elements within the database and present them in numeric form – thus merging the qualitative-quantitative divide. In turn, this led to a more meaningful and useful cohering-construct for the large numbers of reports and once again hermeneutics proved its worth as an analytic tool with plenty of scope for development and methodological evolution.

From the works mentioned above, the hermeneutic applications in aviation become somewhat more esoteric. Santilhano (2018) uses the hermeneutic circle (a concept discussed in detail in the next chapter) as a methodology for data-gathering in her research into pilot peer support (p. 59). Apart from that, other hermeneutic applications become increasingly tangential to the interests of safety-meaningfulness. For example, Jennings (1990) discusses the doctrinal conflict in the US Military over the word "aerospace" while Myrden et al. (2011) use hermeneutics to analyse the role of language in promoting gender bias at Air Canada. However, these works, along with others of the same ilk, are predominantly critical and do not provide any ultimately useful principles for a hermeneutic exposition of the meaningfulness of safety which is of course the intent of this thesis.

While the works covered above seems to be the extent of hermeneutic application to aviation safety, it is important to note a large amount of literature does exist around aviation miscommunication. This mainly pertains to in-flight communications and how intra-cockpit or intra-agency misinterpretation play a significant role in various deadly and large-scale accidents. *Those Fatal Words* is an iconic example of this and a favourite reference on human factors courses (Cushing, 1994). Other examples, and there are many, include Tajima's work on insufficient or improper English (2004); Jones' assertion that the nature of English makes it unsuitable for aviation radio communications (2003); and Molesworth and Estival's work on miscommunication (2015). However, these works do not address the meaning-making implications of safety as a totalising concept and so they are not covered in detail here.

In summary, what most hermeneutic authors demonstrate is the promise of hermeneutics to provide a totalising methodology that successfully integrates the mechanistic with the humanistic. This current research, as will be seen, attempts to provide just such an integrative approach by creating a hermeneutic "methodology of methodologies" that simultaneously examines accident investigations (the ATSB curation), recorded behaviours and attitudes (the Avtex Air case study) and textual meaningfulness (safety regulations).

2.6 Conclusion to the Literature Review

Perhaps the best way to summarise this literature review is to borrow Dekker's (2015) observation regarding the power of language: "Our words matter. Our words have consequences. Our words help conjure up worlds for other people. This should not be walked away from" (p. 161). Safety is chief amongst the words that matter in aviation and yet the implications of safety meaning-making remain relatively unexamined in Australian aviation safety regulations. This is a troubling truth considering the consequential weight safety has in regulations and industry. In Dekker's words, this should not be walked away from.

CHAPTER 3: METHODOLOGY

In theory, there is no difference between theory and practice.
But, in practice there is.

~ Benjamin Brewster

3.1 Introduction

3.1.1 Overview of the Methodological Phases

To answer the four research questions from Chapter 1, the methodological strategy of this research is hermeneutic, reality based, iterative and emergent. A hermeneutic close-reading is brought into a three-way iterative dialogue with Avtex Air, core safety regulations and the ATSB's investigative database. Qualitative data from various meaning-making findings thus emerges while at the same time so too quantitative data, in the form of content-counts and charts of various textual characteristics. This provides both a granular and a generalist meaningfulness of safety and leads to the development of three motifs of "knowingness" intended to encapsulate the competing conceptualisations at work: the motifs of profits-producing, liability-proofing, and accident-proofing.

As is fitting to hermeneutics and the overall goal of this thesis; that is, to cohere the qualitative with the quantitative and the granular with the generalist; a methodology of methodologies is thus employed as illustrated in Figure 3.1 on the next page.

Figure 3.1

The Hermeneutic, Reality Based, Iterative and Emergent Close-Reading Method

Figure 3.1 above shows how the close-reading is structured in its examination of Avtex Air's meaning-making dynamics at the AATA. The close-reading begins with the content and context of an indicative law (CAR 238) then moves to broader regulations and the AATA's findings. The outer circle in Figure 3.1 is an expression of the hermeneutic circle (see Section 3.4 below) and represents the broad phases of the research. The inner circle, within the broader phases, and via the close-reading, iteratively analyses hermeneutics, Avtex Air, regulations, and the ATSB Airtable dynamically throughout the methodology of methodologies.

The research proceeds by first setting forth a hermeneutic explanation as to meaningfulness itself (Chapter 4). It then uses the iterative, close-reading to compare regulatory safety aims with the regulations' own content and context. This occurs in Chapters 5 and 6. Having identified regulatory safety is neither effective nor compelling, the question of what might make safety more meaningful emerges. To answer this, the research moves to establish a meaningfulness of safety from 391 ATSB accident investigations curated from 1968-2021 in the ATSB Airtable (2021).

The Airtable in Chapters 8 and 9 identifies – via an "exegesis of unsafety" – incident and accident attributes from the ATSB investigations. These incident and accident attributes, in antithesis (see Chapter 8), are then thematised into the ten safety attributes which form the red rule IASA model in Chapter 9. The IASA model is then enjoined to the ongoing close-reading to further contrast current regulatory conceptions of safety. This is followed by Chapter 10 where recommendations, conclusions and ideas for future research are presented. In this way the effectiveness of safety as a meaning-maker in the regulations is comprehensively explored at both the granular and generalist levels.

3.1.2 Aim of the Chapter

The aim of this chapter is to articulate the methodological features of the research.

3.1.3 Outline of the Chapter

The outline of Chapter 3 is:

- Section 3.2 – Methodological features of the research.
- Section 3.3 – Methodological challenges.
- Section 3.4 – The hermeneutic phase.
- Section 3.5 – The reality-based phase.
- Section 3.6 – The iterative and emergent phases.

- Section 3.7 – Noteworthy characteristics and limitations.
- Section 3.8 – Conclusion to the methodology.

3.2 Methodological Features of the Research

As introduced above, this research involves a close-reading of safety and an integrated case study involving aviation regulations. Tate (2008) describes a close-reading as a process of exegesis (p. 1) while Buchanan (2010) says a close-reading applies "careful attention to the specificity of language use" to identify meaningful significance (p. 339). The close-reading in this research is qualitative in the sense it uses the hermeneutic features of the close-reading to identify key meaning-making qualities of safety at Avtex Air and in the regulations. The close-reading is also quantitative since, as various qualitative findings emerge, natural attention is drawn to key quantitative-hermeneutic-textual features. These are also bought into the circle and used to further develop previous findings.

An overview of each of the four key features of the methodology is given in the dot points below followed by broader explanations in their own sections:

- **Hermeneutic** (Section 3.4 below): The methodology is "hermeneutic" because it draws on meaning-making and interpretative insights from the literary field of hermeneutics. Additionally, it uses as an organising principle the "hermeneutic circle". The hermeneutic circle is explained in the context of the methodology below and controls the iterative, sub-methodologies of the research.
- **Reality-Based** (Section 3.5 below): The research is reality-based because it involves a hermeneutic close-reading of an

actual case-study as well as ATSB accident investigations.

- **Iterative and Emergent** (Section 3.6 below): The iterative part of the methodology refers to the way in which the close-reading moves iteratively back and forth between hermeneutic principles, Avtex Air, safety regulations and the ATSB findings. This iterative phase is part of the hermeneutic circle and orders and bounds the research. The emergent part of the methodology refers to the fact the key findings emerge from each other as a part of the hermeneutic and iterative phases.

These features are described more fully below after discussing the methodological challenges of the research.

3.3 Methodological Challenges

3.3.1 Three Intertwined Features: Three Challenges

The methodology is best understood if one sees it as emerging from three intertwined features of the research: first, the cross-disciplinary nature of hermeneutics; second, the sheer expanse of hermeneutical literature; and third, the highly practical world of aviation. These features enable unique insights but at the same time bring methodological challenges.

First, the challenge of the cross-disciplinarian nature of hermeneutics. This is evident in the expansiveness of domains that have felt the touch of hermeneutics. Thiselton (2009) says hermeneutics involve "social, critical, or sociological questions about how vested interests, sometimes of class, race, gender, or prior belief, may influence how we read" (p. 1). The expanse of literature and specialisations so mentioned is indeed large and challenging. The challenge intensifies when one considers that hermeneutics is often seen as both science and art (Kinsella, 2006; Mantzavinos, 2016). Terry, cited in Thiselton (2009) explains hermeneutics is a science because it "enunciates principles" as well as "classifying facts and results" but it is also art because it encompasses the way living beings interpret these results (p. 3). While the terms "science" and "art" can be defined in numerous ways, the terms tend to convey the idea hermeneutics is both reasoned and intuitive, both cognitive and affective, both quantitative and qualitative. This was seen in Chapter 2 where it was pointed out in the literature review that hermeneutics is one of only a few disciplines that intentionally combines both objectivist and subjectivist domains. While this means the research-rewards are potentially great, there is the very real challenge of applying a coherent organising schema to such a large domain.

The second challenge is related to the first: how to usefully assimilate thousands of years of hermeneutical literature. Indeed, if one were to comprehensively provide a 2500-year history of the developments in hermeneutics it would require nothing less than a study of philosophical, theological, linguistic, psychological, and sociological thought from 700 B.C.E. till now.

The third challenge is now perhaps more evident: the successful application of the large expanse of ancient and modern hermeneutics to the practical world of aviation. This includes the issue of how ancient Greek or biblical thought, so foundational to modern hermeneutics, could possibly have relevance to modern aviation. The next section addresses each of these three challenges with the methodological strategies to be employed throughout the research.

3.3.2 Meeting the Methodological Challenges

There are three key points to make in addressing the methodological challenges. First, it is important to note that while the research goal of applying key hermeneutic principles requires a comprehensive analysis of hermeneutics across the ages, it does not require an exhaustive one. Instead, an identification of the key principles of hermeneutics, derived and applied in generalised and functional ways, meets the research goal. To this end a summative canon was specifically designed for this research and provides an informational triage to the expanse of historic hermeneutic literature (see Section 3.4.1 below and Appendix A). The establishment of the summative canon is in itself a hermeneutic tactic since meaning-making involves the prioritisation of information contextualised and fused to given situations. The methodology thus attempts to emulate this feature.

Second, no matter the diversity of subjects in aviation, the same textual language with the same textual conventions is used (at least in Australia). This is evident in the regulations where the same regulatory language covers diverse aviation subjects ranging from flight operations to maintenance activities to training and so on. This simplifies the research challenge since hermeneutics is concerned with the form and function of regulatory texts not so much the regulatory content itself.

Third, regarding ancient, religious hermeneutics and its ostensible irrelevance to aviation, the fact is that whether a text is presented in the literary mode of a poem or a statute; the principles of hermeneutic thought are the same. This is because the linguistic, sociological, and literary dynamics of meaning-making occur in similar ways regardless of whether a person is reading the Iliad, the Bible or CAR 238. Additionally, there was a very practical compulsion that drove ancient Greek and biblical interpreters. Domaradzki (2010) observes the motivation of Metrodorus and Diogenes to exegete Homer was no whimsical literary exercise.

Instead, their motivation "was scientific rather than apologetic", since their role as re-interpreters was to "rationalise the life-view contained in the works of Homer" (Domaradzki, 2010, p. 240). For them a right interpretation of the text corresponded to a right understanding of reality. The stakes were high because if it was possible to read Homer falsely it was possible to gain a false view of the world he was attempting to evoke in his epic poems. Thus, the interpretative task of early Greek scholars was not merely to understand what the text was saying in and of itself, rather it was to understand what real and meaningful thing the text was saying about the world which could then be lived and applied. This goal closely mirrors the meaning-making goal of the research: to propose a real and meaningful conception of safety which can be lived out in everyday realities.

The further relevance of ancient hermeneutics is evidenced by the fact a great deal of it continues to reappear in modern hermeneutics. This is evident when Plato, and other ancient scholars, reappear as foundational to modern thought in both Ricoeur (1981) and Gadamer's (2013) works. It is also seen in the very modern Stanford encyclopaedia of philosophy where Ramberg and Gjesdal (2014) highlight the modern hermeneutic debt to the church scholar Augustine: "with Augustine we encounter a thinker whose influence on modern hermeneutics has been profoundly acknowledged by Dilthey, Heidegger, and Gadamer" (para. 5). Thus, the research, in accord with the summative canon in Annex A, freely draws from both modern and historical hermeneutical sources. As Gadamer (2013) points out "the classical preserves itself precisely because it is significant in itself and interprets itself" (p. 301).

3.4 The Hermeneutic Features of the Methodology

3.4.1 The Summative Canon

The hermeneutic features of the methodology are derived from the summative canon specifically created for this research (see Appendix A). The canon had to be specifically created because there is not an officially recognised hermeneutic canon and 2500 years of voluminous hermeneutic references needed to be curated into an employable size. The word "canon" derives from the Greek word "kanon" and signifies, very literally, "a measuring rod or a rule" (Abrams, 1999, p. 28). It also refers to "those authors who, by a cumulative consensus of critics, scholars, and teachers; have come to be widely recognised as 'major'" (Abrams, 1999, p. 29). The canon was created by identifying a cumulative consensus from summative texts including academic encyclopaedias, expanded dictionaries, expanded glossaries, and introductory books on hermeneutics. The cumulative consensus of hermeneutic authors is displayed in Tables A1 and A2 at Appendix A. Table A1 situates the canonical authors chronologically in a timeline (~ 700 B.C.E. to present time) while Table A2 shows the various references along with the associated hermeneutic authors. Where authors in Table A1 appear in bold print this indicates they appear multiples times over multiple references – as shown in Table A2 – thus legitimising their inclusion as part of the summative canon. Table B1 in Appendix B is drawn from the summative canon and provides a collation of key hermeneutic definitions. Table B1, along with Tables A1 and A2, provide a contextualising ready-reference. The ready-reference can be used to situate the general and recurring hermeneutic themes as they are discussed throughout the research.

3.4.2 The Hermeneutic Circle as a Methodology

The hermeneutic features of the research can be summarised by four key hermeneutic concepts drawn from the summative canon: the hermeneutic circle, the hermeneutic spiral, the fusion of horizons and the "worlds" of the text.

Beginning with the hermeneutic circle, Mantzavinos (2016) notes Ast and Schleiermacher seem to be the first scholars to directly call it such in the early 1800s, observing that Ast, in 1808, advocates for a concept of interpretation and meaning that involves finding "the spirit of the whole through the individual, and through the whole to grasp the individual". Schleiermacher (1829) develops this idea, saying "the whole is, of course, understood in reference to the individual, so too, the individual can only be understood in reference to the whole" (p. 3). Other authors insist intonations of the circle are evident as far back as Aristotle. This can be seen in *On Interpretation* where Aristotle (350 B.C.E./2015) says single words do not constitute meaning – it is only when "other words are added that the whole will bring affirmation or denial" (p. 26). Regardless of its genesis, the hermeneutic circle is now well recognised in hermeneutic literature. Palmer (1969) provides the following explanation regarding the nature of the hermeneutic circle in more modern times:

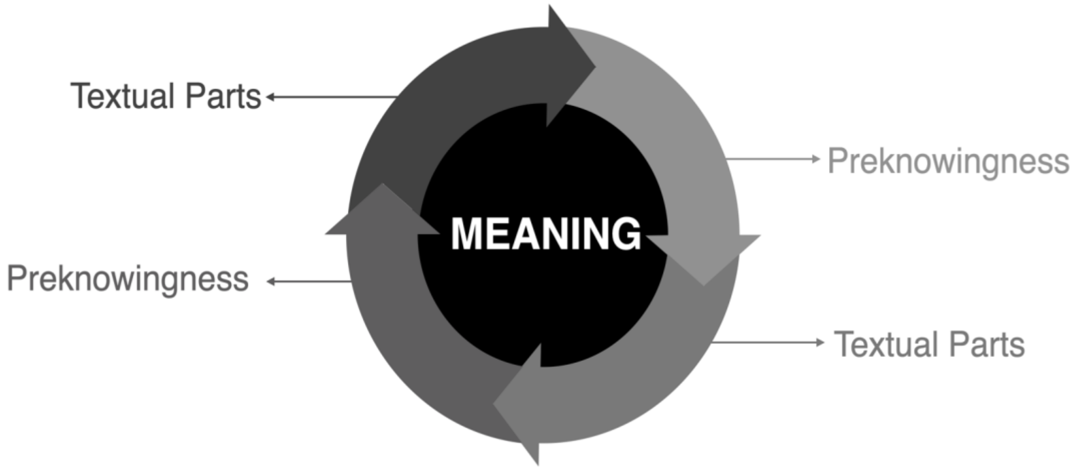
> Understanding is a basically referential operation; we understand something by comparing it to something we already know. What we understand forms itself into systematic unities, or circles made up of parts. The circle as a whole defines the individual part, and the parts together form the circle (pp. 1510-1512).

Thus, meaningfulness in the hermeneutic circle refers to the way in which pre-existing perceptions of a reader – their preknowingness

– iteratively engages with the text being read. The meaning-making dynamics are therefore non-static: as one reads and "interprets" – as one makes-meaning – one's knowingness is modified by the textual parts and then iteratively the textual parts are modified by the changing knowingness. The more one reads the more textual parts are assimilated and the more "knowingness" is concretised. This is illustrated in Figure 3.2 below.

Figure 3.2

The Hermeneutic Circle



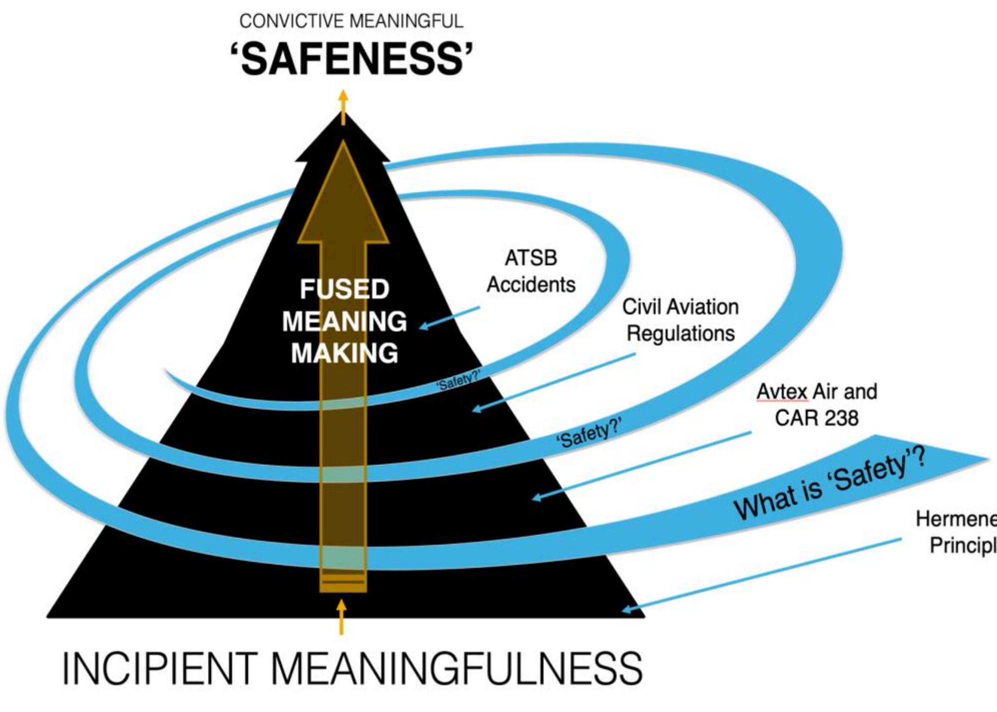
The methodology of the thesis thus integrates the hermeneutic circle by bringing a constant and circular iteration, via the close-reading, to the meaningfulness of safety within Avtex Air, regulations, and ATSB investigations.

3.4.3 From the Circle to the Spiral to the "Fusion of Horizons"

Criticisms of the hermeneutic circle can sometimes connote an endless cycle where true meaning is endlessly deferred and inherently subjectivised, hence some hermeneutic scholars propose a spiral rather than a circle. The hermeneutic spiral re-balances the subjective with the objective by showing that, at the end of the spiral, the iterations have ended with the narrowing to a fixed and "fusional" meaning (Osborne, 2007). This reference to "fusional" emerges from Gadamer's hermeneutic contribution and the idea a reader's knowingness and a text are each seen as having their own horizons. Gadamer (2013) argues when the text and the reader meet, a "fused" knowingness of textual and readerly "horizons" is created (p. 313). Gadamer makes the important point the various iterative interactions of the spiral do not remain separate, instead they merge and fuse, transforming and being transformed by each other. This principle and its fusion with the research methodology is shown in Figure 3.3 below:

Figure 3.3

The Hermeneutic Spiral Fused with the Methodological Phases.



The wide, black arrow in the centre of the spiral, via its initial expanse, indicates the broader, pre-text possibilities of safety-meaningfulness when the reader first encounters the concepts of the research.

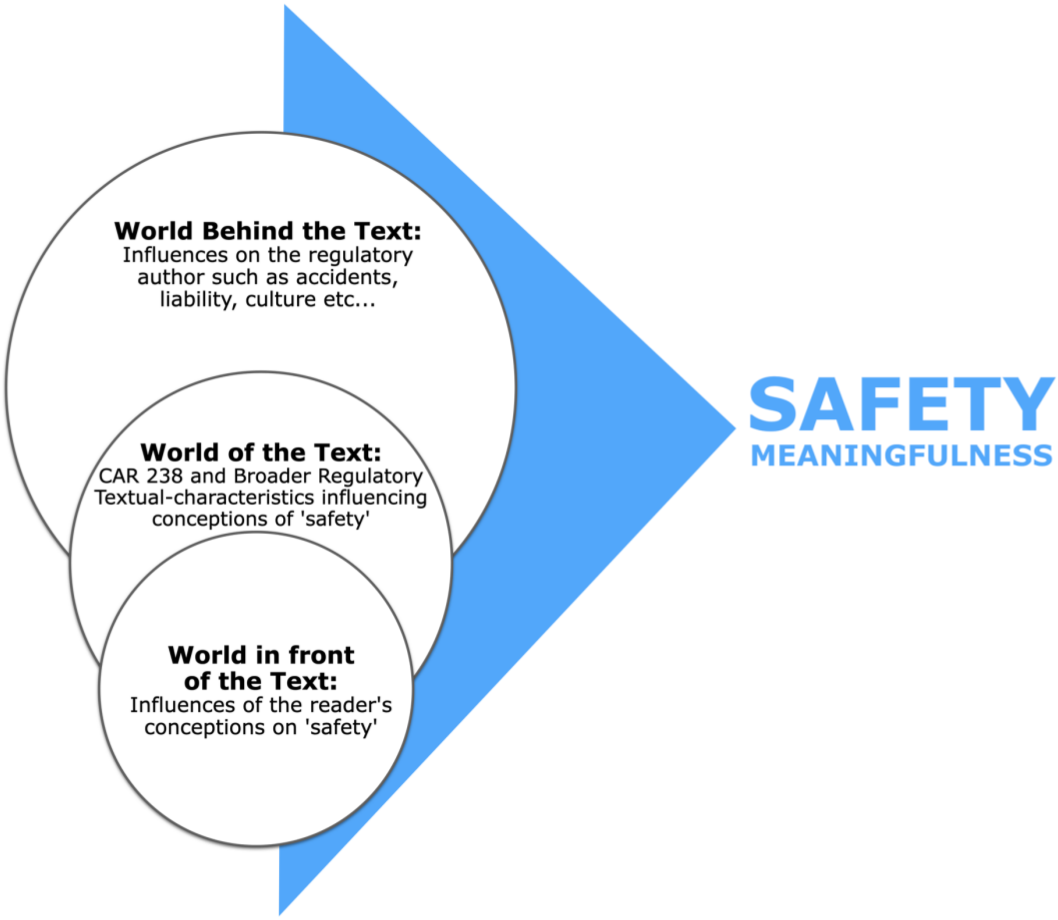
This incipient meaningfulness is represented by the question "what is safety" in the arms of the spiral. As the iterative close-reading identifies and applies hermeneutic principles – bringing Avtex Air, regulations, and aviation accidents into dialogue with the principles and one other – a more meaningful and convictive knowingness of safety emerges.

3.4.4 From the Fusion of Horizons to the "Worlds of the Text"

The third aspect of hermeneutics used in the methodology is the idea of the three "worlds" of the text. These worlds include the world of the text, the world in front of the text and the world behind the text. Kille (2002), summarising the work of Schneiders (1999) and Tate (2008) conceptualises the world *behind* the text as "the context in which a text arose – historical situations, the world of the authors and their communities". The world *of* the text "includes the structures of narrative, characterisation and use of language". Finally, the world *in front* of the text is that "imaginative dialogue in which the reader interacts with the text in the effort to understand it" (p. 129). Importantly, Kille (2002) emphasises that all three worlds are "intimately interconnected" (p. 129). Figure 3.4 below illustrates the intimately interconnected worlds of meaning as they apply to the methodology.

Figure 3.4

Safety as the Confluence of the Three Meaning-Making Worlds



The three worlds in Figure 3.4 represent, in their confluence, the various meaning-making influences on conceptions of safety and can be used to conceptualise the research as follows:

- **The world in front of the text: the world of the reader.** This is the world of the Avtex Air and AATA Tribunal as they read, and attempt to comply with, CAR 238 and with safety regulations more broadly. From this world emerges the meaning-making ways in which safety is conceptualised as these readers engage with the regulatory texts.

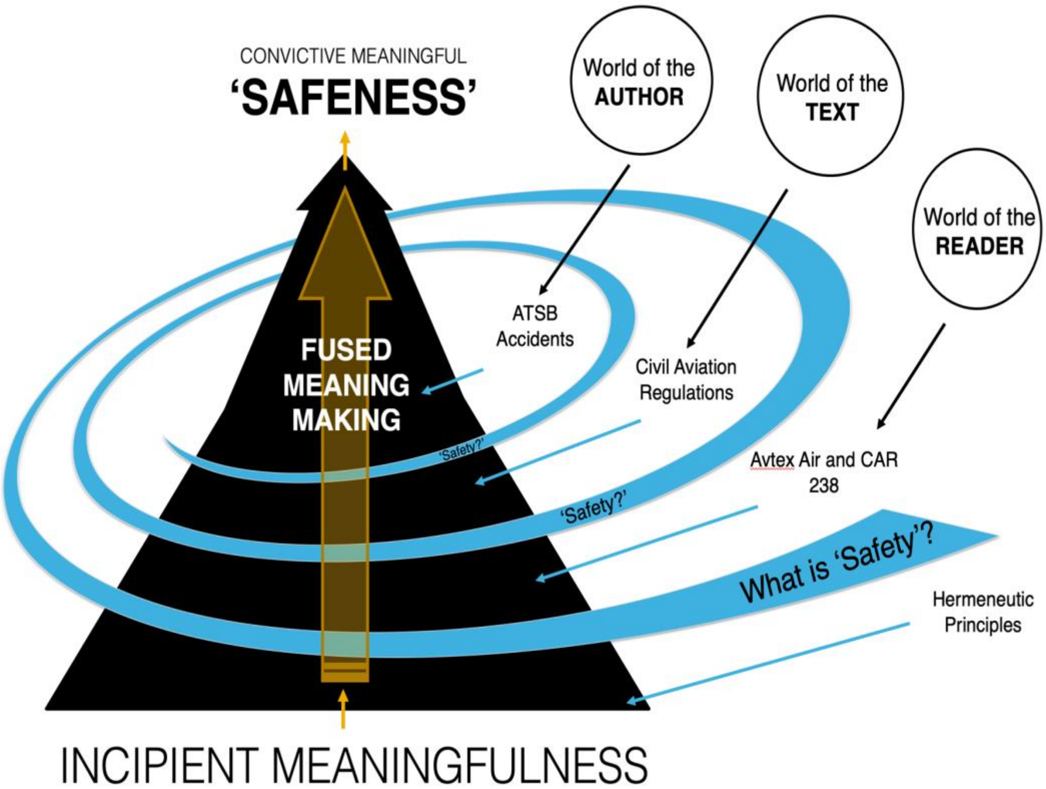
- **The world of the text: the text itself.** This is the world of CAR 238 and safety regulations. This includes, in the words of Kille (2002) above, regulatory "structures of narrative, characterisation and use of language" (p. 129).

- **The world behind the text: the world of authorial influence.** The world behind the text informs the authors of safety-related regulations and processes. This is the world of authorial experiences and influences that then shape the texts they write. For the purposes of the research, this is the world of aviation accidents as investigated by the ATSB and curated in the Airtable.

The methodology, infused with the three worlds is conceptualised in Figure 3.5 below:

Figure 3.5

The Worlds of the Text and the Hermeneutic Spiral in the Methodology



3.5 The Reality-Based Features of the Methodology

3.5.1 Overview of the Reality-Based Features of the Methodology

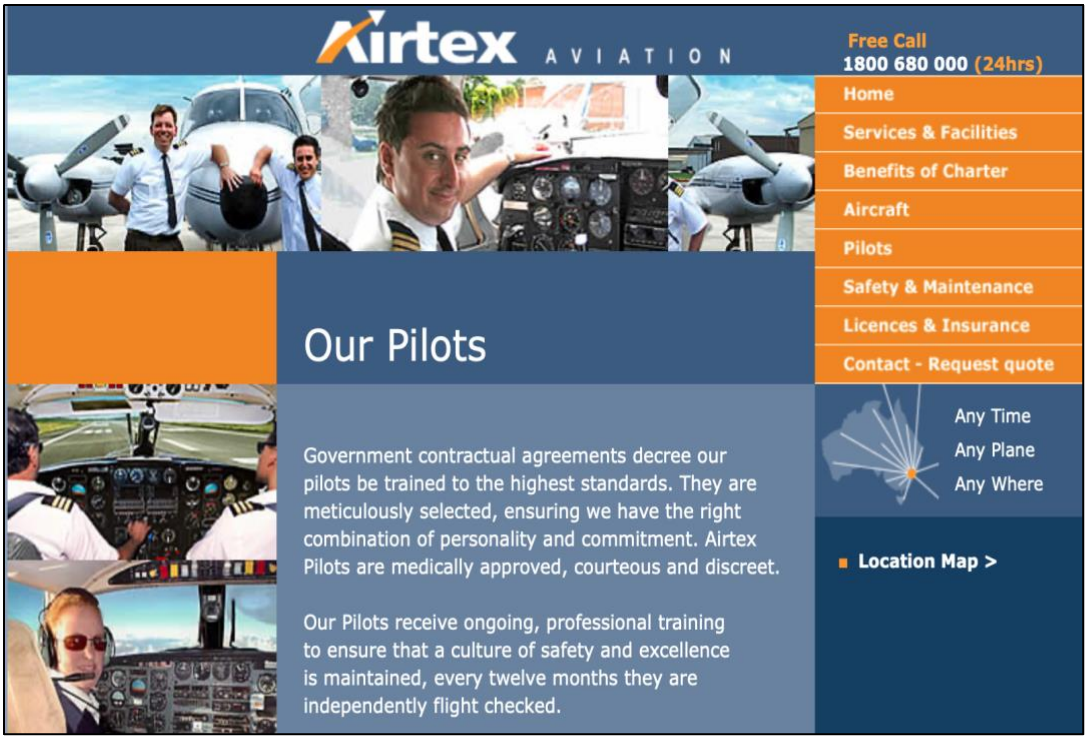
To ensure a tight integration with real-world aviation, and to ameliorate any analytic biases, four reality-based inputs are introduced into the hermeneutic spiral: the Avtex Air hearing at the AATA, ATSB safety investigations curated by the Airtable, a comprehensive regulatory word-count, and a count of ATSB-to-CASA recommendations for regulatory clarification. This reality-based analysis, integrated hermeneutically by the spiral and the three worlds, empowers a tight coupling between the realities of aviation safety and the "realities" of what will be seen to be regulatory safetyism. Theoretical and conceptual thought, and indeed any disposition towards analytic bias, is thus "quality checked" against actual events and documents. Further detail on these four reality-based inputs is provided in the next section.

3.5.2 Safety Preknowingness at Avtex Air (The World in Front of the Text)

As will be seen, any true hermeneutic methodology should wield its explanatory power on the extra-textual as well as the textual medium itself. The methodology does this by examining the meaning-making dynamics of readers, and readings, at Avtex Air (also known as "Airtex" and "Skymaster"). Avtex Air's now defunct webpage is provided in Figure 3.6 to provide a visual context.

Figure 3.6

Avtex Air "Our Pilots" Webpage



Note. Source: *The Wayback Machine* (2011a).

The meaning-making study of Avtex Air and the AATA's interpretation of regulatory texts methodologically moves attention beyond textual characteristics alone, varied as they might be, to the practical responses of each reader. This first reality-based feature of the methodology employs the insights of a hermeneutic sub-field called reader-response theory to look at what the text *does* – not just what it says (see Chapter 4 for more on reader-response theory). This helps overcome a localised methodological challenge which is that one cannot enter the brain of an aviation reader to see what is influencing the reading. What one can do, however, is examine how readers respond to the text itself. To this end, the Avtex Air case study is useful because, unlike most other case studies in aviation, Avtex Air features heavily not only in the ATSB but in the AATA. The AATA transcript, at some 57,000 words, expresses in detail the meaning-making world in front of the regulations (*Avtex Air Appeal*, 2011). It thus provides plenty of material for hermeneutic analysis on both the intra and extra-textual fronts.

3.5.3 Safety Preknowingness in ATSB-Investigated Accidents (the World behind the Text)

The second reality-based feature of the research is the ATSB Airtable Database (2021). As stipulated by the *Transport Safety Investigation Act 2003*, the ATSB's goal in dealing with some 17,000 accident and incident notifications each year, is "to prevent future transport safety occurrences – especially those with the potential for a large-scale loss of life or serious injury to the travelling public" (2017, para. 1). The goal of the ATSB thus lends itself to the goal of this research which is to conceptualise safety in a way that better facilitates the Act's objective of accident-prevention.

In Chapter 8, ATSB safety recommendations from 391 investigations are used to create the ATSB Airtable Database. This database curates and thematises the safety actionables from the recommendations into ten incident and accident attributes which then, in antithesis, are used to establish ten key safety attributes (see Chapters 7 and 8 for more detail). These attributes are the basis for the red rule IASA safety model in Chapter 9. Together, the attributes in the IASA model are designed to provide a reality-based – a red rule safety based – knowingness of safety that can be more effectively conceptualised, standardised, and actioned. A full explanation for the specific methodology of the ATSB Airtable is contained in Chapter 7. The methodological detail appears in Chapter 7, rather than this current chapter, to make it more proximally accessible to Chapter 8 where the ten attributes are created. A comprehensive legend for the ATSB Airtable Database is provided at Appendix C as is the methodology behind the sampling scope.

There are several other points worth noting regarding the ATSB Airtable (2021). First, the table itself is referenced individually in this research but whenever individual investigations from the Airtable are referenced, they are referenced against their report number in the table. This is to prevent an excessively large list of references which would occur if each report was referenced individually (from some 400 reports in the database).

Second, the Airtable also collected other relevant meaning-making data, some of which is intended for use in future research (see Chapter 10). This data includes such things as investigation word-counts, responsible agents, non-compliance iterations, misinterpretative iterations, rule/procedure attentiveness, affirmation-iterations, and so on.

Finally, the ATSB Airtable can be filtered in a variety of ways to highlight trends, themes, and patterns. These filters provision the data expressed in the charts and tables as they appear throughout the ATSB-relevant research. Where this is integrated in the research, a cross reference back to this section highlights where the reader can find the methodology for the Airtable that underpins the chart or table.

3.5.4 The Content and Context of Safety Regulations: The Regulatory Word-Count Methodology

The third reality-based facet of the research is a close-reading examination of contemporary regulations. This begins with CAR 238 and then moves to broader and newer regulations (see Chapters 5 and 6). As a part of this examination, numerous word-counts of regulations were conducted involving the following steps:

- Identifying the extant regulations and their supporting documents as warranted by CASA (2021c) in April 2021. These were identified as "core" regulations as explained in Section 1.6 "Explanation of Terms".

- Downloading, in PDF format, all the volumes, parts and sub-parts from the Federal Register of Legislation or, where unavailable, *The Wayback Machine* and the applicable CASA websites.

- Collating each of the PDF titles on an excel spreadsheet to express a tally of each individual PDF wordcount.

- Taking each of these PDF files and, via a copy and paste function, submitting the text from the files to an online word counter tool (Wordcounter, 2021).

- Cross-checking selected word-counts with other wordcounter tools including Microsoft Word to derive a percentage error range of 4.3%. This was necessary because different word counter tools assess numbers, hyphenated words, and certain grammatical constructions as "words" whereas others do not. The cross-checked word-count tools analysed are shown below along with their individual word-count assessments of the *Civil Aviation Act 1988*:

    - Microsoft Word: **49663**

    - Wordcounter.net (original website 31 May 20): **51941**

    - Wordcounter.net (new website 30 June 2021): **49760**

    - Wordcounter.io: **49663**

- Included in the word-count analysis is how long each regulation would take to read or speak given average reading and speaking speeds which are, respectively, 200 words per minute and 150 words per minute.

Regulatory word-counts are referred to throughout the thesis and are key to Chapter 5 where the regulations are assessed against their own goals of clarity, concision, and appropriateness.

3.5.5 ATSB to CASA Safety Recommendations for Regulatory Change, Clarification or Examination

In Section 5.5.6, a further content-count assesses the ATSB's publicly available (1997-2021) safety actions requesting CASA make regulatory changes, clarifications, or examinations. This count involved the following:

- Collating all of the safety actions from the publicly available database (ATSB, 2021d) into a word-searchable PDF.
- The PDF was then word-searched using the Mac OS word search tool integrated into its PDF "Preview" App.
- The key terms for the search were "CASA" and "Civil Aviation Safety Authority".
- The results were then examined and regulatory actions that did not pertain to regulatory changes, clarifications or examinations were disregarded.
- The results were then tabled and charted as per Figure 5.9 in Section 5.5.6

With the explanation of the reality-based features of the methodology complete, the iterative and emergent features of the methodology are detailed below.

3.6 The Iterative and Emergent Phases of the Methodology

The iterative and emergent phases of the methodology are together in this explanation because they operate integratively in the research. The research, cohered by the hermeneutic circle, and held together by the close-reading process, iteratively and emergently, moves in and out of qualitative and quantitative analysis. This allows the analytic phase of the hermeneutic circle to act as what Mantzavinos (2016) calls a "toolbox for efficiently treating problems of interpretation" (p. 1).

The methodological iterations bring together hermeneutic principles, Avtex Air, aviation safety regulations and emergent findings. This allows the progression of the close-reading to become more and more fully informed by the emergence of new findings which, in turn, provision the expansion of the circle into new areas. As the circle expands, the IASA based concept of red rule safety becomes more hermeneutically concretised. A diagram at the start of each chapter in the thesis shows how the chapter's focus fits within the broader iterative and emergent movements of the study.

3.7 Noteworthy Characteristics and Limitations of the Methodology

The first noteworthy characteristic of the methodology relates to the way in which reality, like hermeneutics, works in totalities not taxonomies. Taxonomies have their strengths and, as will be seen in Chapter 9, their weaknesses. These weaknesses are most obvious when trying to understand the "forest" of reality rather than the individual trees. In the very act of taxonomisation, as features of the whole are broken down into component categories, the totalising conception of meaningfulness is lost (more on this in

Section 9.5). This is not to say such organisational methodologies do not have their place, but to point out a true hermeneutic seeks to show how things work in their totality as well as in their componentry. Thus, when it comes to the meaningfulness of safety, this research builds to generalist outcomes by attempting to express itself in the totalising, every-day realities of the Avtex Air Case Study, ATSB investigations, and the everyday use of regulations. This approach, as will be seen in Chapter 10, eventually leads to a field not merely a focus of study.

The second noteworthy characteristic of the methodology relates to the way the research as a whole is a close-reading of the word "safety". This is fitting since safety is the middle name and the goal of the regulations. This does however impose a limit since it binds the research to the word safety alone when it is quite feasible many other essential terms could have been exegeted in this same way. Future research may see an expansion to other words but for now, as will be seen, safety is an essential word to the regulations and is thus worthy of prime analytic focus.

Another limitation to note is that while the ATSB reports range from 1968-2021 and total 391 investigations (ATSB, 2021b), these represent a percentage of the 7029 total investigations publicly available as at the time of writing. Additionally, the ATSB do not investigate all accidents but prioritise based on risk to the travelling public (2021b, p. 7). The ten attributes must therefore be seen as indicative rather than comprehensive and future research (see Chapter 10) will look to expand the ATSB Airtable. Nonetheless, the 391 investigations still represent a significantly large sample across a large period (1968-2021). They thus provide an expansive safety-emphases not available in most traditional studies.

It may also be asked why other obvious meaning-making conflicts revealed by the *Avtex Air Appeal* (2011) are not explored. These include, amongst others, the interpretative conflicts regarding flight into thunderstorms, maintenance write-ups and emergency training (*Avtex Air Appeal*, 2011, p. 37). While there is plenty of interpretative grist for the mill at Avtex Air, and indeed in other recorded cases such as Pel-Air (as shown in Chapter 2), the intent of the research is to simply to pull at one thread – CAR 238 – with a view to examining its length rather than its breadth. This allows an in-depth examination of the various ways in which CAR 238 could be, and indeed was, meaningfully re-rendered by various interpretative agents. Additionally, there is a very real limit, in terms of word-count, as to how many interpretative trajectories can be properly examined given CAR 238 alone consumes some 20,000 words in Chapters 5 and 6. Also, as stated above, Avtex Air was only ever intended as a granular foothold for the broader examination of the meaningfulness of safety in the 391 curated investigations from the ATSB. This makes deeper examinations of other interpretative trajectories within Avtex Air, or other companies, less important. Having said all that, this does not, of course, preclude broader examinations in future research.

The last aspect of the methodology worth noting is the selection of the Oxford Dictionary as a primary denotative reference. The Oxford Dictionary was chosen because it was the dictionary used in the *Avtex Air Appeal* (2011, p. 47). It was also chosen because it is well-respected with an emphasis on "corpus analysis". In the words of Oxford itself, corpus analysis refers to way in which "editors see words in context and find out how new words and senses are emerging, as well as spotting other trends in usage, spelling, world English, and so on" (Oxford University Press, 2015, para. 1). This echoes Chapter 2 of the research and the notion of general usage and the way in which words are used in every-day situations. This makes it well-suited to the reality-based principle and connects to Chapter 8 where general-usage becomes a starting point for other principles of safety-meaning.

3.8 Conclusion to the Methodology

In conclusion, the chosen methodology is a non-linear, non-traditional approach that, in accord with the hermeneutic circle, is iterative and emergent as it moves through the remaining seven chapters. The steady iteration of real-life contexts (Avtex Air, the AATA and the ATSB investigations), via the close-reading of safety in the safety regulations, authenticates the theoretical principles being developed and keeps the research functionally honest and practical. By "flying the circle" in this way, not only are immediate answers provisioned as the research progresses, but concurrently better questions emerge regarding the dynamics of safety meaning-making.

Having established the methodology, the research now moves to Chapter 4 and hermeneutic explanations as to why meaningfulness matters.

CHAPTER 4: HERMENEUTICS, MEANINGFULNESS, AND WHY THEY MATTER

Speech has power. Words do not fade.
What starts out as a sound, ends in a deed.

~ Abraham Joshua Herschel

4.1 Introduction

4.1.1 Back to "Have a Look"

As introduced in Chapter 1, meaning was made of safety in markedly different ways at Avtex Air. CAR 238 stipulated safety required icing equipment for the proposed flight – a meaning with which the staff pilot agreed. However, according to the *Avtex Air Appeal* (2011), the Chief Pilot and the CEO decided safety meant not only that the aircraft could take off – it *should* take off and "have a look" (p. 57). How is it that such a disparate meaningfulness of safety could be conceptualised by each party? To answer this question another must be asked (the first research question): what makes something meaningful in the first place?

4.1.2 Aim and Aspect of the Chapter

This aim of this chapter is to use hermeneutic concepts to answer the first research question regarding what makes something textually meaningful. It does this in four ways: first, it provides readers who may not be familiar with hermeneutics (most likely the case in aviation) with a working knowledge of its history, its key preoccupations, and its vocabulary. Second, it sets the groundwork for subsequent chapters where each chapter is introduced with hermeneutic concepts that are then applied to Avtex Air and broader regulatory facets. Third, and perhaps most importantly, it emphasises the fact it is not legislation itself – mere words on a page – that meaningfully brings action, inaction, and consequence – it is the interpretation of those words. Finally, as a way of conceptualising underlying motivations of meaning, three meaning-making motifs are introduced: the profits-producing, liability-proofing, and accident-proofing motifs.

With the methodology established in Chapter 3, the close-reading begins here in Chapter 4. This is followed in Chapters 5 and 6 with an examination of how textual content and context shape the meaningfulness of regulatory safety. The current aspect of the research is shown in figure 4.1 below.

Figure 4.1

Chapter 4 within the Broader Movements of the Research

4.1.3 Outline of the Chapter

The outline of Chapter 4 is:

- Section 4.2 – Hermeneutics then and now.
- Section 4.3 – The shaping of preknowingness: Culture, intention, reader-response, and institutions.
- Section 4.4 – The hermeneutic problem (and) the safety problem.
- Section 4.5 – Meaning-making conviction and authority.
- Section 4.6 – The preknowingness of safety and the authority of CAR 238 at Avtex Air.
- Section 4.7 – The motifs of profits-producing, liability-proofing, and accident-proofing.
- Section 4.8 – Summary: Convictional meaning-making and why it matters to safety.

4.2 Hermeneutics Then and Now

The summative canon (see Section 3.4.1 and Appendix A) shows that thousands of years before Avtex Air staff were arguing over the meaning of CAR 238 ancient philosophical, religious and nationalistic scholars were doing the same (Mantzavinos, 2016). These ancient authors attempted, amongst other things, to standardise interpretations that related to moral conduct, philosophical ideas and narratival histories. For them it had seemed reasonable to assume if a text was lucidly written it would be lucidly read. However, this was not always the case. Texts, even "clear" texts, were often misunderstood, misapplied and/or ignored. The texts may have been authoritative, and even divine, but it became apparent the meaningful interpretations of these words were all too human. It is to this ancient and modern challenge that hermeneutics applied its focus. Figure 4.2 below illustrates this focus within the context of CAR 238.

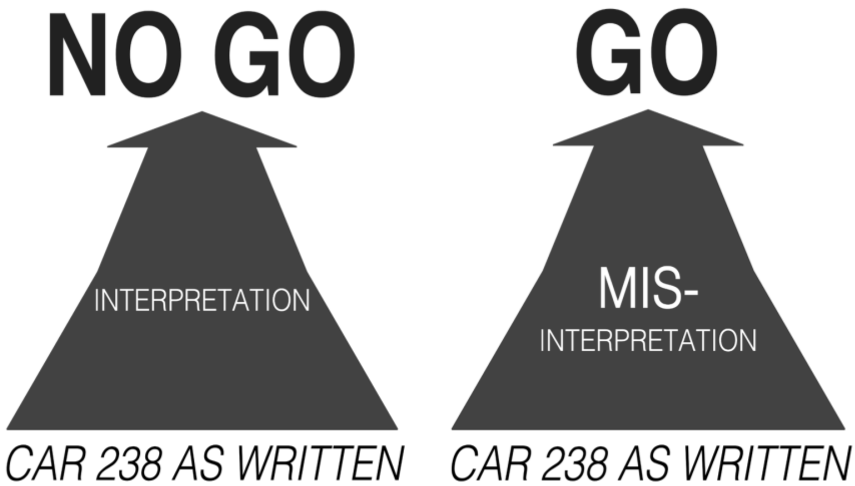
Figure 4.2

The Focus of Hermeneutics in the Context of CAR 238

Figure 4.2 illustrates the fact hermeneutics is the study of how it is the Chief Pilot, the line pilot and the AATA arrive at differing meanings, convictions, and actions – all within the "authority" of the same regulatory words on the same regulatory page. Figure 4.3 below develops the idea by showing how, from the same text, one interpretation leads to a "no-go" while the other leads to a "go". The effect is completely incongruent outcomes from the same text with both outcomes legitimised by the idea that each interpretation is safe.

Figure 4.3

Safety and the Meaningful Incongruence of "Go" and "No Go"



There are many reasons for the dynamics illustrated above and these are examined in subsequent sections but it is worth noting now that, as Palmer (1969) observes, interpretation has "personal import and the power to command obedience" (p. 943). A serious implication for CAR 238, and for regulations more broadly, is that it is not the regulatory words themselves that have compliance-bringing power – it is their interpretation. This means, if one wants to understand interpretative conviction and compliance, one must understand some basic hermeneutics and some basic hermeneutic history.

The historical legacy of hermeneutics is expressed by Grondin (1994) who observes both ancient and modern interpreters are focussed on how to explain clearly "what something means" (p. 7). Bernstein (2011) says a similar thing when noting the interpretative problems of the past have very clear "analogues with the problems of interpretation" in the present (p. 110). This meaning-making scrutiny involves, amongst other things, efforts of "analysis, para-phrase, and commentary" (Abrams, 1999, p. 127). However, hermeneutics has never contented itself with what something means (the text alone) but *how* it means (the world behind and in front of the text). Hermeneutics, in explaining not only what something means but how it means, moves beyond words on a page (or a scroll) to the extra-textual dynamics of preknowingness as introduced in Chapter 1 (and incorporated with the methodology in Chapter 3). Hermeneutics explains that preknowingness is immersed in various aspects of culture, intention, reader-response, and institutions. The next section provides a summary of the ways in which preknowingness is shaped by these four key factors.

4.3 Preknowingness: Culture, Intention, Reader-Response, and Institutions

There are several influences on preknowingness, and therefore on meaning-making, that are identified by hermeneutics. First, the shaping effects of culture. Culture is seen in hermeneutics as a key shaping effect on preknowingness because of a concept called linguistic mediation. Ramberg (2014) makes this very clear when noting hermeneutics emerges as: "linguistically mediated, historical culture. Language is our second nature" (p. 1). Ramberg's insight makes the essential link between culture and preknowingness as does Irvine (2006) who similarly notes emerging textual interpretations in Greek thought "did not take shape in some neutral or purely abstract field" but instead "were systematically encoded with authority and cultural power" (p. 24). To put it another way – the iconic Gadamer's (2013) way – the horizons of culture fuse with the horizons of meaning (see more on Gadamer's "fusion of horizons" below). Culture is also why Gadamer (2013) would later say, pointing to the experiential horizon of the reader, "the great historical realities of society and state always have a predeterminate influence on any 'experience.'" (p. 288).

Gadamer's mention of the reader's "experience" hints at what is considered by hermeneutics to be another key influence on preknowingness – intentionality: Arthos (2009) observes "hermeneutics is a corollary to the idea of rhetorical agency, the idea that communicators act with intention" (p. 2). Hermeneutics thus spends a lot of time discussing the ways in which the reader themselves are "texts" of intentionality shaped by their psychology and their experience. Tate (2008) says "A reader is a complex of 'texts'. A reader can never stand outside these texts and examine a particular literary text from a position of Cartesian purity" (p. 230). Grondin (1994) expresses a similar focus: "there is no such thing as a pure statement i.e., an utterance which one could fully understand without taking into account its motivation, its intent, its addressee, its context, in a word, its soul" (p. 14).

These aspects of intentionality find their most comprehensive hermeneutic treatment in reader-response theory introduced in Chapter 3. According to Thiselton (2009), reader-response theory began in the 1960s and "underlined the part played inevitably by the beliefs and assumptions that readers and interpreters bring with them to texts" (pp. 31-32). Iser, perhaps the most well-known of the reader-response critics (along with Fish and Benn Michaels), further developed the ideas of reader-response (Tompkins, 1980; Iser 1974) by explaining a text always has a degree of indeterminacy – essentially gaps – that a reader must fill through assumption or interpolation.

Fish (1980), following on in a more radical way from Iser, reorientated interpretation by asking not what a text means but what does a text do? In particular, what does a text do within a community of like-cultured or like-intending individuals? This is the basis of Figure 4.3, introduced above, which shows the importance of considering what CAR 238 *does* to the "community" of pilots – it leads to a "no go" interpretation. The community's intentionality thus shapes the interpretation but meanwhile a different community, the managerial community, with different intentions, asserts a "go" interpretation. This outcome-based focus of hermeneutics in reader-response theory is leveraged in subsequent chapters where the safety regulations are examined in terms of what they are actually doing to their readers regarding accident-proofing goals (see Chapter 5).

While reader-response provides important insights, its limitations are seen at Avtex Air where the only way to arbitrate meaning-making once the authority of the text was exhausted was for a third party to arbitrate such meaning – in this case the AATA. The AATA rendered an authoritative ruling on the interpretation of CAR 238 thus demonstrating what hermeneutics notes as another important influence on interpretative knowingness – the influence of institutions.

According to hermeneutics, institutions attempt to systematise, codify, and control meaning-making in the face of conflicting interpretations. This is often necessary because of the "weakness" (the self-limiting characteristics) of all texts. This weakness, Gadamer (2013) notes, goes back to the time of Plato who said "no one could come to the aid of the written word if it falls victim to misunderstanding, intentional or unintentional" (p. 411). Thus, through church history, councils, tribunals, and committees would dictate the "valid, responsible, appropriate, and controlled" interpretation of texts (Jeffrey, 1992, p. 349). These councils would, where disagreement persisted, arrive at a standardised interpretation and then render their interpretations authoritative. The church thus, as Klein et al. (2017) observe, devised "traditional" (i.e., institutional) strategies to standardise interpretation (p. 2271). Eventually this gave rise to the idea of "Ex-Cathedra" – literally, "out of the church" – which insisted final interpretation belonged to the institution of the church and only the church could save the text from its own voiceless weakness.

Ultimately though, the institution ended up with its own hermeneutic weakness. As Dau (1917) observed, institutional authority soon proved be a convenient and self-serving way of enforcing extra-biblical papal decrees which often demanded significant financial sacrifice from the faithful. It was not long before the protestant reformers came along with their catch-cry of "sola scriptura" and a mission to return interpretative authority to the text itself. Sola scriptura, a catch-cry of the reformation, was the interpretative imperative that final meaning was to be derived from scripture (the text) alone (p. 13). However, if the reformers thought the matter was now settled, they were very wrong as the very real hermeneutic limitations of "sola scriptura" quickly burst out of the reformation. The magisterial reformers, so-called because they were able to win the cooperation of established kings, began to splinter into various groups. Each arrived at significantly different conclusions about God, life and the way which the reformation should progress – all on the back of their "right readings" of scripture by "scripture alone" (Heinze, 2005, p. 144).

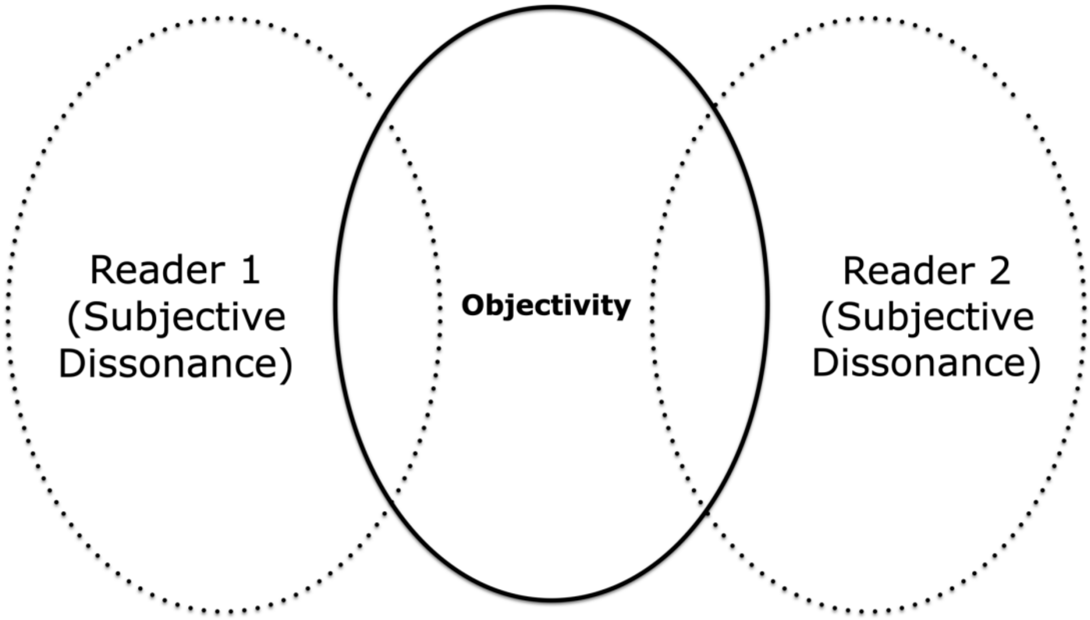
This same dynamic continued in the subsequent centuries until in modern times, according to Barrett et al. (2001), "world Christianity consists of 6 major ecclesiastico-cultural blocs, divided into 300 major ecclesiastical traditions, composed of over 33,000 distinct denominations in 238 countries" (p. 16). Ironically, the great majority of these denominations affirm sola scriptura in some way or another and many have their own institutions to rescue the text from possible "misinterpretations". Yet, each still ends with significantly different readings of the same text showing the perennial challenge of consistent and standardised textual meaningfulness. This issue of interpretative consistency harkens back to Chapter 2 where the call for a standardised meaningfulness of safety in modern aviation academic literature proves to be a formidable challenge. This key challenge is a hermeneutic one and is called, in the literature, the "hermeneutic problem" which is really, as will be seen, the "safety problem".

4.4 The Hermeneutic Problem (and) the Safety Problem

The hermeneutic problem is simply stated the problem of subjectivity versus objectivity. This problem is evident every time readers make-meaning of the same black and white text in different ways (e.g., CAR 238). Bleicher (1980) explains the hermeneutic problem is the difficulty of rendering "accounts of subjectively intended meaning objective in the face of the fact that they are mediated by the interpreter's own subjectivity" (p. 13). Vanhoozer (2009) summarises it with the following question: "is there something in the text that reflects a reality independent of the reader's interpretive activity, or does the text only reflect the reality of the reader?" (p. 15). The hermeneutic problem is illustrated in Figure 4.4 below:

Figure 4.4

The Hermeneutic Problem: Subjectivity versus Objectivity



The idea of subjectivity in interpretation leads to an obvious problem for regulatory compliance: how is consistent compliance possible if consistent meaningfulness is not? To put it another way, as Figure 4.4 above illustrates, can the dissonating subjectivity of readers be reconciled consistently with the objective world? Again, this harkens back to Chapter 2 where it was noted just how challenging it is to render safety objectively – especially when stakeholders are conceptualising safety differently in the first place. Figure 4.5 below illustrates how subjective renderings of safety by a regulatory reader, and for that matter a regulatory writer, can be, and often are, dissonant with objectively rendered safety (whatever that happens to be in the mind of the reader).

Figure 4.5

The Safety Problem: Objective Safety from Subjective Readers?

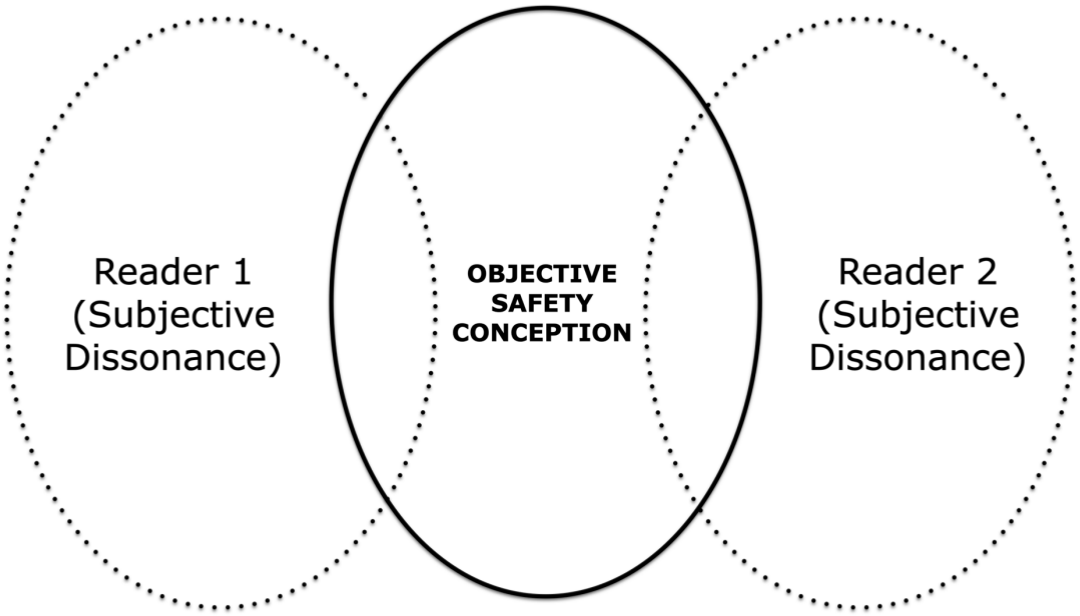


Figure 4.5 shows the hermeneutic problem of subjectivity is also the safety problem of subjectivity which makes hermeneutic insights so helpful to this research. Schleiermacher (1977) is the first of many thinkers such as Dilthey (Bantas, 2014), Weber (Pressler & Dasilva, 1996), Wittgenstein (Van, 2005), Heidegger (Baldick, 2015), Gadamer (Arthos, 2009) and Ricoeur (1981) to offer increasingly sophisticated responses to the hermeneutic problem. While a full analysis is not possible here, the spectrum of answers can be helpfully bookended with the terms "objectivist" and "subjectivist" or; alternatively, "realist" and "non realist" (Thiselton, 2009, p. 31). Scholars tending towards the objectivist end, such as Hirsch (1967) and Betti (1957), emphasise the authority of the text itself. Those tending towards a subjectivist stance such as Palmer (1969) emphasise the nature of understanding itself and encourage analytic moves "beyond an aggregate of textual rules" (p. 811). In hermeneutic history, Schleiermacher (1977) marks the beginning of the subjectivist age with the idea "the task of hermeneutics is no longer to merely

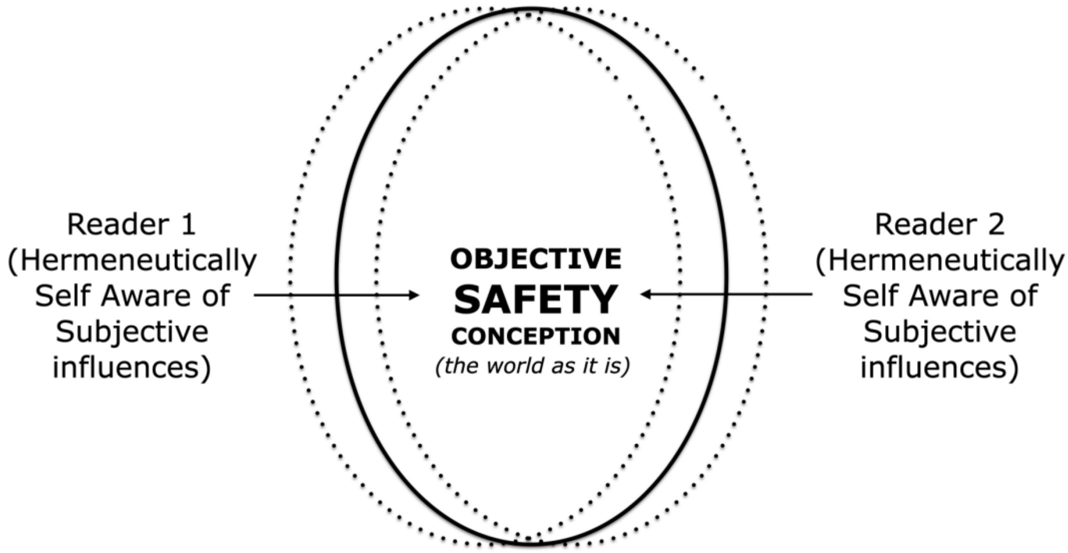
'decode' the text, it is re-purposed into a science and an art of understanding itself" (p. 29).

The subjectivist / objectivist conflict can sometimes appear intractable. However, the problem is not as acute as it seems when one considers "subjectivist" has meanings beyond the negative connotations of the term "subjective". In hermeneutics, "subjectivist" signifies a move from the study of the text to a study of the reader – literally the "subject". Thus, as Palmer (1969) further elaborates, the two "are not totally antithetical; rather, they are working on different aspects of the hermeneutical problem" (p. 1131). Gadamer (2013) is helpful here noting interpretation "involves neither 'neutrality' in the matter of the object nor the extinction of one's self, but the conscious assimilation of one's own fore-meanings and prejudices" (p. 282). Gadamer (2013) is using the subjective focus of the hermeneutic problem to emphasise one must be aware the text does indeed have something objective to say. At the same time, whatever methods are being used to read one must read "with the conscious assimilation of one's own fore-meanings and prejudices" (p. 282.). Hence, the real question is not whether meaning-making can be objective or subjective but how "meaning-making" considers "the conscious assimilation of one's own fore-meanings and prejudices" *as well* as the "objective" reality the text is trying to mediate.

Thiselton (2009) further alleviates the tension of the hermeneutic problem by observing that in modern hermeneutics "the text isn't abandoned" (p. 1). Instead, as Palmer (1969) also notes, hermeneutics becomes concerned with "the more encompassing question of what understanding and interpretation, as such, are" (p. 295). Figure 4.6 below, transitioning from Figure 4.5 above, illustrates Gadamer's idea of a hermeneutically self-aware reader who with subjective influences made visible is better able to understand these influences and more likely to notice objective realities.

Figure 4.6

Hermeneutic Self Awareness



It would be easy to think at this point the research is attempting to concretise safety meaningfulness into an objective reality and thus solve the safety problem (or the hermeneutic problem) once and for all. This is not the case. Instead, the proposal is that an optimised correlation to objectivity is far more likely if the subjective agent can become attentively self-aware to the dynamics that are constantly potentiating meaning-making or meaning-maiming. They will then be better able to detect what is textually subjective and what is not. In so doing, the *possible* range of meaning is narrowed to a more *probable* range. This is illustrated in Figure 4.7 below using the hermeneutic spiral introduced in Section 3.4.2 with the additions of what could be called the "hermeneutic area of possibility" and the "hermeneutic area of probability".

Figure 4.7

From the Hermeneutic Area of Possibility to the Hermeneutic Area of Probability

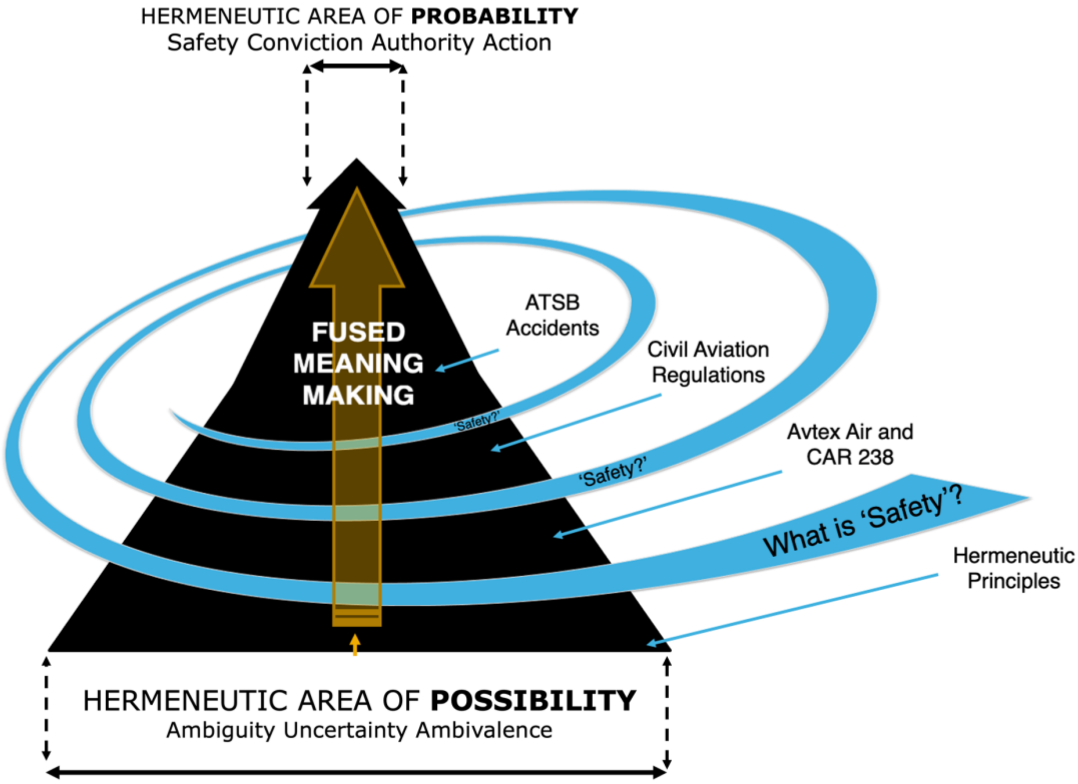


Figure 4.7 illustrates the way the research attempts to methodologically remain self-conscious of the hermeneutic problem and to optimise for closer correlations to reality. It does this with the concept of meaning-maiming possibility versus meaning-making probability. This is important in the consequential world of aviation accidents. The consequentiality of accidents and their influence on conceptions of safety will be more fully explored in Chapter 8, but suffice to say for now the research attempts to avoid a situation where the text, and safety itself, are hijacked by subjectivity and thus trapped in the hermeneutic area of possibility (and therefore in ambiguity and uncertainty). Instead, meaning-making in this research is re-situated to the pursuit of objectivity moderated by the knowledge of one's own subjective limitations. In this way, the ambiguous area of meaningful possibilities becomes

the hermeneutic area of probability where conviction and compliance can be better activated.

In summary, the hermeneutic problem is only a problem if one insists on a mutually exclusive analyses of textual objectivity against reader subjectivity. This research attempts to take a middle way. It does this by equipping readers (and writers) of safety regulations with the ability to better seek the objective realities represented by the text while at the same time providing an objective understanding of their own subjectivity. In other words, the words of Figure 4.7 above, the research makes readers aware of the optimising conditions for movement into the hermeneutic area of probability.

As one might imagine from 2500 years of theory there is much more that could be said about the hermeneutic problem but this overview is sufficient for the remainder of the research. What remains then is a deeper hermeneutic explanation of meaning-making and its power to invoke compliance-bringing certainty.

4.5 Meaning-Making Conviction and Authority

Recall from previous chapters the situation at Avtex Air as illuminated by the *Avtex Air Appeal* (2011): "the Chief Pilot and the CEO were frustrated and felt it necessary to 're-educate' company pilots as to the 'proper' meaning of CAR 238" (p. 59).

One might want to speculate such contention was merely the function of hidden motivations such as commercial pressures, loss of face, over-confidence etc. However, even if this is true, there would still need to be an accounting for the fact that CAR 238 itself was being used to justify very different interpretations. Management never told their pilots to deliberately break the rules; instead, they affirmed the rules and insisted the correct meaning was to take off and "have a look". In the end it was not the rule that was authoritative – it was the interpretation. Until, of course, the AATA's institutional authority asserted itself over the interpretive authority of Avtex Management by rebutting Avtex's interpretation. Before that could happen though, Avtex aircraft regularly took off in icing conditions under the functional authority of the Chief Pilot's interpretation rather than the regulative authority of CASA and CAR 238.

Hermeneutics has some key insights into why this might have occurred at Avtex Air. It insists text-making might often be informational and educational, but only meaning-making is convictional and consequential. Scholars, both modern and ancient, have long understood this. Consider Bleicher's (1980) summative definition of hermeneutics where he articulates the idea a reader's own "system of values and meanings" shapes interpretation (p. 13). The reader is thus not a passive receptacle waiting for textual meaning to be written onto the hard drive of their mind from which objective re-renderings then emerge. Bleicher, along with many other writers, is drawing from a long tradition. Consider Aristotle's *De Interpretatione* (350 B.C.E/2015). Aristotle, recognising and wanting to avoid the arbitrariness that might develop during interpretation, articulates the importance of language's first principles. In English the title of his work simply reads "On Interpretation" (which could also be translated "On Meaning-Making"). To the casual observer, it might seem as though the work is more about grammar than meaningfulness, but this is because, for Aristotle, meaning-making is intrinsic to grammatical structure. Aristotle introduces the work with the statement: "spoken words are the symbols of mental experience and written words are the symbols of spoken words" (p. 3). Aristotle (350 B.C.E/2015) then expounds the basic philosophical tenets of propositional thinking and how one can logically arrive at truth. Essentially, one must interpret correctly what has been spoken or written and then, using logical principles, weigh the veracity of that interpretative judgment. In this way conviction as to falsity and factuality is formed as judgement brings a meaning-making compulsion (Aristotle, 350 B.C.E/2015, p. 22).

Gadamer (2013) expands on Aristotle's idea to emphasise the fact that knowledge derived from interpretation is not something sitting passively idle. On the contrary, it actively confronts a reader and demands interpretative action – demands something be meaningfully construed. Gadamer sees here a convictive and hermeneutic implication: interpretation is not objective ideology derived from black and white text – it is inextricably an experiential reality. Meaning-making is something "one has to do" (Gadamer, 2013, p. 321). It is imbued with convictional power because "to live" is to make judgements and arrive at convictions. The convictional power assigns value (greater and lesser priorities) to textual meaning and in so doing cements convictions that lead to action or inaction. In Figure 4.8 below this can be seen in CAR 238 which according to hermeneutics holds no actualised authority until it is interpreted. The AATA appeal demonstrated that when CAR 238 was interpreted, the interpretation led to a "go" decision for the Chief Pilot but a "no go" for the line pilot. The text had not changed for either reader, yet their text-interpreted actions fundamentally changed. This shows that conviction and action is potentiated, not actualised, in the text itself. The text is merely authority-as-written and authority-as-intended by the author, not authority-as-applied. The authority of the text, as intended by CASA, is subject to the contextualising and "fused" meaning-making of the reader with all of the influences on, and from, preknowingness at work.

Figure 4.8

"Applied" Convictional Authority

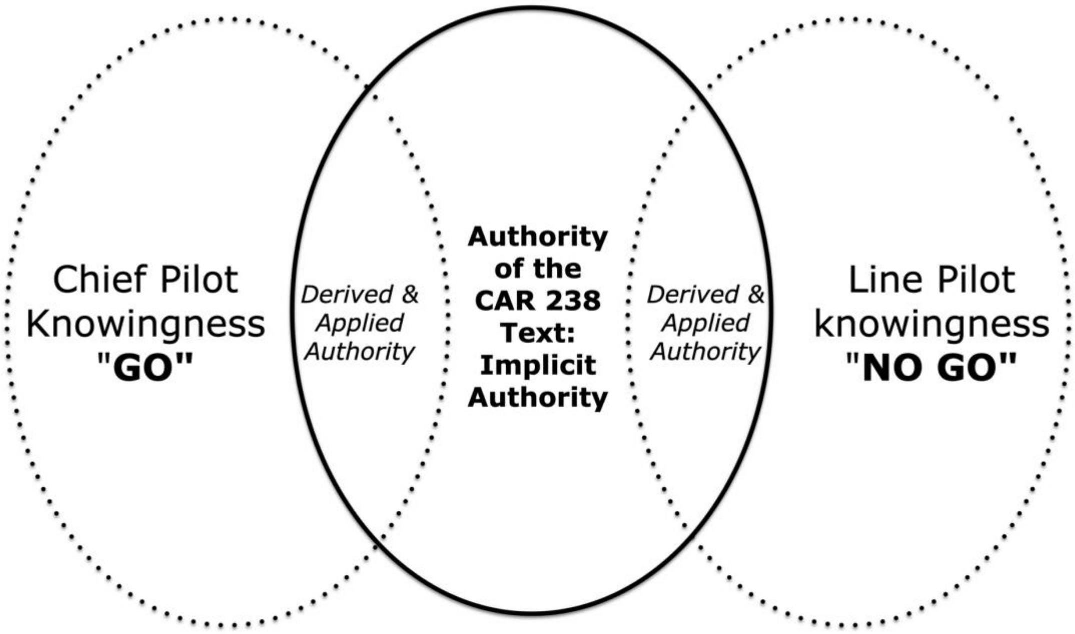


Figure 4.8 shows, as previously noted, regulations themselves are theoretically infused with the primacy of safety (i.e., Civil Aviation *Safety* Regulations) but the Chief Pilot's preknowingness – his history of values and experiences around what is safe (and what is not) – acts as the final warrant. This warrant acts not by denying the regulatory text but by reframing it according to the underlying knowingness. This happens because, as will be seen in chapters 5 and 6, the non-neutral characteristics of language always have within them the potential for divergent meaning-making no matter how well written a text. CAR 238, and in fact every other safety-signifying text, is read and warranted against the preknown safety in the reader's mindset. If this preknowingness is divergent from the author's, the likelihood of a divergent interpretation increases.

This dynamic is strongly indicated by the Chief Pilot's comments at the *Avtex Air Appeal* (2011). It was evident the Chief Pilot had a different mindset to the company pilots which was to "basically to get the job done" (p. 59). The Chief Pilot had made plenty of flights where icing conditions were both forecast and known. The Chief Pilot could make the point that there were no accidents, the job was done, the boss was happy and revenues unthreatened. Thus, flight into icing, no matter what the regulations apparently indicated, was "safe" for the Chief Pilot and therefore it should be safe for his staff pilots. While the legal writer of CAR 238 intended an authoritative safety outcome, the variant safety-knowingness of the Chief Pilot reframed CAR 238 into a dissonant, but compelling, meaningfulness. Figure 4.9 illustrates below the differing preknowingnesses at work and how, because CAR 238 is relatively ambivalent as to a go or no go decision, these preknowingnesses drive variant conceptualisations of safety.

Figure 4.9

Convictionally Safe or Unsafe as a Function of Preknowingness

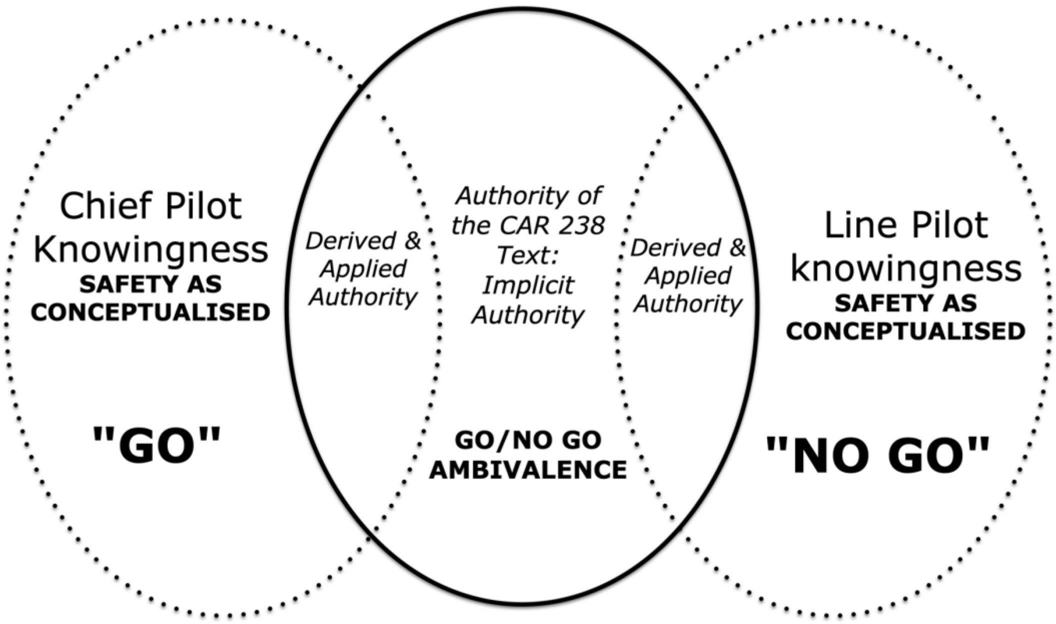
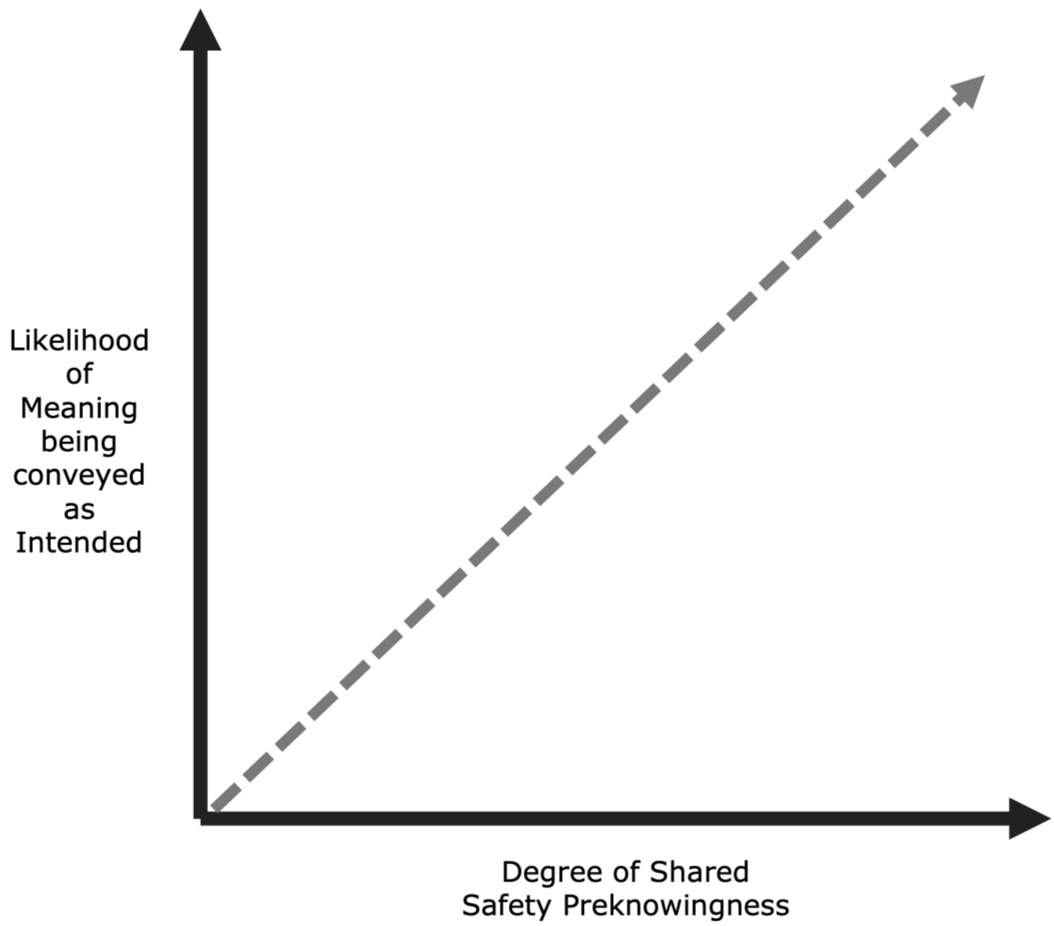


Figure 4.9 above illustrates how the Chief Pilot's safety preknowingness – "get the job done" – fuses with CAR 238 for a "go" decision while at the same time the line pilot preknowingness, perhaps more fearful of an accident, shapes CAR 238 into a "no-go". Importantly, as shown by the confluence of the preknowingnesses with CAR 238, both line-pilot and Chief pilot can

claim the authority of CAR 238 because dissonant meaning-making is the consequence of dissonant preknowingnesses – not just textual ambiguity. An important implication worth emphasising at this point is that the greater the degree of shared safety-meaningfulness between writer and reader, the greater the likelihood the text will be read as it was intended. This is illustrated in Figure 4.10 below.

Figure 4.10

The Implications of a Shared Preknowingness of Safety



Note. The constant linearity is indicative only.

Figure 4.10 above also shows a negative propensity from the concepts of preknowingness: the greater the disparity of safety preknowingness, the greater the propensity for disparate meaning-making. This can also lead to reader distrust that the regulations are addressing safety in the first place. This readerly distrust of the regulations, as will be seen, is a common theme identified by Senate inquiries (for example, Forsyth et al., 2014, p. 69) and will be explored more in Chapters 5 and 6.

4.6 The Preknowingness of Safety and the Authority of CAR 238 at Avtex Air

The hermeneutic concept of preknowingness is helpful for understanding, in more detail, the situation at Avtex Air. According to the *Avtex Air Appeal* (2011) on hearing the interpretation of the Chief Pilot regarding flight into icing conditions, one of the more outspoken pilots went into the pilot's room, printed out CAR 238, and brought it back to the meeting where he proceeded to quote it verbatim. Clearly the staff pilot was not persuaded by the meaningfulness of safety wielded by the Chief Pilot. The staff pilot instead attempted to claim the authorising power of the text itself to rebut the interpretation of the Chief Pilot and the CEO. The implication of his verbatim reading was clear: the text as a safety regulation, written by the safety regulator, has safety-authority. The text should transcend management's opinions about safety regardless of the Chief Pilot's superior knowledge, experience, or rank. Thus, the interpretation from the text, and in a practical sense, for the text, was being emphasised by the staff pilot.

Ironically though, the Chief Pilot could not agree more that the text should be the authority, it was just that he felt the text was saying something different to that which the staff pilot insisted it said. Moreover, the Chief Pilot leveraged the authority of his position to insist the intent of the regulation was what he stated it to be. Significantly, even at the *Avtex Air Appeal* (2011), the Chief Pilot continued to insist his interpretation was the legal one even as the tribunal strongly denied that claim (p. 61). Here the hermeneutic problem (and the safety problem) re-emerges: all parties could be asked point-blank "are we safe?" and all parties, because of their entrenched preknowingness of safety, would nod their heads. Moreover, each party would assert the authority of the text to legitimise their respective conceptions of safety and then, in turn, use those interpretations to legitimise their fundamentally different courses of action.

There are many more meaning-making factors that contributed to the divergent preknowingnesses (and the divergent actions) at Avtex Air and the AATA. These will be explored throughout the subsequent chapters of the thesis using the concept of meaning-making motifs. Three key motifs are identified and introduced in the next section as a way of easily conceptualising the various aspects that can shape a reader's preknowingness.

4.7 Motifs of Profits-Producing, Liability-Proofing and Accident-Proofing

In this research, to capture succinctly the various meaning-making influences on a reader's safety knowingness, a literary term known as a "motif" is reappropriated. A motif, according to Murfin and Ray (2018), is a "recurrent, unifying element in an artistic work, such as an image, symbol, character type, action, idea, object, or phrase" (p. 238). Additionally, the etymology of the word motif comes from the Latin "motivus" which means "to move" (Oxford University Press, 2015). Thus, the term connotes the idea certain motifs "move" the reader's interpretation of a text in certain directions. This also ties into the idea that for something to motivate meaning-making it must matter and, for something to matter, it must, for the reader, invoke ideas of consequence and action (Reece et al., 2021, p. 228). The relationship of "mattering" to meaning was explained in Section 1.6.1 and the application here is that each motif encapsulates that which makes something matter to the aviation reader (and writer).

This research proposes at least three distinct motifs can be identified in the close-reading as it progresses through subsequent chapters. These motifs emerge in more detail in the next four chapters but are introduced and summarised here for ease of reference:

- **The profits-producing motif.** This motif refers to not just to the way financial profits frame interpretations of safety regulations, but more broadly to anything that individually "profits" the reader. This involves financial imperatives, position, status, reputation, and brand as things that most likely matter to a reader. In this motif, safety can fuse with profit-creating and profit-protecting to a negative degree. In and of itself this is not necessarily bad if balanced with an authentic accident-proofing motif but, as Madsen (2013) points out, a "profits over protection" (p. 763) dynamic often dominates to such a degree that safety concerns are ignored or overridden. Compounding the problem, and as will be seen, the regulations have a liability-proofing motif of meaning which congests genuine accident-proofing efforts. This makes it difficult to effectively counter the profits-producing motif.

- **The liability-proofing motif.** This meaning-making motif represents the various litigious preoccupations that emerge wherever the law is invoked. David-Cooper (2015) points out this involves such things as legal defensibility should an accident occur, prosecution against other parties if one is the harmed party, and various other legal legitimisations of regulations and procedures (p. 89). All of this matters to a reader because legal consequences, real or imagined, are a felt threat in modern society (more on this in subsequent chapters). In this motif, safety fuses with concerns for legitimatised protection from liability by optimising for a successful suit whether it be prosecutorial or defensive. Again, this is not necessarily bad in itself, but when liability-proofing becomes dominant, it not only consumes large amounts of writing and reading attentiveness, it congests clarity, subverts succinctness, and creates confusion. This is not safety, but safetyism, and as will be seen in the next four chapters, is strongly indicated in the way CAR 238 and broader regulations are textually construed.

- **The accident-proofing motif.** This reality-based motif emerges from the curated accidents in the ATSB Airtable (2021) and honours the self-stated safety goal of the *Civil Aviation Act 1988*. The accident-proofing motif is the imperative to prevent accidents and is therefore the red rule version of safety. This involves genuine efforts to identify and address the reality-based causalities of accidents, or near accidents, and mitigate them with reality-based strategies. Chapters 8 and 9 propose, and then comprehensively develop, a reality-based, accident-proofing motif from ATSB investigations.

The communicative premise of a text like CAR 238 seems plain at first: the author writes the text and then the reader interprets the text as the writer intended it. The task for the regulatory reader is ostensibly simple: decode textually the intent of the regulatory author and then comply. However, as has been demonstrated things are not quite that simple because there is no such thing as a hermeneutic "Switzerland" where the text is a neutral medium faithfully communicating authorial intent. Instead, interpretative influences – meaning-making motifs – within a reader's preknowingness negotiate and often clash with the non-neutrality of the text. What this means, in the regulatory context, is that meaning-making problems cannot be solved by simply pursuing yet another re-write or perhaps even punitive action against the "misinterpretees". While these approaches may have merit in certain contexts, a comprehensive array of re-writes and punitive actions will comprehensively miss the other mis-interpretative dynamics at play. Thus, divergent interpretations would continue despite the fresh batch of rules as the variant underlying motifs continued to generate variant meanings.

4.8 Conclusion to Chapter 4

An understanding of the three meaning-making motifs and their underlying hermeneutics is important to understanding how a more compelling conception of safety is both possible and necessary. As will be seen, it is demonstrably easy to allow profits-producing and liability-proofing motifs of apparent safety to prevail if authentic, accident-proofing safety cannot be convincingly conceptualised. The next two chapters not only demonstrate the deleterious effects of profits-producing and liability-proofing, but show these effects flourish when there is no compelling conception of true safety.

What will emerge in subsequent chapters is the observation a reality-based, accident-proofing motif is critically important to the Act's goal of preventing accidents and incidents. This is because while one may achieve profits-producing and liability-proofing by reasonably prioritising accident-proofing, the reverse is not true. That is, a profits-producing imperative does not bring about accident-proofing, nor does a liability-proofing fixation necessarily bring about the same – and, in fact, as will be shown, can bring about the opposite.

When concepts of true safety are confused or congested by the regulatory text, as demonstrated in the next few chapters, convictive uncertainty and ambivalence emerges. If an authentic accident-proofing motif of safety is to be reclaimed the prevailing liability-proofing motif must be deconstructed. This is accomplished in the next two chapters (5 and 6) prior to the construction of a reality-based safety model in Chapters 8 and 9.

CHAPTER 5: ISSUES OF REGULATORY MEANINGFULNESS AND TEXTUAL CONTENT

I do not think that word means what you think it means…

~ The Princess Bride

5.1 Introduction

5.1.1 "Unacceptable from a Safety Perspective"

In 2011, the meaning-making of CAR 238 by the Avtex Chief Pilot was finally tested by the AATA (*Avtex Air Appeal,* 2011). Avtex's case was simple: CAR 238 meant aircraft could take off into forecast icing conditions provided pilots just turned around and came back if they noticed icing beginning to accrete on the airframe or engines. CAR 238 stated:

> The pilot in command of an aircraft must not allow the aircraft to take off for a flight during which the aircraft may fly into known or expected icing conditions, if the aircraft is not adequately equipped with either de-icing or anti-icing equipment of the type and quantities directed by CASA (*Civil Aviation Regulations 1988,* p. 212).

Avtex Air argued CAR 238 did not explicitly state one could not take off and have a look. Thus, there was nothing unsafe nor wrong with, in the Chief Pilot's words to the staff pilots, taking off and "pretty much, if you are picking up too much ice, turning around and coming back" (*Avtex Air Appeal,* 2011, para. 267). The AATA Senior Member had a different conception of what was unsafe or safe; wrong or right:

> I am disturbed by the expression the Chief Pilot is said to have used, not only on this occasion, but in relation to flying

> in the vicinity of thunderstorms, that the pilot should go and "have a look". As far as icing is concerned, you cannot see icing until you begin to observe its accretion on the airframe. In other words, it has nothing to do with looking but rather going up to test the environment to see whether in fact icing conditions do exist where they may have been forecast. That is unacceptable from a safety perspective and it is in breach of CAR 238. (*Avtex Air Appeal,* 2011, para. 280).

The Senior Member's interpretation of Avtex Air's conception of safety from CAR 238 was plain: the interpretation of CAR 238 by the Chief Pilot and CEO was "unacceptable from a safety perspective and in breach of CAR 238" (p. 61). Yet some 10 years later, after substantial and prolonged regulatory reform, the new CAR 238 (in the form of CASR Part 91.710) permits one to take off and have a look.

> This regulation applies to a flight of an aircraft if, during the flight, the aircraft flies into icing conditions; and the pilot in command does not, as soon as practicable, change the aircraft's flight path to try and avoid the icing conditions (*Civil Aviation Safety Regulations 1998,* 2022, p. 519).

Part 91.710 clearly contradicts the AATA's 2011 ruling since it explicitly states a pilot must "*change the aircraft's flight path* to try and avoid the icing conditions" which affirms the idea one can indeed take off and have a look. Thus, as will be seen below, despite Part 91.710 increasing the word count by 68% from CAR 238, it does not clarify the Avtex Air contention and in fact introduces, perhaps unintentionally, warrant for Avtex Air's unsafe interpretation.

In the light of such differing interpretations over the same safety regulation, the second and third research questions become critical: how is meaningfulness conveyed textually and how well do the textual characteristics of the regulations convey their own safety requirements?

5.1.2 Aim and Aspect of the Chapter

The aim of this chapter is to further develop the first phase of the research (the critique phase) by examining the meaning-making implications of regulatory textual characteristics. Five textual attentives relating to the meaningful content and context of the regulations are introduced and examined. This chapter examines the first two textual attentives which relate to content while the remaining three, relating to context, are covered in the next chapter. The findings of these chapters suggest safety regulations have several content and context features that subvert their own self-stated accident-preventing goals.

With the idea of meaning-making motifs and their underlying hermeneutics in place from the previous chapter (Chapter 4), the current chapter focuses the close-reading in a more granular way on how regulatory-textual content interacts with readers at Avtex Air and the AATA. This then leads to Chapter 6 where characteristics of textual context are brought into the circle and analysed via the close-reading. This current aspect of the research is shown in context with the broader structure of the thesis in figure 5.1 below:

Figure 5.1

Chapter 5 within the Broader Movements of the Research

5.1.3 Outline of the Chapter

The outline of Chapter 5 is:

- Section 5.2 – Introducing the textual characteristics of meaning-making.
- Section 5.3 – Textual meaning-making relies on representational content
- Section 5.4 – Textual meaning-making relies on dictional and syntactical content
- Section 5.5 – Unmet regulatory-textual goals of concision, appropriateness, and clarity.
- Section 5.6 – Conclusion.

5.2 Introducing the Textual Characteristics of Meaning-Making

Just as the Senior Member at the *Avtex Air Appeal* (2011) emphasised textual content as a primary meaning-maker – "it is in breach of CAR 238" (p. 61) – so too throughout hermeneutic history similar proclamations have been made. This can be seen in virtually all the hermeneutic definitions at Appendix B from the summative canon. Abrams (1999), for example, insists meaning comes from a "formulation of principles and methods" relating to the text (p. 127) while Murfin and Ray (2018) state textual meaning involves "underlying organising principles, or codes" (p. 197). The main hermeneutic idea is that texts are comprised of symbols, arranged according to codified conventions, mediating meaning-making and written to achieve a functional outcome. In the *Avtex Air Appeal* (2011), the pilot verbally presented the symbols of CAR 238 intending to refute the misappropriation of these symbols by the Chief Pilot (p. 59). To this the Chief Pilot responded with more symbols in his document "Pilot Briefing Notes" refuting the line pilot. Later, at the *Avtex Air Appeal*, the Senior Member ruled, with more symbols, that pilots would contravene the symbols of CAR 238 if they took off and "had a look" (p. 61).

The word "symbols" has been deliberately repeated and emphasised in the previous paragraphs to signpost an important but often unnoticed hermeneutic truth: textual meaning is mediated by symbols arranged according to codified conventions. This, in turn, implies meaning is both expressed and limited by these symbols and conventions. In short, the nature of meaning does not remain unaffected by the nature of textual characteristics. The text is not neutral. The meaning-making influences of textual characteristics are legion and any attempt to collate all of them would see, as Palmer (1969) eloquently puts it, "their perimeter becomes so historically vast as to be unmanageable" (p. 766). In this research, the perimeter is constrained by the summative canon (Appendices A and B) and by the boundedness of the Avtex Air case study and the ATSB database (see Chapter 3 and the methodology for more detail).

Within these organising principles, five key attentives relating to textual meaningfulness are identified. These are grouped under two higher order categories as follows:

- The meaningful attentives of <u>content</u> (this chapter):
  - Textual content is representational.
  - Textual content is dictional and syntactical.
- The meaningful attentives of <u>context</u> (see next chapter):
  - Textual context is situational.
  - Textual context is modal.
  - Textual context is material.

These codified textual characteristics, often invisible (but never intangible), shape meaning-making authority and are examined below. It is worth repeating these are only summative compared to the many textual influences articulated by hermeneutics and if more detail is of interest, readers are encouraged to read broadly in hermeneutic literature as well as consulting various style and effective communication guides. The guides are not dealt with in detail here because they do not emerge as directly relevant when contextualised to CAR 238, Avtex Air, and the regulations more broadly (in accord with the boundedness of the iterative, reality-based methodology – see Section 3.7).

5.3 Textual Meaning-Making Relies on Representational Content

5.3.1 Representational Meaning-Making from Hermeneutics

Hermeneutic literature shows that one of the most significant things that can be said textually about the divergent meaning-making at Avtex Air is that divergence occurs because texts are intrinsically representational. The next most significant thing is that because representation depends upon the chosen representational medium – letters, words, sentences, and paragraphs – the traits of the representational medium have intrinsic and fundamental influences upon final meaning. Every single word in this paragraph (and for that matter every other paragraph ever written) is a representation – a graphical symbol of something beyond itself. Because of this, every single word, sentence, and paragraph has its own set of governing characteristics – each imbuing meaning with sometimes unexpected and sometimes unnoticed effects.

Thus, if Schleiermacher (1998) was to answer the question as to why conflicted meaning-making had occurred at Avtex Air, he would probably begin by pointing out misunderstanding can be both quantitative and qualitative. Quantitative misinterpretation is "the confusion of the location of one part of the utterance in the language with that of another part e.g., confusion of the meaning of a word with the meaning of another word" (p. 22). At the same time, qualitative misunderstanding occurs when there is "confusion of the relationships of an expression, such that one gives it another relationship from the one which the speaker has given" (p. 22). This means the text has its own nature and substance – its own quality – and it also has its own quantitative characteristics through textual placement, arrangement, emphases, and so on. As words are written and read, the underlying assumption by the writer is that the meaning attributed to each word-symbol will be read with the same attribution. That, at least according to Pfeiffer (1998), is the "basic theory" (p. 1) of any communicative act and may seem as obvious as breathing. Yet, just as the enablers of oxygenation – air quality, alveoli capacity etc. – have invisible but not intangible influences on breathing, so too word-symbol-realities in textual meaning-making.

Aristotle (350 B.C.E./2015) is perhaps the first to illuminate this point. In one of the earliest examinations of textual meaning-making, Aristotle demonstrates meaning-making starts with understanding the representational essence of language. He writes: "spoken words are the symbols of mental experience and written words are the symbols of spoken words" (p. 1). Five centuries later Augustine (400 C.E./2017) echoes this by saying "all instruction is either about things or about signs; but things are learnt by means of signs" (p. 8). This emphasis on words as "signs"; that is, as representations, is never far from later hermeneutics. This can be seen in the writings of such authors as Betti (1957), Hirsch (1967), Osborne (2007), and of course Gadamer (2013) who specifically says "every text presents the task of not simply leaving our own linguistic usage unexamined" (p. 280).

All of this can be summarised by saying the textual symbols and their textual characteristics have inherent meaning-making and meaning-maiming influence. These symbols are never neutral in their mediation of meaning. Furthermore, because a great deal depends on a reliable symbol-signified relationship, and that relationship is linguistically changing and changeable, the result can sometimes be, as Allen (2018) puts it, a situation where people often "have the same vocabulary but a different dictionary" (para. 8). This is quite evident in the situation at the AATA and Avtex Air.

5.3.2 Representational Meaning-Making at Avtex Air: "Oversight" and "Safety"

The influence of textual content on meaning, and its inbuilt limitations, can be seen at the AATA in the word "oversight" and then, more importantly, in the word "safety". Both of these words, as with all words, can be seen through a hermeneutic lens as having a shared symbol but with significantly variant signifiers (i.e., same vocabulary, different dictionary). This contingent nature of the symbol-word association, and the implications on safety meaning-making, was clear at the AATA as it decided, because of safety concerns, whether to remove Avtex Air's air operator's certificate (AOC). Consider this sentence regarding the "oversight of the safe operation" (p. 81) quoted by the Senior Member of the tribunal: "the Chief Pilot's primary role, in my opinion, is the oversight of the safe operation of the AOC holder and its compliance with all regulatory material" (*Avtex Air Appeal 2011,* p. 81).

"Oversight" and "safe" are key representational signifiers in this sentence but they cannot escape their own symbolic mediation. The limits and traits of the chosen communicative medium – the words (the signs) "oversight" and "safe" – have their own meaning-making limits and traits. To demonstrate, consider how the meaning of oversight seems straight forward at first glance, but upon deeper reflection proves to be somewhat ambiguous. Is the Senior Member making the statement one might think he is making; that is, a general reminder of the Chief Pilot's safety responsibilities? Grammatically and textually, one cannot be certain because, as Lederer (1978) observes, "oversight" is a contranym – also known as an auto-antonym or Janus word. Thus oversight "has its own meaning-making opposite" along with dozens of others in the English language such as "fast", "rock", "splice" etc.

(p. 27) and could refer to an "unintentional failure" or the "action of overseeing" (Oxford University Press, 2015).

Hence, the Senior Member could be doing something much more consequential than just reminding the Chief Pilot of his supervisory responsibilities. He could, in fact, be making a pronouncement that the Chief Pilot has failed in his safety and governance role (that is, the Chief Pilot is guilty of an oversight – he has failed to over-see). This is no philosophical word-trick. This is simply a textual characteristic at work, along with its textual limitation, in a context with high legal import. Will Avtex Air keep their AOC? It will all depend on whether "oversight" means a proclamation there has been a "failure to oversee" or not.

The ambiguity here, albeit in extreme, highlights what some modern hermeneutic researchers such as Kakoliris (2004) have called the "polysemous" nature of texts (p. 283). "Polysemy" not only refers to contranyms, but more broadly highlights the fact that even for the words that are not contranyms, most words have multiple denotations and connotations. In fact, the record for the number of meanings for the same word is 430: the word "set" (Guiness World Records, 2021). The polysemy of language, along with other textual characteristics, produces a certain indeterminacy in the text and when that indeterminacy is filled by a different preknowingness, variant meaning-making is the result. This has serious implications for the signifier known as safety.

5.3.3 Safety and Representational Meaning-full-ness

While safety is not normally counted as ambiguity-bringing contranym, it can act in a polysemic way with serious implications to meaning-making. This has already been demonstrated in a non-hermeneutic way in Chapter 2, but consider the way the dynamic plays out at Avtex Air. First, recall from Chapter 2 how the denotations of safety generally involved such terms as "protected from danger or harm or damage" and how, while this might make one think safety is a well-grounded and relatively static meaning-maker, the opposite was the case. This will be clearly seen in the use of safety at Avtex Air, but first consider, for broader context, the saying "this is a real safety issue!" Nobody thinks, on hearing "safety issue!" an exclamation is being made regarding how extraordinarily well protected from harm or danger one might be. Instead, rightly so, a hearer automatically assumes there is a significant hazard of some sort. Thus, safety in this context has broken its denotative bounds and intonates the very opposite of its dictionary definition (and its legal definition under the general usage clause).

Consider also a "safety" briefing given to passengers prior to take-off on a commercial airliner. The safety brief isn't really a safety brief at all when one considers the context of all the items covered in said brief. These briefing items are generally concerned with how to egress after an accident, how to put on a life-vest after an accident, how to get emergency oxygen during an accident, and so on. This is not a safety brief but more a how-to-crash-well brief. If it was really a safety brief, it would highlight the things the airline has done to prevent a crash in the first place including; for example, how much training the pilots have had, how well maintained the aircraft is, and how prudent the managers are. That would indeed be a safety brief, at least according to the dictionary definition, because it would be highlighting the "no-harm, no-damage, protected from danger" denotations of safety.

All of this highlights the idea that if safety in these simple instances is not well tethered in its meaningfulness, how much more for complex situations such as Avtex Air?

5.3.4 Avtex Air Representations of Safety

The *Avtex Air Appeal* (2011) records that as the Senior Member reviewed various witness accounts describing the various ways in which line pilots were pressured to "get the job done", he quoted Reason:

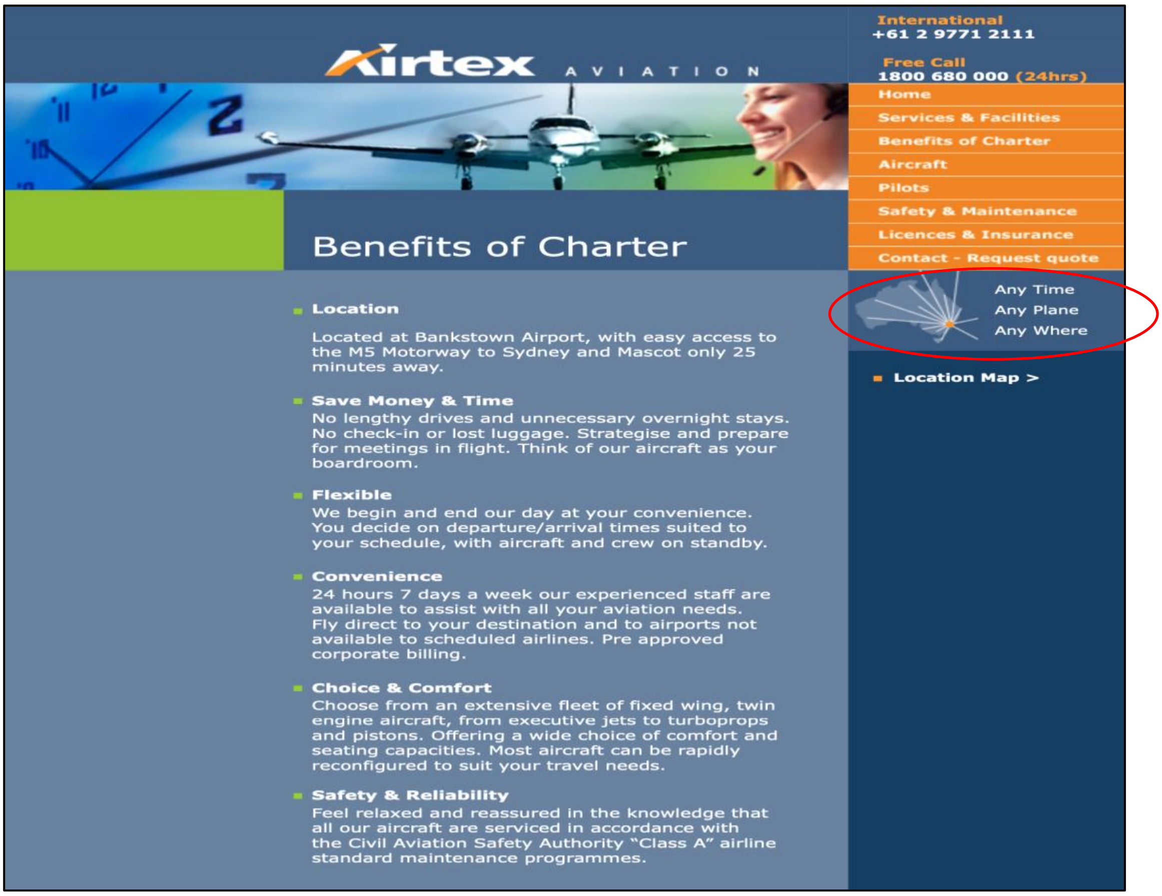
> Time pressure, cost cutting, indifference to hazards and the blinkered pursuit of commercial advantage – act to propel different people down the same error-provoking pathways to suffer the same kinds of accidents. Each organisation gets the repeated accidents it deserves (p. 43).

At the time of the AATA hearing, Avtex Air had indeed experienced "repeated accidents". This was in the form of three major accidents with the last one, an accident on Canley Vale Road near Bankstown airport, killing the pilot and flight nurse on board (more on this in Chapter 10). This was particularly concerning since it would be found the pilot had not received the training he needed to handle the emergency that eventually killed him (ATSB, 2012). At the time of the AATA, the accident was still under investigation by the ATSB but with the weight of evidence gathered at the tribunal, the Senior Member was clearly drawing a connection to the "blinkered pursuit of commercial advantage". And yet, even with this pronouncement, the managers of Avtex Air insisted their conceptions of CAR 238 and other regulations was "safe" (*Avtex Air Appeal*, 2011, p. 31.). Avtex Air management had thus fused their concept of safety with the "blinkered pursuit of commercial advantage" and were conceptualising safety in the sway of a profits-producing motif.

This profits-producing motif (introduced and conceptualised in Section 4.7) is indicated by several additional factors at Avtex Air. These can be seen beginning with Avtex Air's 2011 website and the slogan "Any Time, Any Plane, Any Where" in the sidebar (see Figure 5.2 below).

Figure 5.2

Avtex Air Website 2011: "Any Time, Any Plane, Any Where"



Note. From *The Wayback Machine* Website (2011a)

The website pronounced clients could "save money and time", avoid "unnecessary overnight stays", and "begin and end their day at their convenience" highlighting the profits-producing pressure that each pilot would have had to confront when deciding to cancel a flight due to weather or maintenance. This profits-producing pressure was further amplified by the significant commercial demands from a major Avtex client in the form of Toll Group where "there was pressure from Toll on Avtex and that pressure was then placed onto the pilots to get the work completed" (*Avtex Air Appeal,* 2011, p. 276). With the profits-producing motif in mind, the conflict in the briefing room becomes clearer. The staff pilot who railed against management's "have a look" philosophy, evidently dissonated with management's profits-producing motif. Thus, despite safety (as represented by CAR 238) having the same symbolic representative for the line and Chief pilot; that is, both having the same vocabulary of safety, each had very different "dictionaries" of safety.

There is much more to be said here, but the point is obvious: safety is a symbolic representative and a symbol prone to varied meaning-making. Add to this the observation that one's motif of preknowingness produces dissonant applications of regulations, and the need for standardised conception of safety becomes more real.

5.3.5 The Failures of Safety "Definitionalism"

The dissonant interpretations of safety at the AATA highlight again the vital question of what might anchor safety to a standardised and compelling knowingness. This question will be answered comprehensively in Chapters 8 and 9, but for now consider what will not work at Avtex Air. What will not work is "definitionalism". Definitionalism refers to an over-reliance on the published definition of a word and the way definitions of safety suffer from issues of subjectivity and yet appear to be "objectively" meaningful. It also refers to the lack of expansive meaningfulness in definitions of safety – what could be called "semantic poverty".

The problem of definitionalism and semantic poverty is clearly seen in the regulations. For example, the CASR amendment "How to Use CASRs" (2002) defines the use of definitions as follows:

> Ordinary dictionary words are not normally defined; they are assumed to take their ordinary dictionary meanings. Terms defined in the Act take the same meanings in the Regulations unless redefined in the Regulations. Legal terms also are not normally defined; again, they are assumed to have their ordinary legal meanings. Naturally, the Regulations use many technical terms. A term of which the meaning is well known within aviation and generally accepted is usually not defined. If an unfamiliar word or term occurs in the Regulations, it may be defined in a general dictionary (p. 10).

The question that arises is what, exactly, are "ordinary dictionary words"? That requires, according to the CASR guidance, an ordinary definition of "ordinary". Oxford provides such a definition which is "no special or distinctive features; normal" (Oxford University Press, 2015). But how does that overcome the subjectivity of an "ordinary" reader who might be a part of a community where certain words are ordinary and others are not? It is fairly certain, for example, the ordinary language of the lawyer drafting their "ordinary" legal language into civil aviation regulations at the Office of Parliamentary Counsel (OPC) will be quite different to the ordinary language of pilots, engineers and air traffic controllers (more on the OPC and implications for meaning-making at Section 6.6).

Consider again the implications for Avtex Air. Given the beguiling simplicity of definitions, it might be reasonable to assume the contention can be solved by definitions. This would mean all one has to do is gather the Avtex stakeholders into a room and ensure each of them accepts an agreed upon definition of safety. This might include a definition from ICAO, the relevant CAAP or a general usage dictionary (one would have to pick because, as per Section 2.2, no authorised definition for safety exists in the regulations). However, semantic poverty would soon thwart this approach. The fact is, as shown in Chapter 2, the meaning of safety roves well beyond the perimeter of "protected from harm and danger" and, for that matter, the more "precise" ICAO or CAAP definitions introduced in Chapter 2. This means definitions of safety are simply far too reductionistic – too much like motherhood statements – to provide the specificity one needs for targeted action (see more in Section 9.3). This makes any safety definition, to some degree, functionally irrelevant and unable to counter whatever concept of safety is generated by the reader's preknowingness.

Interestingly, semantic poverty is something of which makers of dictionaries are very much aware. As Dixon (2018) points out, "a word must not be regarded as an isolated item. It is a node in the structural framework of language" (p. ix). Given the predilection for definitions in the preamble to aviation regulations (as though that settles meaning-making authoritatively once and for all), it is an insight worth emphasising. At this point one might want to emphasise the need for an authoritative and expansive dictionary, a book of definitions to rule all other definitions. A lawsuit, as reported on by Warne (2010), illustrates the fraught nature of this strategy. In the lawsuit, the Federal Court had to decide whether a dictionary could authoritatively decide "bathe" and "swim" meant the same thing on a scratchie, worth $100,000 (para. 2.). The outcome rested heavily (so it was thought) on which dictionary had authority to decide the difference between "bathe" and "swim". In the end the court ruled the $100,000 in favour of the plaintiff because:

> Dictionaries recognise that usage varies from time-to-time and place-to-place. However, they do not speak with one voice, even if published relatively concurrently. They can

> illustrate usage in context, but can never enter the particular interpretative task confronting a person required to construe a particular document for a particular purpose. It is dangerous, in interpreting or construing a document, to confine attention to a single dictionary (Warne, 2010, para. 13).

As the ruling expresses, one "can never enter the particular interpretative task" by using definitions alone. This is, in fact, as the court expressed, a "dangerous" strategy because it fails to appreciate the contextual and functional ways in which words change before the dictionary changes. It was only 400 years ago that people thought to capture language in an authoritative book called a dictionary (Dixon, 2018) but even now, after 400 years, the lawsuit above shows words in everyday experience can belie their "authoritative" definitions. Word-meanings overwhelmingly emerge in everyday contexts before the emerge neatly on a dictionary page.

In summary, the concept of definitionalism highlights the need for a semantic fullness of safety in the regulations that is not confined to mere definitions. As a move towards this eventual goal in Chapters 8 and 9, the meaning-making characteristics of diction and syntax are examined in the next section.

5.4 Textual Meaning-Making Relies on Dictional and Syntactical Content

5.4.1 Dictional and Syntactical Meaning-Making from Hermeneutics

The chosen vocabulary (diction), as well as the placement, punctuation, and structure of words (syntax), heavily influences meaning-making. Palmer (1969) explains: "the text itself has its own 'being' in the words themselves, in their arrangement, in their intentions, and in the intentions of the work as a being of a special kind" (p. 449). Buchanan (2010) further highlights this stream of hermeneutic thought in the way "careful attention" must be given to the "specificity of language" (p. 339).

Early hermeneutic writers such as Augustine (400 C.E./2017) and Hillel (Handelman, 2012; Zeitlin, 1963), drew out the importance of diction and syntax, as did pre-reformation and reformation writers such as Aquinas (Andrews, 2009), Wyclif (1905) and Luther (Thompson, 2009). These writers, and many others, produced hermeneutic insights detailing how close attention to diction and syntax allowed exegesis to occur which, in turn, produced authoritative meanings. These writings were widely expressed in rules and principles such as Aristotle's *On Interpretation* and Hillel's *Seven Rules*. However, the efforts of Hillel, Augustine, and others to standardise the meaning-making of the "operations manual" of the church – the bible – was confounded by the Middle Ages when it became completely inaccessible to non-Latin-speaking, non-clerics. As Simms (2015) notes, in medieval times, Latin was considered a sacred language that only the clerical class – the priests – could be allowed to make meaning of (even though the original New Testament was written in Koine Greek which was the street-language equivalent of Greek in ancient times). Thus, a key reformation goal was that "scholars should understand the languages in which the Bible was originally written" (Simms, 2015, p. 17) so that it could then be accurately translated into the language of its more modern readers.

CAR 238 and other modern aviation texts are not written in Latin but there is a key hermeneutic implication here: specialist vocations such as law often have a near-inaccessible diction that might as well be Latin. The representational mode of aviation safety regulations is a legal mode, and this mode has a complex and often confounding diction all its own (more on mode and genre in Chapter 6 below). Kimble (1994) describes this shortcoming of legal "language" calling it "overblown yet timid, homogeneous, and swaddled in obscurity" and "overwhelmed by legalese" (p. 52). While "overblown yet timid, homogeneous, and swaddled in obscurity" might itself be open to accusation of being overblown, the fact remains, regulatory diction in Australia has prompted criticism in Senate reviews and across the industry for a number of years (Senate Standing Committee on Rural and Regional Affairs and Transport, 2013; Forsyth et al., 2014; Australian Flying, 2020). Of particular note, Forsyth et al. (2014) observed that safety regulations are "lengthy, repetitive and wordy which places unreasonable demands on most aviation industry participants to review such turgid documents that are overly legalistic, difficult to understand and focused on punitive outcomes" (p. 96).

A similar critique has been a regular feature in CASA's annual stakeholder satisfaction surveys, the latest of which (2021f) states: "there continues to be low agreement that CASA explains aviation regulations and how they affect industry stakeholders in a clear and succinct manner" (p. 6). Paradoxically perhaps, the finding from the survey also suggests stakeholders are better at deciphering the regulations themselves than CASA. Be that as it may, the lesson is clear: the diction and syntax of air law in Australia is perceived as being overwhelmed by legalese.

On the other hand, it must be stated CASA has attempted to address these issues by implementing the recommendation of the Aviation Safety Regulation Review (Forsyth et al., 2014) to introduce a third regulatory tier known as the "plain language" tier (p. 2). This change finds its most recent expressions in CAO 48.1 (2021) and CASR Part 91 (2022) which, to date, have their own plain English guides and with more planned (more on the hermeneutic implications of this third tier below). The success of these plain language guides (which is still to be determined) will probably be decided to a large degree by the extent to which they are authoritative and the extent to which they fulfil the intent of "plain language" (which also means plain diction, plain syntax, and plain structure).

This leads to the very hermeneutic question of what construes "plain language". Contemporary answers to this question are found in the profusion of "clear writing" or "style" guides and their various clarity-bringing "plain" diction and syntax strategies (well-worn examples are Leddy, 2012; Mazur, 2000; Strunk, 2012). A full hermeneutic treatment of the application of these guides to air law would be too large for the immediate research (and may well appear in future research – see Chapter 10) but suffice to say for now Mazur, citing Steinberg, a proponent of what is known as the "plain language movement", provides both the challenge and the promise of plain language:

> What is plain language? Actually, defining it is not unlike defining information design. Ask 10 people and you'll get 10 different answers. Yet just as with information design, there is a common thread. For example, one definition states that plain language is 'language that reflects the interests and needs of the reader and consumer rather than the legal, bureaucratic, or technological interests of the writer or of the organization that the writer represents' (cited in Mazur, 2000, p. 205).

The meaning-making mission of plain language is clear (plain?) about the use of diction and syntax; namely, language that reflects the interests and needs of the reader. To put it in the context of safety regulations, this should be the diction and syntax of the accident-wary stakeholder not the language of the litigation-minded lawyer or lawmaker. The text's diction should be, as per the reformation imperative, accessible to every reader – not just specialist readers (legal practitioners) who not only have a syntax and diction all their own, but in most cases are far removed from the safety concerns of frontline operations.

This leads to an important observation that, at least according to industry surveys and Senate reviews, there are indications legal diction and syntax has commandeered safety meaning-making. This has serious implications for aviation safety. The most obvious of these is that safety-conviction (and compliance) could potentially be subverted by confusion and unintelligibility. Additionally, "bad actors" (operators deliberately wishing to short-cut legislative requirements) may well be able to leverage off the legalese of the text to suit their own agendas. More concerningly though, the surveys and the Senate inquiries are not the only reasons to believe the meaningfulness of safety has been subverted by dictional and syntactical legalese.

5.4.2 Avtex Air and CAR 238: Dictional and Syntactical Meaning-Making Implications

Consider the hermeneutic implications of diction and syntax in the dissentious CAR 238 (see Figure 5.3 below).

Figure 5.3

CAR 238 as it Appears in the Regulations

238 Icing conditions

(1) The pilot in command of an aircraft must not allow the aircraft to take off for a flight during which the aircraft may fly into known or expected icing conditions, if the aircraft is not adequately equipped with either de-icing or anti-icing equipment of the type and quantities directed by CASA.

Penalty: 25 penalty units.

(2) An offence against subregulation (1) is an offence of strict liability.

Note: For ***strict liability***, see section 6.1 of the *Criminal Code*.

Note. From *Civil Aviation Regulations 1988* (p. 212)

First, note the choices made in the number of words used. This is important because, as noted above, every word is a symbol, and every symbol relies on a standardised symbol-signified relationship. The more word-symbols used, the more potential for misplaced signification because the more words, the more "processing" the reader must do. CAR 238's content, including its title, numbering and "strict liability" warning totals 80 words and 484 characters. That, in Vonnegut's words, is 484 "little marks" (cited in Evans, 2017, p. 19) the reader must make sense of for just one simple outcome – avoidance of icing conditions by an ill-equipped aircraft.

Consider what happens when, as an initial redraft, a more austere diction is used; for example, "the pilot in command must not fly into expected icing if the aircraft is not equipped with certificated equipment for icing". This new rendering reduces CAR 238 from 80 words to 21 words without any loss of the original meaning. This is achieved by the following:

- The phrase "allow the aircraft to take off for a flight during which the aircraft may…" is redundant. Pilots cannot fly without an aircraft and the context clearly denotes an aircraft not a motor vehicle or other mode of transportation.

- The phrase "known or expected" is redundant. If something is "expected", it is "known" and therefore only "expected" is required.
- The phrase "icing conditions" is redundant. "Icing" suffices since icing is a condition.
- The phrase "is not adequately equipped" is redundant since "not equipped" conveys the same thing.
- "De-icing or anti-icing equipment of the type and quantities directed by CASA" can be reduced to "certificated" equipment for icing. "CASA" need not be mentioned because only CASA can "certify" icing equipment and so "CASA" is now redundant (no deeper inference intimated as to CASA being redundant…)
- "Strict liability", "penalty points", reference to "criminal code" etc. is removed. If these must be included (as they do whenever common law is applied) then it can appear as a coverall elsewhere. Additionally, the reference to strict liability has dissonant implications in terms of context and mode (more on that in Section 6.4).

Second, note the dictional choice of the words used to begin the regulation: **"**The pilot in command of an aircraft must not allow the aircraft to…" The intent of the regulation is to allow flight into icing conditions given appropriate certification, and yet for the first 50% of the regulation the pilot-reader is reading "they must not allow the aircraft to take-off". The second 50% then articulates one can fly (with a restriction) but the reader has already had to process the first half of the regulation without even a hint of the main point which is the restriction.

Consider this rewrite: "expected icing may not be flown into if the aircraft is not equipped with certificated equipment for icing". In this re-rendering, the ultimate point – the restriction intended – is the first thing read, not the last. This means the reader is already well on the way towards the intended meaning-making rather than having to wade through generic material that can wait to the latter part of the paragraph or, as evidenced above, trimmed completely.

Third, consider the double-negative construction of the original CAR 238 which begins with "the pilot in command of an aircraft *must not*…" and is followed by "if the aircraft is *not* adequately equipped" thus burdening the reader with two "nots" which may or may not equal a positive. In any case, the two "nots" equate to a double negative which is a well-known clarity-muddler (Thurman & Shea, 2003).

Consider this rewrite: "expected icing may be flown into only if the aircraft is equipped with certificated icing equipment". The sentence is not only more succinct (two "nots" have been removed), it is a downhill run to the main point which is that an aircraft flying into icing conditions must have the appropriate equipment.

Fourth, consider the ambiguity of the word "may" in the "aircraft *may* fly into known or expected icing…" It is hard to know what the *may* "may be" there for (irony intended). That's because the Oxford dictionary (Oxford University Press, 2015) has at least three major meanings for "may":

- Expressing possibility.
- Used to ask for or to give permission.

- Expressing a wish or hope.

If the intended meaning is the first sense (the most used), then the "may" indicates there is a possibility of flying into icing conditions without the appropriate equipment. This immediately casts a pall of confusion over the reading (isn't this sentence supposed to stop aircraft from flying into icing?) If it is the second sense, then the "may" is indicating one might ask for, or even be given, permission in certain circumstances and again confusion arises: is there a caveat or a sub-sub regulation not yet read that allows an exemption thus warranting the use of "may"? If it is the third sense and "may" is indicating a "wishful hope" of an inappropriately equipped aircraft avoiding icing conditions, then is this a rule or just whimsical wish-fulfilment?

Consider this rewrite: "expected icing *can* be flown into only if the aircraft is equipped with certificated icing equipment". The regulation now dispels the confusion-bringing "may" and is down to 16 words succinctly bringing the reader to the intended outcome. The error-potential, in terms of content, is reduced by some 80%. This is because there are now 80% less characters which means 80% less misinterpretative potential and 80% less content for the word-weary reader to process. However, with that said, what this plain language version of CAR 238 clearly shows is that CAR 238 does not prohibit "have a look" and in fact may even encourage it. Interestingly, this meaning-maiming problem becomes even more pronounced when, in subsequent years, CAR 238 become CASR 91.710.

5.4.3 Ten Years Later: CAR 238 becomes CASR Part 91.710

Since Avtex Air and its meaning-making encounters with the AATA in 2011, CASR Part 91 has been released (2022). Significantly, the newly "reformed" regulation has done very little to address dictional and syntactical excess nor clarify the contention at Avtex Air as to whether one can "have a look". Instead, Part 91.710 has, along with all the other regulations (as will be seen), increased its dictional content – from 80 words in CAR 238 to 130 words in Part 91.710 (an increase of some 62%). Figure 5.4 shows CASR Part 91.710 as it exists in the regulation itself:

Figure 5.4

Part 91.710 as it Appears in the Regulations

91.710 Flight in icing conditions—requirements for flight

(1) This regulation applies to a flight of an aircraft if:
 (a) when the flight begins, icing conditions are known or suspected for the flight path along which the aircraft will be flown; or
 (b) both:
  (i) during the flight, the aircraft flies into icing conditions; and
  (ii) the pilot in command does not, as soon as practicable, change the aircraft's flight path to try and avoid the icing conditions.

(2) The pilot in command of an aircraft for a flight contravenes this subregulation if, when the flight began, the aircraft was not type certificated as complying with the airworthiness standards relating to flight in icing conditions.

(3) A person commits an offence if the person contravenes subregulation (2).

Penalty: 50 penalty units.

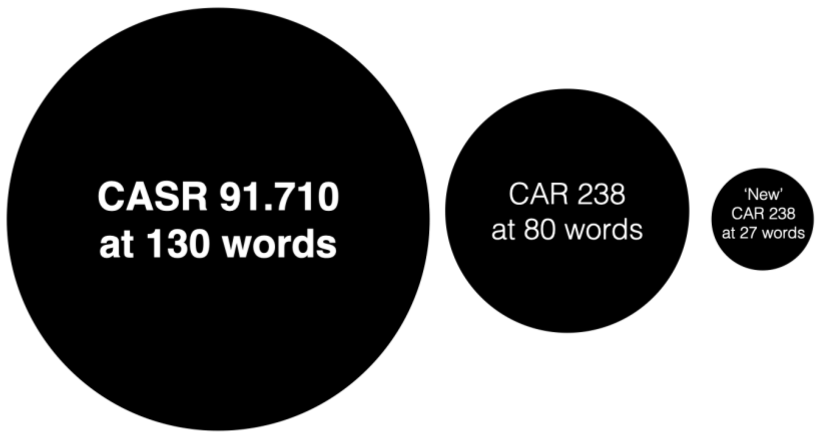
Note. From *Civil Aviation Safety Regulations 1998* (2022, p. 519)

Recall the *Avtex Air Appeal* (2011) recorded the Senior Member's ruling that CAR 238 could not be safely interpreted with "have a look". This was because such an action risked icing on the way up to higher levels – or alternatively incurring other risks while flying VFR at lower levels (p. 61). Significantly, this contentious point has not been resolved in the new Part 91.710 and there is nothing that would decisively prevent another Avtex Air pilot being told, with at least some legitimacy, "have a look". In fact, sub-sub-clause (ii) in para (1) empowers "have a look", where the clause states that the pilot commits an offence if, after sighting icing conditions, "the pilot in command does not, as soon as practicable, *change the aircraft's* *flight path* to try and avoid the icing conditions (my emphasis, p. 519). This strongly infers one can "have a look", since one cannot change a flight path unless they are already in flight. Of course, the ability to have a look may well be the interpretation intended all along by the regulations, but this would only prove the point – the dictional choices of the regulations have led to a meaning-making source of confusion for safety. In any case, at least if one considers the AATA ruling to be correct, the new version of CAR 238, and its 62% increase in words, does not bring greater clarity to the point of contention at Avtex Air. Nor does Part 91's plain language guide which states the same thing as its legalised version albeit with simplified and decluttered clauses (CASA, 2021i). In fact, if Part 91.710 was somehow injected into the past, and into the 2011 Avtex Air situation, it would subvert the Senior Member's comments despite the fact more words have been used.

This leads back to the re-rendered and shortened version of CAR 238 created for the research in Section 5.4.2 above. Why not a similar clarity-bringing word-cull for the new Part 91.710? This is not to say the re-rendered CAR 238 would have prevented the combative meaning-making at Avtex Air but perhaps the shorter, re-rendered CAR 238 would have allowed for a small addition – one still allowing for succinctness but codifying the Senior Member's clarification: "expected icing can be flown into only if the aircraft is equipped with certificated icing equipment. 'Expected icing' for non-certificated aircraft precludes flight to ascertain such icing". The new diction keeps the word-count low (27 words compared to the original 80 of CAR 238 and the 130 of Part 91.710) but now the "wiggle room" to "have a look" is ameliorated. A content-contrast, from largest to smallest, between Part 91.710, CAR 238 and the re-rendered CAR 238 is provided in Figure 5.5 below:

Figure 5.5

Content-Contrast Scale of CAR 238, Part 91.710, and the Re-rendered CAR 238



The dictional excess of CASR 91.710 is obvious in the way it is 4.5 times bigger than is meaningfully necessary to convey the key safety point of avoiding icing conditions.

5.4.4 The Dictional and Syntactical "Goldilocks Zone"

To summarise the main ideas so far of diction and syntax, language is not neutral in its mediation of meaning. While there are many implications of this idea one of the most obvious is that the more words there are, the more potential for both the making and the maiming of meaning. A diminutive word-count cannot necessarily thwart other meaning-making dynamics, but the main point stands which is that there is probably a "goldilocks" zone or "sweet spot" for diction where there are neither too few nor too many words. With too many words, safety is subverted by confusing complexity, while with too few, safety is compromised by semantic poverty and definitionalism. In any case, too many words are just as bad as too few if one wants a compelling meaningfulness to inhere the regulations.

While much more could be said about the meaning-making power of diction and syntax in CAR 238 and Part 91.710, suffice to say for now diction and syntax really matter: they are to meaning as DNA is to physiology, often unnoticed, often intangible but profoundly influential. In the ongoing analysis of textual context there are several more important implications that will be highlighted regarding the transformation of CAR 238 into Part 91.710. For now, the most obvious question that emerges is how widespread is dictional excess in air law? As already seen, there are strong indications CAR 238 and Part 91.710 exist well outside the dictional Goldilocks zone, but what about safety regulations more broadly? A regulatory analysis against regulation's own self-stated dictional goals, including a comparative word-count analysis from 20 years ago to present, is carried out below and provides further findings regarding the ways in which regulations are subverting their own safety goals.

5.5 Unmet Regulatory Goals of Concision, Appropriateness, and Clarity

5.5.1 The Civil Aviation Act's own Dictional and Syntactical Goals

The dictional excess in CAR 238 in the previous section led to the question of whether the rest of the regulations are textually-optimised. Before this question is considered, notice how the *Civil Aviation Act 1988* uses the terms "appropriate, clear and concise" in describing how aviation standards are to be constructed: "CASA has the function of developing and promulgating appropriate, clear and concise aviation safety standards" (*Civil Aviation Act 1988,* p. 14). If "appropriate, clear and concise" applies to the aviation safety standards, it must surely have merit for the rest of the legislation (unless the rest of the legislation is meant to be inappropriate, unclear, and non-concise). Thus these three dictional and syntactical goals provide useful principles in assessing whether or not regulations as a whole are indeed meeting the Act's textual goals. This section uses the Act's own self-stated dictional principles in consort with a regulatory word-count and the ATSB Airtable (2021) as follows (see Chapter 3 for the underpinning methodology):

- **Concise**: To determine concision, a regulatory word-count of legislation in 2021 is carried out and compared with the regulatory word-count in 2001 and a 242 % increase is noted over the 20-year period.
- **Appropriate**: To determine appropriateness, the 2000 and 2020 comparative word-count increase is compared to the 2001-2019 ATSB-recorded accident rates to show the total accident rate has had negligible changes despite a 242 % increase in regulatory words. In fact, a trending increase in the total number of accidents is noted despite a relative stability in Australian aircraft total fleet hours.
- **Clear**: To determine clarity, a count was made of publicly available ATSB to CASA safety actions requesting regulatory changes, clarifications, or examinations (1997-2021). This count noted a 68% significant increase from 2010 to 2021.

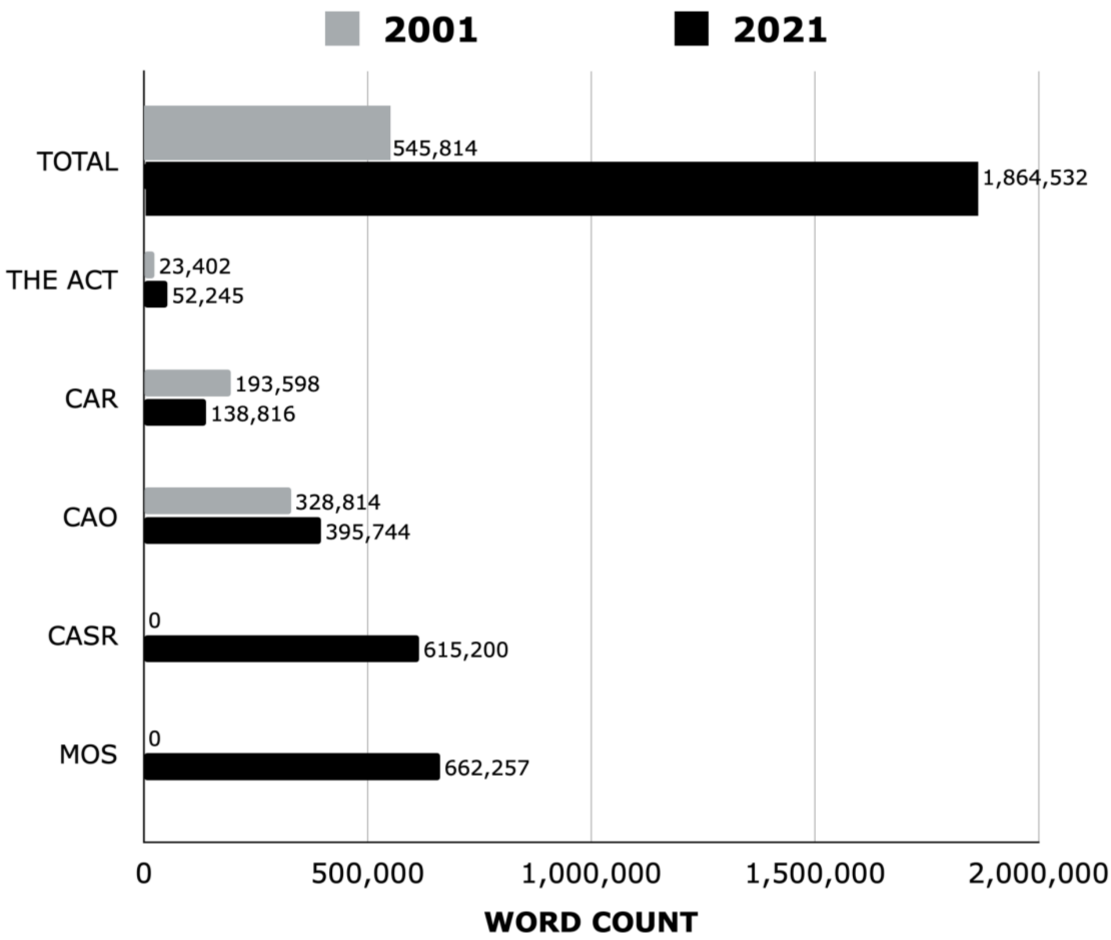
5.5.2 Concise? A Regulatory Comparative Word-count.

A word-count of core safety regulations reveals that in 2001 they contained some 545,814 words. By 2021 this had increased to 1,864,532 words – a 242% increase over 20 years and an average increase of 66,968 words each year. Appendix D contains indicative examples of the spreadsheets used to determine the counts and a breakdown of individual regulations and their own word-counts.

Appendix D also contains average reading and speaking times to provide further perspective. The methodology for the word-count can be found in Section 3.5.4 of Chapter 3. Figure 5.6 below shows a graphical representation comparing the word-counts of the 2001 and 2021 versions of the core regulations namely the Act, CASRs, CARs, CAOs and the MOS suite.

Figure 5.6

Word-count Comparison of Core Regulations 2001 to 2021



Note. The 2001 documents were current as at December 2, 2001: the 2021 documents were current as at June 5, 2021. See Appendix D for more details.

Before discussing the implications of the large increase of words, some other key findings are worth noting. Firstly, CAOs, which should have lessened in its count as the MOS suite (its successor), became more mature, has managed to increase from 328,814 to 395,744 words (at the same time the MOS suite itself managed to add a hefty 662,257 words). Secondly, CARs only reduced by some 55,000 words (35%) over the 20 years despite the fact CARs were intended to be completely subsumed by CASRs ("How to Use CASRs", 2002, p. 3).

Thirdly, it should be noted the count above does not include the many other documents an aviation professional is expected to assimilate such as Aeronautical Information Publications (AIPs), Aeronautical Information Circulars (AICs), AIP Supplements, Plain Language guides and so on. Nor does it include, as CASA points out, "other instruments, such as approvals, Australian Technical Standard Orders (ATSOs), authorisations, designations, determinations, directions, exemptions, instructions, permissions, permits, specifications, revocation notices or airworthiness directives" (CASA, 2021e, para. 3). Also of note, the word-count does not include the legion of aeronautical texts the average aviation professional is examined on as part of their regulatory responsibilities as licence holders e.g., aerodynamics, meteorology, radio-telephony, technical systems, human factors etc.

Moreover, the word-count comparison does not include any extant texts produced after 1 June 2021 when the word-count was finalised. Since then, such documents as the new CASR Part 91, Part 91 plain language guide, Part 133, Part 138, and Part 119 texts (amongst others) have been produced adding many tens of thousands of words to the counts above despite subsuming more CAOs and CARs. Thus, the extraordinary growth in regulatory words appears to show no sign of abating. To give this practical perspective, regulations have added a novel's worth of regulatory material (some 66,000 words) every year since 2001 (an average novel is usually 60,000 to 150,000 words). This means, in 2021, a committed but cursory reading of these 1.8 million words would take an average reader (at 200 words per minute) over 151 hours to read. This is 20 working days or 4 working weeks of reading. If they wanted to read it out loud (at 150 words per minute) – perhaps to a rather bored audience – that would take 26 working days or at least 5 working weeks.

5.5.3 The Sydney Harbour Bridge Dynamic and other Implications

Notwithstanding the varied aircraft, operations and organisations CASA must regulate (which only goes a small way to explaining the immensity of the word-count), the fact remains that there are deleterious meaning-making implications of a word-count as immense as 1.8 million words (and growing). As seen with CAR 238 at Avtex Air, if a "simple" regulation of some 80 words can be so differently interpreted, the probability of 1.8 million words being misinterpreted is even greater. Furthermore, the 1.8 million words of core regulations are now large enough for the "Sydney Harbour Bridge" principle to apply: the bridge is so large that by the time the constant cleaning, repairing, and painting is finished at one end, the other end is ready for work to begin again. So too the regulations: they are now so large (and growing larger) that not only must they be constantly reviewed, edited, and updated but in fact, like the Sydney Harbour Bridge, just as one "end" of the regulations are completed, renewed editing and auditing needs to begin again at the other end. The harbour bridge dynamic is reflected in the Aviation Safety Regulation Review (Forsyth et al., 2014) where constant critiques were directed at the never-ending nature of the regulatory reform program.

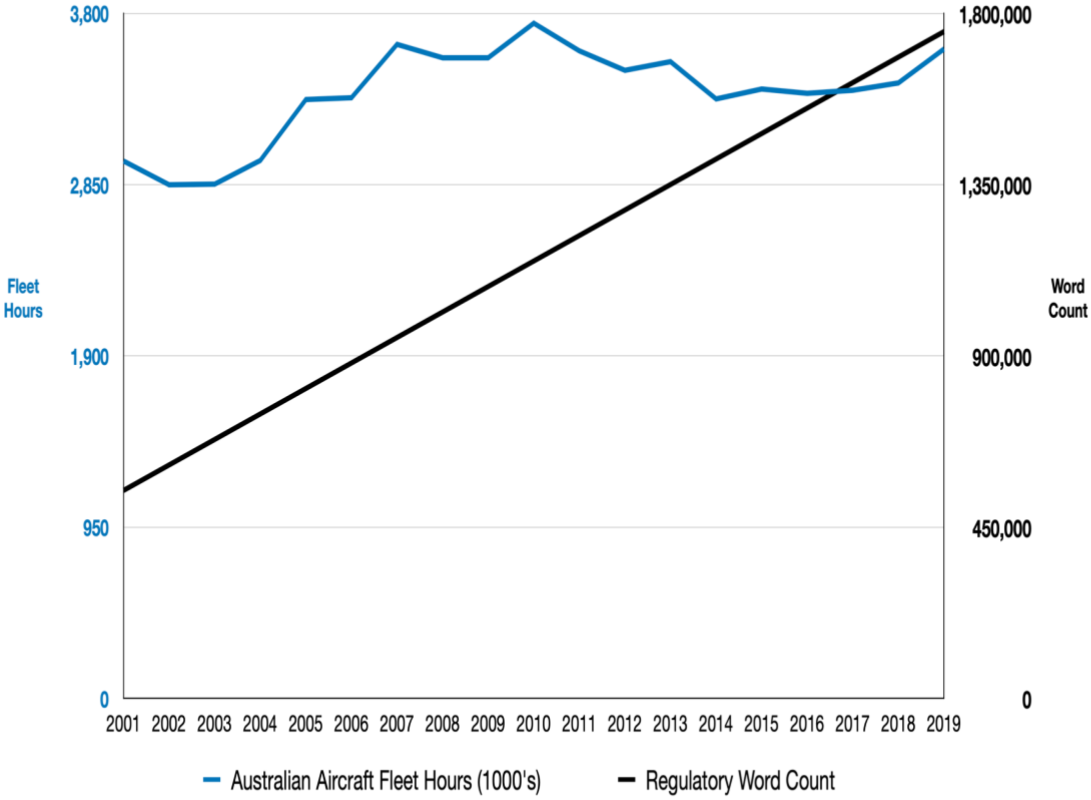
With all this in mind, and considering the unproven assumption humans can compliantly read and assimilate that amount of regulatory words (Zimmermann, 2007), it is difficult to see how the Act's directive of conciseness is being met. If liability-proofing is the goal, then the dictional excess may well be merited, but the safety-essential question remains: even if liability-proofing is achieved are the 1.8 million words, in their excess, really helping prevent accidents and incidents as the Act demands? In the next section, the regulatory word-increase is compared with the ATSB-reported accident rates over the period 2000-2019 to provide an answer.

5.5.4 Appropriate? Regulatory Rates versus ATSB Accident Rates

To determine dictional "appropriateness" of the increased (and increasing) regulatory word- count, the growth was compared with Australian aircraft fleet hours from the Bureau of Infrastructure, and Transport Research Economics (BITRE) and ATSB-recorded accidents and fatalities. Three charts, equating to the 242% regulatory word-count increase (2001-2019), were developed. The first, in Figure 5.7 below, shows the total Australian aircraft fleet hours compared to the yearly regulatory word-count increase. Fleet hours equate to the total hours flown by all aircraft in Australia including regular public transport (RPT), Non-Scheduled Commercial Air Transport (Charter), freight, general aviation, ultralights, gliding and so on (BITRE, 2020, p. 17). These fleet hours provide context to the ATSB accident rates in Figures 5.8 and 5.9 since the investigations involve the same fleet over the same period.

Figure 5.7

2001-2019 Total Australian Aircraft Fleet Hours / Regulatory Word-Count Comparison



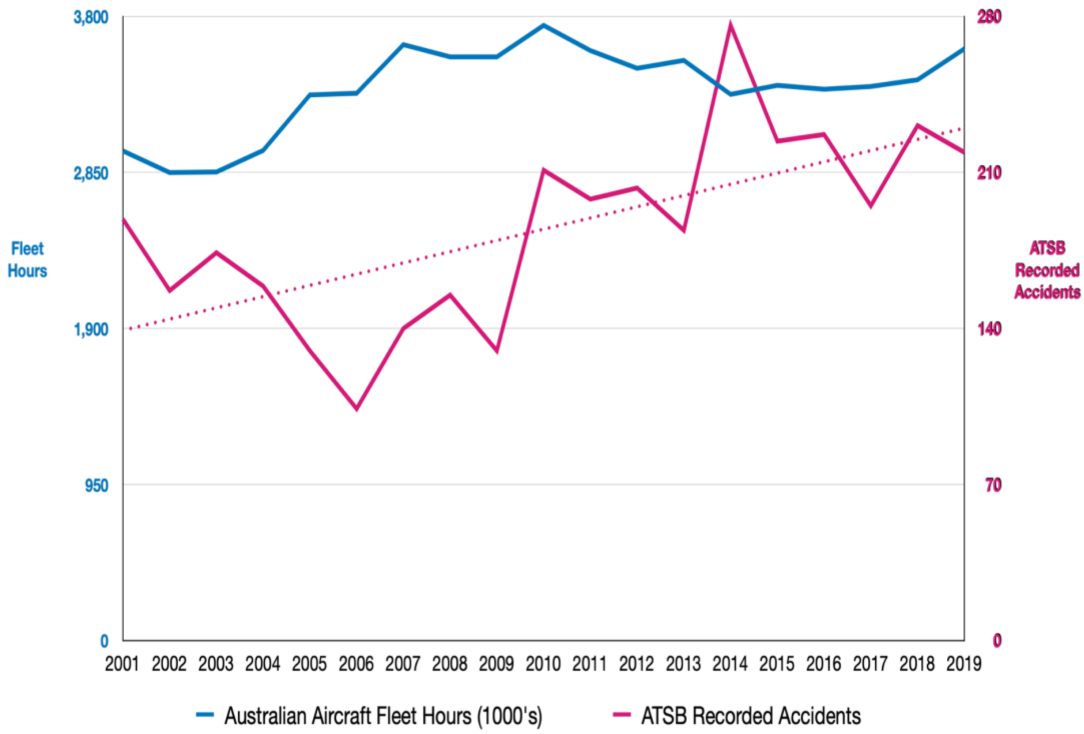
Note. See Appendix E for more detail including original BITRE report excerpts and references. It should also be noted the period ends in 2019 to avoid the statistical disruption of COVID-19.

Figure 5.7 above shows the fleet hours of Australian aircraft remaining relatively stable from 2001 to 2019 as the regulatory word-count increased some two and half times. A slight increase in fleet hours occurs from 2001 to 2006 but remains essentially stable for the remainder of the period. This stability in fleet hours from 2006 is significant in figures 5.8 to 5.10 below since there is no discernible increase in fleet hours to explain the increase in accidents.

Figure 5.8 below takes the same fleet hours as Figure 5.7 above, over the same period, and compares them to ATSB-recorded aircraft accidents.

Figure 5.8

2001 to 2019 Total Australian Aircraft Fleet Hours / ATSB Recorded Accidents Comparison



Note. See Appendix E for more detail including original BITRE and ATSB report excerpts and references. Dotted line in red is a linear trend line.

Figure 5.8 above shows that despite the relatively stable fleet hours, an upward trend in the number of yearly accidents from 2006 is quite discernible. This coheres with the ATSB's own observations which suggested "it is very likely that the trend in the number of GA total accidents was increasing" because of "an overall increase in the number of accidents associated with an aircraft conducting aerial work" (ATSB, 2020, p. 9).

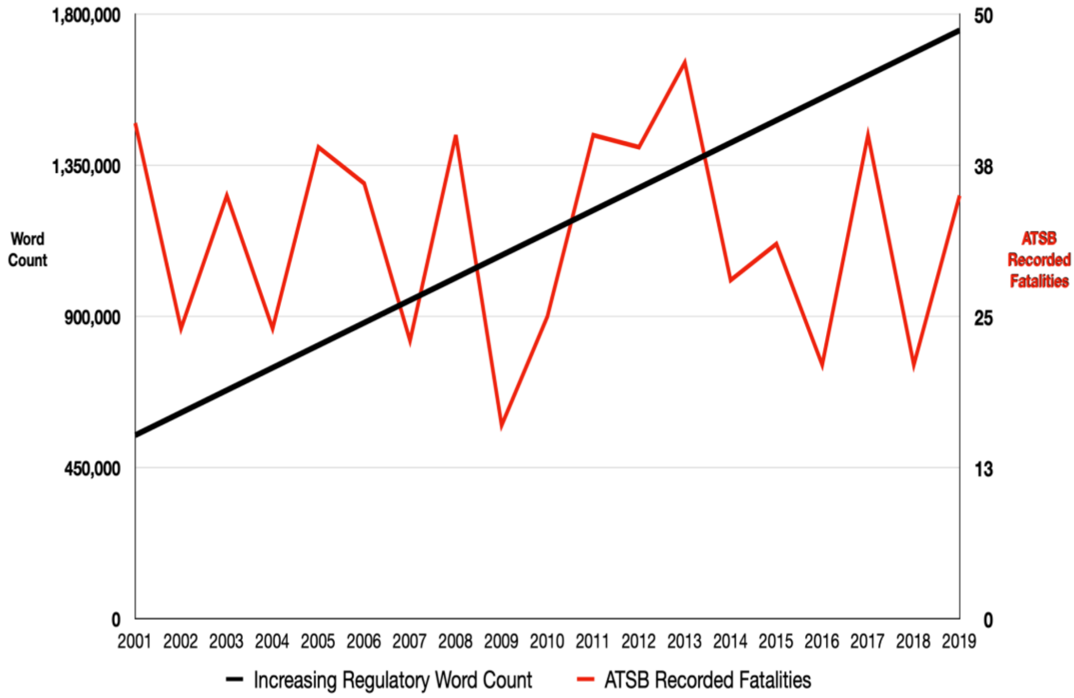
Figures 5.9 and 5.10 below compare regulatory word-count increases to ATSB-recorded aircraft accidents and fatalities.

Figure 5.9

2001-2019 Regulatory Word-Count / ATSB Recorded Accidents

Figure 5.10

2001-2019 Regulatory Word-Count / ATSB Recorded Fatalities



Note. See Appendix E for more detail.

The analysis in Figure 5.9 above shows that from 2001 to 2019, the ATSB-reported accident rate did not reduce and, in fact, showed a discernible trend-increase. At the same time Figure 5.10, also above, shows the fatality trend, although experiencing large peaks and troughs, did not discernibly decrease. Figure 5.9 is the most significant chart in assessing whether the regulatory growth has been appropriate. Over the period 2009-2019, a low of 130 yearly accidents increased to a peak of 276 in 2014 and finished with 219 in 2019. This represented, in totality, a discernible trend upwards of accidents over the period with a marked upswing in 2006 even as fleet hours remained stable and the regulatory word-count continued to experience extremely large growth. Thus the 242% increase in regulations correlated with a noticeable increase in accidents (Figure 5.9 above) and a non-reducing fatality rate (Figure 5.10 above).

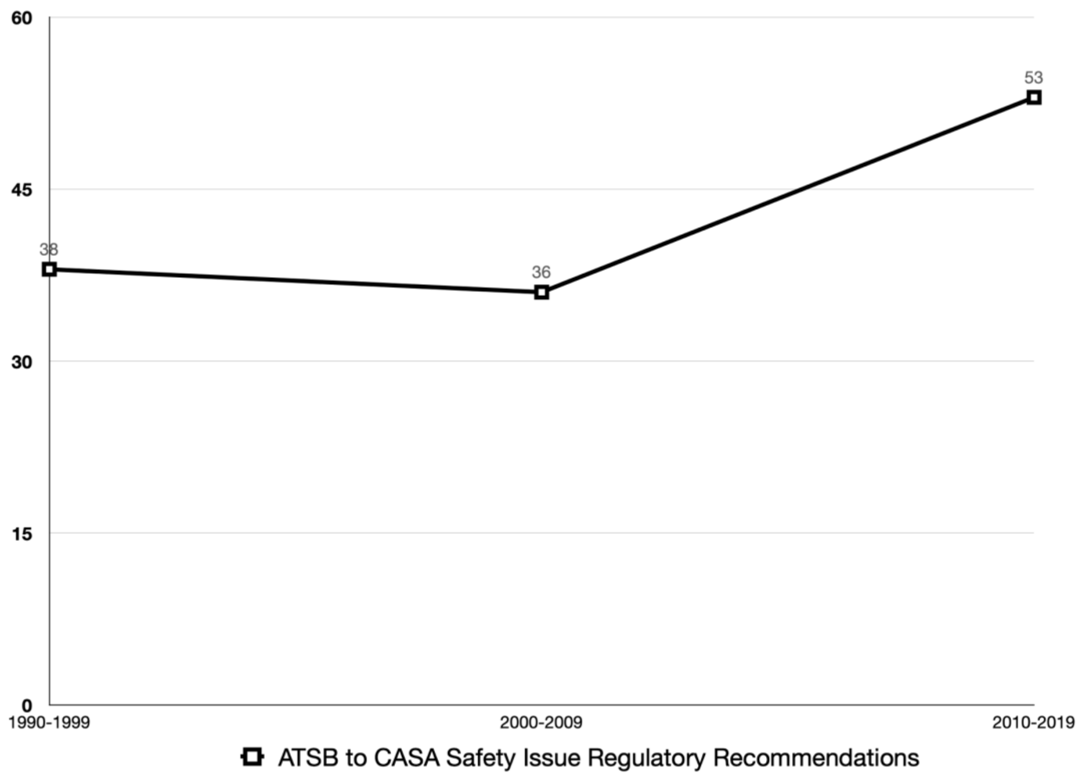
Of course it must be noted that causality is hard to establish between the regulatory-word increase and the increase in accidents. There are, of course, other reasons unexamined and outside the scope of the research, the accident rate may have increased including the type, (not just the quantity of hours being flown), the possible increase in profits-producing pressures, changes to training and changes to crew experience. Nonetheless, and notwithstanding the issues highlighted in Chapter 2 with using accident rates to measure safety success, what can be said is the increased regulatory word-count does not appear to have generated a positive effect on the accident rate. Nor does the regulatory increase seem to be addressing whatever these other causal mechanisms might be which means regulations, in their excess, are not effectively achieving their self-stated goal of preventing accidents and incidents. In short, the "appropriateness" goal of the Act is not being effectively met.

5.5.6 Clear? ATSB-Noted Safety Issues and Actions Regarding Regulatory Clarity

A further count from the ATSB and the ATSB Airtable provides a strong indication the Act's self-stated goal of clarity is also in question. This is evident in the increase in the ATSB count of publicly available (1997-2019) safety actions that requested CASA make regulatory changes, clarifications, or examinations. Figure 5.11 on the next page shows from 30 June 1997 to 8 July 2021, the ATSB made a total of 139 recommendations that CASA should make regulatory changes, clarifications, or examinations. These recommendations significantly increased over the decade 2010-19. Section 3.5.5 of Chapter 3 explains the methodology behind this count.

Figure 5.11

1997-2019 ATSB to CASA Requests for Regulatory Clarifications



Note. From the ATSB Website (ATSB, 2021d).

As can be seen in Figure 5.9 above, from 1997 to the late 2000s, issues of regulatory clarity remained relatively consistent but then, in the last decade from 2010 to 2019, an increase of some 68% occurs. An indicative sampling of the 139 recommendations are as follows:

- "While the Air Display Manual provided guidance to organisers conducting an air display, it did not inherently provide the processes and tools needed for CASA to approve and oversee one and no other documented guidance existed". Safety Issue AO 2017-013-SI-01 (Australian Transport Safety Bureau, 2021d).
- "Section 4 of Civil Aviation Advisory Publication (CAAP) 5.23-2(0), Multi engine Aeroplane Operations and Training of July 2007 did not contain sufficient guidance material to support the flight standard in Appendix A subsection 1.2 of the CAAP relating to Engine Failure in the Cruise". Safety Issue AO-2010-043-SI-01 (Australian Transport Safety Bureau, 2021d).
- "Important information relating to Civil Aviation Safety Authority (CASA) airworthiness directive AD/PZL/5 was not contained in CASA's airworthiness directive file, but on other CASA files with no cross-referencing between those files. This impacted CASA's future ability to reliably discover that information and make appropriately-informed decisions regarding the airworthiness directive". Safety Issue AO-2013-187-SI-07 (Australian Transport Safety Bureau, 2021d).

These indicative safety issues were also accompanied by various ATSB findings which themselves provide important indications to problems with clarity. For example consider the following sampled from the ATSB Airtable (2021):

- "A harness instrument, commonly issued by the Civil Aviation Safety Authority (CASA), stated that a harness could be used instead of a seatbelt for take-off and landing. Although not intended by CASA, this instrument was easily able to be misinterpreted as indicating that a seatbelt was not required to be used during take-off and landing". Report AO-2019-025.

- "Regulatory guidance regarding the measurement of fuel quantity before flight lacked clarity and appropriate emphasis and did not ensure that the fuel quantity measurement procedures used by operators included two totally independent methods". Report AO-2017-017.

Each ATSB recommendation, and the increase of many like them, shows regulatory clarity was in question to a degree that new rules had to be written, existing rules rewritten, and/or guidance issued. Moreover, this increase correlates with the regulatory increase observed in the sections above suggesting that above a certain content-level, the more one writes regulations the more one must write clarifications. This will be discussed further under the "irony of legislationism" in Chapter 9.

In summary, the regulatory word-count increase, the dictional and syntactical congestion, the increase in accident rates and the increase in ATSB recommendations requesting clarity from CASA regarding its dictional and syntactical choices, all strongly suggest the regulation's own goals of concision, appropriateness and clarity are not being met.

5.6 Conclusion to Chapter 5

The findings of this chapter strongly suggest safety regulations have several content-characteristics that are subverting their own safety goals. This is evident in the 242% regulatory word-increase – an increase which makes no discernible contribution to accident-prevention. It is also evident in the way regulatory congestion and confusion predominate when, according to the *Civil Aviation Act 1988,* the regulations should be concise, clear, and appropriate. Having explored the first two textual attentives relating to the content of the regulations, the next chapter explores contextual aspects as expressed in the three remaining textual attentives. The next chapter completes the critique phase of the research.

CHAPTER 6: ISSUES OF REGULATORY MEANINGFULNESS AND TEXTUAL CONTEXT

To expect a man to retain everything he has ever read is like expecting him to carry about everything that he has ever eaten.

~ Arthur Schopenhauer

6.1 Introduction

6.1.1 The "Oversight" of Context at Avtex Air

In the previous chapter, several meaning-making issues of textual content were explored in the AATA's use of the word oversight: "the Chief Pilot's primary role, in my opinion, is the *oversight* of the safe operation of the AOC" (*Avtex Air Appeal*, 2011, p. 81). The word-symbol relationship made the word oversight somewhat slippery because of its characteristics as a contranym. Was the Chief Pilot merely being reminded of his responsibilities or chastised for his failure to carry out those responsibilities? In the same way, in this very introduction, does the tribunal's "oversight" refer to the tribunal missing something or to them supervising something? And if such words as "oversight" can bring polysemous ambiguity, what of the more critical word "safety"? These were the textual-content questions explored in the previous chapter and, having examined the surrounding meaning-making issues in some detail, leads to the equally important issue of contextual influence. As will be seen, textual context makes meaning through at least three key dynamics: the situational, the modal and the material. All three are explored below.

6.1.2 Aim and Aspect of the Chapter

The aim of this chapter is to examine the meaning-making implications of textual context in the world of the Avtex Air and its interactions with the safety regulations. This continues to address the question of how textually effective the regulations are in conveying a compelling conception of safety. It also concludes the critique phase of the research.

In this chapter it is shown that the contextual characteristics of safety regulations, in like manner to their textual-content, have several features that subvert the regulation's own meaning-making effectiveness. A part of the aim is to show that the motif of liability-proofing is strongly indicated with the point being made toward chapter's end that this is because, amongst other contextual reasons, regulations lack any compelling conception of safety. The second phase thus moves to provide a compelling, reality-based, red rule conception of safety which, it is hoped, can bring a shared meaningfulness of safety for both regulatory readers and writers in the form of the Incident, Accident and Safety Attribution (IASA) model.

The current aspect of the research is shown in context with the broader structure of the thesis in figure 6.1 below:

Figure 6.1

Chapter 6 within the Broader Movements of the Research

6.1.3 Outline of the Chapter

The outline of Chapter 6 is:

- Section 6.2 – Hermeneutics and contextual meaning-making: an overview.
- Section 6.3 – The situatedness of a text and its implications for meaning.
- Section 6.4 – The modality of a text and its implications for meaning.
- Section 6.5 – The materiality of a text and its implications for meaning.

- Section 6.6 – The problems of liability-proofing for safety
- Section 6.7 – Summary: Hinderances of regulatory-textual characteristics to safety.

6.2 Hermeneutics and Contextual Meaning-Making: An Overview of Situational, Modal and Material Contexts

Hermeneutic scholars old and new have noted the implications of contextual meaning-making. Vanhoozer (2009) observes this as far back as the Socratic dialogues and the interlocutor Hermogenes with his "picture of language as a system" (p. 17). It can also be seen centuries later when Augustine (400 C.E./2017) notes: "in the case of direct signs, ambiguity may arise from the punctuation, the pronunciation, or the doubtful signification of the words, and is to be resolved by attention to the context (p. 4). And, in modern times, Osborne (2007) reflecting on Saussure, says "the meaning of a word depends not on what it is in itself but on its relation to other words and to other sentences which form its context (p. 94).

In general usage, "context" refers to "the parts of something written or spoken that immediately precede and follow a word or passage and clarify its meaning" (Oxford University Press, 2015). From the summative canon at Appendix B, three attentives of contextual meaning-making emerge:

- **Situational**. The first attentive emerges from that which has already been mentioned above by Osborne (2007); namely, context highlights not "what it is in a word itself but its relation to other words and to other sentences" (p. 94). This first aspect of context is termed the situational context for the purposes of this research.
- **Modal**. The second contextual attentive is perhaps less

obvious than the first but no less important. In hermeneutics, according to Thiselton (2009), the modality of a text refers not to "what is said" but "how it is said" (p. 170). Textual types and genres, as modal influences, significantly contribute to meaning-making by reframing the textual components themselves.

- **Material**. In hermeneutics and literary theory, Hayles et al. (2002) note the term used to describe the idea of the material aspect of a text emerges from structuralism and is called "textuality", or more specifically, when applied to the physicality of the text, "materiality" (p. 19). Materiality refers to the way the physicality of the text provides a visual, formatic "context" with "signifying components" in the "literary artefact" that then shape meaning. The same text presented on different physical materials such as papyrus scroll, ruled legal paper, a scrolling screen, or a PDF result in different meaning-making dynamics. The totality of the text, or its compartmentalisation by the medium, is thus either reinforced or understated by the material context.

In the following sections each of these three attentives are explained hermeneutically and then brought into close-reading dialogue with Avtex Air*.*

6.3 The Situatedness of a Text and its Implications for Meaning

6.3.1 Situational Meaning-Making from Hermeneutics

Thiselton (2009) tells us a reader arrives at meaning not because of a single word or "single proposition, but a system of propositions". Thus meaning-making entails "things standing unshakeably fast by what lies around them" (p. 15). Murfin and

Ray (2018) say the same, pointing out that texts have "underlying organising principles, or codes" meaning that they rely situationally on the where, why and how of textual placement not just the "what" of each word (p. 72).

Interestingly, a similar observation is made as far back as Aristotle (350 B.C.E./2015) where he uses, as an example, the single word-sign of "human" and says "the word 'human' has meaning, but does not constitute a proposition, either positive or negative. It is only when other words are added that the whole will form an affirmation or denial" (p. 4). For Aristotle, breaking down a sentence into its component parts and relying upon the individual parts for derived meaning is, ironically, meaningless. This is because sentences and paragraphs convoke meaning from the sum of the words.

At a popular level an outworking of this can be seen when hapless celebrities or politicians are heard bemoaning their apparent misquote with "I was taken out of context!" (Google, 2017). By this they mean a single sentence or phrase has been decoupled from its situationality and now appears to say something different to that intended. Whether one suspects such a statement is merely a convenient excuse is outside the scope of this study, but the fact that such a statement is widespread, and is often deemed plausible, shows that Aristotle's observations are on point: situationality is instrumental to meaning.

Later hermeneutic writers also highlight the situational aspects of context. Zeitlin (1963) points to Hillel in 20 B.C.E who is attributed with creating, or at least collating, the so called "Seven Hermeneutic Rules" (p. 11). Zeitlin (1963) notes, along with Thiselton (2009), that most of the seven rules rely on situational meaning-making to resolve ambiguities or apparent conflicts (p. 2).

For example, Hillel's first rule is the "light and heavy" rule which, as Dockery (2000) observes, argues for a minor premise to a major one within the broader situation of the text (p. 316). Rule 2 is "cut equally" which is the idea that meaning can be inferred from other, clearer, verses. Rules 5 and 6 derive meaning by arguing from the specific to the general and back again, as well as seeking meaning from similarities in other textual parts (Zeitlin, 1963, p. 316).

Dockery (2000) notes that Augustine emphasises and develops many of Hillel's principles, insisting on the broader meaning-situations of the text (p. 157), and Simms (2015) highlights that Martin Luther develops Hillel's rules still further with his "sola scriptura" (by scripture alone) catch-cry and his insistence that "scripture should interpret scripture" (p. 17). The meaning-making point for all these writers is to show meaning can be discerned by paying close attention to the situationality of the sentence, the paragraph, the passage, the book and so on. As the situational context is expanded from the immediate text to other texts and beyond, this expanding field of reference has meaning-making power that can often be quite disparate from a localised reading.

In modern times, the emphasis on the situational context finds expression in a whole system of hermeneutic thought called "structuralism (from which semiotics emerged). Of note, structuralism shows, amongst many other things, that meaning-making subsists in "contrast or difference within an implied structure or system" and is part of "a field of meaning". (Thiselton, 2009, p. 195). This idea emphasises connections to fields (or situations) of meaning, and in particular, situational binaries of language.

These situational binaries later developed into post-structuralist thought and then into the deconstructive thought of Jacques Derrida who emphasised the situatedness of a text but with a twist. For Derrida (1992), contextual meaning-making "inaccessibly incites from a place of hiding" indicating that an ever-expanding reading can only bring the reader to another (and another) context which is really just another (and another) set of words each demanding further contextual expansion (p. 191). Derrida's complex thought cannot be covered in great detail here – particularly the substantive critiques it has garnered over the years (Thiselton, 2009, p. 332) – but what is important to note is that Derrida, whether he believed in objective meaning or not, saw the importance of the situationality of the text as did his structuralist forebears. Furthermore, as will be seen in Chapter 8, Derrida's observations open a new possibility for arriving at, rather ironically perhaps, a more anchored and standardised meaningfulness for safety. With the hermeneutic insight of situational context in mind, the concept is brought into analytic dialogue with Avtex Air and CAR 238. This is done to illustrate the implications of for the meaningfulness of safety in CAR 238 and regulations more broadly.

6.3.2 Situational Meaning-Making at Avtex Air and in the Regulations

The situational context of CAR 238 is shown in Figure 6.2 on the next page. It shows CAR 238 in the centre of the page as one would see it if reading an electronic or hard copy version.

Figure 6.2

CAR 238 within its Situational Context

Table 235A-3—ICAO minimum runway width						
Code letter	**A**	**B**	**C**	**D**	**E**	**F**
Code number						
1	18 m	18 m	23 m	-	-	-
2	23 m	23 m	30 m	-	-	-
3	30 m	30 m	30 m	45 m	-	-
4	-	-	45 m	45 m	45 m	60 m

maximum certificated take-off weight, for an aeroplane, means the maximum take-off weight stated in the aeroplane's type certificate, foreign type certificate, supplemental type certificate or foreign supplemental type certificate.

reference field length, for an aeroplane, means the shortest take-off distance required for a take-off by the aeroplane at its maximum certificated take-off weight:

(a) on a runway that is level and dry; and

(b) in still air; and

(c) in International Standard Atmosphere conditions at sea level.

take-off distance required, for an aeroplane, means the take-off distance for the aeroplane set out in the aeroplane's flight manual.

Civil Aviation Regulations 1988 211

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Part 14 Air service operations
Division 3 Conduct of operations

Regulation 238

238 Icing conditions

(1) The pilot in command of an aircraft must not allow the aircraft to take off for a flight during which the aircraft may fly into known or expected icing conditions, if the aircraft is not adequately equipped with either de-icing or anti-icing equipment of the type and quantities directed by CASA.

Penalty: 25 penalty units.

(2) An offence against subregulation (1) is an offence of strict liability.

Note: For ***strict liability***, see section 6.1 of the *Criminal Code*.

239 Planning of flight by pilot in command

(1) Before beginning a flight, the pilot in command shall study all available information appropriate to the intended operation, and, in the cases of flights away from the vicinity of an aerodrome and all I.F.R. flights, shall make a careful study of:

(a) current weather reports and forecasts for the route to be followed and at aerodromes to be used;

(b) the airways facilities available on the route to be followed and the condition of those facilities;

(c) the condition of aerodromes to be used and their suitability for the aircraft to be used; and

(d) the air traffic control rules and procedure appertaining to the particular flight;

and the pilot shall plan the flight in relation to the information obtained.

(2) When meteorological conditions at the aerodromes of intended landing are forecast to be less than the minima specified by CASA, the pilot in command shall make provision for an alternative course of action and shall arrange for the aircraft to carry the necessary additional fuel.

Penalty: 25 penalty units.

(3) An offence against subregulation (2) is an offence of strict liability.

Note: For ***strict liability***, see section 6.1 of the *Criminal Code*.

Note. From *Civil Aviation Regulations* 1988 (p. 212)

The first point to note contextually is that the regulatory flow of text is fragmented and the texts situated around CAR 238 are completely unrelated: CAR 238, addressing icing conditions, is bracketed by ICAO minimum runway lengths and pre-flight planning requirements. In the Avtex Air interactions with CAR 238, this situational disjointedness would have required the Chief Pilot, the staff pilots, and the tribunal to move beyond the contexts of the immediate text to resolve the "have a look" contention. The *Avtex Air Appeal* (2011) bears this out where it records the Chief Pilot expanding the situatedness of the text to his own experience of scud running (low level flight below cloud), his meteorological knowledge of icing, and ultimately to his authority to create new textual guidelines. Thus, as seen previously, after "re-educating" the pilot group, the Chief Pilot re-situated CAR 238 into his "Pilot Briefing Notes for the Cooma – Bankstown Run" (p. 57).

In terms of meaning-making, the Chief Pilot's briefing notes provided a new contextual frame which, most likely fused with a profits-producing motif, supported the "have a look" philosophy. This provided a supportive narrative to the Chief Pilot's desire to take off when icing was forecast – a narrative which then found its way into the briefing notes where "ice-breaking" operational profiles (such as scud running) and actions on ice-accretion (*Avtex Air Appeal*, 2011, p. 57) were all discussed and affirmed. For anyone reading these briefing notes, even after reading CAR 238 itself, it would have been difficult to escape the re-situated meaning-making created by the Chief Pilot.

In contrast, as the *Avtex Air Appeal* (2011) further records, the Senior Member of the tribunal, more empowered than the average staff pilot, but nonetheless compelled by the context-less CAR 238, arrived at a different conclusion based on a different type of contextual expansion:

> As far as icing is concerned, you cannot see icing until you begin to observe its accretion on the airframe. In other words, it has nothing to do with looking but rather going up to test the environment to see whether in fact icing conditions do exist where they may have been forecast. That is unacceptable from a safety perspective and it is in breach of CAR 238 (p. 61).

Notice the "breach of CAR 238" was pronounced based on a broader context than the immediate textual situation of CAR 238. Instead, a broader system of propositions was appealed to; namely, basic meteorology, weather forecasts and a knowledge of operational realities (noting again the Senior Member is an instructor-pilot himself). The situational reframing thus resulted in an interpretation of CAR 238 that was far different to that of the Chief Pilot. In the end, the prevailing interpretation drew its meaning-making authority not from the black print of CAR 238 itself, but the out-ranking authority of the tribunal.

All this was necessary because a judgement as to the safety of the Avtex Air actions regarding icing was nowhere informed by the de-contexualised text of CAR 238, nor more broadly by the regulations. The contextual meaning-making thus had to shift to the Senior Member's best judgement based on his own experience, knowledge, and authority. Hence, the AATA tribunal, the Avtex Air Chief Pilot, and staff pilots, with various preknowingnesses, all arrived at situationally-recontextualised readings as to what was safe and what was not.

Significantly, as will be seen below in the "reader's journey" from CAR 238 to Part 91.710, ten years of regulatory reform has not resolved the AATA contention – the new version of CAR 238 remains as locked into legalised situatedness as its predecessor.

6.4 The Modality of a Text and its Implications for Meaning

As introduced earlier, modality refers to the type and genre of a text and "how" things are said. It also refers to the interpretative framing mode with which a reader engages a text. The same textual idea can be re-rendered by didactic, analytical, metaphorical, dialectic and narratival textual modes as each changes "the way a thing is expressed" (Palmer, 1969, p. 399).

Modes of literature – also known as literary genres – have been a focus for hermeneutics since Greek and Roman times where poetry existed as elegy, epic, romantic (erotic) and ode. The meaning-making power of a mode is highlighted by Harrison (2006) who observes what happened when the Roman poet Ovid radically integrated the somewhat risqué modalities of love language into an epic poem. Because an epic poem was supposed to elevate the emperor Augustus, not implicate him in risqué eroticism, the modal-mixture saw Ovid banished (p. 178). In the early church, textual modality became a focus for such scholars as Irenaeus who called for "a proper attention to context" (as cited in Thiselton, 2009, p. 96). This meant attention to the wide spectrum of biblical genres such as narrative, epistolary, poetry, history etc. Readers could avoid pitfalls such as cutting a limb off because they rightly understood "if your right hand causes you to sin, cut it off" as the modality of parable rather than regulation.

This focus on modality would continue through the reformation and re-emerge with the iconic hermeneut Schleiermacher (1998) who acknowledged "the changes of mood" and "the changes of genre" found in the biblical writings, and then "stressed their positive importance for hermeneutics" (p. 146). Additionally he highlighted: "As the single word belongs in the total context of the sentence, so the single text belongs in the total context of a writer's work, and the latter in the whole of the literary genre" (as cited in Gadamer, 2013, p. 303). In the literary disciplines, modal methods have proved very fruitful; developing to such a degree that at last count Murfin and Ray (2018) had identified nearly 50 different methods ranging as widely as gynocriticism to eco-criticism to impressionistic criticism and so on (p. 205) . Obviously, such a large spectrum of methods makes a full exposition impractical for this research, but it is worth mentioning here to show how profound the genre and mode of a text can be on meaningfulness.

Another important aspect of modality can be seen the way a shifting of referential perspective changes the meaning of a text. Gadamer (2013) makes this connection when he observes: "by this we understand, above all, the modern framed picture that is not tied to a particular place but offers itself entirely by itself by virtue of the frame that encloses it” (p. 136). Just as a black frame or a white frame or an ornate frame can change the "meaning" of a painting, so too a changing textual mode acts as a frame to change meaning. An off-colour but instructive example is the Australian Army's use of posters and stickers with the slogan "bring out your best" in the late 1980s (Department of Defence, 1988). In one frame of reference; that is, in one referential perspective, the slogan did as intended emblazoned as it was across various posters showing impressive scenes of army personnel driving tanks, directing vehicles, flying helicopters etc. However, when that same slogan was reframed by a few wags placing the sticker on the inside of toilet-seats across the country, the inspirational "bring out your best" was comprehensively reframed into something less than inspirational when lifting the toilet seat cover and reading "Army: Bring Out Your Best". While perhaps not with the same off-colour connotations as the bottom of a toilet seat, the key point to be made here is modal reframing can bring significant changes to textual meaning-making.

Why is this important for CAR 238 and Avtex Air? Hirsch is helpful here when observing modality (calling it the "intrinsic genre") determines the best "container" to achieve the author's meaning-making goals for the reader (as cited in Osborne, 2007, p. 26). "Genre", according to Hirsch, "is the best 'container' to convey the energy and content to accomplish the desired purpose, that is, to produce the intended effect in the readers, whether to persuade, promise, inform, warn, guide, exhort, etc. (as cited in Klein et al., 2017, p. 7519). Hirsch's point is that "persuading, promising, informing, warning" are dependent in no small part on the intrinsic modality of the text. Any author wishing to write laws will not use a limerick and yet it would be quite feasible for the same text, or at least the same idea, to be presented within these different modes to varying levels of engagement or disengagement from the reader. With this in mind, the close-reading circles back to Chapter 4 and the issue of hermeneutic conviction. This is fitting because if modality can bring about persuasion – or perhaps worse, bring about confusion – then one should be aware of these modal implications in the regulations. This then leads to questions regarding CAR 238 and the ability of its legal modality – its "container" – to convey its safety-related goals in a compelling way.

To illustrate the modal implications of the regulations on conviction, consider the last sub-clause in CAR 238 and many other regulations: "an offence against [this] sub regulation is an offence of strict liability" (*Civil Aviation Regulations 1988*, p. 212). Consider also, quickly following and literally in the "small print" (or at least the *smaller* and italicised print) is the following: "For strict liability, see section 6.1 of the Criminal Code" (*Civil Aviation Regulations 1988,* p. 212). At one level, one might think strict liability and criminal code should prompt the necessary outcome – compliance through threat of punishment. After all, the mode in the message is certainly threatening, but is it persuasive and does the mode convey the intent of the author? The strict liability statements are very much expressions of a contextual modality which, in this case, is a legalised modality. This legal mode has certain textual features, including the criminal-code clauses which are designed to tell the reader the consequences of non-compliance. Various other features such as paragraph by paragraph (and sub-paragraph by sub-paragraph) numbered clauses, judicial language and so on, complete the suite of modal traits. This is to be expected of course, from legalised aviation regulations, but the problem is that these are also safety regulations with an intended safety outcome and the legal mode interferes with that outcome.

Consider the threatening nature of the legal modality; while it may well, at first glance, seem persuasive, it may simply come across as unfair and if it seems unfair it will be seen as uncompelling. As has been pointed out by a senior judge in Australia, Chief Justice Allsop (2016): "law, at its very foundation, is conceived and derived from values. These values inform and underpin a rational and fair expectation of how power should be organised, exercised and controlled at a private and public level (p. 1). The keys to persuasion, according to Justice Allsop, are rationality and fairness so rules should make safety-sense to the reader and "strictly liable" should thus be strictly *fair*. While no-one would necessarily say CAR 238 or CASR Part 91.710 are irrational or unfair, one might say the threat of criminal-code punishment and/or strict liability – a clearly punitive modality – is unfair for genuine aviation practitioners trying to safely manage the complexities of their industry and suffering an omission here and there. A criminal-code punishment in this instance would feel unfair because most aviators who have made unintentional mistakes are not criminals. It would seem especially unfair if the inadvertently omitted requirement was obscured or congested by 1.8 million words (and growing) of core regulations and one then discovers, under strict liability, intent need not be proven (see more on this below).

The perceived lack of fairness can be seen when one recalls the "adversarial relationship" between the regulator and industry enunciated by the Aviation Safety Regulation Review (Forsyth et al., 2014) and covered earlier. This was expressed again more recently in in the Senate where the many industry representatives almost uniformly expressed that theirs was "an industry struggling under the weight of regulation and a regulator deaf to the appeals" (Australian Flying, 2020, p. 1). Thus, when the reader infuses their reading of air law with this mode of meaning-making – the mode where the regulator is perceived to be unfair, irrational or both – the subverting effects on persuasion become more evident. This should not be surprising when a law ingrafted with criminal code is very literally a punishment looking for a crime, and crimes involve criminals, and most aviation-readers are not criminals. This points to a modal tension between criminal code and the safety goal of what is known as a "just culture" within aviation regulations:

> CASA embraces, and encourages the development throughout the aviation community of, a "just culture", as an organisational culture in which people are not punished for actions, omissions or decisions taken by them that are commensurate with their experience, qualifications and training, but where gross negligence, recklessness, *wilful* violations and destructive acts are not tolerated (my emphasis, CASA, 2021b, p. 1).

Just culture is a safety modality that insists the reflex after an unintended mistake, that was reasonable in the circumstances, should be remedial rather than punitive but herein is the problem: strict liability, in its lawful meaning, denotes a punishment that need not consider the wilful intent of the pilot. This is despite the fact CASA uses "wilful" as a key word in establishing the just culture principle, but then explains elsewhere that "the difference between strict liability offences and other 'fault-based' offences has to do with the mental element" and that there is no requirement to prove the existence of "a particular state of mind–intent, knowledge, recklessness or negligence–on the part of a defendant" (Flight Safety Australia, 2017, p. 1).

In CASA's articulation of just culture (2021b), "people are not punished for actions, omissions or decisions" but at the same time "gross negligence, recklessness, wilful violations and destructive acts are not tolerated" (p. 1). Yet, strict liability insists "intent, knowledge, recklessness or negligence" need not be considered. This casts the idea that the criminal-code modality of regulations can effectively square with just culture into doubt. Most pilots understand, and the ATSB database bears this out (see Chapter 8), it is impossible to have a career free of omissions and errors. Some errors involve the breaching of a law; for example, a cognitively loaded or cognitively distracted pilot dipping below 500 feet or other legislated minima. Thus, reading in the same regulations that the assessment of wilful intent is at the centre of a just culture, but the assessment of wilful intent is not required to establish an offence, easily leads to a healthy distrust in the justice of "just" culture.

In summary, what should be emphasised is that when strict liability appears repeatedly in the regulations it repeatedly cements the prospect of an awaiting punishment where intent need not be considered (except in a finite range of circumstances). The punitive modality thus "shouts" at the reader while "just culture" whispers on a website (CASA, 2021b). The Aviation Safety Regulation Review sums up well the hermeneutic implications of criminal-code and the punitive modality of the regulations on a reader's convictions:

> The Panel considers the application of Criminal Code provisions to the CASRs, and the consequent phrasing of each provision in terms of what is prohibited rather than what is permitted, is a central cause of industry confusion and dissatisfaction with the regulatory reform process. While such language may be beneficial for successful prosecutions, it has caused significant disharmony within industry and contributed to a breakdown of trust between industry and CASA. To be effective, rules must be clear and easily understood (Forsyth et al., 2014, p. 98)

This critique of criminal code, and the consequent "confusion, dissatisfaction, disharmony and distrust" in the regulations, is a modal clash. This modal clash is between just culture aspirations and the reality of ingrained criminality provisions within the law.

6.5 The Materiality of a Text and its Implications for Meaning

Another contextual characteristic of the text that shapes meaningfulness is the aesthetic medium of that text – its materiality. Throughout history, texts have taken differing forms based on differing mediums. These have included, amongst others, rock walls, clay tablets, papyrus, scrolls, codices, pamphlets, books, and screens. All these mediums, according to Hayles et al. (2002), have a hermeneutic effect on the meaningfulness of the text. This is because the physicality of the text provides a visual, formatic "context" that provides certain "signifying components" (p. 19). Thus, the meaningfulness of the same text presented on different materials such as a papyrus, codices, scrolls, ruled legal paper, scrolling screens or PDFs, is either reinforced or understated by these formatic characteristics. This is because each material representation – the physicality and flow of the text – has inbuilt meaning-modifying characteristics.

This idea of materiality and its meaning-making effects was in many ways popularised in the second half of the 20th century by McLuhan. McLuhan (2003) was a highly influential communications scholar and most readers of communications and media theory would recognise his famous phrase "the medium is the message" (p. 25.). This is from McLuhan's observation that a text has signifying content and character: the content of the message is its syntax and diction while the "character" of the text is its medium (McLuhan, 2003, p. 25). McLuhan further observes technological mediums such as telegrams, print media, visual media and so on each bring structural changes to textual meaningfulness because of the material changes to the transmission of the message. His key point is that the medium is never neutral in the conveyance of meaning. While McLuhan was not necessarily espousing hermeneutics directly, his theories build on hermeneutic ideas around modal and material contextuality.

The way in which the medium of CAR 238 (and the long journey to CASR Part 91.710) contributes to the meaningfulness of safety will be seen in the next section but for now, by way of illustration, consider a contemporary example of Twitter and the way in which Posner (2018) notes the material effects on meaning:

> Through its core design–short messages, retweets, engagement metrics–Twitter incapacitates the safeguards

> necessary for civil discussion. It eliminates context, encourages us to present each other out of context, prevents us from explaining ourselves, rewards the most incendiary messages and most impulsive reactions, drives us to take sides and build walls. If Twitter is going to foster healthy conversation, it will have to change fundamentally. It won't be a matter of tuning some filters and tweaking some ranking algorithms (p. 1).

Twitters' materiality, its core design of "short messages, retweets and engagement metrics", leads to fundamental misunderstandings because it "eliminates context" (p. 1). What Twitter shows is that once the material context is changed, so too the potential for understanding and misunderstanding. There is much more that could be said here, but the key point to note is the way Twitter (and, as will be shown below, CAR 238) alters meaning by eliminating or altering context.

There are several material implications worth noting for CAR 238 and the other core regulations. To set the context, recall again safety is the undergirding aim of all aviation laws including, of course, CAR 238, and its modern successor Part 91.710. As a working example of what could be called "de-contextualised safety", consider the materiality of CAR 238 and what happens when one attempts to confidently answer a relatively simple question: is CAR 238 the entirety of one's obligations regarding icing safety? To answer this, the next section traces out an imaginary "reader's journey" through various regulations and associated documentation.

6.6 The Reader's Journey: CAR 238 to Part 91.710

As a start point for the reader's journey, consider, in application, the situational, modal and material features of CAR 238. What is evident is that these features allow no sense of coherent narrative; that is, no sense of a contextualised flow. Moving down the text from CAR 238, the subjects are: flight planning (CAR 238-241), testing of radio apparatus (CAR 242), listening watch (CAR 243) and safety precautions before take-off (CAR 244). Moving up the textual flow, and the next thing noted is that the sections before should be CAR 237 (if the reader follows the numerical flow) but this, as well as CAR 236, is missing, presumably moved as part of the regulatory reform program into CASRs (more on that below).

CAR 235 is next up the page which has numerous pages of take-off and landing requirements including codes and explanations for field lengths and aeroplane wing lengths. And then CAR 234A incongruently explains how a pilot who does not take off with sufficient oil is committing an offence of strict liability. The materiality of CARs is thus disjointed and non-narratival: it has paragraphs with repeating criminal code and strict liability clauses amidst randomly clustered clauses, sub-clauses, and sub-sub-clauses.

There is a still greater problem. Having read CAR 238, one may well think one is now fully informed of one's regulatory-safety obligations regarding icing but then, if the reader recalls the preamble to CARs:

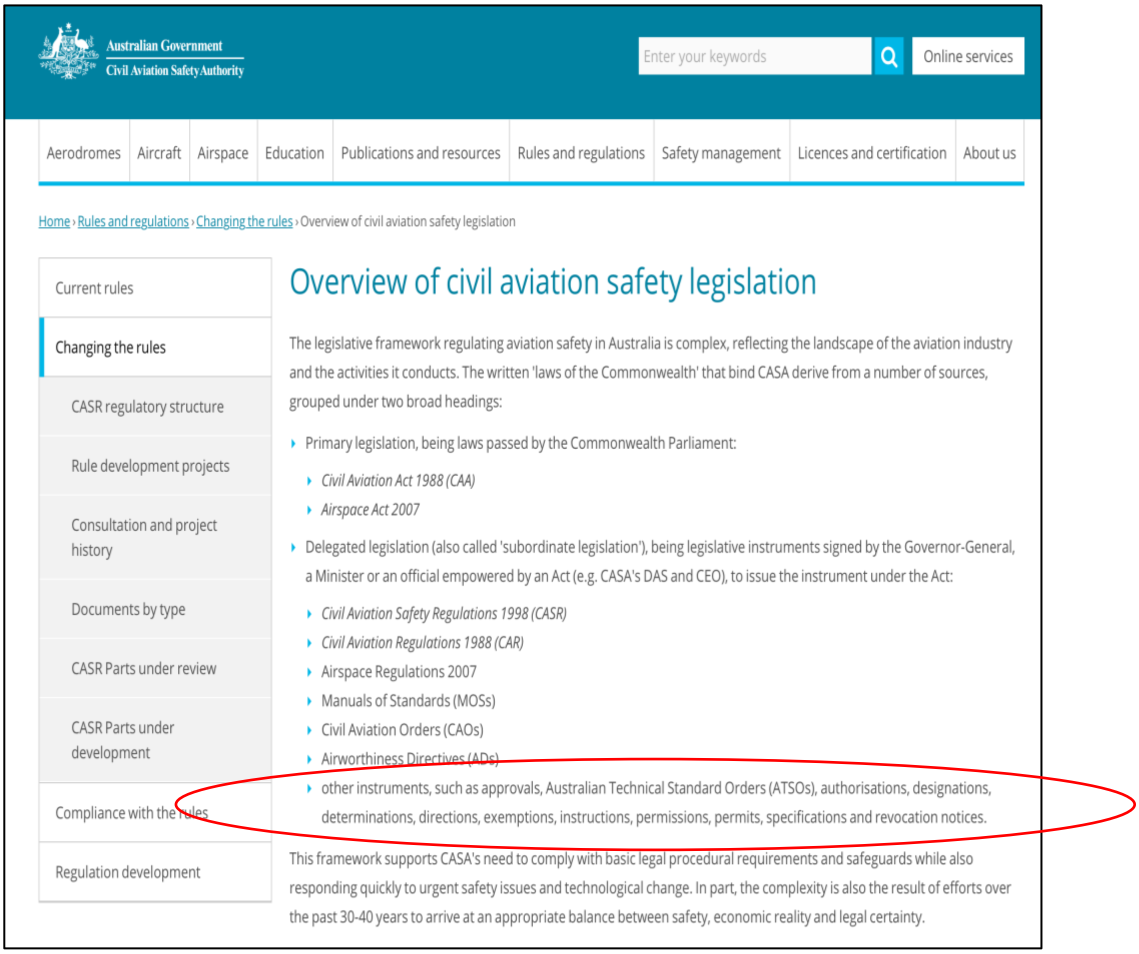
> If the compiled law is modified by another law, the compiled law operates as modified but the modification does not amend the text of the law. Accordingly, this compilation does not show the text of the compiled law as modified (*Civil Aviation Regulations 1988*, p. 2).

The reader experiences dissonance at this point and not just because of the perplexing prose. This clause seems to be trying to convey the point that if CAR 238 is modified by another law, the modification will not be shown by CAR 238 itself. At this point the reader might rightly begin to doubt whether CAR 238 is a text that can be relied upon not to be modified by another clause, sub-clause or sub-sub clause hiding elsewhere in the 1.8 million words of legislation. Nonetheless, the reader decides to persist (this is a determined reader) and conduct a search for the possible regulatory modifiers to CAR 238. These, it should be noted, are nowhere signposted within CAR 238; nor are they indicated by its contextual flow despite the fact the reader will be obligated to obey them if they do exist.

Uncertainty grows when the reader comes across, within CARs, numerous mentions of other legally binding texts. For example CAR 5 (*Civil Aviation Regulations 1988*, p. 21) describes CASA's right to issue CAOs while CAR 2C describes the role of CASRs (p. 19). By now the reader's hope of an easily contextualised and easily obeyable meaningfulness is waning. They therefore decide to visit CASA's website to get an overview of regulations and, hopefully, whether a clear ruling on icing can be found. There they find a webpage entitled "Overview of Civil Aviation Safety Legislation" as per Figure 6.3 below:

Figure 6.3

Overview of Civil Aviation Safety Legislation on the CASA Website



Note. From the CASA Website (CASA, 2021a)

Here the reader finds further uncertainty as the reader discovers it may well be the case CAR 238 has been modified by:

> CASRs, CARs, MOSs; CAOs; Airworthiness Directives (ADs) or "other instruments, such as approvals, Australian Technical Standard Orders (ATSOs), authorisations, designations, determinations, directions, exemptions, instructions, permissions, permits, specifications and revocation notices" (CASA, 2021a).

The reader also finds from the same website there are such documents as Advisory Circulars (ACs), Acceptable Means of

Compliance (AMC) documents, Civil Aviation Advisory Publications (CAAPs), Airworthiness Advisory Circulars (AACs) and so on. Further along the reader finds there are differences between delegated legislation and advisory documents which must be clearly understood and that:

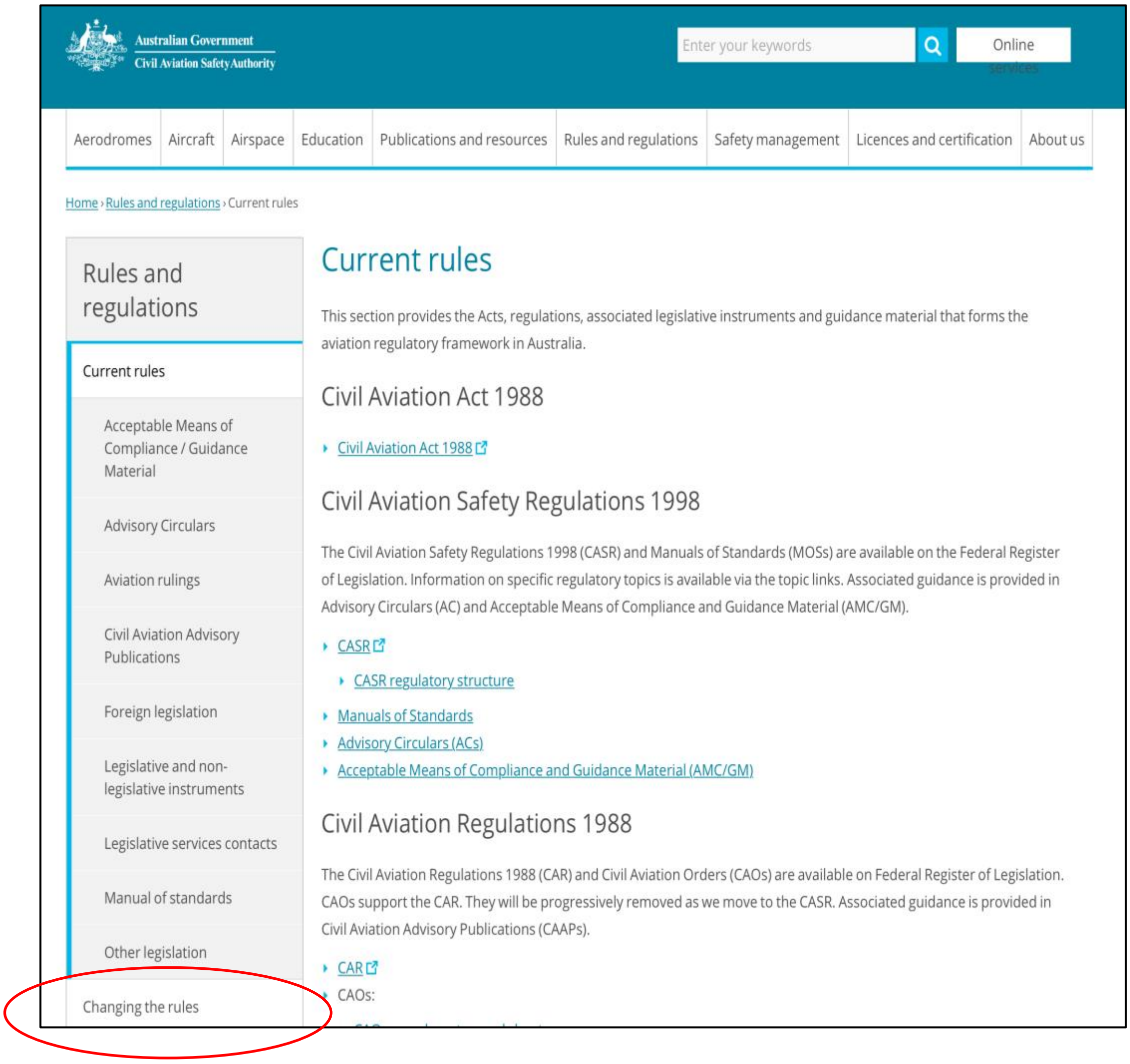
> These publications serve to illustrate the meaning of certain requirements by offering interpretative and explanatory guidance. They are drafted by CASA technical specialists and are not disallowable legislative instruments for the purposes of the Legislation Act 2003 (CASA, 2021a).

It becomes apparent that if one does find something compelling in the various forms of explanatory material, this can in no way disallow the legal rulings which means even if the reader has a very good grasp of the nuances in interpreting someone's interpretation of the law (the ACs, AMCs, CAAPs etc.) the reader is in for a long journey. This is because to make sure there is nothing additional modifying CAR 238, the reader will need, at least theoretically, to read CASRs, CAOs, MOSs, ADs, instruments, ATSOs, authorisations, designations, determinations, directions, exemptions, instructions, permissions, permits, specifications, revocation notices, ACs, AMCs, CAAPs and AACs .

In this clutter of back-and-forth interpretative movements, the reader's meaning-making hope of finding a short answer to their CAR 238 query, and indeed a compelling knowingness of safety regarding flight into icing, dwindles further. Still, perhaps the reader is an exceedingly persistent and conscientious reader, so they decide to make their way through all the above-mentioned regulatory materials. The reader finally completes this journey, perhaps with the confidence that there can be no further untended regulatory requirements because the reader has now completed their exhaustive review of all the regulations. However, in their journey they would have noticed another CASA website: "Current Rules" (CASA, 2021c) as per Figure 6.4 on the next page.

Figure 6.4

"Current Rules" CASA Website



Note. From the CASA Website (CASA, 2021c)

Unhappily, uncertainty returns because this is a subtly different list of regulations to those found previously in CASAs overview of the regulations (see again figure 6.3 above). More worrying is the hitherto unnoticed side-tab in the lower left which is annotated "changing the rules". Here the reader finds that not only is CAR 238 due to be superseded but the whole regulatory framework is, and has been, undergoing "reform" since 1998. This means there is a flux of supporting documentation detailing which regulations are due to change, when they are due to change, which ones have current authority, what the implementation measures are, and so on. An uneasiness grips the reader: even if they have successfully understood 1.8 million words there is now the distinct possibility the flux of all these transitioning words may well bring new obligations, or modify the old obligations, in yet unexamined ways. More reading must now ensue.

More reading does indeed ensue and, despite the uneasiness, the reader takes heart when they recall (somehow) CAR 2C which explains "How to read CASR" and informs the reader "if there is any inconsistency between CAR and CASR, CASR prevails to the extent of the inconsistency" (*Civil Aviation Regulations 1988*, p. 19). Now at least the reader knows if they do find a new obligation it will be the "new" CASRs that trumps any other references.

There is still further cause for encouragement because the reader discovers CAR 238 has indeed been superseded by CASR Part 91.710 (2022, p. 519) – as already noted in chapter 5 and Figure 5.4 – which means, presumably, this is the final authority. Moreover the reader notes, as an implemented recommendation from the Aviation Safety Regulation Review, (Forsyth et al., 2014, p. 2), there exists a plain language guide for Part 91 (see Figure 6.5 below). Having finally exhausted the search through the legion of other regulatory materials the reader might well have cause to hope a resolution is at hand:

Figure 6.5

CASR Part 91.710 Plain Language Guide Excerpt

Flight in icing conditions – requirements for flight (91.710)

You must not commence a flight in known or suspected icing conditions unless your aircraft is certified to fly in icing conditions.

If you fly into icing conditions you must, as soon as practicable, change your aircraft's flight path to try and avoid the icing conditions.

Note. From CASA's Plain Language Guide (CASA, 2021i)

However, as the reader soon discovers, the plain language guide from CASA (2021i) "summarises and restates" Part 91 and "should not be used as a substitute for the aviation regulations or the MOS, as it does not reproduce all the text that appears in the legislation" (p. 1). Furthermore, there is a disclaimer that feeds the returning uneasiness:

> The guide has been prepared by CASA for information purposes only, and while every effort has been made to ensure that the contents accurately conform to the civil aviation legislation, this guide is not the law. CASA accepts no liability for damages or liability of any kind resulting from its use (p. 1).

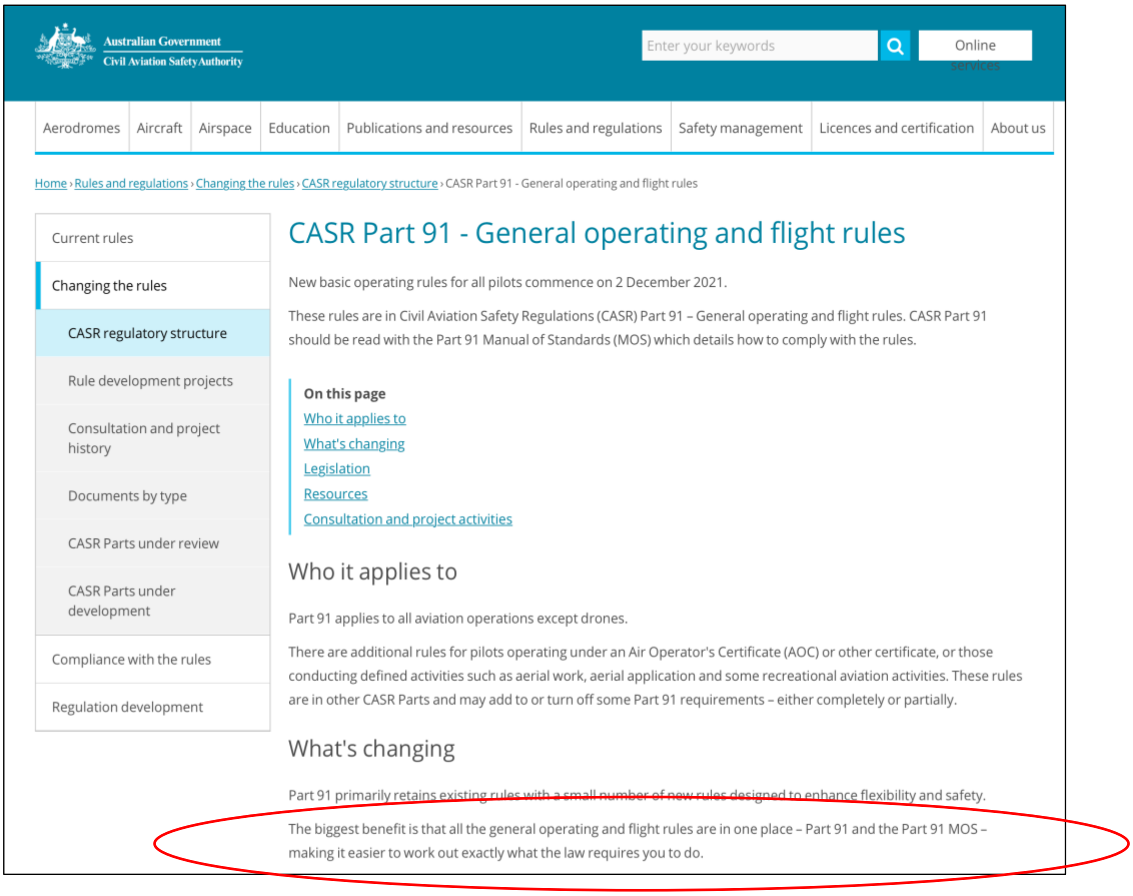
The reader now has two key problems. The first is that the regulation appears in three different places: CAR 238, CASR Part 91 and the Plain Language Guide. This is not entirely unexpected as CARs have already made it clear there may be modifying legislation elsewhere (albeit without indications in the CAR itself) and CAR 2C says CASRs "prevails to the extent of the inconsistency". Hence CASR Part 91.710 should be the authority but again a meaning-making problem persists for the reader: as for CARs so for CASRs – there is no guarantee there is not a clause (or sub-clause) hidden somewhere else such as an instrument or directive yet unsighted (or perhaps sighted and now forgotten in the sheer mass of regulatory reading).

The second problem is that CASA (2021a) tells the reader via its website "interpretative and explanatory guidance" is provided to elaborate on the legislation and is not disallowable "for the purposes of the Legislation Act 2003" (s 3.1). And yet, at the same time, the reader is told "CASA accepts no liability for damages or liability of any kind" resulting from the use of the plain language guide. At this point the reader will probably wonder why the core regulations themselves simply can't be written in plain language. This would negate the need for the many thousands of additional words in plain language attempting to explain the (presumably) un-plain language of the core regulations.

Still feeling uncertain about their obligations, the reader seeks further guidance from the CASA website and finds a promising explanation as to the nature of Part 91 (as per Figure 6.6 on the next page).

Figure 6.6

CASA Website Detailing the Nature of Part 91



Note. From CASA website detailing CASR Part 91 (CASA, 2021d)

Here the reader finds that CASR Part 91 provides the following "benefits" of the new and reformed legislation: "The biggest benefit is that all the general operating and flight rules are in one place – Part 91 and the Part 91 MOS – making it easier to work out exactly what the law requires you to do (para. 7). "In one place" seems to offer the reader the assurance that this is finally where the uncertainty regarding their icing obligations will end. Again though, the reader's momentary hope for a final and certain word on flight into icing conditions is stymied. This is because of the previous paragraph on the same CASA (2021d) web page as the one promising there is one place to find out what the law requires of the reader:

> There are additional rules for pilots operating under an Air Operator's Certificate (AOC) or other certificate, or those conducting defined activities such as aerial work, aerial application, and some recreational aviation activities. These rules are in other CASR Parts and may add to or turn off some Part 91 requirements – either completely or partially (para. 5).

Just when the reader thinks Part 91.710 is the one place they are told "there are additional rules" and "these rules are in other CASR Parts and may add to, or turn off, Part 91 requirements" (CASA 2021d, para. 5) Uncertainty is again the order of the read while the reader continues to wonder what safety rules they've missed. Thus, despite CAR 238 and the other regulations being subject to over 20 years of regulatory reform, the reader's journey ends with the uncertainty with which it started.

The depiction of the "reader's journey" from CAR 238 to Part 91.710 may appear a little churlish, but the point is clear that there are very real implications from the textual modality and materiality of modern aviation regulations. Consider the implications of the time taken to find (and trust) the simple answer to the simple question of what to do in icing conditions. Multiply this for the thousands of other safety regulations and imagine the flicking of pages, the swiping through of PDFs, the clicking of internet links, the pressing or tapping of the browser back-key, the searches, and the downloads at the Federal Register of Legislation. Imagine the impression-shaping effects on the reader's trust in the legislation as more and more time passes and less and less certainty arises. Little wonder the Aviation Safety Regulation Review (Forsyth et al., 2014) noted: "industry is frustrated with many new CASRs, viewing them as overly legalistic, difficult to understand and focused on punitive outcomes" (p. 2).

The reader's journey shows that the contextual characteristics of regulations hinder the reader's ability to confidently derive their safety obligations. As seen above, regulations have their own textual situatedness, modality and materiality and these, in their non-neutrality, dilute and congest meaningful conceptions of safety. This again raises the question of what might be driving the legalese and the excessive growth of the regulations in the first place. The answer proposed by this research is the liability-proofing motif first introduced in Chapter 4. This is elaborated upon in the next section in light of the findings so far.

6.7 Liability-Proofing and Fussy Law "Safety"

6.7.1 The Problems of Liability Proofing for Safety

The textual problems within the safety regulations can be conceptualised as being driven by liability-proofing. This, it will be recalled from Chapter 4, is the motif concerned with legal defensibility, prosecutorial potentiality, and various other legal optimisations. The Aviation Safety Regulation Review (Forsyth et al., 2014) succinctly summarised the idea of liability-proofing when they observed that safety regulations seem constructed in such a way as to be "beneficial for successful prosecutions" (p. 98). This regulatory optimisation for prosecutions, it was noted by the review, congests the safety message of the regulations and "frustrates industry" because the regulations, in the grip of legalised language, become difficult to understand and apply (p. 98).

The Senate are not the only ones to note the negative effects of liability-proofing. Dekker (2014), points out that while "bureaucratisation" brings the benefits of a systematised approach to safety management, it also distances bureaucracies like CASA from frontline safety concerns (p. 349). Thus, the regulatory writer, who is part of a bureaucracy, with bureaucratic concerns; must not only concern themselves with the threat of an accident, but the threat of what the lawyers might do to said bureaucrat in the aftermath of such an accident.

The bureaucratisation of safety echoes the concept of safetyism (Haidt & Lukianoff, 2018), introduced in Section 1.6.5, and is worth re-quoting here:

> Overreaction and overregulation are usually the work of people within bureaucratic structures. They know they can be held responsible for any problem that arises on their watch, especially if they took no action to prevent it, so they often adopt a defensive stance. In their minds, overreacting is better than underreacting, overregulating is better than underregulating, and caution is better than courage (p. 203).

Thus, the tendency of bureaucrats and law-writers, removed from frontline safety concerns, is towards overregulation and safetyism. This then, albeit unintentionally, dilutes and congests true accident-proofing safety and, as indicated in the first half of the research, generates larger masses of legislative words.

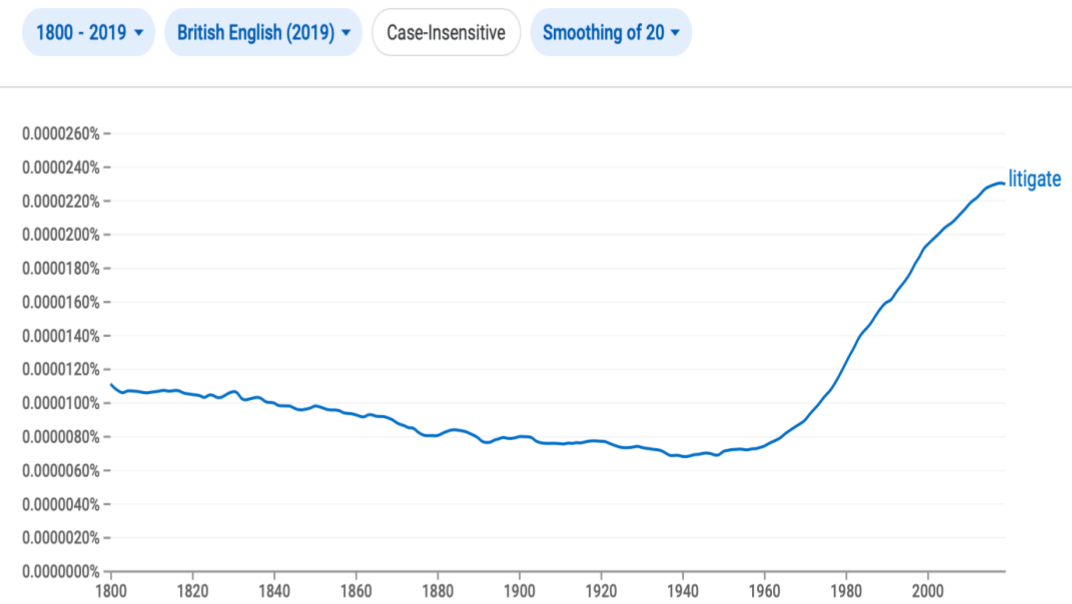
This tendency in the regulations should not be surprising given the litigious tendencies of general society over the last few decades. As noted by more than a few authors in various fields, there has been a strong trend towards liability and litigation as a corollary to safety (Goldberg et al., 1990; Luman & Dodson, 2006; Astor, 2008). It is little wonder then these concerns would drive an increasing number of regulatory words as the aviation regulator tries to protect itself in an increasingly litigious milieu.

6.7.2 The Problems of increased Litigious Language Usage for Safety

The litigious trend is not only evident in the references cited above, it is reflected hermeneutically in the increased use of the word litigate over the last forty years. This is evident in Google's *Ngram Viewer* (2019) and its analysis of word-usage in English-speaking society. The Ngram viewer analyses words from an English corpus containing millions of digitised books. It goes back to 1800 and adjusts for publication numbers to give a reliable indicator of word-prevalence in English-speaking society at any one time. Figure 6.7 below shows, from the early 1800s till present, the usage frequency of the word litigate.

Figure 6.7

Google Ngram Viewer: Usage of the Word "Litigate" from 1800-2019

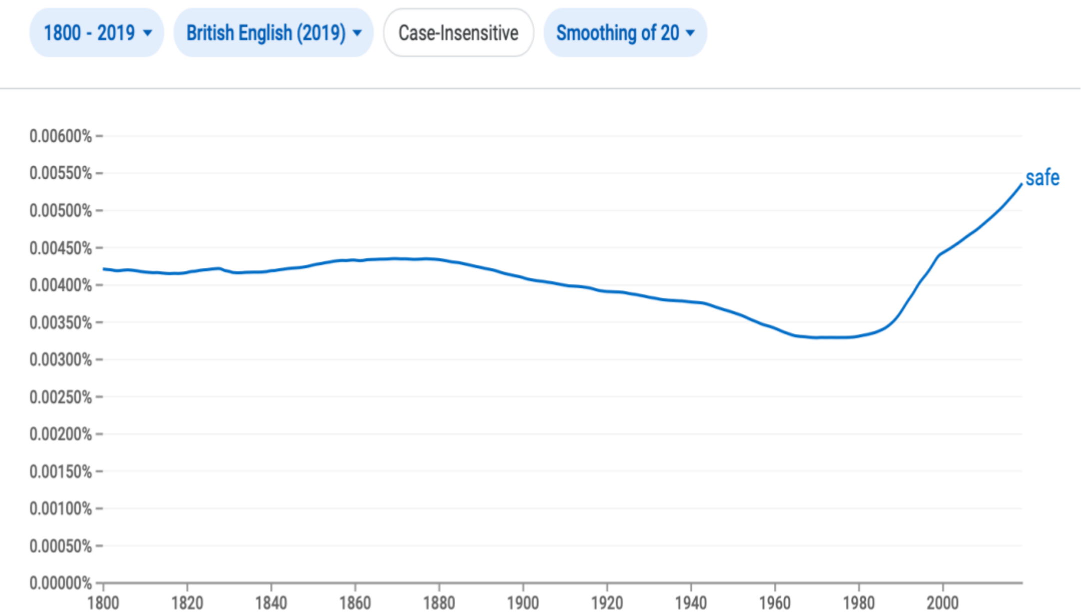


Note. From *Google Ngram Viewer* website (Google, 2019a)

As can be seen from Figure 6.7 above, the prevalence of "litigate" decreases slowly from 1800 to 1960 and then, from 1980 onwards, increases sharply. Since "litigate" literally means to "resort to legal action to settle a matter; to be involved in a lawsuit" (Oxford University Press, 2015), the increased use of the word likely indicates increases in litigation and liability-proofing. At the same time, over the same period, the Ngram viewer shows another increase in the prevalence of a word: the word safe (see Figure 6.8 below).

Figure 6.8

Google Ngram Viewer: Usage of the Word "Safe" from 1800-2019



Note. From *Google Ngram Viewer* website (Google, 2019b)

Significantly, Figure 6.8 shows that at the same time as "litigate" was increasing in everyday word-usage, so too the word "safe". It is outside of the current scope of this research to provide a full analysis of why "litigate" and "safe" have increased their word-usage correlatively; nonetheless, it is suggestive of some sort of relationship between conceptions of litigation and conceptions of safety. At the very least, Figures 6.7 and 6.8 show that in English-speaking society, since the 1980s, people have been increasingly immersed in the language of liability and culpability – a fact which seems to be reflected in the findings of the research so far and the

242% increase in aviation regulatory words. This regulatory increase makes more sense in the litigious dynamics indicated by the Ngrams which are dynamics of prosecuting, suing, and countersuing along with the consequent need to protect individuals and organisations with liability-proofing regulatory clauses and sub-clauses.

Liability-proofing dynamics are also not surprising when one considers the way in which aviation safety regulations are created. As CASA (2021g) themselves explain, rules are not written by the regulator themselves. Instead, CASA, after industry consultation, "gives instructions to the Office of Parliamentary Counsel (OPC) on what to draft, once the policy is settled". The OPC is then responsible for "ensuring the legislation meets the government's standards for drafting Australian legislation and is legally effective" (para. 24).

This poses a significant challenge to achieving a shared and compelling conception of safety in the evolution of safety regulations in Australia. Not only is the regulator quite removed from frontline conceptions of safety, the 50 lawyers, the 40 publishing staff, and the 15 corporate services staff of the OPC are even more removed (Office of Parliamentary Counsel, 2022, para. 6). Moreover, after the OPC drafts a new safety regulation, the draft then moves in ever-increasing degrees of separation from the operator/industry level in the following way (CASA, 2021g, para. 25):

- CASA executive approval.
- CASA’s portfolio department approval (the Department of Infrastructure, Transport, Regional Development and Communications).

- The Minister's approval.
- The Australian Government Executive Council's approval.
- The Governor-General's approval.
- Parliament's approval (after the disallowance period).

Each of these parties has the authority to change the wording of the regulation which means it is highly unlikely, given the semantic distance between these parties and the operational context, accident-proofing concerns will survive untouched. This is evidenced in Fawcett's (2019) comment that it is often possible for CASA to be bureaucratically correct – or, as is the case here, legally correct – "without a safety outcome" (para. 1).

6.7.3 The Problems of "Fussy" Law for Safety

There is another reason the motif of liability-proofing should not be a surprise, and this goes to the underpinning philosophy of regulations in the first place. This is perhaps best summarised by Campbell (1996) in her explanation of the advantages and disadvantages of the two types of legal drafting styles used in Australia. She usefully identifies these as the "fussy" and "fuzzy" legal styles of drafting (para. 1). Campbell (1996) makes the point that English/Australian styles of legal drafting tend toward the fussy style. A fussy style is where "explicit certainty is prized above all else and statutes tend therefore to be elaborate and detailed as they attempt to be exhaustive and cover every imaginable situation" (para. 1). Fuzzy law, on the other hand, provides general principles in the context of broad legislative purposes" (para. 1).

Campbell (1996) summarises several disadvantages (paras. 13-17) in the use of fussy law and they are worth listing here since they bear a clear resemblance to the already-identified regulatory-textual problems of the liability-proofing motif:

- Intelligibility tends to be compromised by "contorted complexities" (para. 13) leading to bewilderment rather than comprehension.
- The unintelligibility can be so severe that the law is bought into disrepute because it is well beyond the grasp of the citizens to which it is addressed (para. 13).
- "Desired comprehensiveness" means more and more specificity which, in turn, means it is more likely something is left out since no amount of laws can address all eventualities. In fact, when something is left out, this generates uncertainty about whether the omission was intentional or not (para. 14).
- "So-called comprehensiveness" generates enormous word counts in regulatory documents and "the more words there are, the more words there are about which doubts may be entertained" (para. 15).
- The regulatory excess produces an adversarial system where "large sums of money are spent looking for and defending loop-holes" (para. 15).
- Overuse of specificity conceals the intent of the law, making it difficult to educate and influence the community as to its aims (para. 16).
- Fussy law has its own regulatory inertia that means changing circumstances are not quickly addressed by regulatory changes (para. 17).

Interestingly, Aleck (Head of CASA legal affairs), quoting Campbell, made the point in 2007 that the evolution of Australia's aviation safety regulations needed to be an optimisation of fussy and fuzzy law (2007, p. 3). Aleck's opinion was that for safety regulations to meet performance-based outcomes, there were certain types of regulations that would always need to be written as fussy laws while others were better suited to the fuzzy style of drafting. However, because this comment was made some 15 years ago, and since then the regulations have increased by 242%, see Chapter 5, it is hard to see how this intended optimisation has been implemented. Indeed, it is hard to see which laws, if any in the 1.8 million regulatory words, have been written with anything but fussy dictates in mind. This is clear from the following:

- The ambiguity-bringing dictional and syntactical features of the legalese in the safety regulations (Forsyth et al., 2014, p. 98). These include, amongst others, dictional redundancy and syntactical excess both at the granular level of CAR 238 and the regulations as a whole (see Chapter 5).
- The new CASR Part 91.710 (the "reformed" CAR 238) and its increased word-count from 80 to 130 words without bringing clarification to the “have a look” contention of Avtex Air and the AATA (Section 5.4).
- The failure of the regulation’s self-stated goals of concision, appropriateness, and clarity in Section 5.5.
- The 242% increase in regulations *without* a commensurate decrease in accidents and, in fact, a discernible increase (Section 5.5).
- The situational, modal and material contexts of the regulations strongly indicating the legalistic goals of the regulator have supplanted the safety-related goals of the

readers i.e., from this current chapter, the "significant disharmony within industry contributing to a breakdown of trust between industry and CASA" (Forsyth et al., 2014, p. 98).

It is important to note the key issue here is not only that fuzzy law tendencies make regulations harder to read – it is that they tend to subvert true accident-proofing conceptions of safety. This is because a focus on the liability of aviation participants can easily subvert the response-ability of those participants. Liability means culpability which assigns, very literally, blame and guilt followed by consequent punishment (Oxford University Press, 2015). This punitive recompense may, in the wake of an accident, satisfy prosecutors and aggrieved parties, but it does not address the causal factors if the causes are organisational and systemic. This is especially true when the decision a culpable person makes has been bounded, empowered and/or otherwise influenced by organisational factors. Thus, a person, or an organisation, might well be successfully punished because of their proven culpability but this will do little to improve their capacity to respond and improve. Additionally, such punitive measures will likely cement the idea that the safety regulations are more about punishment than about accident-proofing which, in turn, means the dissonant knowingness between regulatory writers and readers will grow.

All of this makes it extremely difficult for fussy regulations to enhance accident-proofing goals and ameliorate profits-producing ambitions. Furthermore, the "fussier" the safety regulations become in their expanse, the less likely it is the regulatory reader will easily identify, and therefore legitimise, the safety goals of the regulations in the first place. This seems to be the current state of readerly conceptions based on CASA's (2021f) own stakeholder surveys (p. 19) which have been consistently negative. This raises the question of what might better provision a meaningful and compelling conception of safety from which both regulatory writers and readers can draw.

6.8 Conclusion to Chapter 6

The end of this chapter marks an important transition in the research. The findings of this first phase of the research have been inherently critical but the next phase of the research pivots from critique to solution. The solution is not, as one might expect, to simply reform and optimise the textuality of the regulations. This would miss the key hermeneutic point made in Chapter 4: no matter how "clear and concise" the regulations; differing knowingnesses of safety within different readers (and writers) will drive differing interpretations. Thus, any solution, if it is to be effective, must provide regulatory readers and writers with a compelling and standardised knowingness of safety in the first place; in short, it must show what regulatory safety really means and why it matters.

This is not to say textual reforms are not warranted. Quite clearly the last few chapters demonstrate serious and comprehensive reforms serving the safety interests of the non-legal regulatory audience are in order. However, unless reforms are driven by a standardised meaningfulness of safety it is likely reformed regulations would simply end up "clear" to some and not to others. Besides, and as already demonstrated in Chapter 5, clarity directives already exist within the *Civil Aviation Act 1988* and if regulatory reforms extending back to 1998 have failed to meet these goals why should new reforms bring change? Having said that, future research will, as an important supplement to concepts of reality-based safety, explore the ways in which regulations could optimise their textuality for clarity and concision (see Chapter 10).

Notwithstanding future research, the solution presented in the next few chapters is a standardised meaningfulness of safety that can be used to empower the safety-focussed goals of the regulations. This solution is the IASA safety model drawing from 391 ATSB investigations. The IASA model is intended to provision regulatory readers and writers with a conceptualisation of red rule safety that is demonstrably anchored to actual incidents and accidents.

The next chapter (Chapter 7) sets the groundwork for the IASA model and provides the rationale for the principles, attributes and concepts used to derive the ten thematised safety attributes in Chapter 8. This then leads to Chapter 9 and a discussion of the implications of these derived attributes and the final formulation of the IASA model itself. These latter chapters together form the second and solutional phase of the research.

CHAPTER 7: THE PIVOT FROM CRITIQUE TO SOLUTION AND TO AN EMERGENT MEANING-MAKING METHODOLOGY

Always solve for the big picture, not for the problem.

~ Gyan Nagpal

7.1 Introduction

7.1.1 The Problem So Far

This chapter marks the end of the critique phase and the beginning of the solution phase. In the first phase the meaning-making problems of regulatory safety were identified and discussed. In the second half of the research a standardised conceptualisation of safety is proposed as a solution to the first-phase critique. The solution emerges from a meaning-making method (see below) specifically designed for the thesis and addresses the key meaning-making problem raised so far: safety is difficult to meaningfully conceptualise in a way that is compellingly consistent and actionable. This was first indicated in Chapter 2 where the literature review identified the limitations of current conceptualisations of safety and the ongoing issues of successfully measuring safety. Later chapters showed how other meaning-making problems also exist in the form of differing motifs of meaning as well as content and context-based textual problems of the regulations.

An obvious response to the textual critiques might be to insist upon further regulatory reform – a reform of the reforms – by applying stronger clarity and concision directives. However, this would be to solve the smaller problem of the textual rather than the bigger picture of the conceptual. This is because, as Hayakawa (1990) succinctly puts it, "the meanings of words are not in the words; they are in us" (p. 212). Hence the real challenge is how to conceptualise safety "in us" in a way that meaningfully and compellingly drives the textual reading towards authentic accident-proofing goals. The research answers this challenge by pivoting from critique to solution and to an emergent methodology that leads to the Incident, Accident, and Safety Attribution (IASA) conceptualisation of red rule safety.

7.1.2 Aim and Aspect of the Chapter

As introduced above, this chapter begins the transition from critique to solution in the thesis. It summarises and situates the meaning-making problems of safety identified so far into the hermeneutic motifs introduced in Chapter 4. It then, based upon a key insight from Derrida's (1976) theory of deconstruction (Section 7.3 below), provides the rationale for the meaning-making narratives, attributes and principles used to construct the IASA model. This provides the groundwork for the subsequent derivation of the incident, accident, and safety attributes in Chapter 8 and then, in Chapter 9, the implications of the attributes and the IASA model itself.

The current aspect of the research is shown in context with the broader structure of the thesis in figure 7.1 below:

Figure 7.1

Chapter 7 within the Broader Movements of the Research

7.1.3 Outline of the Chapter

The outline of Chapter 7 is:

- Section 7.2 – Constructing a meaning-making methodology as a foundation for Red Rule Safety in the IASA model
- Section 7.3 – The role of deconstruction and bivalence in the IASA Model.
- Section 7.4 – Narrative-based meaning in the IASA Model.
- Section 7.5 – Principle-based meaning in the IASA Model.
- Section 7.6 – Attribute-based meaning in the IASA Model.
- Section 7.7 – Conclusion.

7.2 Constructing a Meaning-making Methodology as a Foundation for Red Rule Safety in the IASA Model

The research so far shows there are fundamental meaning-making problems at work in the conceptualisation of safety within the regulations. The problems can be seen as stemming from the representational nature of the term safety which, when fused with differing reader knowingnesses, lends itself to non-shared, non-standardised meaning-making (as discussed in Sections 5.2 and 5.3). Thus "safety" has representational intonations that may or may not be shared by competing and/or complementing parties.

This was first seen in the corporate knowingness of Avtex Air managers and the way in which a profits-producing motif dominated frontline safety concerns (see Section 5.3). A regulatory knowingness was then evidenced in the contention over CAR 238 at the AATA where the liability-proofing textuality of the regulations was unable to resolve the CAR 238 contention.

The three types of knowingness and their motifs of meaning are illustrated in Figure 7.2 below.

Figure 7.2

Influences of Differing Knowingnesses on the Interpretation of Regulations

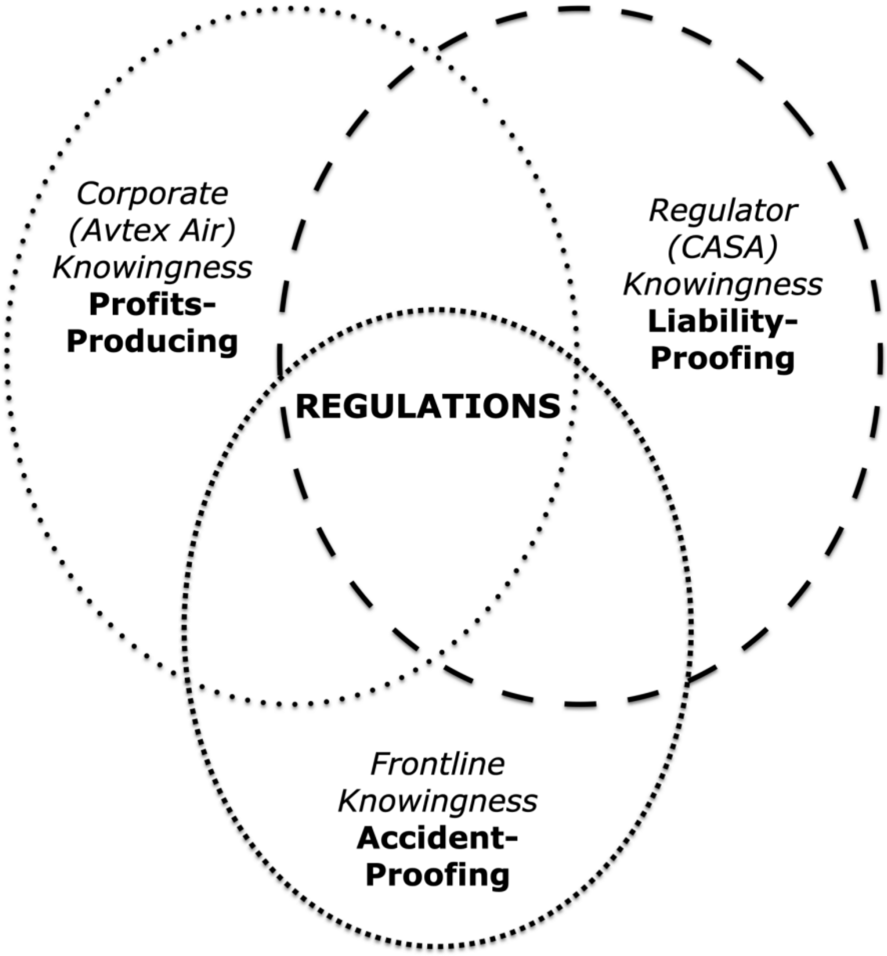


Figure 7.2 above illustrates each stakeholder's knowingness as an oval. The considerable amount of extra-textual influence of each stakeholder is illustrated in the large extra-regulatory area of each oval. Despite all three types of aviation stakeholders having the same regulatory text, the extra-regulatory influence of each has a large and differing influence on the reading of the text. This then, as the text fuses with the differing motifs, increases the potential for differing interpretations. The potential for disparate meaning-making thus arises because the non-neutral textual characteristics of the regulations rely upon the reader's conceptualisations of safety for final interpretation – not just the text itself.

The illustration in Figure 7.2 is useful in hermeneutically situating the meaning-making dynamics at Avtex Air. Avtex Air's corporate knowingness was a non-textual profits-producing motif that fused and then recontextualised the authority of CAR 238. This generated an apparent legitimacy to Avtex Air's corporate interpretations. Thus, "have a look" could be reframed as "safe" even as the frontline operator (the pilot) insisted the safe thing to do was to stay on the ground. The pilot's decision was empowered by quoting verbatim CAR 238 at his managers in the hope this would legitimise his own interpretation. However, this was thwarted because CAR 238 itself was fused with another motif: the liability-proofing motif. This motif drives the regulation to be written with governing motivations of legal defensibility as well as prosecutorial potentiality. In so doing, not only is textual concision, appropriateness, and clarity compromised but so too a compelling safety outcome. Thus, without a clear resolution available within CAR 238 or the broader regulations, Avtex Air management could persuasively and erroneously delegitimise the interpretation of the pilot. Management did this by intimating the regulations were always open to interpretation and therefore there was no point arguing over them.

The important question that arises here, especially for similar contentions in the future, is whether one can rely on the regulatory texts to successfully rebut hazardous motifs of meaning. Extra-textual knowingness powerfully affects the legitimisation of the regulation being read by the reader. If that reader cannot see resonance in the text with their conception of safety, it is likely the regulation will appear irrelevant or even illegitimate. This illegitimacy only grows if the textual characteristics of the regulation tend towards legalese.

What all of this means is that the solution to the problems identified in Chapters 5 and 6 must be twofold. First, the identified textual issues of the regulatory texts must be addressed by clear-writing strategies that address the needs of the reader. Much has already been said in this regard and it is not the intent here to elaborate further on textual solutions except to remind readers again of the clear writing guides mentioned in Section 5.4.1 (Leddy, 2012; Mazur, 2000; Strunk, 2012; etc.). A full application of these guides to safety regulations is too large for the immediate thesis but may appear in future research as detailed in Chapter 10. In any case, it is evident CASA has already recognised this need with the publication of several plain language guides (2019b) and, notwithstanding the fact they do not accept liability for the guides (see Section 6.6), this is an important step in resolving the textual problems.

Nonetheless, this does not solve the problem of disparate safety knowingnesses generating disparate interpretations. Thus, the standardisation of safety knowingnesses for both regulatory readers and writers is the second and more important solution. If a greater sharedness in the knowingness of safety can be achieved, it is far more likely readers will interpret and legitimise the regulatory text in the same way (see Figure 7.3 below).

Figure 7.3

Shared Safety Knowingness and the Influence on the Interpretation of Regulations

Figure 7.3 above illustrates the situation when the differing knowingnesses are harmonised by a shared knowingness of safety. Such a knowingness, if successfully legitimised and standardised by a compelling accident-proofing motif, can then moderate profits-producing and liability-proofing conceptions. Thus, various stakeholders, with a variety of motivations and pressures (including both regulatory writers and readers), are more likely to see the legitimacy and relevance of the "safety" goals in the safety regulations. This means even if textual characteristics tend towards something less than clarity, concision, and appropriateness; the

standardised safety knowingness should ultimately lead back to an emphasis on accident-proofing safety.

It is evident from the first half of the research the challenge of achieving a standardised conception of safety is a difficult one. Nonetheless, the next phase of the research intends to address this challenge by constructing, standardising, and legitimising the IASA conceptualisation of safety from actual ATSB incidents and accidents (ATSB Airtable, 2021). As preparation for the creation of the IASA model, the following sections present the construction of the meaning-making methodology constituting the IASA model. This begins with the first organising feature of the model's meaning-making structure which is the principle of bivalence from Derrida's theory of deconstruction (1976).

7.3 The Role of Derrida and Deconstruction in the IASA Model

The challenge that has been present throughout the research is how safety can be conceptualised to the satisfaction of the diversity of aviation stakeholders. The research comes at the problem in reverse; that is, not by asking what is safe but what is unsafe.

This is a very hermeneutic tactic particularly in the wake of Derrida's influence on hermeneutic thought (1976). It is also a surprising tactic since Derrida has been called the enemy of meaning (Rolfe, 2004, p. 274). This is because of Derrida's oft-quoted paradoxical pronouncements about the "pervertability" of texts and the instability of final meaning – ironically while Derrida himself uses texts to justify his conclusions about textual instability (Pirovolakis, 2010, p. 3). Nonetheless, Derrida's work provides a key hermeneutic insight – a strategic deconstructive device – that can be usefully appropriated. This device is the "bivalency" of language and is perhaps best explained in the foreword of Derrida's key work *Of Grammatology* (1976):

> To locate the promising marginal text, to disclose the undecidable moment, to pry it loose with the positive lever of the signifier; to reverse the resident hierarchy, only to displace it; to dismantle in order to reconstitute what is always already inscribed is deconstruction in a nutshell (p. lxxvii).

As Rolfe explains (2004, p. 275), this idea of "reversing the resident hierarchy" refers to a key idea from deconstruction called the "bivalence of language" (Norris, 2010; Vanhoozer, 2009). Bivalence refers to an inhering duality of thesis and anti-thesis in language; that is, an indwelling double-coding of binary oppositions (Rolfe, 2004, p. 275). Thus, to write about light is also to write about darkness and to write about good is also to write about evil – even when the opposites are not mentioned. This is because, in the previously lived-out dualistic reality of the opposites (i.e., in the reader's knowingness) the implied "other" is always present, despite its textual absence.

It is in this deconstructive attentiveness a reality-based conception of safety can be derived. This is because investigative texts are texts like any other in that they contain bivalent conceptions – especially bivalent conceptions of safety and unsafety. Any person, upon encountering an aviation accident (whether in report or in person) finds it self-evidently true they have encountered something unsafe – especially in the face of crumpled metal, injury, and death. Theoretically then, once this compelling "unsafety" is identified it is relatively simple, via a bivalent twist, to nominate its reverse attribute – its safety attribute. Thus, via a deconstructive pivot, the problem of denoting safety in a compelling way is rerouted via the much easier path of denoting unsafety. This idea is seen in action in the next chapter (Chapter 8) in the derivation of the incident and accident attributes where the attributes are shown in bivalent pairs e.g., "situationally attentive / situationally inattentive", "vocationally proficient / vocationally deficient", "decisionally reliable / decisionally unreliable" and so on (see Section 7.6 below for further explanation).

It is worth noting that a likely objection to this Derridian strategy is that since Derrida is seen by critics as the enemy of meaning (e.g., Rolfe, 2004, p. 274; Pirovolakis, 2010, p. 3) it is unlikely his ideas could successfully derive a meaningfulness of safety. However, one seriously wonders how far Derrida would be willing to go with his idea that meaning "inaccessibly incites" towards meaninglessness (1992, p. 191). Would he, for example, as a passenger mid-cruise on an Avtex Air charter flight, and hearing the announcement there was a significant safety concern, insist "safety" and "concern" were just words "inaccessibly inciting" towards meaninglessness. Or would he tighten his seatbelt, wish for a cigarette, and nervously wait for the aircraft to safely reach its destination. One suspects it would be the latter because in aviation, unlike literature, when all is said and done deconstructively, there is always the reality-bringing awfulness of an accident to cement meaningfulness in one's mind. Hence, the IASA model cautiously leverages off the analytic power of Derrida's bivalent observation without accepting his insistence final meaning is out of reach – it is thus deconstruction with the seatbelt on.

With the idea of language bivalence and its importance explained, the next section elaborates upon the utilisation of narratives in the construction of the IASA model.

7.4 Narrative-Based Meaning in the IASA Model

The role of narratives is critical to meaning-making and features heavily in historical and modern hermeneutics (e.g., Bruns, 1995; Campbell, 1949; Parry & Doan, 1994). It also features in modern psychology (Parry & Doan, 1994). According to Murfin and Ray (2018), narrative is an "explicitly constructed system… a representation that creates and shapes meaning" (p. 241). Narrative is thus an integrative mechanism in meaning-making that coheres apparently disparate elements into a meaningful whole. This contextualised story-telling flow provides a way of situating otherwise inexplicable, discordant, and fragmented events. It also simplifies the complexity of such events into manageable cognitive sizes.

According to one of the most famous studies of narrative, *The Hero of a Thousand Faces* (Campbell, 1949, p. 1), narratives have given civilisations meaning-making power for millennia. They come with a basic structure: a beginning, a middle and an end. Generally, the beginning of a narrative sets the uninitiated and unenlightened context while the middle is some disturbance or disruptor to that initial setting. The end of a narrative is a resolution (and restorer) of the middling disruption which is then intended to illustrate a renewed, fuller, and wiser character (and a wiser reader). Campbell (1949) called this basic narrative structure a "monomyth" (p. 1) to describes its prevalence as a governing structure throughout the history of meaning-making stories. In so doing, Campbell demonstrated narratival structures, or a lack thereof, are a powerful influence on a reader's preknowingness.

Another way of expressing the narrativised version of knowingness, the monomyth, is as a "worldview" (Makkreel, 2015, p. 83). A worldview is a narrative-form that harmonises the fused aggregate of such things as beliefs, attitudes, fears, hopes, present knowledge, past knowledge, and future imaginings. This "Weltanschauung" (Oxford University Press, 2015) – a term carried over to English by the Germans – is a grand narrative that coheres life's observations, statements, events and feelings. It then drives or constrains attitudes, values, and actions as a function of "how things really are". Thus, from a safety perspective, narratives and worldviews are an important consideration in meaning-making because they act as an internal organising matrix for a reader's preknowingness. If the worldviews and narratives of safety are not shared in this knowingness, then neither will the textual priorities of the regulations.

Narratives are also directly relevant to the meaningfulness of safety as it appears in the regulation's safety goal. This is seen in the safety goal of the *Civil Aviation Act 1988* which is, in micro, narratival ("maintaining, enhancing and promoting the safety of civil aviation, with particular emphasis on preventing aviation accidents and incidents"). The goal of the Act has a beginning (civil aviation), a middle (the prevention of accidents and incidents) and an end (the enhancement and promotion of aviation safety). Through this narratival goal, a reader is invited to consider aviation as it stands without the Act – its "uninitiated", "unenlightened" context. Then one is confronted with the disruptive middle (the potential for accidents) and finally, the enlightened end (safety enhanced and promoted).

In fact, safety in and of itself can be seen as a narrative act. This is because safety involves personal experiences (knowingnesses and worldviews) of people who every day are "doing aviation" (the narrative beginning). They experience risk (the disruptive middle) and then apply controls to that risk to generate a safer context (the restorative and enlightened "end").

When the meaning-making structure of safety is conceptualised in narratival terms, it becomes more obvious why the textual characteristics of the regulations identified in previous chapters are so problematic. The fragmented or congested context of the regulations acts to de-cohere any ongoing sense of narrational meaningfulness. The result is the absence of a totalising flow that would enable a compelling meaning-making "sense" and vision of regulatory safety. Thus, if a conception of safety is to meaningfully resonate at the level of a reader's knowingness and worldview, it should seek to integrate a narrational flow.

In Chapter 8 and the construction of the IASA model, narrational flow is achieved by taking the natural narratives of the ATSB investigations and conceptualising "narrative markers" for each attribute. This is easily done since the curated investigations in the Airtable Database (2021), as will be seen in Chapter 8, exist within a clear narrational framework. These markers play an essential part in constructing the meaningfulness of safety as it is formed around the incident and accident attributes. With this understanding of narratives in place, the next section describes the utilisation of the concept of principle-based meaning in the IASA model.

7.5 Principle-Based Meaning in the IASA Model

Alpa (1994) provides a very useful hermeneutic-legal discussion on principles. He explains that a principle can act as: "a synonym for fundamental value, an element of basic notion or as a progressive abstraction generalised from a series of data and particular cases" (p. 1). It is this last point – the progressive abstraction point – that makes principles especially useful in the IASA model. This is because the "progressive abstraction" of a principle provides a functional meaningfulness that tangibly connects to the all-important narratives discussed in the previous section. This then acts to anchor the meaning-making in the IASA model to actual stories of accidents and incidents with a self-evidently weighty significance. At the same time, the progressive abstraction makes the principle-based meaning sophisticated enough to be relevant but not so large as to become unwieldy. This is important because it means principles are less likely to avoid the meaning-making extremes demonstrated in Section 5: in one extreme, concepts suffer from semantic poverty and lose relevance in practical applications (i.e., the "definitionalism" in Section 5.3.5); in the other, a congestion of words and complex concepts make meaning-making in everyday contexts unwieldy and confusing. The conceptualisation of safety meaningfulness provided in the IASA model intentionally utilises principles to avoid these two extremes. The IASA model also, for the same reason, uses an attribution-based approach to further concretise meaning in the model (see Section 7.6 below). Thus, in Chapter 8, for each of the ten attributes derived from the ATSB investigations, there are eight underpinning principles of meaning. For ease of reference, these principles have their own sub-headings under each main attribute in Chapter 8. These principles are intended to shape the safety-knowingness of readers as follows:

1. **The Principle of Emergence.** This section of each attribute's description provides a contextual introduction. It does this by showing the emergence and relative prevalence of each attribute from the ATSB investigations against the other attributes. The meaning-making idea here is that the reader is immediately connected to the attribute in a manner that is numerically legitimising.

2. **General-Usage Descriptors**. This section of each attribute's description provides a denotative introduction. In the same

section as the principle of emergence, a "general-usage" descriptor provisions an initial denotative meaning to the attribute. (It should be noted the use of definitions only introduces the attribute and is not meant to be its meaning-making whole – the meaning-making whole comes from the entirety of the principles).

3. **The Principle of Phrasing Variations.** This section expresses phrasing variations that provide more flexible textual forms of each attribute. It expresses the attributes in verb and noun forms thus connoting agency and action as well as aspirational or avoidant states.

4. **The Principle of Narrative Markers.** This section provisions a representative synopsis of the narrative flow of the attribute (recall Section 7.4 above for a deeper explanation on the importance of narratives in meaning-making). The narrative markers provided are the "beginning" (initial state); "middle" (disruptor); and "end" (restorer) markers. Full narratives for all 391 investigations can be found in column 6 of the Airtable Database (2021).

5. **The Principle of Indicative Nested Concepts.** This section provides indicative concepts that are nested within each attribute and directly contribute to the attribute's meaning or its function. This section thus provides meaning-making depth. The relevance and implications of nestedness is explored in detail in Section 9.4.

6. **The Principle of Meaning-Consilience**. This section describes the ways in which various attributes overlap and interact with each other to "consiliate" meaning-making. "Consilience" is a 19th century term first identified in 1840 and later appropriated in Wilson's work *Consilience: The Unity Of*

Knowledge (1999). Consilience is a word referring to the way facts and facts-based theories are linked "across disciplines to create a common groundwork of explanation" (Oxford University Press, 2015) . In a more general sense, consilience refers to the concurrence of things (Chambers, 2014). Consilience is appropriated in its general sense in Chapter 8 and expressed in the principles of meaning. This section thus provides meaning-making "width" and forms a totalising perspective as each attribute's place in the meaning-making whole is demonstrated. This connotes the important idea that reality-based safety is formed by nestedness and consilience – not atomistically. This is explained in detail in Section 9.5.

7. **The Principle of Responsible Agents**. This principle ratifies the meaning-making by embodying it in "responsible" agents. Responsible in this sense, and as explained in Section 1.6.6, is not used in its legalised form but in a sense that connotes the agent is "response-able"; that is, they have individual agency to action the incident and accident attributes. Thus, each safety actionable, and indeed safety as a whole; is not merely propositional, legal, or idealised but a lived-out and actionable reality. This is explained in detail in Section 9.8 and is intended to add further meaning-making legitimacy through the call to personal agency.

8. **The Principle of Historical Prevalence**. While the prevalence of each attribute is shown in the "Emergent / General-Usage Descriptors" as relative to each other, this section shows the prevalence across history. The meaning-making idea here is that the reader is immediately connected to the attribute in a manner that is historically legitimising. The historical prevalence adds to the relative prevalence and further legitimises meaning-making by showing proportionate

and historical contexts. This sharpens the sense of consequence and exposure as well as demonstrating persistent themes rather than just one-off occurrences. In this way, a sense of frequency and proportionate import of the attribute is formed. The importance of this is discussed in Section 9.6.

With the principles of meaning articulated above, the next section provides the rationale for the use of attributes in the IASA model.

7.6 The Role of Attributes in the IASA Model

In the development of the IASA model, the characteristics and features inherent to ATSB investigative outcomes are derived as attributes; namely, the incident, accident, and safety attributes. An attribute is "a quality or feature regarded as characteristic or inherent" to an object or concept (Oxford University Press, 2015). Like the concept of a principle, an attribute serves a summative function without losing the substantiveness of meaning and thus provisions a balance between the potential extremes of cumbersome or curt meaning-making.

There are a total of ten attributes derived from the content analysis of ATSB investigations (see the next chapter – Chapter 8 – for a comprehensive articulation of these ten attributes and their underpinning principles of meaning). The content analysis examines 391 investigations (ATSB, 2021b) over the period 1968-2021 identifying and thematising the ATSB's safety recommendations into the ten incident and accident attributes (ATSB Airtable, 2021). Appendix C provides explanatory details of how the reports were curated and sampled.

The incident and accident attributes emerge in the "Safety Actions" or "Safety Message" of the ATSB report and are what the ATSB articulates as the actions that will, at least theoretically, prevent recurrence. Safety messages and actions are therefore the crux of what the ATSB intends the reader *to do* from the unsafeness of the accident so that future incidents and accidents are avoided (ATSB, 2021b, para. 8). In hermeneutic terms, this makes the incident and accident attributes semantically anchored to real accidents and a legitimising reality-base for safety-meaningfulness. Elaborating comments for the next chapter, where the derivation of the ten incident and accident attributes is conducted, are as follows:

- Safety actions are not explicitly expressed as such by the ATSB prior to the year 2000. In these cases, an implicative judgment was made to derive the incident and accident attribute. This was done by identifying verbs (doing words) or nominalisations (nouns acting as a verb) that shaped phrases from the ATSB narrative into a "doing" phrase. The attributes were also identified through causal statements such as "the probable cause of the accident" or "the accident occurred because". This was ratified by the implied meaning that if the cause was removed or ameliorated, the accident (the unsafeness) would not have occurred.

- The data collection proceeded in reverse-chronological order beginning 22 April 2021 and curating each publicly available investigation back three years to 17 April 2018 (153 reports). The remainder of the analysis then sampled a year's equivalent of investigations at each decade's turn from 1970 - 2010 (that is, 1970, 1980, 1990, 2000, 2010). Table C1 in Appendix C provides further details on how the scope of analysis was derived. The curation period, in its totality, thus provided a broad, 50 year expanse of safety-meaningfulness with a particular focus on the last three years to ensure its relevance to modern times (2018-2021).

- The actionable statements from the investigations, after being gathered in reverse chronological order, were expressed verbatim in Column 11 of the Airtable (a full explanation of each column appears in Appendix C). From these verbatim statements, obviously-emergent core themes were identified and placed within square brackets in column 11 immediately after each recommendation. The term "obviously-emergent core" is borrowed from Peterson and Seligman (2004) and helpfully identifies the concept of "central tendencies" inhering the more specific phrases of the recommendations (p. 35). These central tendencies, from the actionable statements, "reliably converge to a recognisably higher-order category" in the form of the incident and accident attributes. To understand this concept more fully, take the example of the derivation of attributes from ATSB number AO-2019-053 in Serial 1 of the ATSB Airtable. Three attributes can be extracted verbatim from the "safety message" section of the ATSB report in the Airtable (2021). For example:

    - "This occurrence highlights the value of flight crews being fully conversant with operating procedures, particularly those related to aircraft unserviceability. Those procedures are critical to the safety of flight operations" (p. 3).

    - "It is also important that any unserviceability is recorded in the aircraft's technical log to ensure that it is addressed and to provide future reference in case of further, or related, instances" (p. 3).

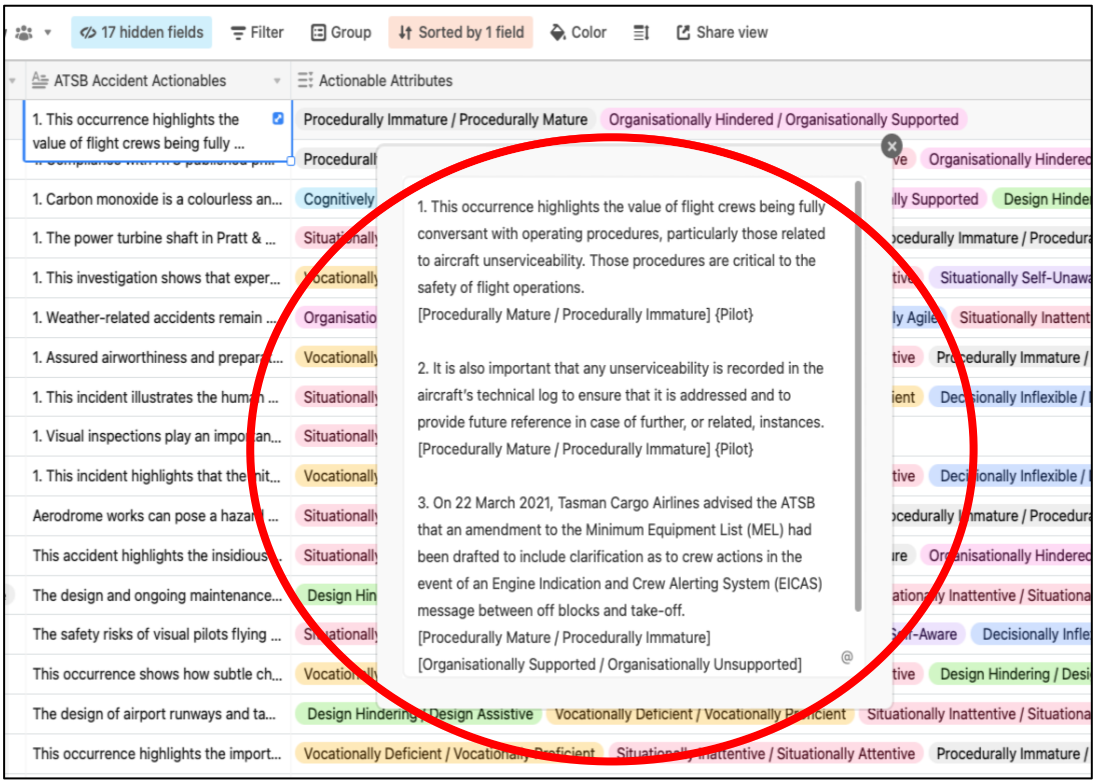
    - "On 22 March 2021, Tasman Cargo Airlines advised the ATSB that an amendment to the Minimum Equipment List (MEL) had been drafted to include clarification as to crew actions in the event of an Engine Indication and Crew Alerting System (EICAS) message between off blocks and take-off" (p. 23).

- An example derivation of incident and accident attributes at Figure 7.4 below shows what the process enunciated in the previous chapter looks like in the Airtable Database (as indicated by the red circle):

    - In Figure 7.4 below, the accident attribute converges to a higher order procedural action: flight crews need to be fully conversant with operating procedures; unserviceabilities need to be recorded (a procedure) and the MEL should be updated (another procedure). This is coded as a "procedurally-mature / procedurally-immature" with both poles of the attribute coded together in keeping with the deconstructive and bivalent feature of the analysis (recall Section 7.3 above for an explanation of this feature).

Figure 7.4

Example Derivation of Attributes from Column 11 of the ATSB Airtable



Note. Excerpt from ATSB Airtable Database (2021). A full explanation of this column and all other elements of the Airtable is contained at Appendix C.

- As can be seen in Figure 7.4 above, reference to procedures is cited as an attribute within square brackets next to the statement from the report itself that lends itself to the attribute e.g., "[Procedurally-Mature / Procedurally-Immature]". This is then catalogued under its own identifying tag in column 12 of the Airtable.

- It is important to note the derivation of the attributes is hermeneutic rather than judicial; that is, judgements are not being made about the rightness or wrongness of an action or inaction; rather a hermeneutic identification of the meaning-making traits of the safety messaging is being made.

- In the same way as the "Procedurally-Mature / Procedurally-Immature" attribute was coded, so too the additional attribute shown in Figure 7.4 above; that is, the attribute of an operator providing an updated MEL. This is coded as "Organisationally-Enabled / Organisationally-Hindered" because it is the organisation's "attribute", and this attribute has distinct organisational implications (see next chapter).

While unable to be visualised in the Airtable, it is important to note the ten attributes emerged iteratively. This meant each attribute was tentatively named and renamed as investigations were progressively catalogued. This iterative renaming continued until an appropriate balance between expansiveness and specificity for each attribute was attained. The same process was applied repeatedly to recurring, unifying phrases, actions, and ideas of a lower order until a final list of incident and accident attributes was obtained.

Consistency of the ten attributes was checked using the qualitative assurance principle as provided by Schreier (2012). This was to code the content at different points in time. The ATSB Airtable was first initiated in April 2019 and completed in April 2021 with a repeat coding of the entire contents carried out from April-July 2021. In the second coding, most of the ten attributes were ratified as generally consistent with the first coding sweep but, where differences were noted, these resulted in further refinement of the ten attributes themselves. For example, the "organisationally supported" attribute was originally "organisationally-culturally supported" but this was abandoned since culture could be seen as being subsumed by the word "organisational". As can be seen in Chapters 8 and 9, the "organisationally supported" attribute now refers to any actions taken by the organisation prior to, or after, the accident as well as any cultural aspects.

Of course, it should be noted that while there was general consistency for each attribute this does not mean perfect precision was attained; nonetheless, each attribute has an internal coherence distinct enough to situate itself as its own meaning-making entity. Thus, as Morgan (2007) observes, while "most generalities will have the odd exception, the odd exception will not invalidate the general picture" (p. 35).

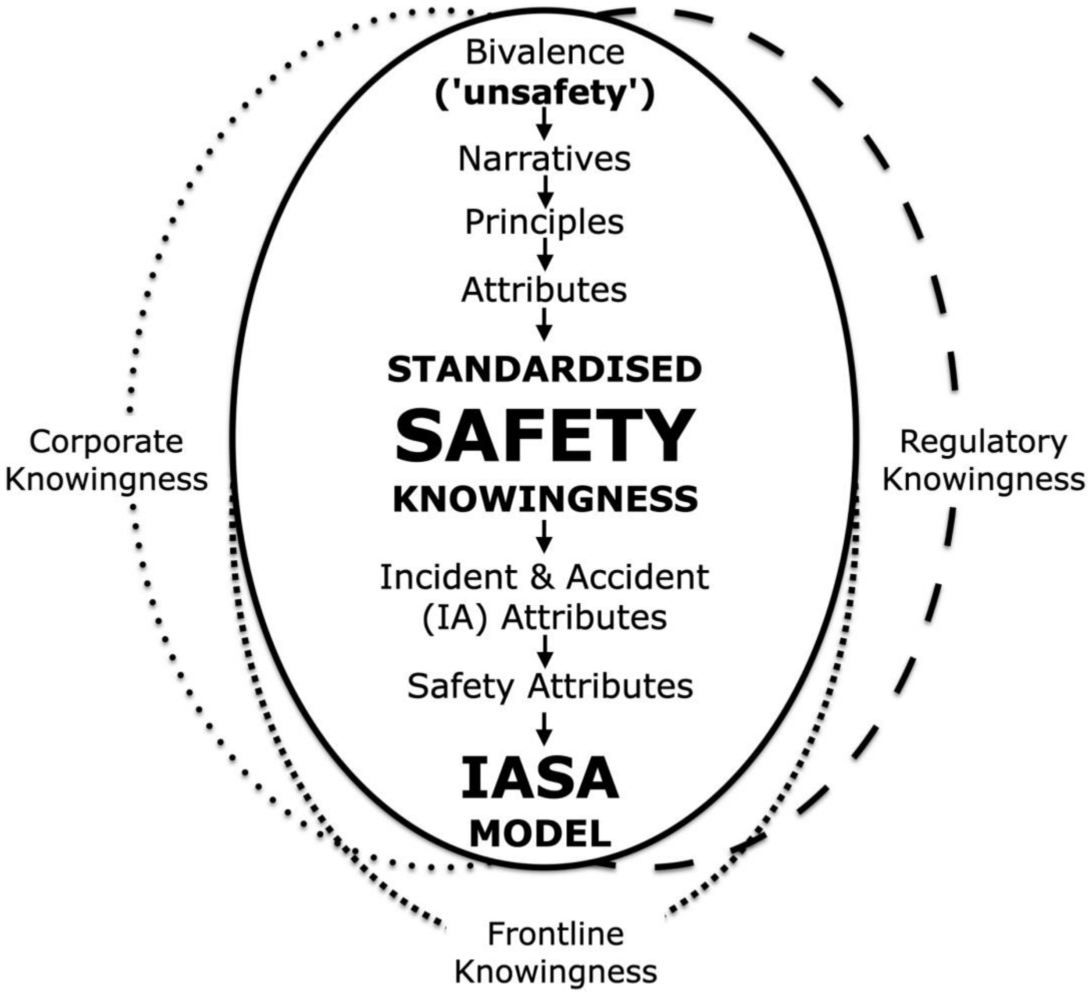
7.7 Conclusion to Chapter 7

This chapter has set the groundwork for the IASA model and responds to the key safety problem: how can safety be more objectively, compellingly, and actionably conceptualised? This question, which is also the fourth research question, is answered in the next chapter by providing a meaningfulness of safety that is underpinned by the meaning-building methodology presented above. This method can be summarised as bivalent, narratival, principle-based, and attributive.

Figure 7.5 below illustrates the meaning-building process behind the IASA model of safety.

Figure 7.5

Shared Safety Knowingness (IASA) Built upon Bivalence, Narratives, Principles and Attributes

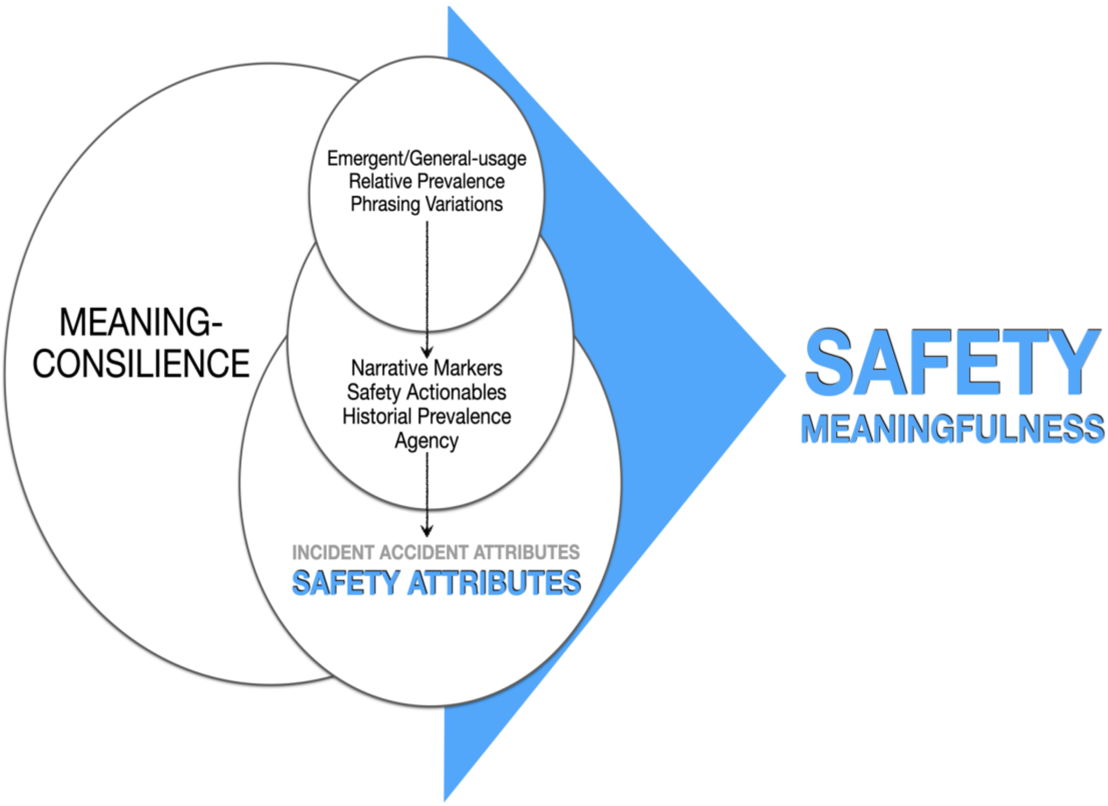


In Figure 7.5 above, the shared and standardised safety knowingness (the centre oval) begins with a shared understanding of "unsafety" existing bivalently with safety. This is represented at the top of the centre oval. Principles and attributes of unsafety (and bivalently, safety) are then drawn from the ATSB narratives. This is shown in downwards sequence from the bivalence label to the standardised safety knowingness in the centre of the oval.

The same meaning-making dynamics are illustrated in Figure 7.6 below, but in this rendering the hermeneutic fusion of the various elements is emphasised to demonstrate the totality of meaning-making influences on the eventual construction of the IASA model. All of this is then applied to the ATSB Airtable and thematised into the ten incident and accident and safety attributes. These together, as shown at the end of the sequence, form the IASA conceptualisation of safety.

Figure 7.6

Safety: Meaning-making Fusion of Bivalence, Narratives, Principles and Attributes



With this groundwork in place, the next chapter (Chapter 8) provides a comprehensive presentation of the meaning-making construction of the ten incident, accident, and safety attributes followed by the construction of the IASA model in Chapter 9.

CHAPTER 8: SAFETY MEANINGFULNESS IN TEN RED RULES

I may not know [how to define it] but I know it when I see it…

~ Supreme Court Justice Potter Stewart

8.1 Introduction

8.1.1 Providing Constancy to "Safety"

As expressed earlier, the meanings of words are as much in the reader as in the words themselves. Thus, if there is no consistent meaning of safety within a reader, there can be no consistent meaning read out of the regulatory text. The research so far has proposed that this variability of safety meaningfulness is carried into the regulations whenever safety is used as a legal word. This leads to increased potential for ambiguity and misinterpretation because the very law that attempts to convey a consistently stable meaningfulness to the reader relies upon a variable masquerading as a constant.

This leads to the development of the answer to the fourth research question regarding how safety might be more objectively, compellingly, and actionably conceptualised for regulatory readers and writers. The previous chapter (Chapter 7) set the groundwork for the answer by situating the problem hermeneutically within the three motifs of meaning: profits-producing, liability-proofing, and accident-proofing. It then provisioned an emergent meaning-making methodology and several features of meaningfulness designed to build a red rule, accident-proofing motif; namely, language bivalence, narratival power, principle derivation and attribute extraction. This emergent method is used below to derive a comprehensive meaningfulness for each of the ten incident, accident, and safety attributes – the ten red rules – and then, in Chapter 9, safety meaningfulness as a whole in the IASA model.

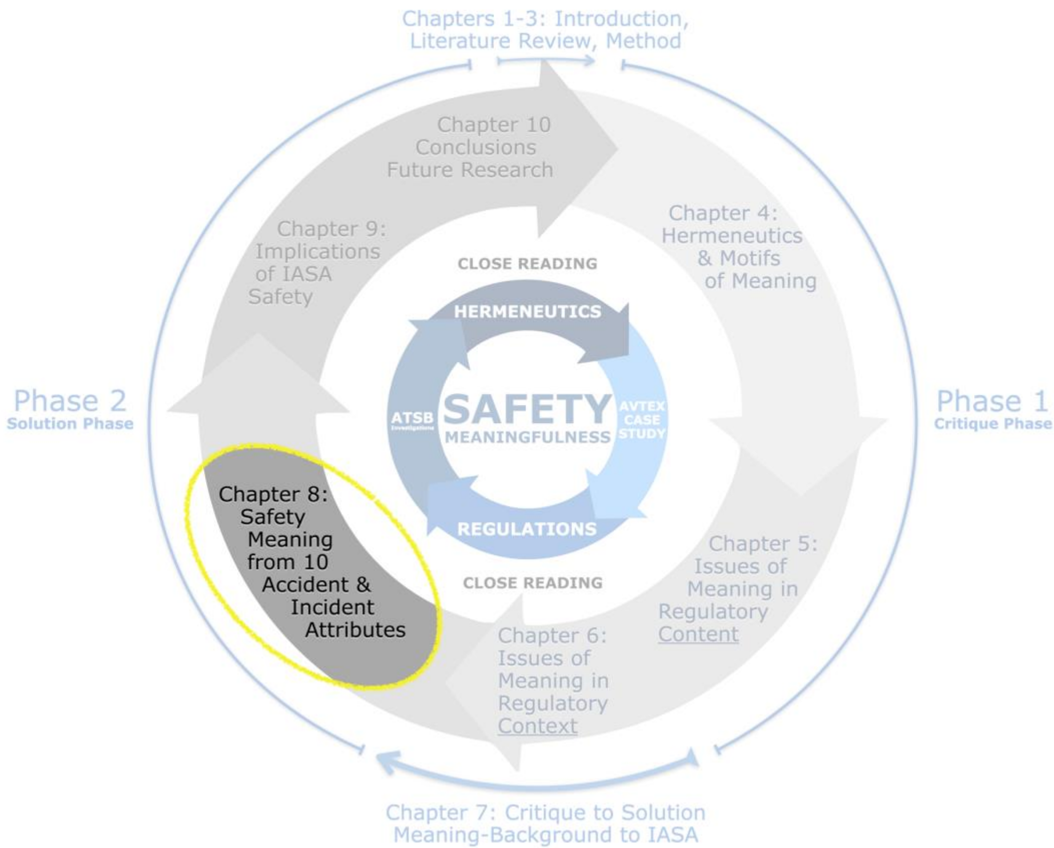
8.1.2 Aim and Aspect of the Chapter

The aim of this chapter is to present with meaning-making detail the ten incident and accident attributes (the ten red rules) that form the IASA safety model. This is done using the bivalent, narratival, principle-based and attributive approach discussed in the previous chapter. A total of 391 ATSB-investigated aviation incidents and accidents from 1968-2021, curated in the ATSB Airtable Database (2021), are analysed to construct the ten incident and accident attributes and the red rule safety conception. The methodology for this curation is explained in Section 3.5.3, elaborated upon in Section 7.5, and scoped in Appendix C.

Worth repeating here from previous chapters is that this derivation of the attributes is not an attempt to merely define safety (a somewhat troublesome goal as seen in Chapter 2). Instead, the methodology uses Derrida's bivalent insight (see Section 7.3) to extract the inhering attributes of "unsafety". This, in turn, leads to a meaningfulness of safety as the deconstructive antithesis of unsafety in the ten safety attributes. In Chapter 9, the ten derived attributes are brought into iterative dialogue with previous observations to provide further emergent findings and to lead to the IASA model itself. The current aspect of the research is shown in context with the broader structure of the research in figure 8.1 below:

Figure 8.1

Chapter 8 within the Broader Movements of the Research



8.1.3 Outline of the Chapter

The outline of Chapter 8 lays out the derivation of the ten incident and accident attributes in the following way:

- Section 8.2 – Summarising the meaning-making of the ten attributes.
- Section 8.3 – The "situationally-attentive / situationally-inattentive" meaning-making attribute.
- Section 8.4 – The "vocationally-proficient / vocationally-deficient" meaning-making attribute.
- Section 8.5 – The "decisionally-reliable / decisionally-unreliable" meaning-making attribute.

- Section 8.6 – The "procedurally-mature / procedurally-immature" meaning-making attribute.
- Section 8.7 – The "design-assistive / design-hindering" meaning-making attribute.
- Section 8.8 – The "regulatively-effective / regulatively-ineffective" meaning-making attribute.
- Section 8.9 – The "organisationally-enabled / organisationally-hindered" meaning-making attribute.
- Section 8.10 – The "situationally-self-aware / situationally-self-unaware" meaning-making attribute.
- Section 8.11 – The "crashworthy / uncrashworthy" meaning-making attribute.
- Section 8.12 – The "cognitively-resilient / cognitively-compromised" meaning-making attribute.
- Section 8.13 – Conclusion.

8.2 Summarising the Meaning-Making of the Ten Attributes

In millions of words over thousands of investigations, the ATSB Airtable Database (2021) provides a comprehensive record of unsafety. This provisions a vast amount of data for the exegesis of unsafety in the bivalent analysis below and, in turn, the emergence of the safety attributes. Integral to this reality-based analysis is the articulation of a shared sense of exposure and consequence which the ATSB Airtable is well able to provision because:

- An accident has profound meaning-making influence on stakeholders at all levels. It performs as its own semantic symbol with a manifestly evident concentrate of individual and organisational factors.

- As already discussed above, it is self-evident that an accident is unsafe. The causes of the unsafety may be debatable, but the reality of the unsafety presented by the injuries, the damage and the loss of life are not.

- The ATSB's self-stated mission is to determine causality and make recommendations as to preventative measures – not to apportion blame. Thus, the whole reality-based point of an investigation is to provide "safety actions" and "safety recommendations" to prevent similar accidents (ATSB, 2021a, p. 1).

With this in mind, the ten meaning-making incident, accident, and safety attributes – the ten red rules - constituting the IASA model are presented below. (Table F1 at Appendix F provides an overview of the attributes and can be used as a ready-reckoner to this chapter since the chapter is quite expansive.)

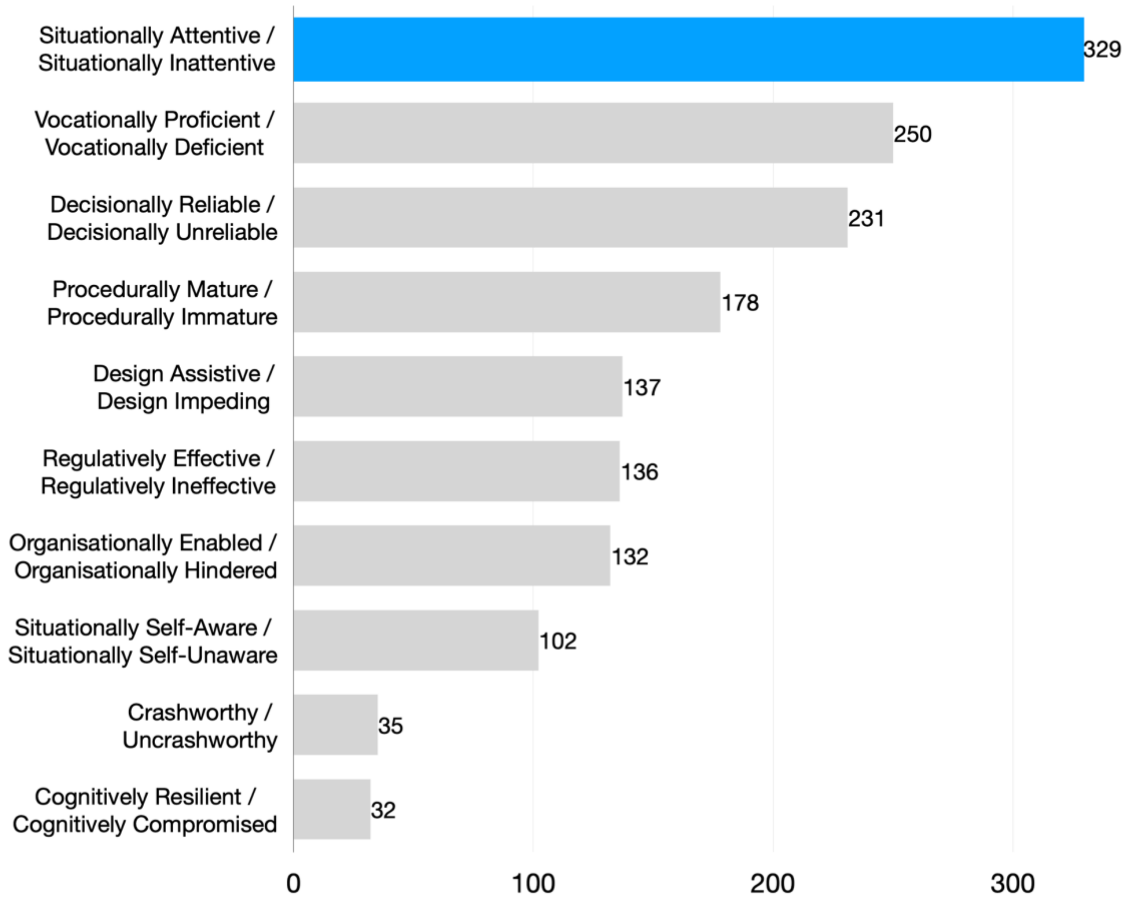
8.3 The "Situationally-Attentive / Situationally-Inattentive" Meaning-Making attribute

8.3.1 Emergent / General-Usage Descriptors

It will be of little surprise to most aviation professionals the first incident and accident attribute is the "situational attentiveness / inattentiveness" attribute and that it has the greatest prevalence. This attribute appears in 329 of the 391 curated reports. Attention or inattention to a vital pre-accident detail or event was noted as being important enough to lead the investigators to include it in 84% of the safety-related attributes in the ATSB Airtable (2021). The relative prevalence is shown in Figure 8.2 below in blue:

Figure 8.2

"Situationally-Attentive / Situationally-Inattentive" Relative Prevalence 1968-2021



Note. From the ATSB Airtable Database (2021).

The phrase above "vital pre-accident detail" is drawn from the general-usage of the terms "attentiveness" and "situation" (Oxford University Press, 2015). "Circumstance" is the key word in the definition of "situation" and is defined as "a fact or condition connected with or relevant to an event or action". It can also mean "an event or fact that causes or helps to cause something to happen, typically something undesirable". This part of the definition is important in that it points out "situation" is not referring to all circumstances but to those that matter. Otherwise, if it referred to all circumstances, not only would it be completely unachievable, but it would mean the "aware" part (see next paragraph) makes the "situation" part redundant (i.e., if one is encouraged to be "aware" then "situational" is not required since "aware" by itself implies one is aware of everything).

With the key terms so articulated, the strong general-usage connotation is that the situational attentiveness red rule demands one must be attentive to operational objectives while at the same time maintaining attentiveness to the vital details and events that may lead to, or prevent, an accident or serious incident. This rendering simplifies and delineates the attribute from more traditional renderings of "situational awareness" and technically dense definitions which most people would not arrive at intuitively.

To summarise, a situationally-inattentive agent is an agent who is not attentive to the vital detail implicated with the accident or serious incident. This attribute also, in antithesis, indicates a situationally-attentive individual is a safe individual. It calls agents to be prepared to be attentive to, and not distracted from, the vital details that cause or prevent accidents and incidents. Situational Awareness is to be delineated from Situational Self-Awareness (see Section 8.10 below) in that it is attentiveness to the external situation whereas being self-aware is awareness of one's own "internal" physiological and psychological characteristics.

8.3.2 Phrasing Variations

The phrasing variations for this attribute are as follows:

- "Situationally-Attentive / Situationally-Inattentive" to connote agency and action.
- "Situational-Attentiveness / Situational-Inattentiveness" to connote the aspirational or avoidant state.

- "Situational-Savviness / Situationally-Savvy", "Switched On", to connote colloquial, and, arguably, more engaging forms.

8.3.3 Narrative Markers

Incident-Accident-Attribution Narrative. The everyday task (initial state) is disturbed by a threat or threats (disruptor). A situationally-inattentive agent does not notice the threat, or unknowingly empowers the threat, and an accident or incident occurs. Situational-attentiveness recommendations (restorers) offer the promise of renewal to the everyday state (or the protection of the everyday state for those with similar everyday activities not involved in the accident or incident). The everyday state is renewed (and protected) in a reformed and improved way when the lessons from the findings and recommendations are embodied and applied.

Derived Safety-Attribution Narrative. An everyday task (initial state) is disturbed by a threat or threats (disruptor). A situationally-attentive agent notices the threat and addresses it in a timely way (restorer). The everyday state is renewed with the responsible agent (and those influenced by the agent) reformed and improved.

8.3.4 Indicative Safety Actionables

Indicative safety actionables from the ATSB Airtable (2021), with comments, are as follows:

- **AO-2019-033:** "This incident highlights that the initial indications of component failure/malfunction may be subtle. Automation can obscure significant changes in aircraft system status, including engine health*".* Here, readers are alerted to the fact that prevention of similar incidents will require pilots to be attentive to subtle indications of failure and to be aware of automation-obscuring indications. Attentiveness to vital details is conceptualised as an attribute that will prevent accidents and is thus a safety attribute. Also note the way in which this type of attentiveness consiliates (works with) a level of vocational proficiency (see consilient attributes in Section 8.3.4 below) – one cannot understand subtle indications if they do not have the vocational proficiency in the first place. Notice another consilient concept in the form of "design-assisting" from the OEM where a design-assisting (see below) attribute would enhance attentiveness because subtle indications would be more pronounced. This consilience of attributes is discussed more in Chapter 10.

- **AO-2019-062:** "It is important to ensure that the location and intention of surrounding traffic is well understood and communicated prior to commencing take-off or landing". This attribute, as part of a separation-breakdown recommendation, highlights that attentiveness must be given to traffic details for safety to occur. It also draws attention to the nested concept of communication. Nested concepts are shown in respective sections below and discussed in detail in Chapter 10.

- **AO-2018-025:** "Where possible, ALA owners should also consider the inclusion of runway overrun areas. Obstacles in the overrun area at the end of the runway may increase the risk of aircraft damage and injury to persons should a runway excursion occur". In this attribute the vital detail, after a runway overrun, is the design of the runway environment. Additionally, it is important to note the agent capable of actioning this recommendation (to prevent recurrence) is the infrastructure operator. This introduces the idea that situational attentiveness, and safety, is not just for pilots but various other agents. Agency is shown in respective sections below and discussed in detail in Chapter 10.

8.3.5 Indicative Nested Concepts

From the indicative examples above it was noted situationally-attentive has nested within it the idea of communications (see AO-2019-062). This and other nested concepts for the situationally-attentive /situationally-inattentive attribute are identified below (in *italics)* with indicative ATSB investigation numbers that can be cross-referenced to the respective Airtable reports:

- **Communication**: See AO-2019-062 where situational attentiveness depends upon traffic being *communicated*. See also AO-2007-070 and the attribute "Flight deck door procedures for improved *communications* in an emergency situation as per Operations Manual Part A" where this recommendation sees communication as enhancing situational attentiveness.

- **Workload Management:** See AO-2020-011 where "Singapore Airlines issued a notice to flight crew, *highlighting strategies to manage high workload situations*, as well as reiterating the importance of correct readbacks and acknowledgement from ATC".

- **Distraction Management:** See 199903131 where "both crewmembers then became *preoccupied* with the error to the extent that the airspeed was allowed to reduce to minimum flaps-up manoeuvre speed *before either pilot noticed* that the autopilot/flight director system was incorrectly configured".

8.3.6 Meaning-Consilient attributes

The consilient attributes for the situationally-attentive/situationally-inattentive attribute are identified below in square brackets with indicative ATSB report numbers that can be cross-referenced to the ATSB Airtable (2021):

- **Procedurally Mature, Vocationally Proficient, Decisionally Reliable, Organisationally Enabled.** See AO-2018-054 where procedures [procedurally-mature / procedurally-immature] are not followed and aircraft is not correctly configured for flight; that is, the incorrect configuration goes unnoticed "due to a number of factors including training [vocationally-proficient / vocationally-deficient], distraction, high workload [decisionally-reliable / decisionally-unreliable], low expectancy of error and supervision lapses [organisationally-enabled / organisationally-hindered]".

- **Decisionally Reliable, Organisationally Enabled, Vocationally Proficient.** See AO-2008-043 where "the operation of the helicopter at low altitude and airspeed, and at high gross weight (thus limiting options and decisional agility) was probably adversely influenced by the pilot's perception of the requirements of the filming task [organisationally-enabled / organisationally-hindered]. The conduct of the flight suggested a lack of awareness by the pilot of the LTE (Loss of Tail Rotor Effectiveness) risk during filming flights and of the appropriate LTE recovery actions [vocational proficiency]".

- **Procedurally Mature.** See also AO-2018-064 where "this incident serves as a reminder that a failure to follow procedures [procedurally-mature / procedurally-immature], such as functional checks, can result in unintended consequences. Functional checks are the last line of defence in maintenance work and can identify a range of errors that may have occurred during the job". See also AO-2019-048. "Insufficient guidance in the operator's maintenance procedures [procedurally-mature / procedurally-immature] meant that inspections required by the component maintenance manual that might have identified the developing fatigue crack were not carried out".

- **Situationally self-unaware, Decisionally Reliable.** See 98903777 where "the following factors were considered relevant to the development of the accident: The pilot was in a hurry to depart [self-unaware of effects of being rushed] and did not climb to a safe height before making a turn downwind in turbulent wind conditions [decisionally-reliable / decisionally-unreliable]. See also 198802414 where "the pilot subsequently advised that he had been complacent [situationally-self-aware / situationally-self-unaware]".

8.3.7 Responsible Agents

The situational attentiveness / inattentiveness attribute has many responsible agents nominated in the ATSB Airtable. Indicative examples are provided below (with key parts from each report relating to the attributes in *italics*).

- **Pilots** such as in AO-2008-043 where " the operation of the helicopter at low altitude and airspeed, and at high gross weight was probably *adversely influenced by the pilot's perception*.

- **Aircraft Engineers** See AO-2019-047 where "it was considered likely that the fatigue crack was present at the most recent maintenance visit, *however, it had not been detected*…" And also, AO-2016-174 where "a catastrophic rotor blade fatigue failure can be averted if pilots and mechanics *are alert to early indications of a fatigue crack.*

- **Managers and Operators** See AO-2019-048 where "insufficient guidance *in the operator's maintenance procedures* meant that inspections required by the component maintenance manual that might have identified the developing fatigue crack were not carried out".

- **OEM and OEM support agencies** See AO-2009-006 where NDI testing facilities, audits etc. provide situational attentiveness to possible metal fatigue issues. See also AO-2018-69 for OEM engine related attentiveness.

- **ATC** See AO-2020-005 where "*air traffic controllers* can potentially further assist foreign crew by proactively factoring the crew's unfamiliarity when providing airways clearances".

- **Regulator** See AO-2020-005 where "the ATSB's Safety Watch program *highlights broad safety concerns* that come out of ATSB investigation findings and from the occurrence data reports by industry".

- **Cabin Crew and Operations Support Crew**. See AO-2007-070 where the presence of such crew expands situational attentiveness.

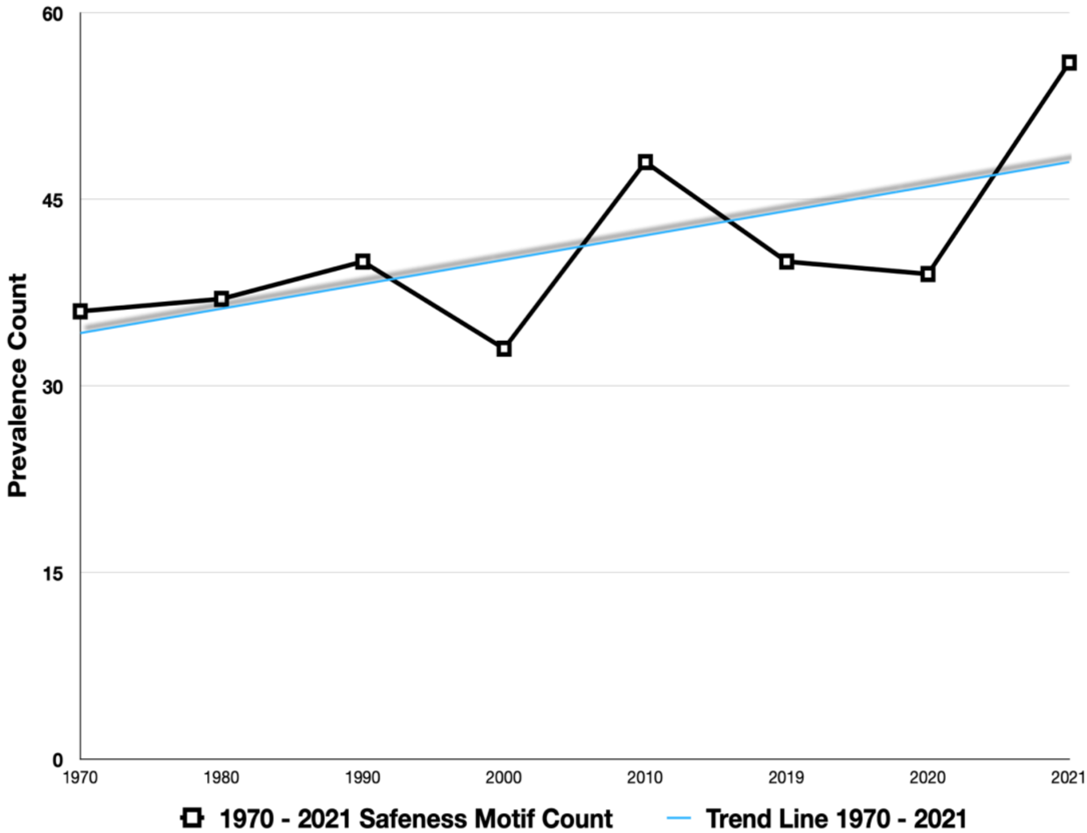
- **Infrastructure Operators** See AO-2016-166 where they can assist pilot attentiveness by providing "*centreline lighting*" because this "*greatly assists flight crews* align the aircraft with the runway but many runways, including most in Australia, are not equipped with it".

8.3.8 Historical Prevalence

A safety attribute count for situationally-attentive / situationally-inattentive is plotted across the period 1968-2021 in Figure 8.3 below.

Figure 8.3

The "Situationally-Attentive / Situationally-Inattentive" Attribute 1968-2021



Note. From the ATSB Airtable Database (2021).

What Figure 8.3 above shows is that this safety attribute has remained historically prevalent and relatively consistent since 1969. This will be discussed, together with the other findings and the other attributes, in Chapter 9 (summary discussion and findings).

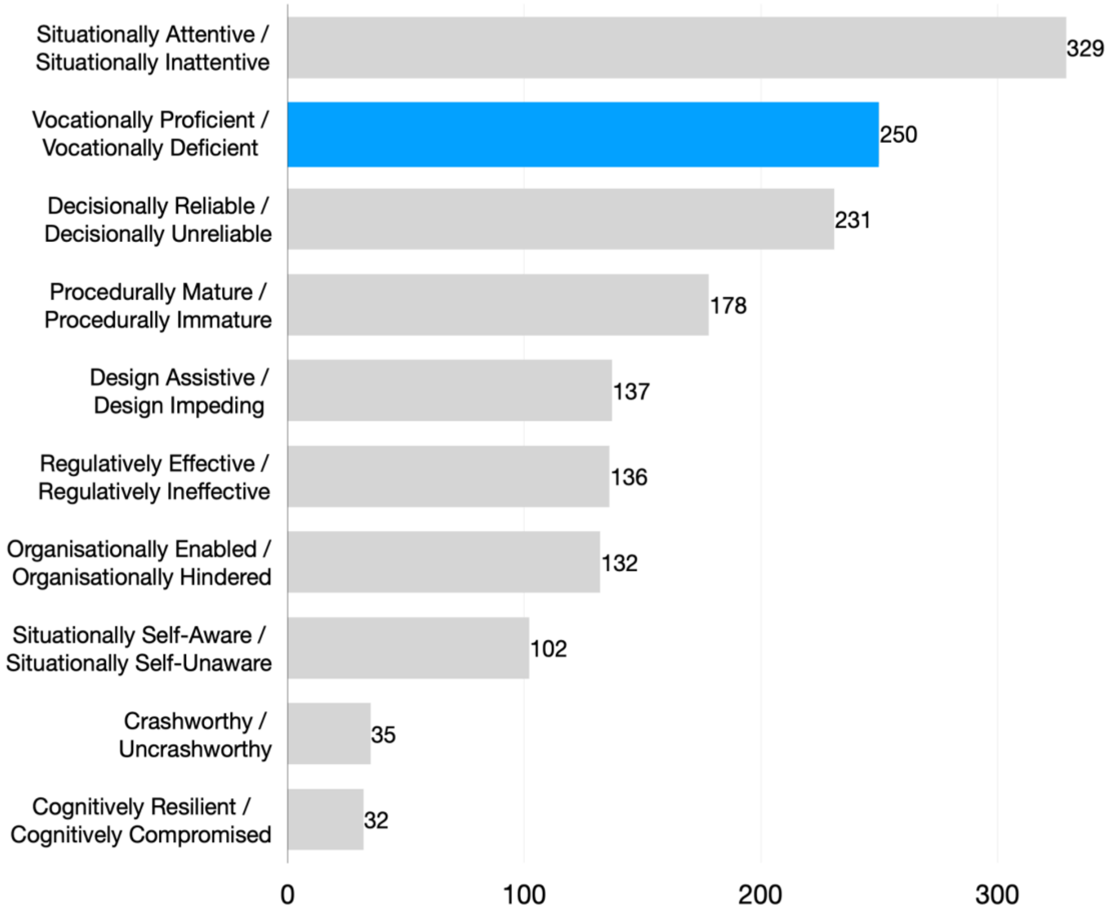
8.4 The "Vocationally-Proficient / Vocationally-Deficient" Meaning-Making attribute

8.4.1 Emergent / General-Usage Descriptors

The second most prevalent attribute is the "vocationally-proficient / vocationally-deficient" attribute. This attribute occurs 250 out of 391 times and appears in 64% of the incident, accident, and safety attributes from the ATSB Airtable (2021). The relative prevalence is shown in Figure 8.4 on the next page in blue:

Figure 8.4

"Vocationally-Proficient / Vocationally-Deficient" Relative Prevalence 1968-2021



Note. From the ATSB Airtable Database (2021).

This attribute focusses on the ways in which vocational proficiency (or lack thereof – a vocational deficiency) appears in various safety recommendations. This includes accounts of deficiencies in training, knowledge, qualifications, and practice. On the flip side, safety inheres training, competency, proficiency, and practice.

In general-usage terms, the "vocational" part of "vocationally-proficient and "vocationally-deficient" relates to "an occupation or employment, particularly the skills and knowledge required". The "proficient" part refers to the idea of being "competent or skilled in doing or using something" and then, borrowing from the nesting concept of "competent", "the necessary ability, knowledge, or skill to do something successfully". The "deficient" part, in the attribute's meaning-making opposite, refers to "not having enough of a specified quality" (Oxford University Press, 2015).

This attribute emerges from, and coheres, statements from the ATSB identifying vocational aspects of proficiency (or lack thereof). It relates to any aspect of the various occupations identified by the ATSB (see the "agency" sections of each attribute) and the occupational abilities, knowledge and/or skills required to successfully fulfil the relevant vocational duties.

In summary, this red rule demands that training, competency, proficiency, and practice be optimised individually and organisationally to be safe. "Deficient" is the descriptor for the antithesis to proficient mainly because the more intuitive "incompetent" has strong connotations of blame. Additionally, the term incompetent can be misleading since, as demonstrated in the ATSB Airtable, most attribute agents are "competent" but, for various other reasons, a lack of organisational support, situational self-awareness etc., are found to be deficient in the specific skills and knowledge required to prevent the accident or incident.

8.4.2 Phrasing Variations

The phrasing variations for this attribute are as follows:

- "Vocationally-Proficient / Vocationally-Deficient" to connote agency and action.
- "Vocational-Proficiency / Vocational-Deficiency" to connote the aspirational or avoidant state.
- "Vocational-Mastery" to connote a more colloquial, and, arguably, more engaging form.

8.4.3 Narrative Markers

Incident-Accident-Attribution Narrative. The everyday task (initial state) is disturbed by a threat or threats (disruptor). A vocationally-deficient agent does not employ the vocational skills and knowledge to prevent the threat, or empowers the threat, and an accident or incident occurs. Vocational-proficiency recommendations (restorers) offer the promise of renewal to the everyday state. The everyday state is renewed (and protected) in a reformed and improved way when the lessons from the findings and recommendations are embodied and applied.

Safety-Attribution Narrative. An everyday task (initial state) is disturbed by a threat or threats (disruptor). A vocationally-proficient agent uses their vocational skills and knowledge to ameliorate the threat or prevent it in the first place (restorer). The everyday state is renewed with the responsible agent, (and those influenced by the agent) protected, reformed and improved.

8.4.4 Indicative Safety Actionables

Indicative examples of the vocationally-proficient attribute from the ATSB Airtable (2021), with comments, are as follows:

- **AO-2020-023: "**Pilots can choose natural features in lieu of human-made markers where markers are absent. Additionally, if a landing cannot be conducted as planned, pilots should reject the landing and re-evaluate their options from a safe position". The choice of natural or human-made alignment markers, a landing, the decision to reject the landing and the evaluation of options all require vocational proficiency to achieve safety. In antithesis, where a pilot is vocationally-deficient, these contribute to the accident.

- **AO-2018-061:** "This accident highlights the inherent risks associated with performing low-level aerobatics in high performance aircraft. Pilots engaged in such flights are encouraged to observe minimum approved operating heights above the ground, commensurate with their ability and qualifications, and to engage in regular flight reviews and/or flight instruction". The "ability and qualifications" as well as the "regular flight reviews and/or flight instruction" all relate to vocational proficiency and again imply an inhering safety when accomplished. There is also, again through the comment "regular flight reviews and/or flight instruction" the idea of legislative nesting; that is, regulations that ensure a level of proficiency (see consilient concepts as well as discussion on regulations and the Airtable in Chapter 9).

- **AO-2007-062:** The report ″identifies safety factors relating to cabin crew knowledge of the passenger oxygen system". This report highlights vocational proficiency as a safety attribute by citing a deficiency in systems knowledge.

- **198802415:** Where "the following factors were considered relevant to the development of the accident: The pilot rotated the aircraft at a speed below the optimum take-off speed. The pilot failed to maintain flying speed. Loss of control with insufficient height available to effect a recovery". The ability to rotate at optimum take-off speed, maintain appropriate flying speed etc. indicates a vocational deficiency at work leading to unsafety of the accident.

- **196902356.** Where the "accident cause was that the pilot did not receive adequate training before he was permitted to fly solo". This attribute from 1969 shows vocational proficiency was as important to safety some 50 years ago as it is today (see also historical prevalence below).

8.4.5 Indicative Nested Concepts

The nested concepts for the "vocationally-proficient / vocationally-deficient" attribute are identified in *italics* with example ATSB investigation numbers that can be cross-referenced to the Airtable:

- **Classroom Training and Simulator Training**: See AO-2019-052 where "Following the occurrence, Airservices Australia implemented the following proactive safety actions: *Classroom briefings and simulator exercises were completed* by all New England controllers…"

- **General Training; Technical Knowledge**. See 196902356 where the "accident cause was that the pilot *did not receive adequate training* before he was permitted to fly solo".

8.4.6 Meaning-Consilient attributes

Consilient attributes are identified below in square brackets with example ATSB investigation numbers that can be cross-referenced to the ATSB Airtable:

- **Organisationally-Enabled, Design-Assistive, Decisionally-Reliable**. See AO-2009-013 where "the PIC attributed his quick response [decisionally-reliable / decisionally-unreliable] to the event as being the result of; (a) the utilisation of the head-up display guidance system fitted to the aircraft [design-assistive / design hindering], (b) the high level of simulator training provided by the operator, which incorporated avionics system failures including dual radio altimeter (RA) failure, and (c) the operator's proactive attitude towards transferring information relevant to flight crews [organisationally-enabled / organisationally-hindered].
- **Decisional Reliability** See AO-2019-052 where "this accident also emphasises the importance of pilot and flight preparation. Ensuring that all required training is completed assists a pilot to both develop and maintain the necessary skills to manage challenges that may be encountered during a flight, such as inclement weather or inadvertent entry into non-visual conditions [decisionally-reliable / decisionally-unreliable].
- **Regulatively-Effective**. See AO-2018-061 where "pilots engaged in such flights are encouraged to observe minimum approved operating heights above the ground, commensurate with their ability and qualifications, and to engage in regular flight reviews and/or flight instruction [regulatively-effective / regulatively-ineffective].
- **Procedurally-Mature**. See AO-2020-019 where "strict adherence to standard operating procedures and increased cross-checking of system inputs and mode-changes [procedurally-mature / procedurally-immature]" supports and enhances proficiency.

- **Situational Self Awareness**. See 198903777 where vocational proficiency is consilient with a naivety towards the effects of being rushed e.g., "the pilot was in a hurry to depart [situationally-self-aware / situationally-self-unaware], and did not climb to a safe height before making a turn downwind in turbulent wind conditions.

8.4.7 Responsible Agents

The responsible agents associated with the attribute "vocationally-proficient / vocationally-deficient" are provided below in the following key examples and the reports they appear in (key parts from each report relating to the attributes are in *italics)*:

- **Pilots**. See AO-2019-033 (and many others) where pilots must understand "the numerous factors to be considered when *managing the initial and subsequent aspects of power loss in a complex aircraft".*

- **Aircraft Engineers**. See AO-2017-059 where "the introduction of revised damage limits and referencing a *newly introduced training video that demonstrated how to conduct a "tap test"* to identify acoustic panel damage, including delamination". And see AO-2019-035 where "the location of the fatigue crack in this accident highlighted *the need to be vigilant when performing inspections* in difficult or hard to reach places. In the case of the tail rotor pedal, *the inspection was made difficult* due to the location, and required a torch and mirror to inspect a matte black surface.

- **Managers and Operators.** See AO-2019-074 where "to minimise risk, maintenance manuals should be closely followed when conducting field repairs, *and operators should consider alternatives such as replacement over repair* whenever practical". By optimising the conditions within which the repairs are done, the vocational proficiency aspects are enhanced.

- **OEMs and Regulators.** (EASA). See AO-2019-005 where "controlling yaw in helicopters with a Fenestron tail rotor, as in this case, is an important consideration. *Airbus Helicopters and the European Union Aviation Safety Agency (EASA) provide specific guidance* relating to this issue to assist pilots".

- **ATC** where "following the occurrence, Airservices Australia implemented the following proactive safety actions: *Classroom briefings and simulator exercises* were completed by all New England controllers…" See AO-2019-052.

- **Support Staff – Flying.** See AO-2017-098 where "*Cabin crew emergency procedures training* that include role-playing of the full range of expected passenger behaviour, including panic and confusion, can better prepare cabin crew when exposed to more complex real-world scenarios".

- **Support Staff - Non Flying**. See 199903768 where "the radio operator was not familiar with aircraft movements and had never been instructed to provide runway-in-use information".

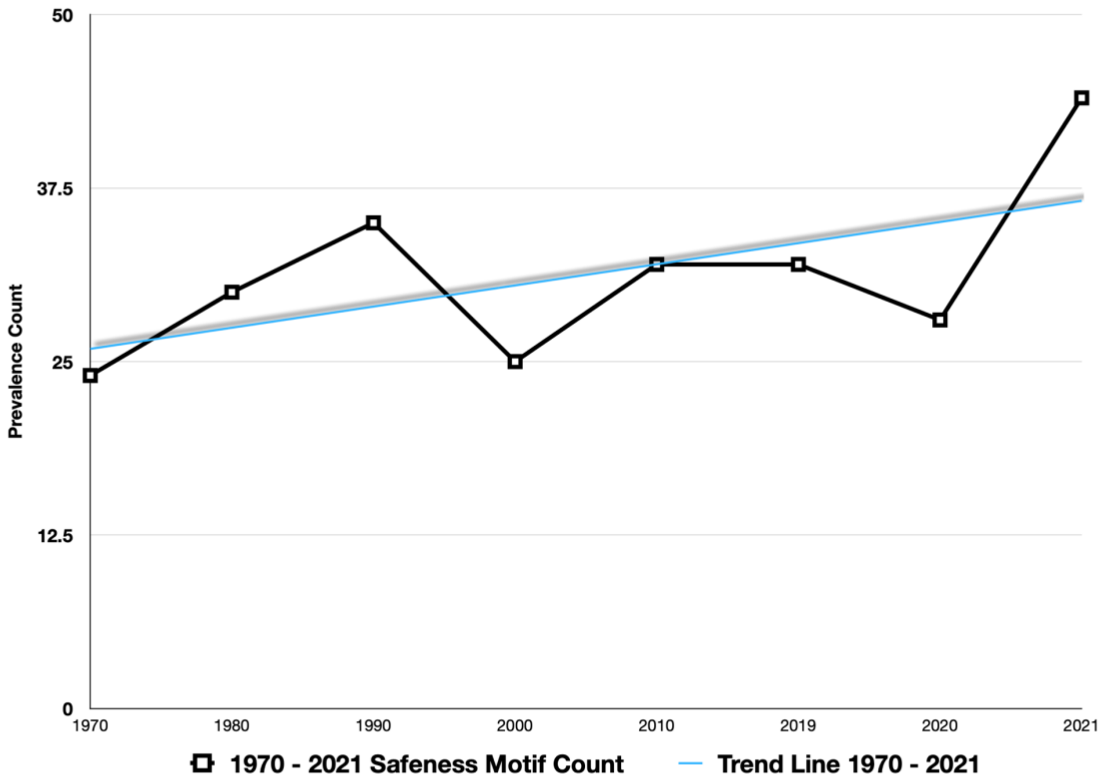
- **Infrastructure Operators.** See 199901012 where "Airservices Australia management has introduced regular in-flight emergency response for tower staff. The first course was completed between 19 - 23 July 1999". Airservices Australia as the infrastructure operator (ATC, tower, aerodrome etc) facilitates the support of vocational proficiency for their ATC staff.

8.4.8 Historical Prevalence

The safety-attribute count for "Vocationally-Proficient / Vocationally deficient" is plotted across the period 1968-2021 in Figure 8.5 below.

Figure 8.5

The "Vocationally-Proficient / Vocationally-Deficient" Attribute 1968-2021



Note. From the ATSB Airtable Database (2021).

What Figure 8.5 above shows is that this safety attribute has remained historically prevalent and relatively consistent since 1969. This will be discussed, together with the other findings and the other attributes, in Chapter 10.

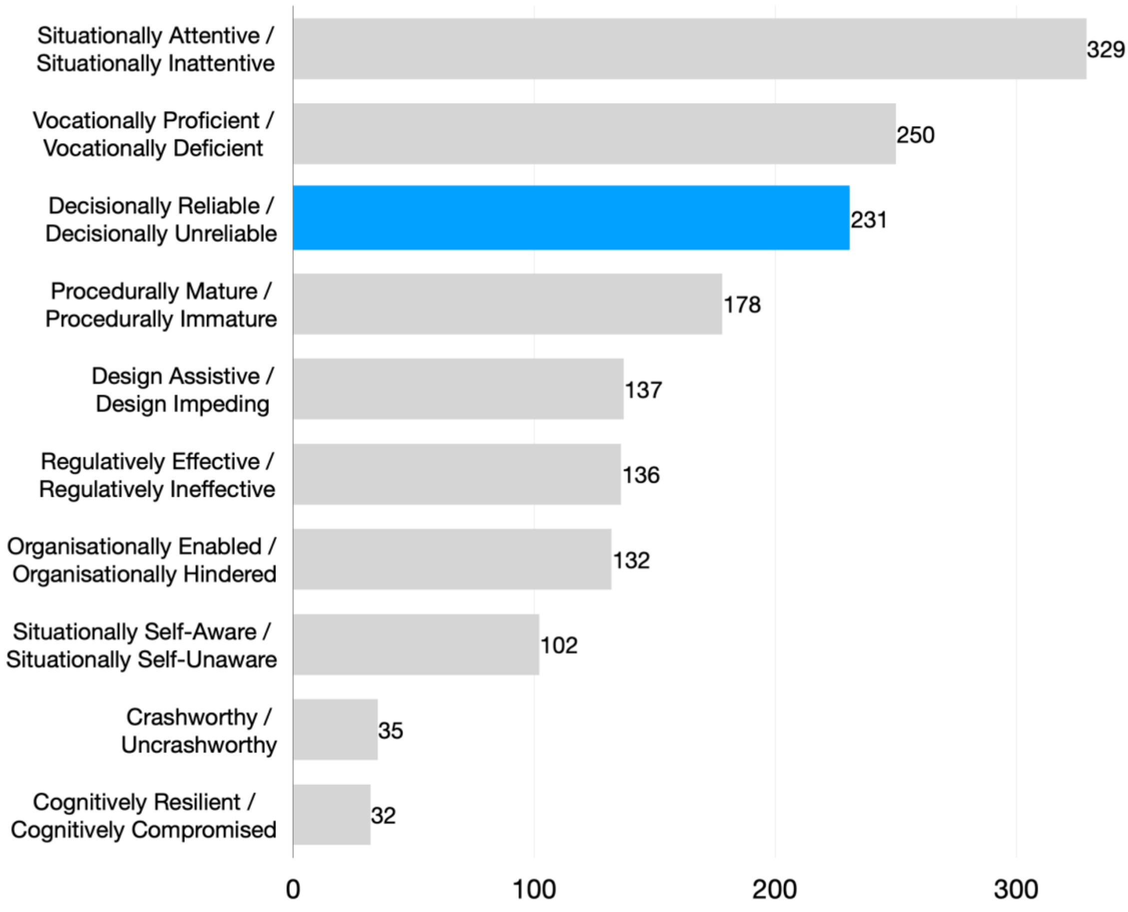
8.5 The "Decisionally-Reliable / Decisionally-Unreliable" Meaning-Making attribute

8.5.1 Emergent / General-Usage Descriptors

The third most prevalent meaning-making attribute at a count of 231 is the "decisionally-reliable / decisionally-unreliable" attribute. This attribute appeared in 59% of the incident, accident, safety attributes from the ATSB Airtable (2021). The relative prevalence is shown in Figure 8.6 below in blue:

Figure 8.6

"Decisionally-Reliable / Decisionally-Unreliable" Relative Prevalence 1968-2021



Note. From the ATSB Airtable Database (2021).

This meaning-making attribute emerges from, and coheres, statements from the ATSB identifying a lack of reasonably-expected responsiveness in worsening conditions. This includes such accounts as aircraft continuing un-stabilised approaches, continuing into valleys with ever-deteriorating weather and/or delayed or prolonged response to malfunctions. This "decisional inertia" sees a bad or worsening course of action pursued despite significant evidence contrary actions are required. As well as individual responsiveness, it also relates to organisational responsiveness and unresponsiveness.

On the positive side, this attribute identifies any safety attributes that include actions to improve responsiveness. The ATSB put it this way in AO-2018-80: "You cannot improvise a good decision, you must prepare for it. You will make a better and timelier final decision if you have considered all options in advance…(ATSB Airtable Database, 2021).

This attribute anchors itself to the "decision" part of "decisionally-reliable" and "decisionally-unreliable" by appropriating the generally accepted usage of "decision" as "a conclusion or resolution reached after consideration". The "reliable" part refers to the ability to respond with "consistently good performance" while the "unreliable" component refers to an inability to "consistently perform" or to be appropriately responsive (Oxford University Press, 2015). Thus, the decisional reliability red rule demands that one responds quickly in a considered and reliable way to changing circumstances and when they do so they can be considered safe.

8.5.2 Phrasing Variations

The phrasing variations for this attribute are as follows:

- "Decisionally-Reliable / Decisionally-Unreliable" to connote agency and action.

- "Decisional Agility / Decisional Inertia" to connote the aspirational or avoidant state.
- "Decisionally Agile / Decisionally Inflexible" to connote a more engaging meaning.
- "Professional Judgement", "Good Judgement", "Level Headed" and "Quick Thinking" to connote colloquial forms.

8.5.3 Narrative Markers

Incident-Accident-Attribution Narrative. The everyday task (initial state) is disturbed by a threat or threats (disruptor). A decisionally-unreliable agent does not respond swiftly or reliably to prevent the threat, or empowers the threat, and an accident or incident occurs. ATSB recommendations (restorers) offer the promise of renewal to the everyday state. The everyday state is renewed (and protected) in a reformed and improved way when the lessons from the findings and recommendations are embodied and applied.

Safety-Attribution Narrative. An everyday task (initial state) is disturbed by a threat or threats (disruptor). A decisionally-reliable agent responds swiftly and reliably to the threat or prevents it in the first place (restorer). The everyday state is renewed with the responsible agent, (and those influenced by the agent) reformed and improved.

8.5.4 Indicative Safety Actionables with Safety/Unsafety Comments

Indicative examples of the "decisionally-reliable / decisionally-unreliable" attribute from the ATSB Airtable (2021), with comments, are as follows:

- **197901391:** "The probable cause of the accident was that the pilot persisted with an unsafe landing approach procedure in adverse weather conditions". To put it in "decisionally-unreliable" terms, the aircraft was unsafe in this moment because the pilot persisted with a landing technique that was clearly not working in the worsening weather conditions.

- **AO-2019-060:** "Pratt & Whitney Canada did not provide a timeline for the review and implementation of any related safety action". There is a degree of unsafety implied here because a systemic problem with an engine, requiring OEM intervention, has no timely resolution.

- **AO-2019-035:** "Additionally, the quick-thinking actions of the pilot following the failure resulted in a good outcome, with no injuries reported…" "Quick thinking actions" indicates a decisional agility that makes this a safe action.

- **AO-2009-078:** "As a precaution, the number-1 generator control unit, number-1 DC generator and left bus tie relay were replaced". This decision meant greater options for future crews in-flight since the likelihood of a subsequent failure was greatly lessened.

- **AO-2019-074:** "This occurrence also illustrates that in-flight damage may not always be apparent to flight crew and the risks posed by incorrect attribution. Serious consideration should be given to terminating the flight following any unexplained abnormal indication". A decision to terminate the flight is decisionally-reliable and safe because it prevents ongoing deterioration of aircraft health where this deterioration could reduce future decision-making options.

8.5.5 Indicative Nested Concepts

Indicative nested concepts for the "decisionally-reliable / decisionally-unreliable" attribute are identified below in *italics* with ATSB report numbers that can be cross-referenced to the ATSB Airtable:

- **Briefing and Planning.** See AO-2018-080 where "you will make a better and timelier final decision if you have considered all options in advance. This is *why good briefings are important*".

- **Checklists.** See AO-2018-080 where one should use *"decision-making aids–operational checklists*–to ensure you have not forgotten anything important".

- **Workload Management.** See AO-2018-080 where one should "always have *reserve capacity* for reacting to unexpected events". And AO-2008-004 "The pilot in command was unable to comply with company incapacitation procedures *due to workload*". It also involves, from AO-2018-080, maintaining "a reserve capacity for reacting to unexpected events and *delegating workload* "to other team members".

- **Delegation.** See AO-2018-080 where one should "*delegate* your load to other team members (if multi-crew) when time is critical".

- **Flight Training.** See AO-2017-059 where "this event demonstrated the effectiveness of the certification design requirements and *flight crew training* to ensure continued flight despite effectively losing the power of one of two engines during a critical phase of flight".

- **Timely Go Arounds.** 196902342 where "the cause of the accident was that the pilot *did not take timely action* to initiate a go-around following a misjudged approach".

8.5.6 Meaning-Consilient attributes

The consilience identified for the "Decisionally-Reliable / Decisionally-Unreliable" meaning-attribute, indicated by square brackets, is as follows:

- **Situationally-Attentive.** See AO-2018-080 where one should "keep the big picture in mind [situationally-attentive / situationally-inattentive] rather than focusing on one aspect of a problem".

- **Design-Assistive, Vocationally-Proficient and Regulatively-Effective.** See AO-2017-059 where "this event demonstrated the effectiveness of the certification design requirements [design-assistive / design hindering] and flight crew training [vocationally-proficient / vocationally-deficient] to ensure continued flight despite effectively losing the power of one of two engines during a critical phase of flight". The design requirements that provide redundancy are also consilient with "regulatively-effective" because it is the regulator that generally enforces design features as well as training.

- **Situationally-Self-Unaware.** See AO-2008-024 where "the co-pilot did not seek or receive adequate information in relation to his condition [situationally-self-aware / situationally-self-unaware] before returning to flying duties".

- **Cognitively-Compromised.** See AO-2008-004 where the co-pilot became incapacitated due to diverticulitis shortly before the aircraft turned onto final. The illness onset was rapid with little warning [cognitively-resilient / cognitively-compromised]". This meant decision-making was impaired by cognitive compromise. Also, AO-2007-046 where "The recent use of cannabis by the pilot increased the risk of impaired motor skills and reduced cognitive capacity [cognitively-resilient / cognitively-compromised]; in particular, in response to in-flight problems, such as an engine or rotor system drive failure".

- **Procedurally-Mature.** AO-2018-080 where one should use "decision-making aids–operational checklists etc [procedurally-mature / procedurally-immature] –to ensure" one does not miss anything.

8.5.7 Responsible Agents

Indicative responsible agents associated with this safety attribute are provided below (with key parts in *italics*):

- **Pilots**. See AO-2019-015 (and many others) where "*sound decision-making* and experience do not necessarily go together. Using pilot experience as mitigation for potential operational risks is inadvisable".

- **Aircraft Engineers.** See AO-2018-020 where "Continuing airworthiness also relies on inspections that allow the identification of damage, *so that parts can be repaired or replaced prior to failure*. In addition, where a structure may have experienced excessive loads (for example, hard landings) additional inspections may be required".

- **Operator/Managers**. See AO-2017-092 where "Virgin Australia *have updated the training and information* provided to pilots about overspeed and overspeed recovery".

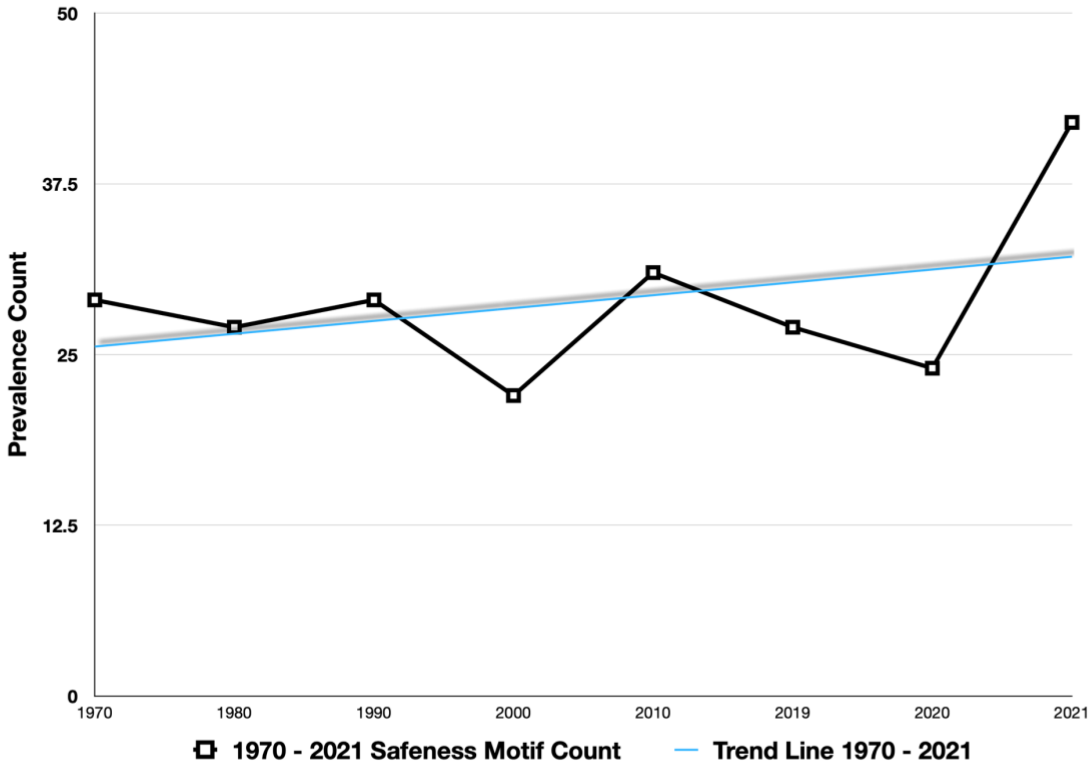
- **OEM.** See AO-2016-007 where "Wipaire Inc. *published an amendment* to the pilot operating handbook supplement for the Cessna 208 amphibian on 22 December 2016. The engine operating limits now identify that a transient torque of 2,400 ft-lb is available for 20 seconds…"
- **ATC** where "controllers are reminded that they play an important role in remaining vigilant to the content of displayed data, *and updating the system* when deviations do occur". See AO-2018-038.
- **Regulator.** See AO-2017-105 where "Civil Aviation Advisory Publication 234-1(2) provides guidance on the current fuel requirements *and good fuel-management practices…*"
- **Support Staff - Flying** See AO-2007-064 where "the communication between the flight crew was adversely affected *by a steep trans-cockpit authority gradient…*"
- **Support Staff - Non Flying** See AO-2018-003 where "Planning and loading of freight within this sector is often conducted *in a time-pressured environment* where delays can lead to scheduling issues".
- **Infrastructure Operators.** See AO-2007-06 where "The airport safety officer saw the aircraft accelerating on taxiway Alpha *and alerted the aerodrome controller*".

8.5.8 Historical Prevalence

A safety attribute count for "Decisionally-Reliable / Decisionally-Unreliable" is plotted across 1968-2021 in Figure 8.7 below.

Figure 8.7

The "Decisionally-Reliable / Decisionally-Unreliable" Attribute 1968-2021



Note. From the ATSB Airtable Database (2021).

What Figure 8.7 above shows is that the trendline for this safety attribute, notwithstanding a slight rise in 2000, remained historically prevalent and consistent. This will be discussed, together with the other findings and the other attributes, in Chapter 10. This attribute, along with vocational mastery and situational attentiveness, falls under the title of the "royal three". This is because of their consistently high prevalence and the fact that at least one of these three appear in every incident and accident (see more in Section 9.6).

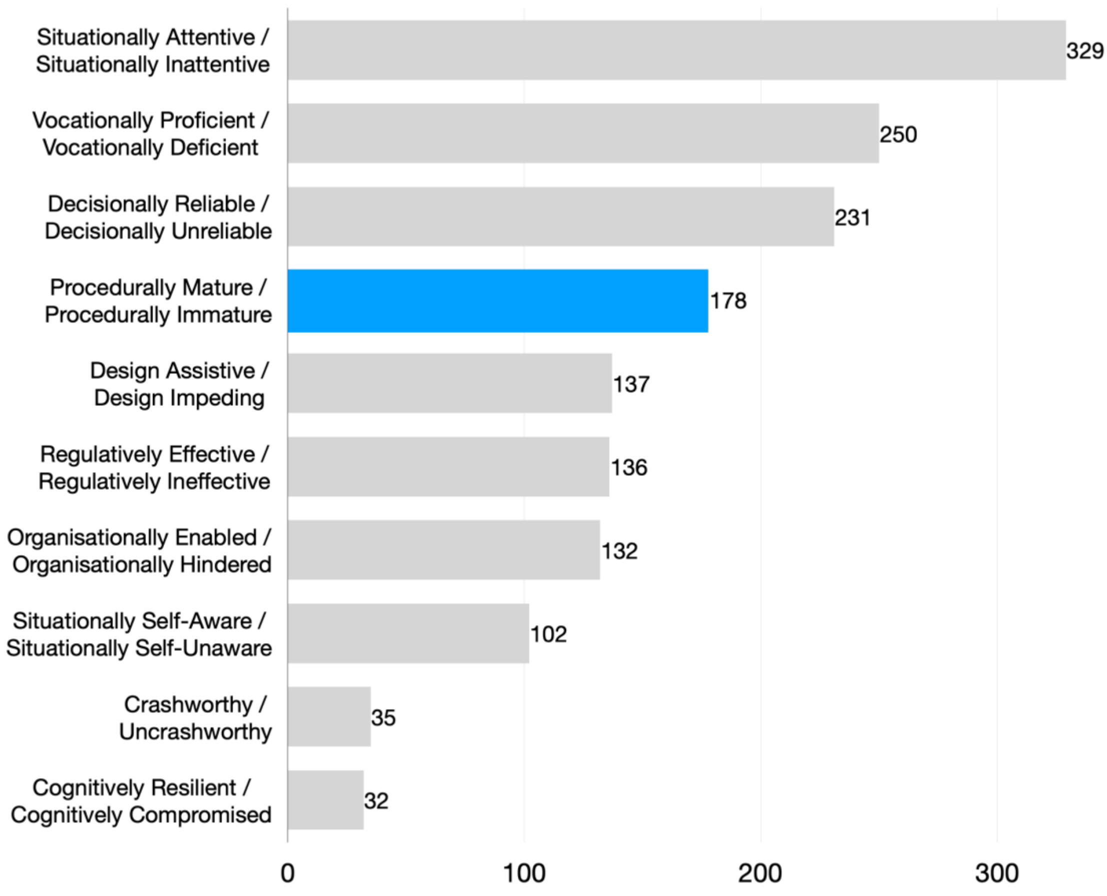
8.6 The "Procedurally-Mature / Procedurally-Immature" Meaning-Making attribute

8.6.1 Emergent / General-Usage Descriptors

The fourth most prevalent meaning-making attribute at a count of 178 is the "procedurally-mature / procedurally-immature" attribute. This attribute appeared in 46% of safety-related attributes in the ATSB Airtable (2021). The relative prevalence is shown in Figure 8.8 below:

Figure 8.8

"Procedurally-Mature / Procedurally-Immature" Relative Prevalence 1968-2021



Note. From the ATSB Airtable Database (2021).

This meaning-making attribute emerges from, and coheres, statements from the ATSB identifying the appropriate application of flight manual information, checks, SOPs, guides, and other procedural documents. It also refers to the ways in which procedures are understood and applied. This includes, amongst others, unsafe accounts of pilots who deviate from procedures; operators that need to revise or update procedures after an incident; and OEM procedures that are ambiguous or hard to understand. On the positive side, procedural maturity indicates the ways in which written publications exist in appropriate, clear, and easily accessible forms and can be generally understood and applied.

This attribute articulates the "procedure" part of "procedurally-mature" by appropriating the generally accepted usage of "procedure" which is "an established or official way of doing something"; that is, "a series of actions conducted in a certain order or manner". The "mature" part refers to "having reached the most advanced" or most developed stage while the "immature" component refers simply to "not fully developed" (Oxford University Press, 2015).

Thus, this attribute sees agents with procedures that are not fully developed, in the sense of not existing at all, or existing in confusing, ambiguous, and disproportionate forms, as exhibiting, in their "procedural immaturity", a degree of unsafety. It also sees, for example, a pilot or crew person who deviates or misapplies a procedure as exhibiting, in their procedural immaturity, an additional degree of "unsafety". On the other hand, organisations that have clear and concise procedures that are understood and applied by crews, enhance their organisational safety by exhibiting "procedural maturity".

8.6.2 Phrasing Variations

The phrasing variations for this attribute are as follows:

- "Procedurally-Mature / Procedurally-Immature" to connote agency and action.
- "Procedural-Maturity / Procedural-Immaturity" to connote the aspirational or avoidant state.

8.6.3 Narrative Markers

Incident-Accident-Attribution Narrative. The everyday task (initial state) is disturbed by a threat or threats (disruptor). A procedurally-immature agent does not apply, or fails to apply, a response using approved/ordered actions and an accident or incident occurs. Procedurally-Mature recommendations (restorers) offer the promise of renewal to the everyday state (and the protection of the everyday state for those with similar everyday activities not involved in the accident or incident). The everyday state is renewed (and protected) in a reformed and improved way when the lessons from the findings and recommendations are embodied and applied.

Safety-Attribution Narrative. An everyday task (initial state) is disturbed by a threat or threats (disruptor). A procedurally-mature agent notices the threat and addresses it using ordered actions (restorers). The everyday state is renewed with the responsible agent, (and those influenced by the agent) reformed and improved.

8.6.4 Indicative Safety Actionables

Indicative examples of the "procedurally-mature / procedurally-immature" attribute from the ATSB Airtable (2021), with comments, are as follows:

- **AO-2019-053:** "This occurrence highlights the value of flight crews being fully conversant with operating procedures, particularly those related to aircraft unserviceability. Those procedures are critical to the safety of flight operations". In "procedurally-mature" terms, safety inheres flight crews when they are "fully conversant with operating procedures".
- **AO-2015-084: "**Airservices Australia has also instigated a stagger procedure for land and hold short arrival pairs such that aircraft will not come into unsafe proximity in the event of a missed approach". In this instance the lack of a "stagger procedure" indicates procedures are not yet at their most advanced (most mature) stage and so safety is enhanced by including the stagger procedure in the land and hold short arrivals.
- **AO-2019-072:** "If an aircraft is not flown regularly, the airframe and engine/s should be preserved in accordance with the manufacturer's procedures". In this case the call to safety is a call to adherence– to "procedural maturity" – with the OEM requirements relating to airframe and engine preservation.
- **AO-2019-066: "**Following this occurrence AAPA implemented additional controls for students operating to Albury Airport". As a part of a separation breakdown the local flight training academy applies extra separation-control procedures, thus maturing these procedures and, presumably, enhancing safety margins.

8.6.5 Indicative Nested Concepts

Indicative nested concepts for the "procedurally-mature / procedurally-immature" attribute are identified below (in *italics)* with example ATSB investigation numbers that can be cross-referenced to the Airtable:

- **Written Communication.** See AO-2019-028 where "the operator has revised its training procedures for use of trim" which *assumes the written procedures* are written in a way that can be understood and assimilated. In fact, this assumption inheres all procedural recommendations.

- **Underpinning Knowledge.** See AO-2018-006 where "the intent behind checklist actions is not always apparent when learning procedures. "Pilots should ensure *they understand the purpose behind* all checklist items", and if any doubt exists, seek clarification to reduce the likelihood of misunderstanding the requirements.

- **Consultation with the Author or SME.** See AO-2018-006 where "if any doubt exists, *seek clarification* to reduce the likelihood of misunderstanding the [procedural] requirements".

- **Distraction Management.** See 199001967 where "on the downwind leg the instructor pilot called out the pre-landing checklist, which was apparently complied with by the pilot-under-training. At about this time the *pilot-under-training was also involved with obtaining an onwards airways clearance* through Flight Service". See also the consilient concept of "decisional agility" below.

- **Promulgation and Distribution.** See 199906038 where

"The Australian Transport Safety Bureau (formerly the Bureau of Air Safety Investigation) recommends that Rolls Royce Commercial Aero Engine Limited *notify all operators* using Rolls Royce RB211-524D4 or similar engines of the possibility of failure of the cold stream nozzle during operation".

8.6.6 Meaning-Consilient attributes

The consilience identified for the "procedurally-mature / procedurally-immature" attribute is comprehensive because the nature of procedures are such they can empower, or be empowered by the other nine safety attributes. This is explained with the following examples (see square brackets for consiliently relevant part of attribute):

- **Situationally-Attentive / Situationally-Inattentive**. See all safety attributes pertaining to such things as checklists and other methodicalness measures. For example, see AO-2020-019 where "these actions include strict adherence to standard operating procedures [to preserve situational attentiveness] and increased cross-checking of system inputs and mode changes.

- **Vocationally-Proficient / Vocationally-Deficient.** See all safety attributes relating to procedural maturity that empower skills, knowledge and ability including such things as training, education, and information sharing. For example, see AO-2017-011 where "the operator strengthened its guidance on the effects of sustained low power settings during approach and landing and the importance of avoiding that situation. These aspects are also being reinforced in training" [thus strengthening vocational proficiency].

- **Decisionally-Reliable / Decisionally-Unreliable.** See all safety attributes pertaining to such things as checklists and other methodicalness measures that enable prioritisation and ordered thinking. For example, see AO-2018-037 where "deviations from flight details, as presented in the air traffic system, affect the ability of controllers and flight crews to understand and predict the behaviour of aircraft. Furthermore, limited defences exist to identify when instructions have deviated from the information recorded in the system". [These defences were then improved via procedural improvements thus enhancing decisional agility by better handling these deviations.]

- **Design-Assistive / Design-Hindering.** See attributes that apply procedures to design features such as those found in the cockpit, cabin, aircraft maintenance, ATC towers, control rooms etc. For example, 198900256 where "The aircraft flight manual indicates that flight with the canopy partly open, but not fully open, is permissible… the effect of a fully opened canopy [where the design feature of the canopy requires a procedure to ensure it is used as per OEM instructions] on the aerodynamics of the aircraft was not determined".

- **Regulatively-Effective / Regulatively-Ineffective.** See attributes that are procedural but are enforced by the regulator. For example, AO-2016-044 "The following publications provide useful information to pilots, operators, and refuellers regarding the use of drum stock: CAO 20.9 titled Air service operations – precautions in refuelling, engine and ground radar operations; available from the Federal Register of Legislation" [this regulation, amongst others enforces a refuelling procedure].

- **Organisationally-Enabled / Organisationally-Hindered.** Organisational empowerment is found in the "procedural maturity" attribute when the operator (the organisation) produces new procedures in response to, or anticipation of, a threat or hazard. For example, AO-2019-006 where "Cobham also emailed all company pilots, further highlighting the despatch procedure" [thus organisationally supporting procedural maturity].

- **Situationally-Self-Aware / Situationally-Self-Unaware.** Procedures that impose physiological or psychological limit-enabling restrictions, or bring greater awareness of such limits, can be considered as consilient with situational self-awareness. For example, "pressing on into IMC conditions without a current instrument rating [a rating which would have taught procedures and skills to deal with IMC as well as the awareness of susceptibility to disorientation] carries a significant risk of encountering reduced visual cues leading to disorientation".

- **Cognitively-Resilient / Cognitively-Compromised.** This attribute relates to anything that can compromise cognitive capacity such as drugs, alcohol, fatigue etc. It can be protected by a procedure. For example, AO-2017-103 where "the ATSB considered that there were opportunities for aviation organisations to collect more data and to enhance the extant risk controls [that is enhance limiting procedures…] for problematic drug and alcohol use". Another example is a Fatigue Risk Management System or other procedures that optimise alertness and minimise undue fatigue.

- **Crashworthy / Uncrashworthy.** See attributes relating to procedural maturity around use of accident attenuating and post-accident devices such as EPIRBs. For example, AO-2018-039 where "people have a responsibility to aid their own rescue. Up-to-date registration of an EPRIB [where registration is a procedure], and correct use of an EBIRB and other signalling equipment, simplifies a rescue of people in need. Australian Maritime Safety Authority guidelines exist to help people prepare for onshore and offshore remote area travel".

8.6.7 Responsible Agents

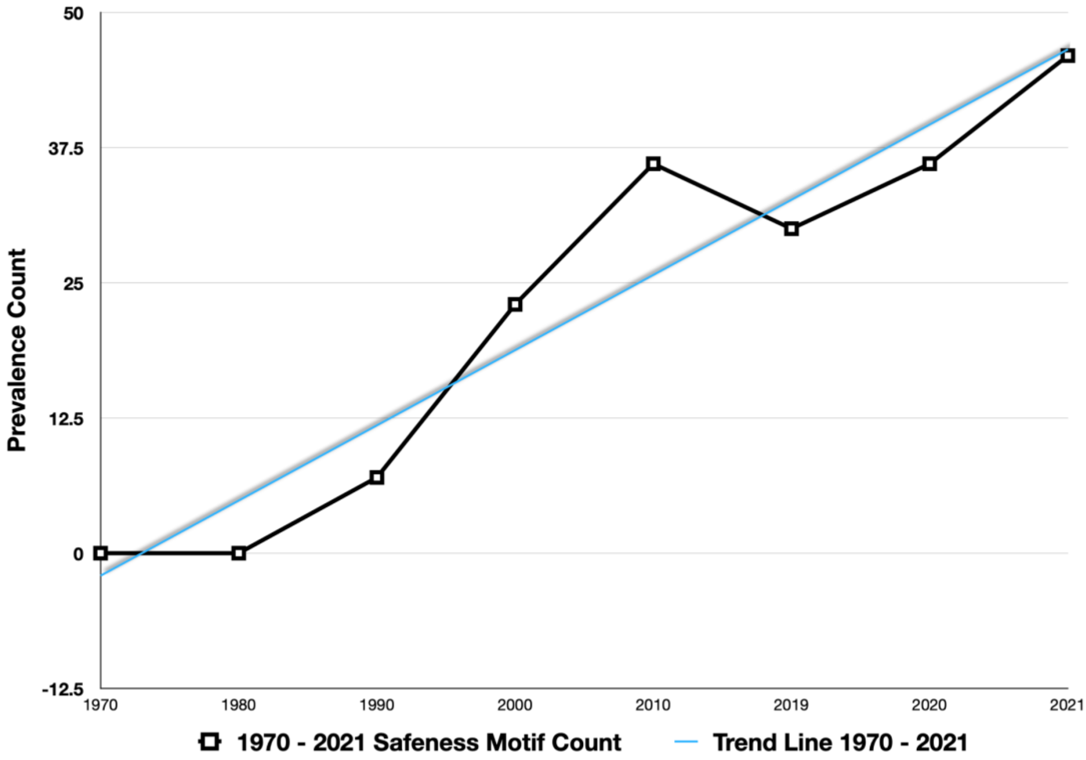
The responsible agents associated with the safety attribute of procedurally-mature / procedurally-immature in the ATSB Airtable are not provided below since procedural use pervades all areas of aviation. All agents in the Airtable, in some way or another, whether issuing or following procedures, participate in this attribute.

8.6.8 Historical Prevalence

A safety attribute count for procedurally-mature / procedurally-immature is plotted across the period 1968-2021 in Figure 8.9 below.

Figure 8.9

The "Procedurally-Mature / Procedurally-Immature" Attribute 1968-2021



Note. From the ATSB Airtable Database (2021).

What figure 8.9 above shows is that this attribute has significantly increased within the timeframes of ATSB Airtable (1968-2021). This will be discussed, together with the other findings and the other attributes, in Chapter 10.

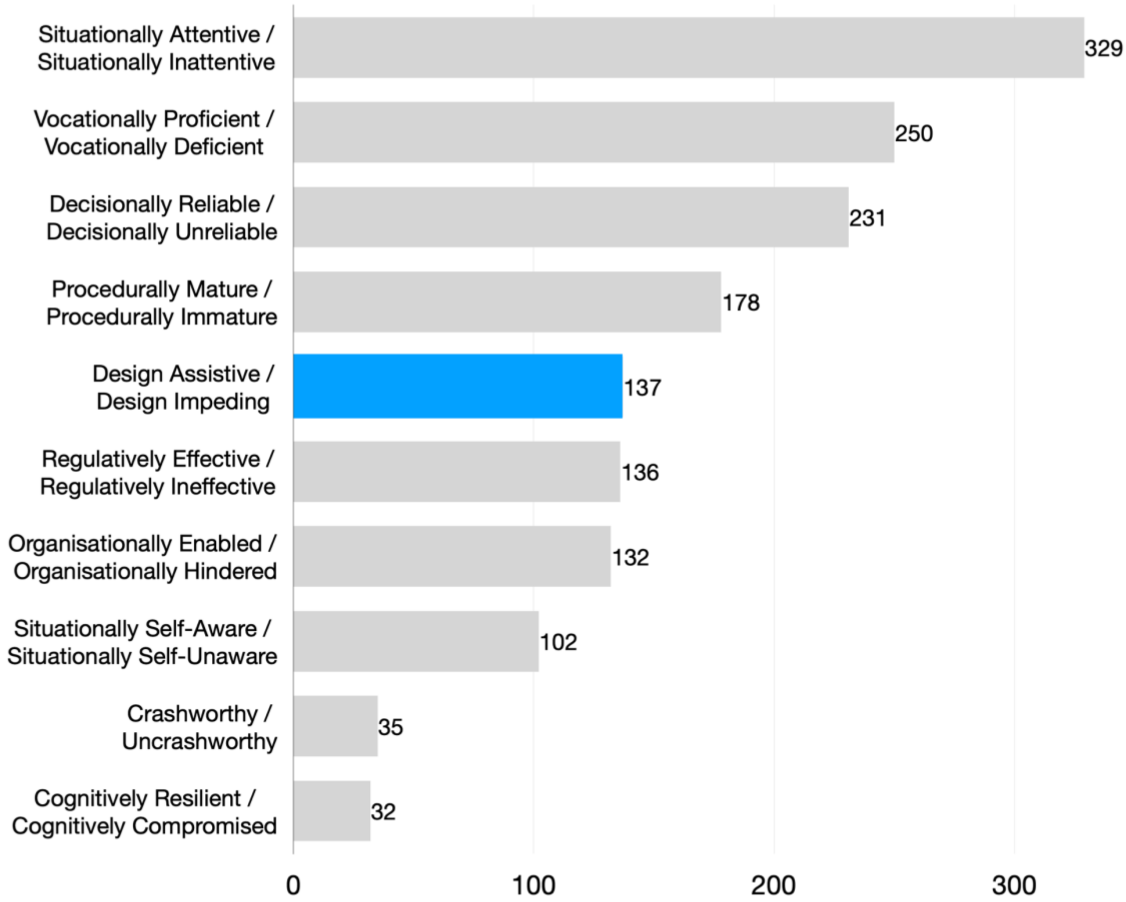
8.7 The "Design-Assistive / Design-Hindering" Meaning-Making attribute

8.7.1 Emergent / General-Usage Descriptors

The fifth most prevalent meaning-making attribute at a count of 137 is the "design-assistive / design-hindering" attribute. This attribute appeared in 35% of the incident, accident, safety attributes in the ATSB Airtable (2021). The relative prevalence is shown in Figure 8.10 below in blue:

Figure 8.10

"Design-Assistive / Design-Hindering" Relative Prevalence 1968-2021



Note. From the ATSB Airtable Database (2021).

This meaning-making attribute emerges from, and coheres, statements from the ATSB identifying the ways in which design-features assist and/or impede responsible agents by either decreasing or unduly increasing workload. It often refers to design features of an aircraft but also to the design of supporting systems such as those found in engineering, air-traffic control, logistics and ground support.

This attribute includes, amongst others, OEM design features that put similar but functionally different switches together, cluttering of CAS messages, warning-less component failures etc. On the positive side, design-assistive features consider human characteristics regarding ergonomics, monitoring, communications and do not require work-arounds, extra attentiveness and/or add-on procedures.

The "design" part of the design-assistive attribute is "the arrangement of features" (Oxford University Press, 2015). In this case the "arrangement of features" are those features forming the system-interfaces of aircraft, maintenance, air traffic control, infrastructure etc… The "assistive" part refers to "the action of helping someone by sharing work". Thus, an assistive-design feature reduces the workload of the agent while the opposite "impedes" ("makes difficult") a key task or function and thus increases workload.

Any design arrangement that intensifies workload by hindering ease-of-function exhibits a degree of unsafeness. On the other hand, any design feature that offloads workload, minimises distractions, appropriately directs attention and thus enhances situational awareness and/or decisional agility enhances safety.

8.7.2 Phrasing Variations

The phrasing variations for this attribute are as follows:

- "Design-Impeding" as an alternate rendering to "Design-Hindering".
- "Ergonomically-Assistive / Ergonomically-Hindering" to provide a more technically familiar phraseology.

8.7.3 Narrative Markers

Incident-Accident-Attribution Narrative. The everyday task (initial state) is disturbed by a threat or threats (disruptor). An agent utilising a design-hindering system is unprotected from the threat and/or remains unalerted and/or is hindered in resolving the threat in a timely way and an accident or incident occurs. ATSB recommendations (restorers) offer the promise of renewal to the everyday state (or the protection of the everyday state for those with similar everyday activities not involved in the accident or incident). The everyday state is renewed (or protected) in a reformed and improved way when the lessons from the findings and recommendations are embodied and applied.

Safety-Attribution Narrative. An everyday task (initial state) is disturbed by a threat or threats (disruptor). An agent with a design-assistive system is protected from the threat and/or alerted to the threat and/or assisted in resolving the threat in a timely way (restorer). The everyday state is renewed.

8.7.4 Indicative Safety Actionables

Indicative examples of the design-assisting / design-hindering attribute from the ATSB Airtable (2021), with comments, are as follows:

- **AO-2020-005:** "Any amendment to the flight management computer (FMC), particularly those applicable to the more critical phases of flight (departure and arrival procedures) should always be announced, and then carefully and independently verified by at least one other crew member". The verification procedure here is required because the FMC design is such it facilitates "finger trouble" where "typos" and other error-producing actions can occur. New technologies including alternative input methods as well as Artificial Intelligence guided corrections or alerts may well be more "design-assistive" in the future thus enhancing safety.

- **AO-2018-069:** "This occurrence also shows that positively identifying the factors contributing to technical failures can be difficult and time consuming. However, manufacturers and operators can implement interim risk mitigation measures". The difficulty in the positive identification of "the factors contributing to technical failures" requires extra work and diligence, sometimes to a point beyond human capacity, and is thus "design-hindering" and, in turn, an unsafe factor.

- **AO-2020-034:** "Aerodrome works on markings and lighting must be unambiguous and laid out in accordance with relevant standards, to minimise the likelihood of confusion for flight crew and the potential for a runway undershoot or excursion". In this instance the design of aerodrome markings and lighting meant more work for pilots interpreting and understanding, with clarity, their meaning and thus an increase to some degree in the unsafety of the moment.

- **AO-2019-074:** "As a result of this occurrence, Cobham released an engineering notice in March 2020 requiring the entire blade assembly to be replaced in the event of a loose or cracked blade collar". In this accident the design of the blade collar made the severity of looseness and cracking hard to determine.

8.7.5 Indicative Nested Concepts

Indicative nested concepts for the design-assistive / design-hindering attribute (indicated by *italics)* are identified below with example ATSB investigation numbers that can be cross-referenced to the ATSB Airtable:

- **Standardisation of Design**. See AO-2007-036 where "the previous two sectors were on the 737-800 series aircraft. The incident occurred on the fourth sector while flying the 737-400 series aircraft, which *had a different fuel system and displays*". In this case the design differences for the same functionality require extra workload and are therefore design-hindering.
- **OEM Recognition and Response.** See AO-2008-068 where "*Eurocopter* has also considered the probability that the bearing was worn in excess of maintenance manual limits *but was not detected* at the last inspection and has been working with the European Aviation Safety Agency (EASA) *on complementing and adding some precision to the present wording and figure related to the pitch link inspection*". The aircraft manufacturer then released Safety Information Notice 2000-S-65 to alert customers to this design hinderance.
- **Classroom Training and Simulator Training.** See AO-2019-052 where "Following the occurrence, Airservices Australia implemented the following proactive safety actions: *Classroom briefings and simulator exercises* were completed by all New England controllers…" This training empowers operator ability in dealing with the design-assistive and design-hindering features of ATC systems.
- **Aircraft Emergency Technical Training.** See AO-2009-013 where "the PIC of VH-VYL attributed his quick response to the event as being the result of…. the high level of *simulator training* provided by the operator, which incorporated

avionics system failures including dual radio altimeter (RA) failure…" Thus, the training enables a quick recognition of the design-hindering and assisting symptoms of the dual radio altimeter system.

- **Briefing and Planning.** See AO-2018-080 where "you will make a better and timelier final decision if you have considered all options in advance. *This is why good briefings* are important". Briefing and planning are often to overcome design hinderances.

- **Checklists.** See AO-2018-080 and many others where operational checklists ensures one has "not forgotten anything important" required by the design.

8.7.6 Meaning-Consilient attributes

Consilient attributes are identified below (in square brackets) with example ATSB investigation numbers that can be cross-referenced to the ATSB Airtable:

- **Situationally-Attentive, Organisationally-Enabled, Decisionally-Reliable, Vocationally-Proficient.** As for consilience above, see AO-2009-013 where "the PIC of VH-VYL attributed his quick response [decisionally-reliable / decisionally-unreliable] to the event as being the result of; (a) the utilisation of the head-up display guidance system fitted to the aircraft [design-assistive / design hindering], (b) the high level of simulator training provided [vocationally-proficient / vocationally-deficient] by the operator, which incorporated avionics system failures including dual radio altimeter (RA) failure, and (c) the operator's proactive attitude towards transferring information relevant to flight crews [organisationally-enabled / organisationally-hindered].

- **Procedurally-Mature, Regulatively-Effective.** See AO-2017-109 where a hydraulics design issue causes a number of accidents during emergency training and "compliance with the AS350 flight manual [procedurally-mature / procedurally-immature] requirements following a real or simulated hydraulic failure ensures that the helicopter remains controllable during all phases of flight…Following this accident, the operator: employed a trained and regulator-approved safety manager [regulatively-effective / regulatively-ineffective] who updated the training school operations manual with stricter controls on performing AS350 sequences".

- **Crashworthy**. See AO-2008-013 where "the pilot in command's intercommunication system (ICS) lead was inadvertently disconnected when the flight crew donned their emergency oxygen equipment" [Crashworthy / Uncrashworthy].

8.7.7 Responsible Agents

The responsible agents associated with this safety attribute are provided below (with *italics* emphasising key parts):

- **OEM, OEM support and Regulators in general.** See AO-2017-066 for example where the "investigation demonstrates the importance *for manufacturers of critical components, and regulators monitoring the manufacturers*, to have systems in place to quickly identify core issues and put in place measures to mitigate risk".

- **Operators / Managers.** See AO-2018-003 where, for example, "*Qantas advised that an internal project to address freight discrepancies and loading errors was commenced* in

June 2018 and was completed in June 2019. The project involved the replacement of the loading supervisors' portable electronic tablets (iPads) with handheld scanning devices". This action by the operator/manager implemented a better method – a design-assisting method – via electronic tablets for loading supervisors.

- **Regulator - FAA/CASA etc.** See AO-2019-070 where "in 2018, the driveshaft manufacturer provided *a position paper to the FAA, which recommended* that driveshafts with the same part number as the accident helicopter should be replaced at 5,000-hours service" because a design issue with the drive shaft meant unannounced / undetectable failures.

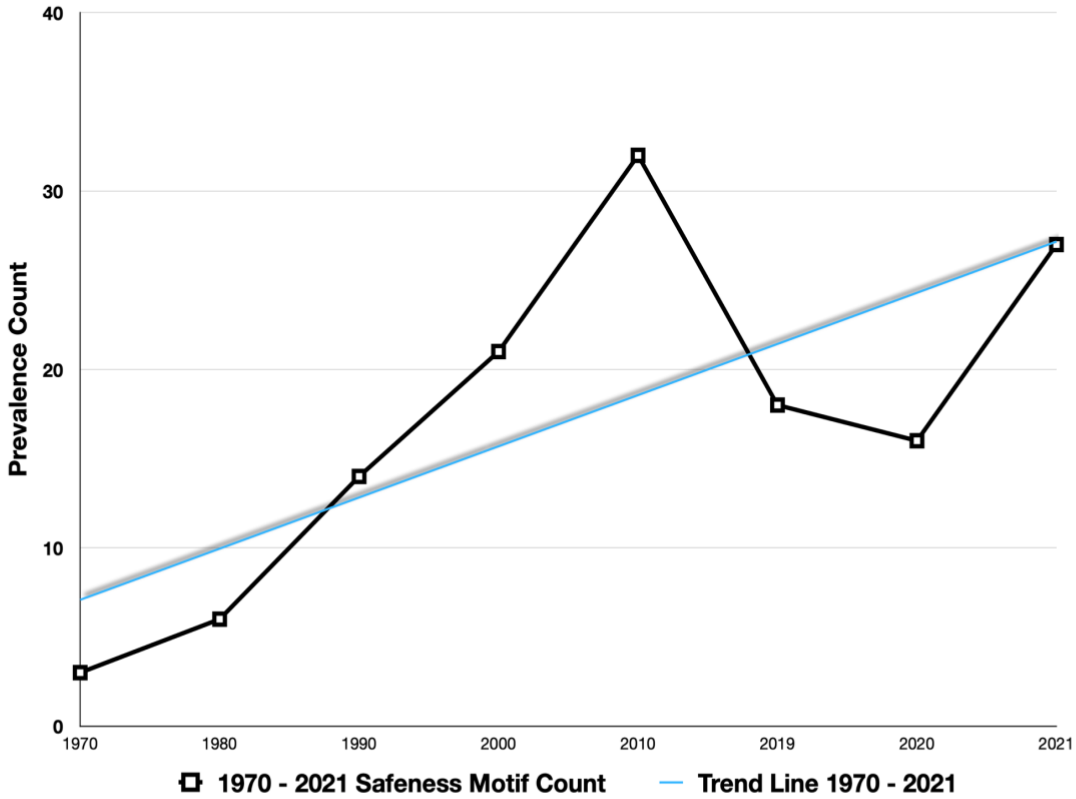
- **Regulator - ATSB.** See AO-2020-005 where "The *ATSB's Safety Watch program highlights* broad safety concerns that come out of ATSB investigation findings and from the occurrence data reports by industry" and thus highlight any design issues.

8.7.8 Historical Prevalence

A count for the design-assistive / design-hindering attribute is plotted across the period 1968 - 2021 in Figure 8.11 below.

Figure 8.11

The "Design-Assistive / Design-Hindering" Attribute 1968-2021



Note. From the ATSB Airtable Database (2021).

Figure 8.11 above shows the prevalence of design-assisting / design-hindering findings increased within the timeframes of ATSB Airtable. This is not discussed in Chapter 9 but may become future research (see Chapter 10).

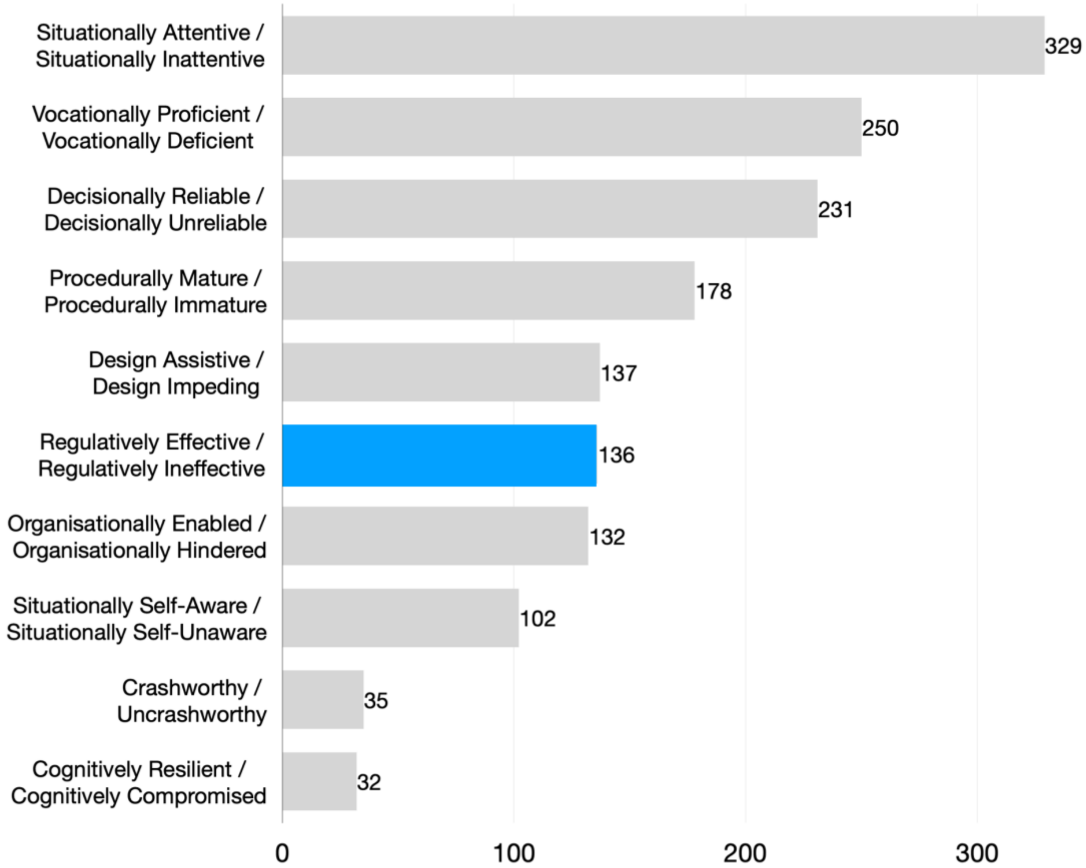
8.8 The "Regulatively-Effective / Regulatively-Ineffective" Meaning-Making attribute

8.8.1 Emergent / General-Usage Descriptors

The sixth most prevalent meaning-making attribute at a count of 136 is the "regulatively-effective / regulatively-ineffective" attribute. This attribute appeared in 35% of the incident, accident, safety attributes from the ATSB Airtable (2021). The relative prevalence is shown in Figure 8.12 below:

Figure 8.12

"Regulatively-Effective / Regulatively-Ineffective" Relative Prevalence 1968-2021



Note. From the ATSB Airtable Database (2021).

This meaning-making attribute emerges from, and coheres, statements from the ATSB identifying the need for, or the effect of, regulatory interventions and actions by CASA, the ATSB and external regulatory bodies such as ICAO, the FAA, and EASA.

This attribute also encompasses rules mentioned as relevant to the incident but not complied with for various reasons. This attribute includes, amongst others, unsafe accounts of regulatory absence or ambiguity. On the positive side, regulative effectiveness refers to the ways in which regulators produce rules that are effectively supported by advisory circulars, plain language guides, airworthiness bulletins, safety promotion materials etc. It also refers to the ways in which the regulator themselves convenes working groups, industry briefs and so on – in essence any regulatory action or intervention is included (notwithstanding all the potential regulatory issues as per Chapters 5 and 6).

The "regulative" part of regulatively-effective appropriates the generally accepted usage of "regulative" which is the "control by means of rules and regulations". The "effective" part refers to "success in producing a desired or intended result" while the "ineffective" component refers simply to "not producing the desired effect" (Oxford University Press, 2015).

The attribute of regulatively-effective is delineated from procedural-maturity by attributing any action or writing from the regulator as a regulatively-effective / regulatively-ineffective attribute while procedural-maturity/immaturity relates to non-regulatory operators and their actions (see Section 8.6 above). Having said that, it is recognised regulatory actions often include processes and procedures while, at the same time, procedures in operations manuals, training manuals and so on, have regulatory weight. Hence the need to delineate via agency rather than function.

In summary, regulations not fully developed and/or not existing at all and/or existing in confusing, ambiguous, or excessive forms (see more on this Section 9.7) exhibit, in their regulatively-ineffectiveness a degree of unsafeness. On the other hand, regulations and regulatory actions that exist in forms that effectively achieve their self-stated aims enhance safety.

8.8.2 Phrasing Variations

The phrasing variations for this attribute are as follows:

- "Regulatively-Effective / Regulatively-Ineffective" to connote the ways in which regulations and regulators actively realise safety (or otherwise).
- "Regulatory Effectiveness / Regulatory Ineffectiveness" to connote the aspirational or avoidant state.
- "Legislatively Effective / Legislatively Ineffective" can be used interchangeably.

8.8.3 Narrative Markers

Incident-Accident-Attribution Narrative. The everyday task (initial state) is disturbed by a threat or threats (disruptor). An agent in a regulatively-ineffective system is not protected from the threat, and/or prepared for it, and/or unalerted and/or hindered in resolving the threat in a timely way and an accident or incident occurs. ATSB recommendations (restorers) offer the promise of renewal to the everyday state (or the protection of the everyday state for those with similar everyday activities not involved in the accident or incident). The everyday state is renewed (or protected) in a reformed and improved way when the lessons from the findings and recommendations are embodied and applied.

Safety-Attribution Narrative. An everyday task (initial state) is disturbed by a threat or threats (disruptor). An agent in a regulatively-effective system is protected from the threat, and/or prepared for it, and/or alerted to the threat and/or assisted in resolving the threat in a timely way (restorer) by the regulations. The everyday state is renewed with the agent, (and those influenced by the agent) reformed and improved.

8.8.4 Indicative Safety Actionables

Indicative safety actionables from the ATSB Airtable (2021), with comments, are as follows:

- **AO-2019-060:** "The ATSB acknowledges the safety action taken and proposed by P&WC to address this safety issue and considers that, if implemented, such action will probably address the issue". Here safety abides within the ATSB's findings, recommendations and monitoring of Pratt and Whitney in relation to a servicing issue. Thus, the regulative effectiveness of the ATSB in this instance is equated to safety.

- **AO-2007-066:** "CASA did not seek information to establish whether conditions "...necessary for the safety of other airspace users and persons on the ground or water" were required prior to issuing the Special Certificate of Airworthiness". Here it is noted the seeking of relevant information to establish the safety of airspace users and persons on the ground during an air display was not carried out adequately by the regulator. The other regulator, the ATSB, calls this regulative ineffectiveness a "safety issue".

- **AO-2019-072:** "The regulatory requirement to use simulators for conducting engine failure after take-off exercises has eliminated the risk for those aircraft where simulators are available". In a positive sense a safety goal is achieved here by eliminating risk during actual aircraft emergency training by regulating the use of simulators.

- **AO-2018-006:** "They completed an audit of the Yulara Town helipad and amended the published departure and approach procedures to align with designs recommended, but not mandated, by the Civil Aviation Safety Authority in Civil Aviation Advisory Publication 92-2(2)". The helipad design criteria of the CAAP is utilised to improve the safety of the helipad and environs. Interestingly it is "advised" but not "mandated" and yet is still effective.

- **19690001:** "A.N.R. 143(l)(b) The pilot did not conform with the pattern of traffic formed by other aircraft operating at the aerodrome". This early observation after an accident from 1969 is an example, amongst a number of others in the ATSB Airtable, where it is not the regulations themselves in question but their compliance. In this instance unsafety occurs because the regulation is not conformed with and thus "regulative ineffectiveness" occurs because regulations, in terms of concrete safety goals, require compliance (more on this in Section 9.7 including an Airtable count of deliberate non-compliances).

8.8.5 Indicative Nested Concepts

Indicative nested concepts for the regulatively-effective / regulatively-ineffective attribute (indicated by *italics)* are identified below with example ATSB investigation numbers that can be cross-referenced to the ATSB Airtable:

- **Open Reporting.** See AO-2019-056 where "*Through reporting* and investigation of UAV and RPA accidents and incidents, the ATSB is able to monitor trends and identify areas for safety improvement". The nested concept here is that, notwithstanding regulated reporting requirements, industry will openly and willingly report because regulations cannot be bought to bear on that which the regulator has no knowledge.

- **Compliance.** See AO-2019-018 where "The ATSB is concerned about the frequency of accidents, many fatal, *which involve pilots flying with reduced visual cues*". In this instance the high number of accidents correlates to pilots flying non-compliantly in less than the mandated visibility requirements.

- **Capacity to Comply.** See AO-2017-092 where the ATSB notes "In these situations, *pilots may not be able to effectively process information* or make good decisions". These are high demand, high workload situations which means compliance can be subverted because "pilots may not be able to effectively process" the processes (see more in Section 9.7).

- **Clarity / Appropriateness**. See AO-2007-017 where "Regulatory guidance regarding the measurement of fuel quantity *before flight lacked clarity and appropriate emphasis* and did not ensure that the fuel quantity measurement procedures used by operators included two totally independent methods". The nested concept demonstrated is clarity of regulations (and already covered extensively in Chapters 4-6).

8.8.6 Meaning-Consilient attributes

The consilience identified for the regulatively-effective / regulatively-ineffective safety attribute, like the procedural maturity attribute, is comprehensive because the nature of regulations is such they empower, or are empowered by the other nine safety attributes. This is explained with the following examples (see square brackets for consiliently relevant part of attribute):

- **Situationally-Attentive / Situationally-Inattentive.** See all safety attributes pertaining to regulatory interventions that seek to preserve or enhance situational awareness. For example, AO-2018-077 where a regulator in the form of the ATSB alerts pilots to the necessity of enhancing attentiveness by "recognising the risks and hazards [situationally-attentive] of low-level flying". Additionally, it should be avoided when there is no operational requirement…" And "further information is available from the ATSB publication [regulatively-effective / regulatively-ineffective]: Avoidable Accidents No. 1 – Low-level flying".

- **Vocationally-Proficient / Vocationally-Deficient.** See all safety attributes relating to regulatory interventions that empower skills, knowledge and ability including such things as training, education, and information sharing. For example, AO-2016-074 where "the AWB was intended to alert R22 operators to the development of a significant crack that was identified from this occurrence. The Airworthiness Bulletin (AWB) [regulatively-effective / regulatively-ineffective] also highlighted the need for particular vigilance during the daily pre-flight checks of the main, and for pilots to be alert to sudden and increased vibrations [vocationally-proficient]".

- **Decisionally-Reliable / Decisionally-Unreliable.** See AO-2018-080 where the "accident highlights the hazards of spontaneous decision-making, particularly during a high-workload phase of flight in a complex aircraft. The Civil Aviation Safety Authority Resource booklet [regulatively-effective / regulatively-ineffective] and video "Decision Making" provides tips to improve the quality of decision making".

- **Design-Assistive / Design-Hindering.** See attributes that apply regulations to design features such as those found in control systems, cockpit, cabin, aircraft maintenance, ATC towers, control rooms etc. For example, AO-2019-025 where "Controlling yaw in helicopters with a Fenestron tail rotor, as in this case, is an important consideration [a design feature]. Airbus Helicopters and the European Union Aviation Safety Agency (EASA) [regulatory intervention] provide specific guidance [regulatively-effective / regulatively-ineffective] relating to this issue to assist pilots". See also AO-2019-019 where "Operators are encouraged to submit reports of PC-12 pitch trim defects [design-hindering] to the Defect Reporting Service to facilitate the Civil Aviation Safety Authority's monitoring [regulatively-effective / regulatively-ineffective] of continuing airworthiness data".

- **Procedurally-Mature / Procedurally-Immature.** See attributes that are procedural but are enforced by the regulator. For example, AO-2016-044: "The following publications provide useful information to pilots, operators, and refuellers regarding the use of drum stock: CAO 20.9 [regulatively-effective / regulatively-ineffective] titled Air service operations – precautions in refuelling, engine, and ground radar operations; available from the Federal Register of Legislation".

- **Organisationally-Enabled / Organisationally-Hindered.** Organisational empowerment is often found in the "regulatively-effective" attributes when the operator (the organisation) is regulated into any consilient feature such as vocational proficiency, cognitive resilience, design-assistiveness and so on that enhances safety. For example, AO-2009-079 where "The owner of the organisation has held discussions with all employees to highlight the importance of a thorough dual inspection and the need to examine the entire flight control system for travel distances and functionality. All employees were also provided with a copy of CAR 42G (flight control system: additional requirements) and CAR 42ZP (certification not to be made) to ensure that they were aware of their regulatory responsibilities [regulatively-effective / regulatively-ineffective]".

- **Situationally-Self-Aware / Situationally-Self-Unaware.** Regulatory interventions that impose physiological or psychological limit-enabling restrictions, or bring greater awareness of such limits, can be considered as consilient with situational-self-awareness. For example, CAO 48.1 fatigue management regulations [regulatively-effective / regulatively-ineffective] which stipulate duty limits within which one can reasonably be assured they will not be cognitively compromised by fatigue (2019).

- **Cognitively-Resilient / Cognitively-Compromised.** This attribute relates to regulations that prevent the compromise of cognitive capacity such as drugs, alcohol, fatigue etc. For example AO-2018-077 "This accident is also a reminder that blood-alcohol can persist the day after significant alcohol consumption, and the residual effects of alcohol may impair performance, especially in demanding situations". And see relevant regulations prohibiting [regulatively-effective / regulatively-ineffective] flight with blood alcohol levels greater than zero.

- **Crashworthy / Uncrashworthy.** See attributes relating to regulatory interventions around use of accident attenuating and post-accident devices such as EPIRBs, harnesses, helmets, floats, oxygen masks etc. For example, AO-2017-098 "The ATSB has issued AirAsia Indonesia with a safety recommendation to review its current passenger pre-flight safety briefing and safety information card to ensure passengers are provided with clear instruction on how to activate the flow of oxygen [crashworthy / uncrashworthy] from the passenger oxygen masks and that the bag may not inflate when oxygen is flowing".

8.8.7 Responsible Agents

The responsible agents associated with this safety attribute are provided below:

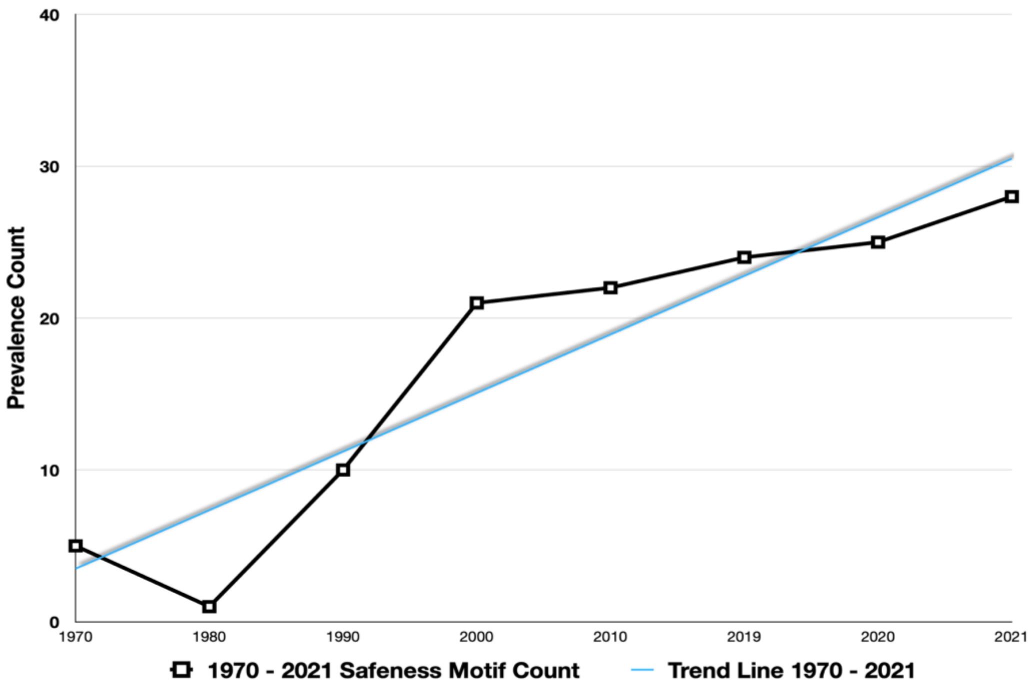
- **CASA** (formerly CAA and sometimes referenced as such in Airtable particularly in older reports). For example, AO-2019-025 where "A harness instrument, commonly issued by the Civil Aviation Safety Authority (CASA), stated that a harness could be used instead of a seatbelt for take-off and landing".
- **ATSB** (formerly BASI and sometimes referenced as such in Airtable particularly in older reports). For example AO-2019-060 where "as a timeline for implementation was not provided, the ATSB remains concerned with resolution of the safety issue. Accordingly, the ATSB issues the following safety recommendation to support P&WC's proposed safety action".
- **FAA, Transport Canada, AMSA, EASA**, plus numerous others where overseas regulators are assigned actions (or whose actions determine a safety actionable).

8.8.8 Historical Prevalence

A count for the "regulatively-effective / regulatively-ineffective" attribute is plotted across the period 1968-2021 in Figure 8.13 below.

Figure 8.13

The "Regulatively-Effective / Regulatively-Ineffective" Attribute 1968 - 2021



Note. From the ATSB Airtable Database (2021).

Figure 8.13 above shows that this safety attribute significantly increased within the timeframes of ATSB Airtable. This correlates to the findings of Chapters 4 and 5 and will be discussed further, together with other findings, in Chapter 9.

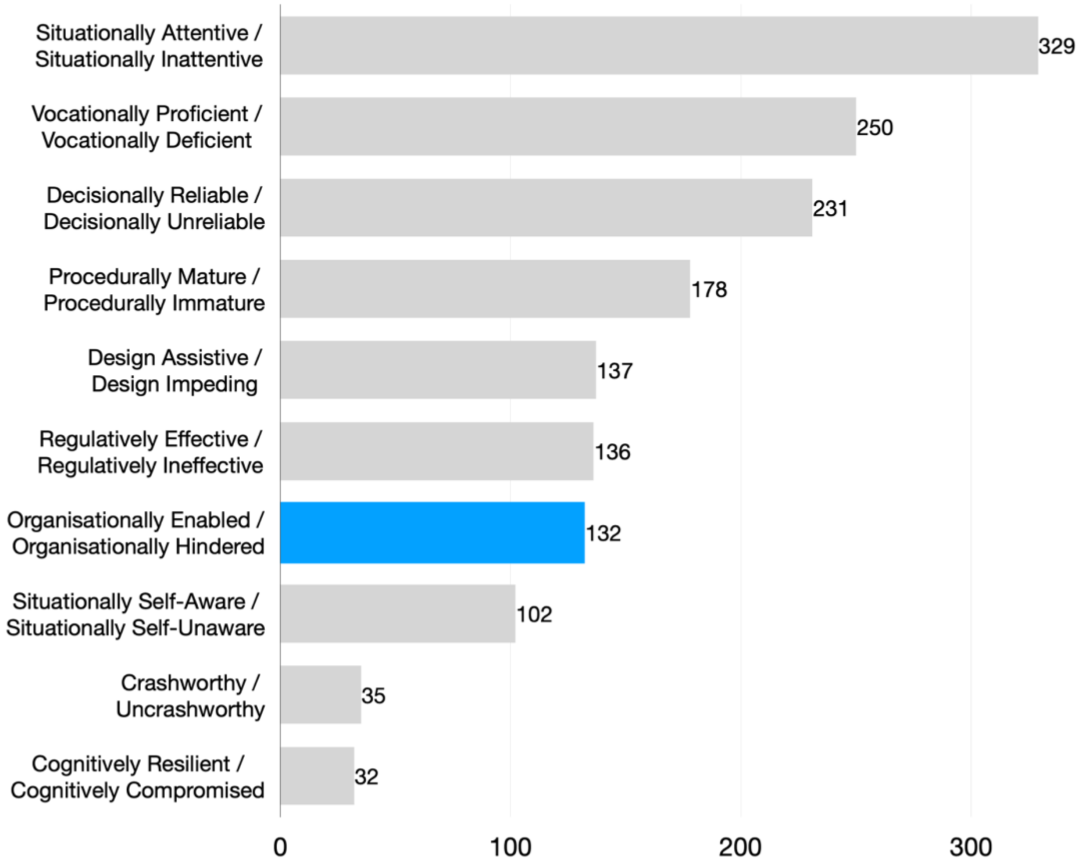
8.9 The "Organisationally-Enabled / Organisationally-Hindered" Meaning-Making attribute

8.9.1 Emergent / General-Usage Descriptors

The seventh meaning-making attribute at a count of 132 is the "organisationally-enabled / organisationally-hindered " attribute. This attribute appeared in 34% of incident, accident, safety attributes in the ATSB Airtable (2021). The relative prevalence is shown in Figure 8.14 below in blue:

Figure 8.14

"Organisationally-Enabled / Organisationally-Hindered" Relative Prevalence 1968-2021



Note. From the ATSB Airtable Database (2021).

This attribute emerges from, and coheres, statements from the ATSB identifying the importance of organisational support. It includes the various organisational entities and structures supporting safety actions through leadership, management, governance, and other support measures. Unsafety within this attribute looks like leadership failures, organisational inaction, governance shortfalls, compliance failures and so forth. On the positive side, organisational enablement sees safety enhanced through good leadership, swift responses to incidents, effective governance structures, standardisation, equipment improvements etc.

The "organisation" part of "organisationally-enabled" appropriates the generally accepted usage of "organisation" which is "a systematically arranged group of people with a particular purpose". The "enabled" part refers to "the authority or means to do something" while the "hindered" component refers to a situation that "makes it difficult for someone to act". (Oxford University Press, 2015).

Thus, the meaning-making in this attribute sees such things as poor leadership, organisational mismanagement, poor systems, and lethargic responsiveness as "hindering" safety. On the other hand, organisations that have good leadership, clear and concise governance, sophisticated management systems, and demonstrated responsiveness enhance their safety by being organisationally-enabled.

8.9.2 Phrasing Variations

The phrasing variations for this attribute are as follows:

- "Organisationally-Enabled (-ing) / Organisationally-Hindered (-ing)" connoting resultant influence.

- "Organisational Enablement / Organisational Hinderance" to connote the aspirational or avoidant state.
- "Culturally Enabled / Culturally Hindered" to connote the cultural influence of the organisation as a corollary to organisational enablement / hinderance.

8.9.3 Narrative Markers

Incident-Accident-Attribution Narrative. The everyday task (initial state) is disturbed by a threat or threats (disruptor). An agent who is organisationally-hindered is not protected from the threat and/or prepared for it, or unalerted and/or hindered in resolving the threat in a timely way and an accident or incident occurs. ATSB recommendations (restorers) offer the promise of renewal to the everyday state (or the protection of the everyday state for those with similar everyday activities not involved in the accident or incident). The everyday state is renewed (or protected) in a reformed and improved way when the lessons from the findings and recommendations are embodied and applied.

Safety-Attribution Narrative. An everyday task (initial state) is disturbed by a threat or threats (disruptor). An agent who is organisationally-enabled is protected from the threat and/or, prepared for it, or alerted to the threat and/or assisted in resolving the threat in a timely way (restorer). The everyday state is renewed with the attribute agent, (and those influenced by the agent) reformed and improved.

8.9.4 Indicative Safety Actionables

Indicative examples of the organisationally-enabled / organisationally-hindered attribute from the ATSB Airtable (2021), with comments, are as follows:

- **AO-2019-028:** "The operator has revised its training procedures for use of trim to include detailed instructor demonstrations prior to the student practicing manoeuvres". In organisationally-enabled terms, safety is enhanced because the operator responds swiftly to an incident by enhancing its theoretical and practical training regimes.
- **AO-2017-092:** "Virgin Australia have also changed procedures for ground handling staff when responding to requests from emergency services". In this instance the improvement by Virgin is organisationally-enabling for ground handling crews and thus enhances safety.
- **AO-2017-092**: "The ATSB also found that the captain was highly concerned about avoiding an overspeed. This was partly because of a perception that Virgin Australia were also concerned about overspeed and wanted to avoid overspeed events". In this example the organisational focus by the company became a personal fixation on airspeed and led to cabin crew members being injured during over-controlling at high speed during a rapid descent.
- **AO-2018-032:** "Although Qantas provided detailed guidance to flight crews about the content of departure and approach briefings, it did not specifically require aerodrome hot spots to be briefed". In this instance, a degree of organisational-hinderance exists because the briefing content was missing. Of course, a question could be asked whether the "detailed content" was essential and whether it potentially obscured more significant items by its own over-abundance. This is not covered in the report (but is discussed further in Section 9.7).

8.9.5 Indicative Nested Concepts

Indicative nested concepts for the organisationally-enabled / organisationally-hindered attribute (indicated by *italics)* are identified below with example ATSB investigation numbers that can be cross-referenced to the Airtable:

- **Training Provision.** See AO-2017-092 where "Virgin Australia have *updated the training and information* provided to pilots about overspeed and overspeed recovery".

- **Maintenance Support.** See AO-2019-074: "To minimise risk, maintenance manuals should be closely followed when conducting field repairs, and *operators should consider alternatives* such as replacement over repair whenever practical".

- **Rostering and Personnel Support.** See AO-2019-069 and "*Operators can provide guidance to assist pilots to make good decisions* in these situations, by providing peer support and emphasising the importance of reporting abnormal events in a timely manner".

- **Written Communication.** See AO-2017-078: "Although verbal communications are an important method of explaining and understanding problems, they are not a reliable means for capturing essential tasks over an extended time-period. This accident highlights the importance for maintenance organisations to consider the human factors elements associated with their practices, *capture them in their documented quality control".*

- **Governance and Compliance.** See AO-2019-047: "When situations or issues arise that do not fit into standard operating procedures, maintenance personnel should always be *prepared to consult or request further guidance*. This guidance can come from internal support materials, such as procedures, or external materials such as maintenance manuals or the manufacturer.

8.9.6 Meaning-Consilient attributes

Consilient attributes are identified below (in square brackets*)* with example ATSB investigation numbers that can be cross-referenced to the Airtable:

- **Situationally-Attentive.** See all attributes where the organisation enables situational attentiveness through education, training, or equipment. For example see AO-2019-019 where "more generally, operators and pilots are advised to enhance awareness of expected system behaviour from switch and other control selections [situationally-attentive / situationally-inattentive]".

- **Vocationally-Proficient, Decisionally-Reliable.** See all safety attributes where the organisation enables or hinders these attributes. For example, AO-2019-033 where "the operator provided several internal safety communiqués to all flight crew reiterating the importance of effective failure management [vocationally-proficient / vocationally-deficient] and inflight decision making [decisionally-reliable / decisionally-unreliable]".

- **Design-Assistive.** See all attributes where an organisation enables procedures or new equipment to account for design issues. See AO-2019-070 "As a result of the occurrence, the maintenance organisation advised the ATSB that they took the following safety action: Addition of maintenance worksheet line item for all Kaflex (and similar) driveshafts over-and-above the maintenance manual data checks [design-assistive / design-hindering]".

- **Procedurally-Mature.** All attributes where operators provision procedures. For example, AO-2016-007 where "the operator advised they have enhanced/updated existing procedures and checklists [procedurally-mature / procedurally-immature] for their float plane operations".
- **Regulatively-Effective.** See all attributes where organisations must work with regulators. For example, AO-2019-019 where "Operators are encouraged to submit reports of PC-12 pitch trim defects to the Defect Reporting Service to facilitate the Civil Aviation Safety Authority's [regulatively-effective / regulatively-ineffective] monitoring of continuing airworthiness data".
- **Situationally-Self-Aware, Cognitively-Resilient.** See all attributes relating to an organisation's education, leadership and governance relating to member self-awareness and cognitive resilience. For example, AO-2016-166 where "The aircraft operator and airport operator initiated a number of safety actions as a result of the occurrence, including providing flight crews with information about the specific risks of approaches [situationally-self-aware / situationally-self-unaware] to Darwin Airport at night in conditions with reduced visibility". See also AO-2014-032 where "Although Toll Aviation Engineering (approved maintenance organisation) specified fatigue management procedures, the licenced aircraft maintenance engineers (LAMEs) who were involved in the inspection… operated outside the nominated hours of work. As such, the LAMEs were at risk of fatigue

[cognitively-resilient / cognitively-compromised] on the day of the inspection and/or the day following…"

- **Crashworthy.** See safety attributes where the organisation equips staff with items such as helmets and other PPE. For example, AO-2020-023 "The wearing of helmets is an important safety consideration [crashworthy / uncrashworthy] when performing utility aerial work. The survivability in the event of an accident is greatly increased, as highlighted by this accident".

8.9.7 Responsible Agents

The responsible agents associated with this safety attribute are provided below:

- **AOC Holders.** For example, AO-2017-092 where "Virgin Australia have updated the training and information".

- **AMO Organisations.** Such as AO-2019-070 where "the maintenance organisation advised the ATSB that they took the following safety action: Addition of maintenance worksheet line item for all Kaflex (and similar) driveshafts over-and-above the maintenance manual data checks".

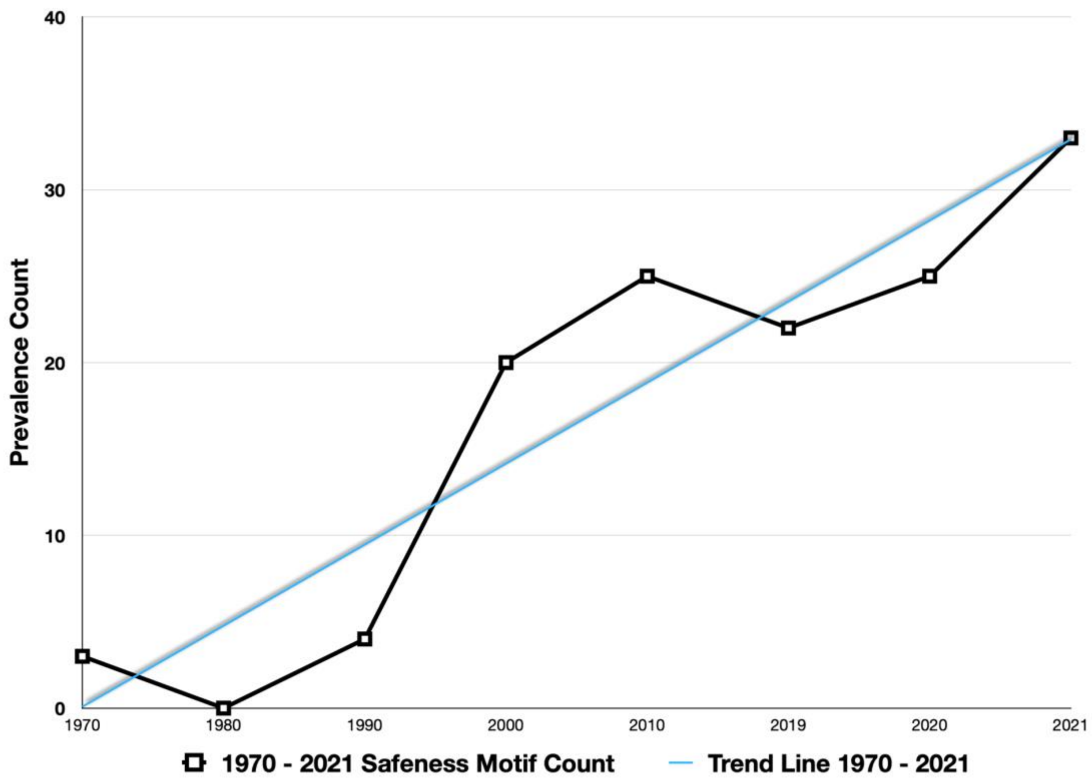
- **Other Management Organisations** within entities such as CASA, Airservices, OEMs and so on. For example, AO-2019-025 where "a harness instrument, commonly issued by the Civil Aviation Safety Authority (CASA), stated that a harness could be used instead of a seatbelt for take-off and landing". (Note: See also Section 9.8 for a discussion on the meaning-making implications of managers not being enunciated as such within accident and incident investigations).

8.9.8 Historical Prevalence

A safety attribute count for the organisationally-enabled / organisationally-hindered attribute is plotted across the period 1968-2021 in Figure 8.15 below.

Figure 8.15

The "Organisationally-Enabled / Organisationally-Hindered" Attribute 1968-2021



Note. From the ATSB Airtable Database (2021).

Figure 8.15 above shows this safety attribute significantly increased within the timeframes of ATSB Airtable. This is not discussed in Chapter 9 but may become future research (see Chapter 10).

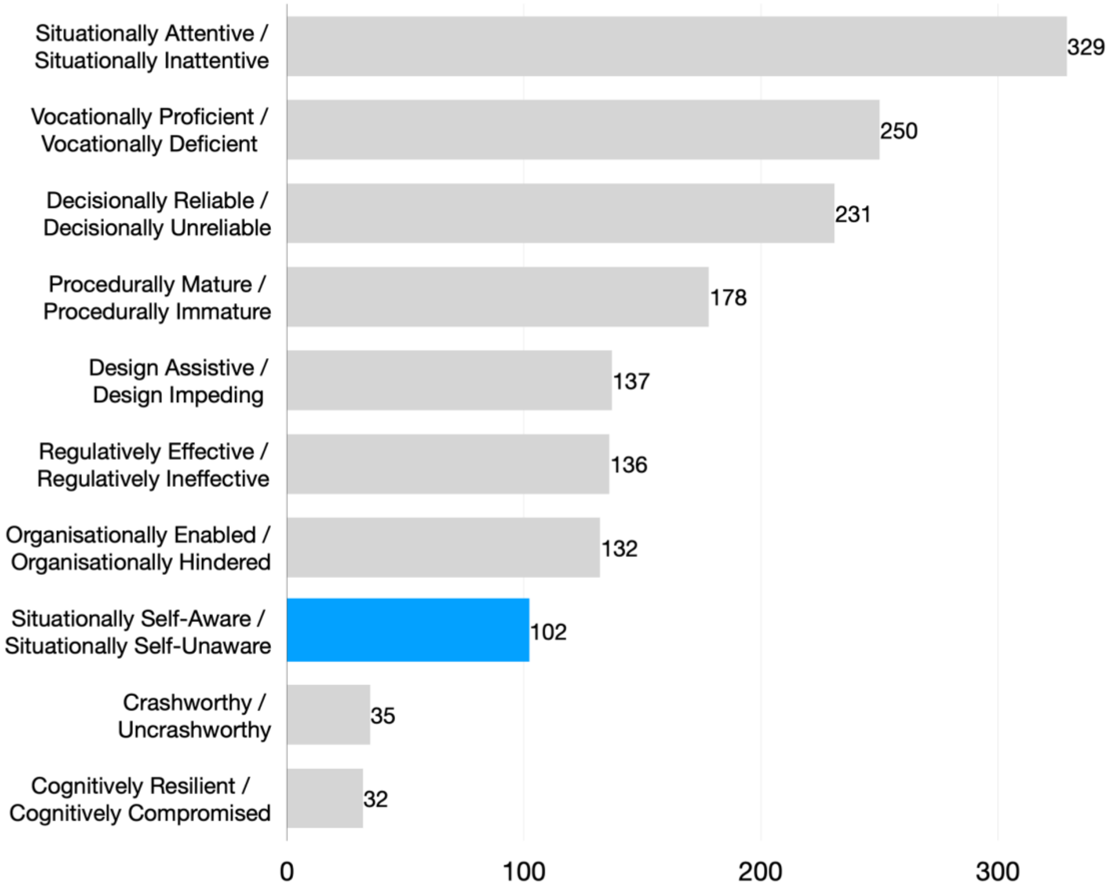
8.10 The "Situationally-Self-Aware / Situationally-Self-Unaware" Meaning-Making attribute

8.10.1 Emergent / General-Usage Descriptors

The eighth most prevalent meaning-making attribute at a count of 102 is the "situationally-self-aware / situationally-self-unaware" attribute. This attribute appeared in 26% of the incident, accident, safety attributes in the ATSB Airtable (2021). The relative prevalence is shown in Figure 8.16 below in blue:

Figure 8.16

"Situationally-Self-Aware / Situationally-Self-Unaware" Relative Prevalence 1968-2021



Note. From the ATSB Airtable Database (2021).

This meaning-making attribute emerges from, and coheres, statements from the ATSB identifying the need for, or the effect of, an individual being self-aware of physiological, psychological, and experiential features and limits. This attribute of unsafety is expressed in the unawareness of the features and limitations of one's experience, capabilities, skills, and cognitive capacities. On the positive side, being situationally-self-aware means enhancing safety by recognising personal limits particularly as they relate to contexualised situations. It also means operating within these limits and/or avoiding situations where these limits might be exceeded. Additionally, it refers to the ways in which operators, regulators, and industry bodies educate and/or legislate in this area.

The "self-aware" part of "situationally-self-aware" appropriates the generally accepted usage of "self-aware", which is the "conscious knowledge of one's own character, feelings, and actions" (Oxford University Press, 2015). The "situation" part is like the *situation* in "*situational* attentiveness" (see Section 8.3 above) and refers to the "vital details and events" in a particular set of circumstances and how they relate to individual limits. Thus, when one is "situationally-self-aware" one is attentive to the interaction of their own features and limitations with the situation around them. To be "situationally-self-unaware" is to be incognisant, to a significant degree, of these features.

Thus, the "situationally-self-aware" attribute sees safety in agents being "in touch" with their own limitations and characteristics as they interact with the situation around them. On the other hand, if one is unaware of these limits, they find themselves dealing with the unsafety of a situation as the situational demand exceeds personal capacity.

8.10.2 Phrasing Variations

The phrasing variations for this attribute are as follows:

- "Situational Self-Awareness / Situational Self-Unawareness" to connote the aspirational or avoidant state.

- "Self Savvy" to connote a more colloquial, and, arguably, more engaging form.

8.10.3 Narrative Markers

Incident-Accident-Attribution Narrative. The everyday task (initial state) is disturbed by a threat or threats (disruptor). A situationally-self-unaware agent, naive to their strengths and weaknesses, notices the threat but fails to optimise their strengths and weaknesses to avoid or to deal with the threat in a timely way and an accident or incident occurs. Situational self-awareness recommendations (restorers) offer the promise of renewal to the everyday state (or the protection of the everyday state for those with similar everyday activities not involved in the accident or incident). The everyday state is renewed (or protected) in a reformed and improved way when the lessons from the findings and recommendations are embodied and applied.

Safety-Attribution Narrative. An everyday task (initial state) is disturbed by a threat or threats (disruptor). A situationally-self-aware agent, already knowing their strengths and weaknesses, notices the threat and optimises their strengths and weaknesses to avoid or to deal with the threat in a timely way (restorer). The everyday state is renewed with the attribute agent (and those influenced by the agent) reformed and improved.

8.10.4 Indicative Safety Actionables

Indicative examples of the "situationally-self-aware / situationally-self-unaware" attribute from the ATSB Airtable (2021), with comments, are as follows:

- **AO-2020-004:** "VFR pilots should use a "personal minimums" checklist to help control and manage flight risks through identifying risk factors that include marginal weather conditions and only fly in environments that do not exceed their capabilities". Here safety is found in situational-self-awareness through the use of a personal minimums checklist.
- **AO-2019-052:** "The safety risks of visual pilots flying into non-visual conditions are well documented". These documented risks include the susceptibility to disorientation and vestibular illusions thus such training enhances safety by enhancing self-awareness of physiological limits in this area.
- **AO-2019-025:** "The helicopter operator: immediately actioned a fleet wide check and retorque of engine flexible and rigid oil, air and fuel lines/hoses/pipes attachments, improved procedures for use of third-party harnesses aboard company aircraft, and outsourced human factors training for engineers which expanded quality and content of the training". The human factors training serves to educate agents on their propensity for distraction and error thus enhancing safety through the enhancement of self-awareness.

8.10.5 Indicative Nested Concepts

Indicative nested concepts for the situationally-self-aware / situationally-self-unaware attribute (indicated by *italics)* are identified below with example ATSB investigation numbers that can be cross-referenced to the Airtable:

- **Openness**: See AO-2019-028 where "the first stages of flight training can be an exciting yet daunting period for a student. *Any uncertainty should be raised* with the instructor before taking action in case it leads to an unsafe situation. Conversely, *instructors need to account* for the potential for the student to carry out unexpected actions".
- **Workload Management:** See AO-2020-011 where Singapore Airlines issued a notice to flight crew, *highlighting strategies to manage high workload situations*, as well as reiterating the importance of correct readbacks and acknowledgement from ATC. Workload management also means more cognitive capacity to avoid situations where personal limits may be exceeded.
- **Education:** See AO-2017-069 where "Angel Flight Australia advised it had received permission for all registered pilots to *access the community service pilot education* online course Public Benefit Flying: Balancing safety and compassion, developed in the United States by the Aircraft Owners and Pilots Association Foundation's Air Safety Institute, while an Australian course is developed".

8.10.6 Meaning-Consilient attributes

Consilient attributes are identified below (in square brackets*)* with ATSB investigation numbers cross-referenced to the Airtable:

- **Situationally-Attentive.** See all attributes where situational-self-awareness means situational attentiveness is preserved or enhanced. For example, AO-2019-019 where "more generally, operators and pilots are advised to enhance awareness of expected system behaviour from switch and other control selections" [situationally-attentive / situationally-inattentive].

- **Decisionally-Reliable, Vocationally-Proficient.** See all safety attributes where situational-self-awareness enables or hinders decisional agility and/or vocational proficiency. For example, AO-2018-040 where "this occurrence highlights that increased workload and distraction [decisionally-reliable / decisionally-unreliable] can reduce performance [vocationally-proficient / vocationally-deficient] and increase errors. In the air traffic control context, using tools/practices that reduce reliance on memory and delaying handover until lulls in activity can mitigate these effects".

- **Design-Assistive.** See all attributes where situational-self-awareness involves an awareness of likely error-potentiating interactions with various designs. For example, AO-2017-102 where "This can include additional (cue-based) training [design-assistive / design-hindering], guidance specific to the risks in the region, education initiatives from industry bodies, and learning from the knowledge and experience of peers.

- **Procedurally-Mature.** All attributes where procedures account for personal limits. For example, AO-2018-064 where "this incident serves as a reminder that a failure to follow procedures, such as functional checks, can result in unintended consequences. Functional checks are the last line of defence in maintenance work and can identify a range or errors that may have occurred during the job completion process [procedurally-mature / procedurally-immature]. The extra few minutes taken to complete a functional check could detect an unsafe situation".

- **Regulatively-Effective.** See all attributes where regulations account for personal limits. For example, AO-2009-018 where "the duties and hours flown [regulatively-effective / regulatively-ineffective] by the pilots in the preceding 9 days were not conducive to optimal alertness levels for either pilot".

- **Organisationally-Enabled.** See all attributes where a company accounts for personal limitations. For example, AO-2017-102: "Smaller operators employing pilots with limited exposure to local conditions, such as in the tropics, can better manage related risks by pairing new pilots with ones experienced in those conditions [organisationally-enabled / organisationally-hindered]".

- **Cognitively-Resilient.** See all attributes where an awareness of factors producing cognitive compromise are accounted for. For example, AO-2014-032 (again) where "As such, the LAMEs were at risk of fatigue [cognitively-resilient / cognitively-compromised] on the day of the inspection and/or the day following…" And again "AO-2009-018 where "the duties and hours flown by the pilots in the preceding 9 days were not conducive to optimal alertness levels [cognitively-resilient / cognitively-compromised] for either pilot".

8.10.7 Responsible Agents

The situationally-self-aware attribute applies to all agents but a few indicative examples are provided below:

- **Pilots**. For example, AO-2009-018 where "the position of the rising sun would have made it difficult for a pilot to identify an aircraft approaching from a north-easterly direction" thus demonstrating the unawareness of the physiological limit to seeing into the sun.

- **Engineers**. Such as AO-2018-064 where "The United States Federal Aviation Authority has conducted research into the topic of failure to follow procedures. A number of useful articles and training tools can be found on their website, including: 'The Buck Stops with Me; Failure to Follow Procedures: Deviations are a Significant Factor in Maintenance Errors'".

- **Operators / Managers**. See AO-2018-039 "Operators should document their minimum acceptable levels of illumination and levels of tolerable risk. Where the risk exists, predetermined responses should be readily available".

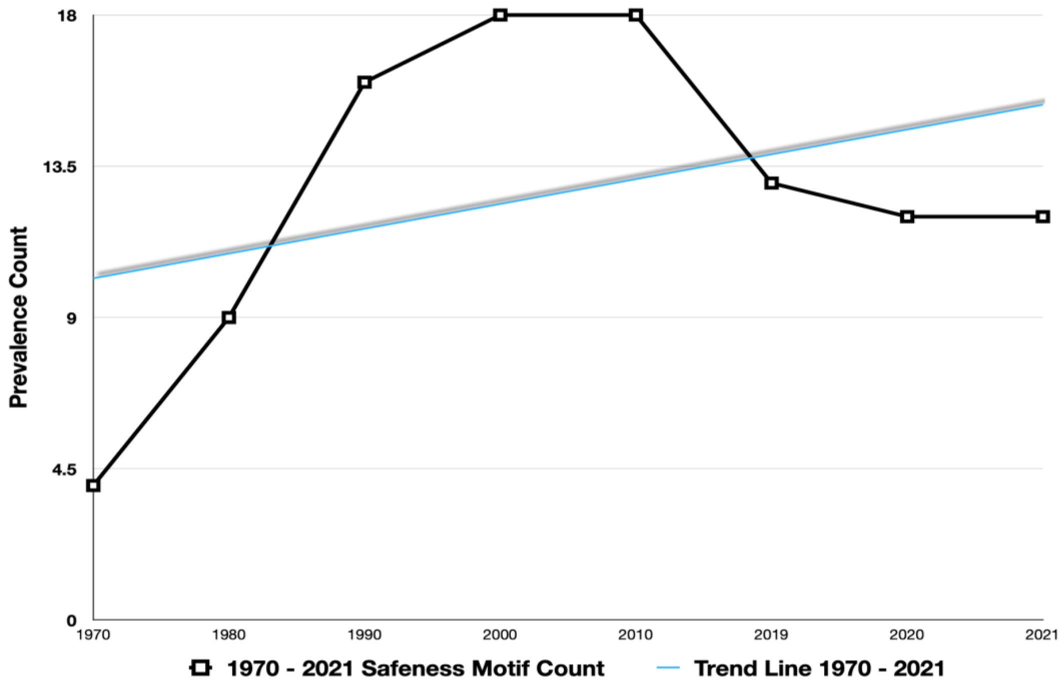
- And see many others in the "Responsible Agents" column of the ATSB Airtable Database (2021).

8.10.8 Historical Prevalence

A safety attribute count for the "situationally-self-aware / situationally-self-unaware" is plotted across the period 1968-2021 in Figure 8.17 below.

Figure 8.17

The "Situationally-Self-Aware / Situationally-Self-Unaware" Attribute 1968 - 2021



Note. From the ATSB Airtable Database (2021).

Figure 8.17 above shows that this safety attribute remained relatively constant within the timeframes of ATSB Airtable. This is not discussed in Chapter 9 since it is outside the scope of the current research but may become a focus in the future (see Chapter 10 for future research areas).

8.11 The "Crashworthy / Uncrashworthy" Meaning-Making attribute

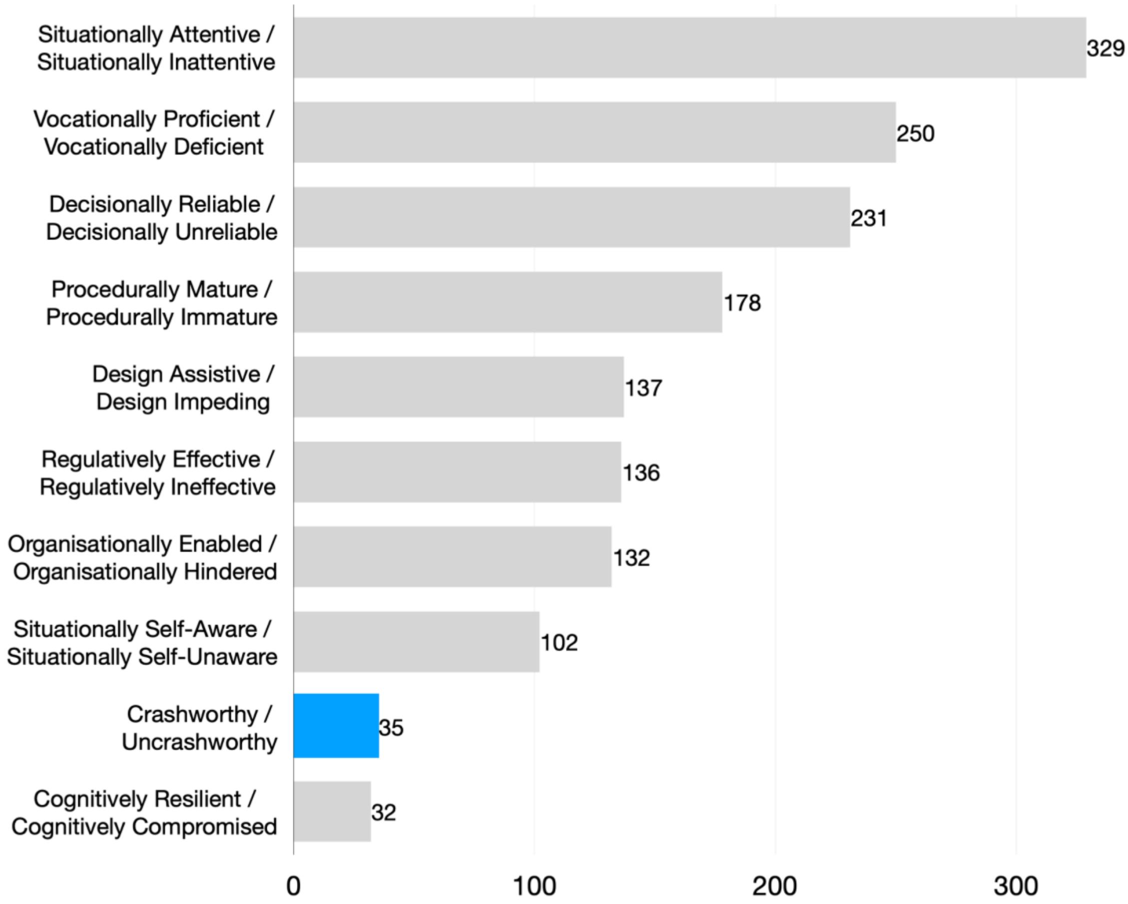
8.11.1 Emergent / General-Usage Descriptors

The second-least most prevalent meaning-making attribute at a count of 35 is the "crashworthy / uncrashworthy" attribute. This attribute appeared in 9% of incident, accident, safety attributes in the ATSB Airtable (2021). The relative prevalence is shown in

Figure 8.18 below in blue:

Figure 8.18

"Crashworthy / Uncrashworthy" Relative Prevalence 1968-2021



Note. From the ATSB Airtable Database (2021).

This meaning-making attribute emerges from, and coheres, statements from the ATSB identifying "last line of defence" features (see comment in AO-2019-011). After such things as damage, impact, collision, or hard landing; these features affect the ability of the aircraft, or aircraft equipment, to minimise injury, damage and/or to optimise survivability. Unsafety within this attribute emerges in such things as seatbelts and helmets not being worn or not being made available, deficient emergency procedures, and unfamiliarity with emergency equipment such as oxygen and emergency exits. On the positive side, where an aircraft and aircraft equipment are optimised for survival during and after an accident/incident, crashworthiness is enhanced along with safety.

This attribute uses "crashworthy" in the generally accepted way of "relatively well able to withstand a crash" where its sub-meaning of "withstand" means being able to remain relatively "unaffected by" or "able to resist" (Oxford University Press, 2015). The "relatively" word infers optimisation of crashworthy features rather than an imperviousness to an accident (which would be unrealistic). The un-optimised antithesis is very simply "uncrashworthy" which is a self-explanatory neologism created for the research.

Thus, in situations where an accident is occurring, or has occurred, and such things as seatbelts, impact-protection devices, crash redundant features, emergency-oxygen etc. are unavailable and/or not used appropriately; safety and survivability is non-optimised because the aircraft and aircraft equipment are uncrashworthy. On the other hand, where these features are available – where crashworthy attributes are present – safety is enhanced.

8.11.2 Phrasing Variations

The phrasing variations for this attribute are as follows:

- "Crashworthy / Uncrashworthy" to connote the aspirational or avoidant state.
- "Accident worthy/Accident Unworthy" to connote non-flying measures used to mitigate an accident such as PPE, safety switches etc.

8.11.3 Narrative Markers

Incident-Accident-Attribution Narrative. An everyday task (initial state) is disturbed by a threat or threats (disruptor) and an accident ensues. An agent without crashworthy features is non-optimised for injury/damage minimisation meaning injury, damage and death are more likely. ATSB recommendations (restorers) emphasise the need for crashworthiness and offer the promise of renewal to the everyday state (or the protection of the everyday state for those with similar everyday activities not involved in the accident or incident). The everyday state is renewed (or protected) in a reformed and improved way when the lessons from the findings and recommendations are embodied and applied.

Safety-Attribution Narrative. An everyday task (initial state) is disturbed by a threat or threats (disruptor) and an accident ensues. An agent benefiting from crashworthy features is optimised for injury and damage minimisation (restorer). The everyday state is renewed with the responsible agent, (and those influenced by the agent) reformed and improved.

8.11.4 Indicative Safety Actionables

Indicative examples of the crashworthy / uncrashworthy attribute from the ATSB Airtable (2021), with comments, are as follows:

- **AO-2019-025:** "Although the Director of National Parks" safe operating procedures required shooters and spotters to wear helmets during aerial culling tasks, helmets were not provided or used on a routine basis". The meaning-making within this safety attribute highlights the "uncrashworthy" attribute because of a lack of helmets and points to a lower degree of safety as a result. It also points to consilient organisational issues.

- **AO-2017-098:** "The ATSB has issued AirAsia Indonesia with a safety recommendation to review its current passenger pre-flight safety briefing and safety information card to ensure passengers are provided with clear instruction on how to activate the flow of oxygen from the passenger oxygen masks and that the bag may not inflate when oxygen is flowing". In this case the clarity of safety-briefings relating to emergency-oxygen systems was in question thus highlighting the "uncrashworthy" nature of these briefings and adding a degree of unsafety. Additionally, in the same example, crashworthiness (and therefore safety as part of this safety attribute) could be enhanced by cabin-crew emergency-procedures training that include role-playing of the full range of expected passenger behaviour, including panic and confusion…"

- **AO-2017-115:** "Circular 85-AN/71 Safety in aerial work Part 1. Agricultural Operations discusses the importance of reducing serious head injuries by wearing a correctly fitting flight helmet". In this case the crashworthiness element relates to not only the availability but the appropriate usage of the helmet. Because the ill-fitting helmet is uncrashworthy, an element of unsafety exists.
- **197804069:** "The pilot suffered serious head injuries and was extricated from the wreckage by the passengers He had not worn the shoulder sash of his safety harness". In this case the failure to wear the shoulder sash meant the restraint system was not as crashworthy as it could have been thus exacerbating the pilot's injuries and demonstrating a degree of unsafety.

8.11.5 Indicative Nested Concepts

Indicative nested concepts for the crashworthy / uncrashworthy attribute (indicated by *italics)* are identified below with example ATSB investigation numbers that can be cross-referenced to the

Airtable:

- **Written Communication.** See AO-2017-098: where "Airbus advised they would recommend a manual cabin pressure controller changeover in case of abnormal cabin altitude. This modification *was implemented in the A320 Quick Reference Handbook* revision March 2019".

- **Adequate Promulgation.** See AO-2017-005: "While this is being considered by CASA, *the ATSB has issued a safety advisory notice* to encourage all owners and operators of small aircraft to fit upper torso restraints for all passenger seats to minimise injury risk".

8.11.6 Meaning-Consilient attributes

Consilient attributes are identified below in square brackets with example ATSB investigation numbers that can be cross-referenced to the Airtable:

- **Situationally-Attentive, Vocationally-Proficient, Decisionally-Reliable.** See all safety attributes where attentiveness to the ways in which emergency equipment can and cannot be used is essential as is vocational proficiency and decisional agility. For example, AO-2017-098 where "An important aspect of managing abnormal passenger responses is the cabin crew's ability to recall and use the appropriate standard commands [decisionally-reliable / decisionally-unreliable; vocationally proficient / deficient]. In this case, the passengers generally responded well when appropriate commands were used, but incorrect commands resulted in some confusion and panic [situationally-attentive / situationally-inattentive]". Also, "cabin crew emergency procedures training that include role-playing of the full range of expected passenger behaviour, including panic and confusion, can better prepare cabin crew [vocationally-proficient / vocationally-deficient] when exposed to more complex real-world scenarios".

- **Design-Assistive.** See attributes that articulate design features affecting crashworthiness in various ways. For example, AO-2017-098 where "Airbus advised they would recommend a manual cabin pressure controller changeover in case of abnormal cabin altitude" [design-assistive / design-hindering]. See also AO-2019-011 "Helicopter wire strike protection (WSPS) can provide a last line of defence [design-assistive / design-hindering] in the event of a wire strike. Some aircraft selected for aerial agriculture operations can be configured to include a wire strike protection system. However, this technology is not currently available on smaller helicopters such as the R44".

- **Procedurally-Mature.** For example, AO-2019-003 "The operator who supplied the loadmasters has reviewed and updated their procedures [procedurally-mature / procedurally-immature]. They have identified a "dynamic exclusion zone" as a position above a person's head height that is in the pathway of a potential uncontrolled load that may drop and impact onto a person".

- **Regulatively-Effective.** See crashworthy attributes that are enforced (or not) by the regulator. For example, AO-2017-005 "CASA has stated that it will not be mandating [regulatively-effective / regulatively-ineffective] the fitment of upper torso restraints, even for air transport flights in small aircraft…".

- **Organisationally-Enabled.** See attributes where an organisation's role in providing support to crashworthy feature through expenditure, procedures, and education. For example, AO-2019-025 "Although the Director of National Parks" safe operating procedures [organisationally-enabled / organisationally-hindered] required shooters and spotters to wear helmets during aerial culling tasks, helmets were not provided or used on a routine basis".

- **Situationally-Self-Aware.** See attributes where self-awareness during stressful contexts are highlighted. For example, AO-2017-098 "Cabin crew emergency procedures training that include role-playing of the full range of expected passenger behaviour, including panic and confusion [situationally-self-aware / situationally-self-unaware".

8.11.7 Responsible Agents

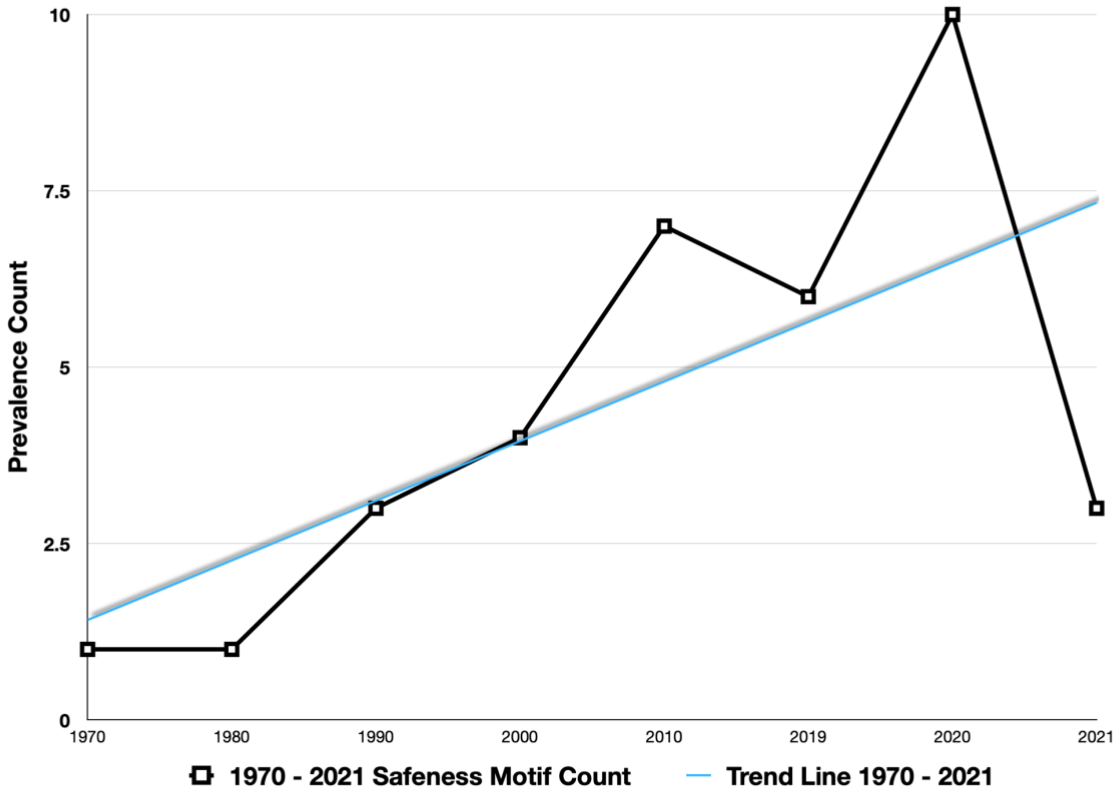
As for some other sections the safety attribute of "crashworthy / uncrashworthy" relates to all agents in the Airtable since each agent self-evidently could be exposed to a survivable accident. As such no indicative examples are given.

8.11.8 Historical Prevalence

A safety attribute count for the "crashworthy / uncrashworthy" is plotted across the period 1968-2021 in figure 8.19 below.

Figure 8.19

The "Crashworthy / Uncrashworthy" Attribute 1968-2021



Note. From the ATSB Airtable Database (2021).

Figure 8.19 above shows that this safety attribute increased within the timeframes of ATSB Airtable. This is not discussed in Chapter 9 since it is outside the scope of the current research but may become a focus in the future (see Chapter 10 for future research areas).

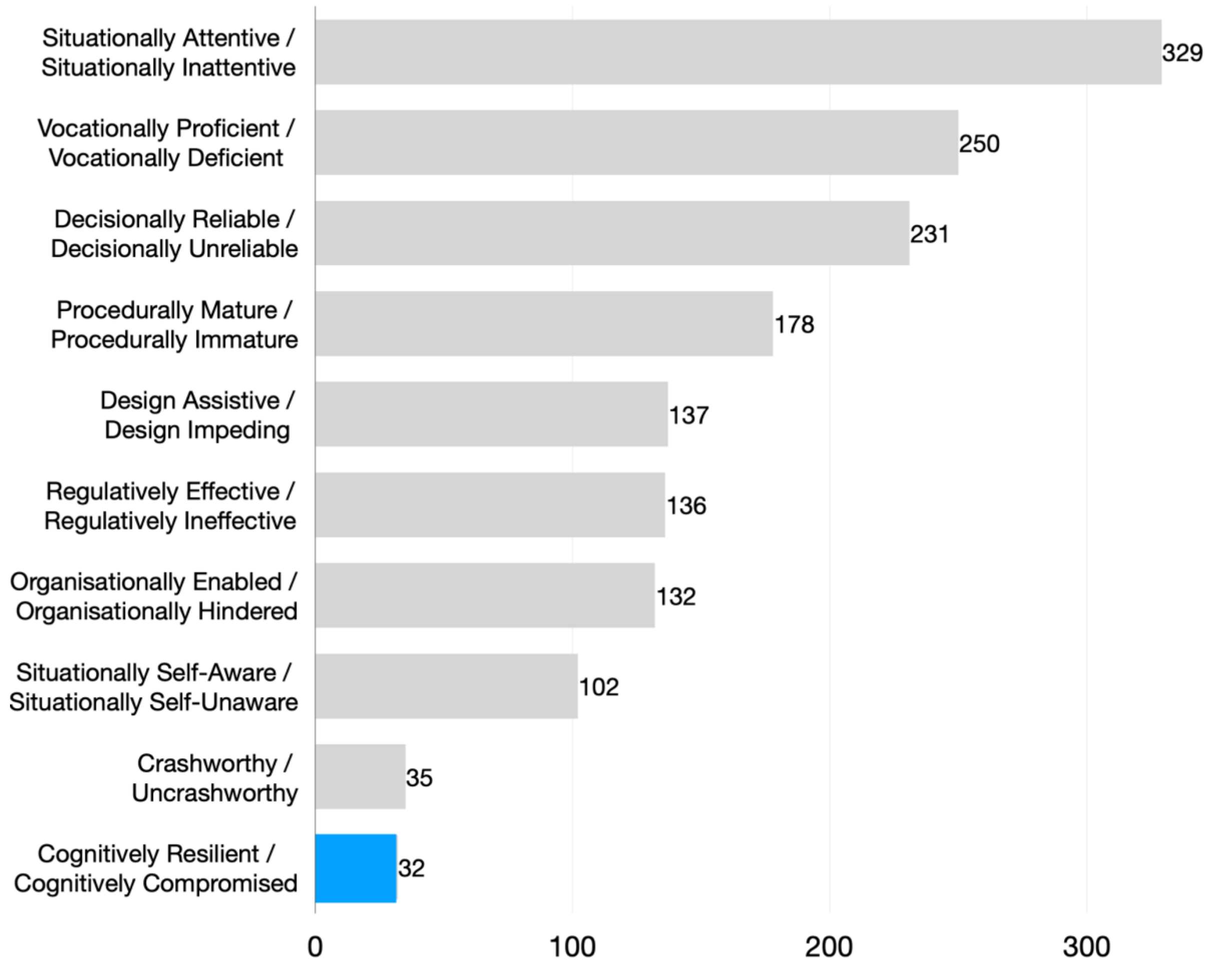
8.12 The "Cognitively-Resilient / Cognitively-Compromised" Meaning-Making attribute

8.12.1 Emergent / General-Usage Descriptors

The least most prevalent meaning-making attribute at a count of 32 is the "cognitively-resilient / cognitively-compromised" attribute. This attribute appeared in 8% of the incident, accident, safety attributes in the ATSB Airtable (2021). The relative prevalence is shown in Figure 8.20 below in blue:

Figure 8.20

"Cognitively-Resilient / Cognitively-Compromised" Relative Prevalence



Note. From the ATSB Airtable Database (2021).

This meaning-making attribute emerges from, and coheres, statements from the ATSB identifying factors that compromise cognitive functions such as illness, medication, illicit drugs, alcohol, fatigue, carbon monoxide, mental health, disorientation, lack of food etc. Unsafety within this attribute expresses itself as personnel working fatigued, drug affected, alcohol affected and/or excessively affected by anxiety, depression etc. On the positive side, where these cognitive-compromising factors receive due education, management, regulation, and avoidance; cognitive resilience is preserved and/or enhanced.

The "cognitive" part of "cognitively-resilient" appropriates the generally accepted usage of "cognitive" which is "mental action or process of acquiring knowledge and understanding through thought, experience, and the senses". The "resilient" part refers to being "able to withstand or recover quickly from difficult conditions" and the "compromised" component refers simply to "weakened or harmed" (Oxford University Press, 2015).

Thus, when individuals are, amongst other things, fatigue, alcohol, drug and stress affected, they are "cognitively-compromised" and safety is negatively affected. On the other hand, where agents are alert, healthy, sober etc. they are cognitively-resilient and safety is enhanced.

8.12.2 Phrasing Variations

The phrasing variations for this attribute are as follows:

- "Cognitively-Resilient / Cognitively-Compromised" to connote agency and action.
- "Cognitive Resilience / Cognitive Compromise" to connote the aspirational or avoidant state.

8.12.3 Narrative Markers

Incident-Accident-Attribution Narrative. The everyday task (initial state) is disturbed by a threat or threats (disruptor). A cognitively-compromised person has non-optimised cognition and does not notice the threat, or creates the threat, and an accident or incident occurs. Cognitive-resilience recommendations (restorers) offer the promise of renewal to the everyday state (or the protection of the everyday state for those with similar everyday activities not involved in the accident or incident). The everyday state is renewed (or protected) in a reformed and improved way when the lessons from the findings and recommendations are embodied.

Safety-Attribution Narrative. An everyday task (initial state) is disturbed by a threat or threats (disruptor). A cognitively-resilient agent has optimised cognition and thus notices the threat and addresses it in a timely way (restorer). The everyday state is renewed with the responsible agent, (and those influenced by the agent) reformed and improved.

8.12.4 Indicative Safety Actionables

Indicative examples of the "cognitively-resilient / cognitively-compromised" attribute from the ATSB Airtable (2021), with comments, are as follows:

- **199903790:** "The flight service officer reported that he was pre-occupied with his personal situation and was tired. As a result, he probably did not adequately monitor the progress of his routine actions". In this case the officer's stress and anxiety compromised his routine actions leading to a degree of unsafety.
- **200000176:** "Formalising procedures for medical examinations and counselling after the event". In "cognitive resilience" terms the operator enhances safety by providing procedures that bring awareness to any cognitive-affecting conditions. The procedure also allows individuals to talk with trained counsellors thus provisioning an opportunity for post traumatic strengthening.

- **AO-2017-087:** "Engineer's overtime is being monitored while a more permanent solution for workplace fatigue management is being considered". Such "monitoring" and then, in time, a fatigue management solution, preserves cognitive alertness and thereby enhances safety. Also points to consilient organisational influences.

- **196900024**: "The probable cause of the accident was that the pilot, whose judgement and ability were impaired by the consumption of alcohol, became disorientated when darkness restricted visual reference". In this case, where cognition should be optimised for high-demand night flying, it is instead compromised by alcohol which, in turn, compromises safety".

- **AO-2020-26: "**Carbon monoxide is a colourless and odourless gas, and its presence may not be detected until the physical symptoms and cognitive effects are more developed". In this instance the operator introduces training and procedures to minimise cognitively compromising effects of carbon monoxide and thus enhances safety".

8.12.5 Indicative Nested Concepts

Indicative nested concepts for the cognitively-resilient / cognitively-compromised attribute (indicated by *italics)* are identified below with example ATSB investigation numbers that can be cross-referenced from the attribute statements corresponding to that report in the ATSB Airtable (2021):

- **Medical Intervention.** See AO-2019-018 where "The medication and *associated condition had not been disclosed to the pilot's DAME* or recorded on the pilot's CASA medical file. Although the medication had also not been taken in accordance with the patient guidelines". This example shows cognitive resilience very much depends on members accessing and availing themselves of medical help.

- **Health and Fitness**. See AO-2018-075 where "this occurrence highlights the importance of pilots *assessing their fitness* (a condition which permits a generally high level of physical and mental performance) to fly prior to commencing their shift and continuing to monitor their fitness to fly throughout the shift, specifically their level of fatigue".

- **Support.** See AO-2017-103 where "a defined protocol exists within the CASA aviation medical framework for pilots in stable remission from the problematic use of substances to return to work. *Employer and independent peer support organisations are becoming more widely available* to assist pilots with the safe return to work".

- **Self-Disclosure.** See AO-2017-103 where "the risks to pilots associated with self-referral are less than the health, safety, and legal risks of continuing to operate with problematic substance use".

- **Education**. See AO-2020-026 where the operator will "*Instruct* pilots to monitor both the instrument panel-mounted CO detector and the domestic electronic detector, with the instruction to land as soon as possible should the presence of CO be detected". Also see AO-2018-065 "Operating unpressurised aircraft above 10,000 ft requires careful oxygen management and planning. Where an increased risk of hypoxia exists, *good risk management practices should be used for flight planning*".

8.12.6 Meaning-Consilient attributes

The consilience identified for the "cognitively-resilient / cognitively-compromised" meaning-making attribute infuse all the other attributes since human cognition is self-evidently a requirement for each one. As such no indicative examples are given for this section.

8.12.7 Responsible Agents

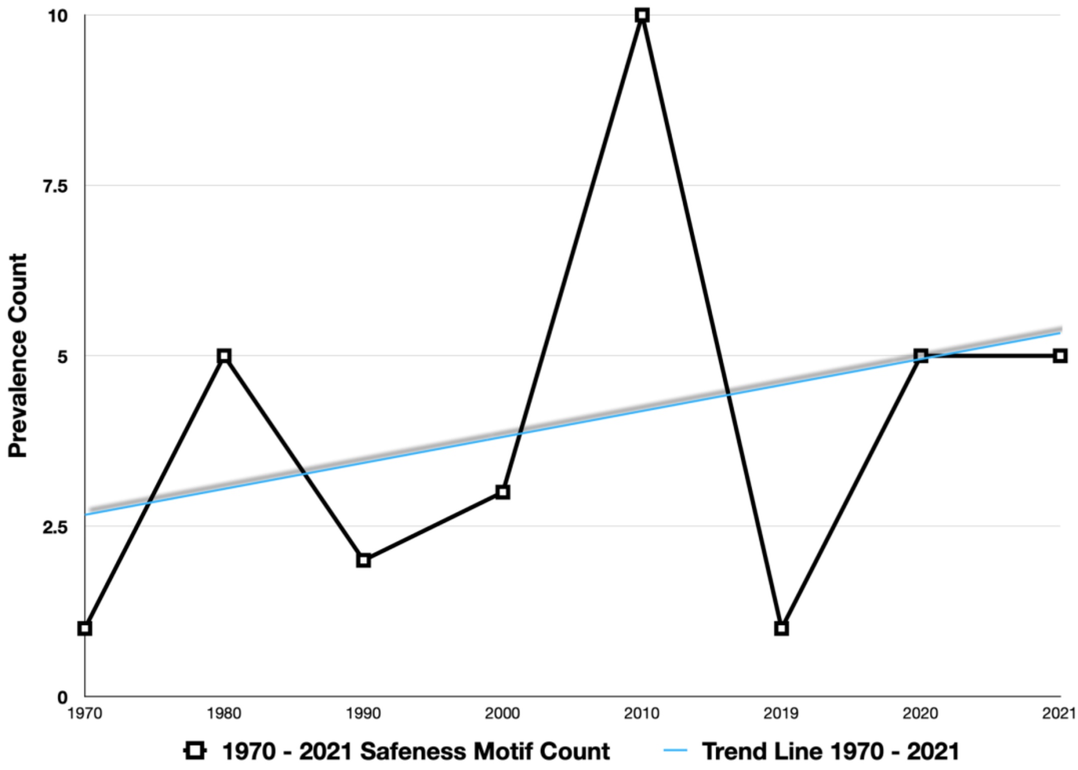
As for the previous section the safety attribute of "cognitively-resilient / cognitively-compromised" is, by its very nature, related to all agents in the Airtable since each agent self-evidently requires cognition to operate in their respective roles. As such no indicative examples are given.

8.12.8 Historical Prevalence

A safety attribute count for the "cognitively-resilient / cognitively-compromised" is plotted across the period 1968-2021 in Figure 8.21 below.

Figure 8.21

The "Cognitively-Resilient / Cognitively-Compromised" Attribute 1968-2021



Note. From the ATSB Airtable Database (2021).

Figure 8.21 above shows that this safety attribute was relatively consistent within the timeframes of ATSB Airtable. This is not discussed in Chapter 9 since it is outside the scope of the current research but may become a focus in the future (see Chapter 10 for future research areas).

8.13 Conclusion to Chapter 8

The question asked at the beginning of this chapter was how safety might be more meaningfully conceptualised. The response has been an examination of unsafety from 391 curated ATSB investigations spanning the last 50 years. This led to the construction of ten incident and accident attributes – the ten red rules. These attributes have then been deconstructively flipped into ten safety attributes with each attribute characterised and constructed by the principles of meaning. The intent of this process was to both illuminate the key meaning-making attributes of safety and to substantiate them. This substantiation was intended to be empowered by the compelling narratives of fatalities, injuries, damage, and hull losses in the ATSB incident and accident investigations. This is the "red" in the ten red rules.

The next chapter moves to final construction of the IASA model by bringing the ten attributes and the issues of regulatory ineffectiveness covered in Chapters 4-6 under close-reading analysis. This is followed by recommendations and conclusions in Chapter 10 which continues to answer the fourth research question of how safety might be compellingly construed and what the consequent implications are for the safety regulations.

CHAPTER 9: CIRCLING TOWARDS A MORE OBJECTIVE, COMPELLING, AND ACTIONABLE VERSION OF SAFETY: THE IASA MODEL

Reality is that which, when you stop believing in it, doesn't go away.

~ Philip K. Dick

9.1 Introduction

9.1.1 "Reasonable People Can Differ"

The Avtex Air lawyer was arguing at the AATA: the issue, he argued, was not one of Avtex Air being unsafe, but instead a "legalistic approach to the meaning of the legislation and the Operations Manual provisions upon which reasonable people could differ" (*Avtex Air Appeal,* 2011, p. 31). In that one comment the lawyer summarised a key problem highlighted by this research: regulations can easily be perceived as "legalistic" and their "safety" a matter of interpretative opinion.

While the lawyer obviously had vested interests in taking such a line of argument, the fact remains this research has demonstrated people's subjectivity – their hermeneutic knowingness – will always be bigger and more varied than the limited words of the law. Their hermeneutic knowingness will thus tend to reframe the safety-ambiguous regulations into whatever safety worldview the person happens to have – reasonable or otherwise. This problem was demonstrated in the first phase of the research where it was shown aviation law never manages to provide a compellingly meaningful conception of safety. Chapter 8 addressed this problem by articulating a reality-based meaningfulness of safety in the ten attributes – the ten red rules. This chapter examines the attributes and their meaningful implications for regulations and for safety as a whole.

9.1.2 Aim and Aspect of the Chapter

The aim of this chapter is to discuss the implications of the ten safety attributes presented in Chapter 8. This is done in dialogue with the regulatory issues identified in the first phase of the research. This chapter also shows how the ten red rules can be usefully conceived into a meaningful model of safety – the Incident Accident and Safety Attribution (IASA) model. This answers the fourth research question regarding how safety might be more compellingly conceptualised. This aspect of the research is shown in Figure 9.1 below. It leads to the conclusion of the research in Chapter 10 where various recommendations and ideas for future research are discussed.

Figure 9.1

Chapter 9 within the Broader Movements of the Research

9.1.3 Overview of the Chapter

The implications of the ten attributes and their evolution towards the IASA model are laid out in this chapter in the following way:

- Section 9.2 – Implication 1: Motherhood statements, specificity, and reality-based safety.
- Section 9.3 – Implication 2: "Definitionalism" revisited and the need for semantic warrant.
- Section 9.4 – Implication 3: The nestedness of safety.
- Section 9.5 – Implication 4: Safety in consilience.
- Section 9.6 – Implication 5: The safety of the royal three.
- Section 9.7 – Implication 6: The "irony of legislationism".
- Section 9.8 – Implication 7: Response-able agents matter more than ever.
- Section 9.9 – Modelling the findings: Final construction of the IASA model.
- Section 9.10 – Concluding the circling.

9.2 Implication 1: Motherhood Statements, Specificity, and Reality-Based Safety

The following statements, perhaps surprisingly, have something in common: "be safe" and "maintain, enhance and promote the safety of civil aviation". They are both "motherhood" statements. A motherhood statement is popularly construed as a "feel good platitude" and a "worthy concept that few people would disagree with, but without any specified plans for realisation" (Wordnik, 2021).

"Be safe", while a nice crew-room salutation, provides "no specifics for realisation". Likewise, "maintain, enhance and promote the safety of civil aviation" provides very few actionable details as to what safety is in the first place (so that safety can be compellingly realised). The latter phrase though, is not just a crew room colloquialism: it is, as will be recalled, the main goal of the *Civil Aviation Act 1988.* This is a problem because in the 1.8 million regulatory words (and growing) that purport to be about "safety", safety as a key enabling word is semantically unanchored and untethered from any shared and workable specificity. Thus, whether one is reading the legacy CAR 238, the new CASR Part 91.710, the plain English guides, or any regulatory text; there is no compelling way of assessing whether said text is actually achieving a shared safety outcome in the first place.

This leads to the first implication from the ten safety attributes: safety, if it is to be compelling, must be more than a motherhood statement. Consider again the ten incident, accident and safety attributes – the ten red rules – that emerged from the ATSB Airtable in Chapter 8:

- Situationally-Aware / Situationally-Inattentive (Section 8.3).
- Vocationally-Proficient / Vocationally-Deficient (Section 8.4).
- Decisionally-Reliable / Decisionally-Unreliable (Section 8.5).
- Procedurally-Mature / Procedurally-Immature (Section 8.6).
- Design-Assistive / Design-Hindering (Section 8.7).
- Regulatively-Effective / Regulatively Ineffective (Section 8.8).
- Organisationally-Enabled / Organisationally-Hindered (Section 8.9).

- Situationally-Self-Aware / Situationally-Self-Unaware (Section 8.10).
- Crashworthy / Uncrashworthy (Section 8.11).
- Cognitively-Resilient / Cognitively-Compromised (Section 8.12).

In contrast to the regulatory intonations of safety, the ten attributes, anchored as they are to accidents, provide a shared specificity that is actionable and workable. There are several important implications to this specificity. First, direct connections are immediately evident between the meaningfulness of the safety attributes and the actual incident or accident. In hermeneutic terms, the symbol (safety) is given semantic warrant by the attributes because of the close interaction with the operationalised signifier (accidents and accident learnings).

This contrasts with the situation at Avtex Air where the semantic warrant is washed out by differing knowingnesses of safety (remaining uncorrected by compromised regulatory renderings of safety). This was seen when the Chief Pilot insisted it was safe to apply CAR 238 in such a way as "to have a look" while the line pilot insisted the only safe thing to do with CAR 238 was to remain on the ground. The Chief Pilot and the line pilot had no shared specificity of safety and CAR 238 failed to provide this specificity. If there was a shared specificity, the shared appreciation of consequence and exposure, expressed by the regulations, might have led the contending parties towards shared meaning-making regarding the Cooma to Bankstown run. Instead, both parties were left with the ambiguities of the legal text, which, unable to defend itself, was reframed by its interpretation. Ironically, all this occurred with the warrant the Chief Pilot had been given by the regulations.

The more compelling meaningfulness of the ten attributes can be seen in application to Avtex Air and the AATA. One can imagine an exasperated Avtex Air staff pilot exclaiming "this just isn't safe!" as they recoil at management's proclamation one can indeed take off and have a look (*Avtex Air Appeal*, 2011, p. 58). The problem here for a pilot's meaning-making, and for safety as lived out reality, is one of semantic imprecision. For the meaningfulness of safety to convict it must invoke a connection to experience and to the safety-knowingness of those involved. Non-specific generalities have no semantic warrant; that is, no shared meaningfulness and therefore no shared sense of threat and consequence. Moreover, the propositions "unsafe!" (or "safe!") have no shared connection to specific narratives and therefore no shared compulsion about what must be done. And, in meaning-making as in nature, the vacuum is abhorred, and in flows a mash of non-compelling ambiguity.

The absence of a standardised meaning of safety was the crux of the issue for Avtex Air at the AATA hearing. The key contention centred on how to discern "whether Avtex's operations presented a serious and imminent risk to air safety" (*Avtex Air Appeal*, 2011, p. 9). Avtex Air's lawyer argued that because of the "seriousness of the consequences for their reputation and livelihood of adverse findings" the tribunal should only "act on proofs which were not 'inexact'; testimony which was not 'indefinite' and inferences which were not "indirect" (p. 11). Counsel was using case-law evidence standards set by *Briginshaw vs Briginshaw* (1938) to argue for a convincing specificity in testimony. The defence case was relatively simple: CASA's determination as to the safety or otherwise of Avtex Air was built on "inexact, indefinite and indirect" evidence and should therefore be dismissed.

In some ways a good point was being made because, as seen in previous chapters, safety as construed by the regulations is indeed "inexact, indefinite and indirect". Defence counsel seemed to be exploiting this characteristic. Significantly, even when Avtex Air counsel was rebuffed by the Senior Member of the AATA, the Senior Member did not appeal to the law itself to determine a standardised specificity of safety. Instead, after stating the *Briginshaw vs Briginshaw* standard of evidence was not required to be "satisfied that a serious and imminent risk to air safety would exist", he used Avtex Air stories of accidents, inadequate training, organisational pressures, and his own experience as a pilot to justify his ruling – not, tellingly, the law itself (*Avtex Air Appeal,* 2011, p. 63.). In choosing not to use the law to refute the Avtex Air lawyer, the Senior Member demonstrated meaningfulness in the law itself is not necessarily an ally in proving the safety of a situation or otherwise – at least from the law's textual specifics.

How then might the ten safety attributes have assisted the tribunal? At the very least, each of the attributes could have become organising principles, perhaps even broad terms of reference, in the assessment of safety at Avtex Air. This might have manifested in such pronouncements as:

- Avtex Air is primed for an accident, not for safety, because it fails to enforce reasonable levels of vocational proficiency in its pilots. Safety is strengthening vocational proficiency and minimising vocational deficiency.
- Avtex Air is primed for an accident, not for safety, because pilots are being pressured to make decisions that place them in option-limiting situations. Safety is strengthening decisional reliability and encouraging option-generation.
- Avtex Air is primed for an accident, not for safety, because

pilots are being pressured to fly in circumstances that are beyond the capacity of their situational attentiveness. Safety is strengthening situational attentiveness and minimising situational inattentiveness.

- Avtex Air is primed for an accident, not for safety, because pilots are being asked to ignore written procedures regarding maintenance defects. Safety strengthens procedural maturity and constrains procedural immaturity.
- Avtex Air is primed for an accident, not for safety, because pilots are not being supported when they make command decisions based on weather hazards. Safety requires organisational support in saying no to such hazards.
- And so on…

Instead of being able to lean on the compellingness of the safety attributes, the tribunal had to make subjective assessments anchored not to a reality-based model of safety, but to academic models such as those provided by James Reason and Patrick Hudson (2011, p. 3). While these models have their own meaning-making usefulness, it is evident in the tribunal their utility as a metric of safety was limited by their generality and their non-emergence from accidents. In contrast, the ten red rules not only provide a reality-based conception of safety they also provide organising principles upon which lines of enquiry can be established when assessing the safety (or otherwise) of an organisation. These have been applied only tentatively above but will be further developed and substantiated in future research (see Chapter 10).

9.3 Implication 2: "Definitionalism" Revisited and the Need for Semantic Warrant

An obvious but mistaken response to the meaning-making ambiguities of safety at Avtex Air would be to pursue "better" definitions. But definitions are words, and words, as shown in Chapter 5, have their own meaning-making and meaning-maiming characteristics. In Chapter 2, the three most prominent definitions of safety from general-usage, CAAP SMS-01, and ICAO were established. First, in general-usage, "the condition of being protected from or unlikely to cause danger" (Oxford University Press, 2015). Second, in the CAAP SMS-01 version, "the state in which the probability of harm to persons or of property damage is reduced to, and maintained at, a level which is as low as reasonably practical through a continuing process of hazard identification and risk management" (CASA, 2018, p. 9). Finally, the ICAO (2018) definition: "the state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level" (p. 2-1).

In the shadow of implication 1 and the problem of motherhood statements, a meaning-making problem with these definitions (and definitions in general), is further enforced: the generalised meaning-making tending towards a non-anchored and non-compelling meaningfulness. "Safety", rendered as "a condition of being protected from or unlikely to cause danger, is almost a nihilistic safety; that is, very literally, a semantic nothingness (the literal meaning of the "nihil" in "nihilism"). So too safety as the possibility of harm reduced to "as low as reasonably practicable" or "maintained at or below, an acceptable level". At least this is safety with deferral to some specificity, but it is a deferral ultimately undermined by the non-specific and subjective realisation of "reasonable" in "reasonably practical" and "acceptable" in "acceptable level".

This problem was introduced in Chapter 2 and elaborated upon in Section 5.3.5 as the problem of "definitionalism". Definitionalism describes, amongst other things, the assumption that because a definition is provided, the definition will comprehensively provide an authoritative meaning. This was shown to be problematic because semantic poverty will see the intuitive meaning of safety ranging far beyond the definitional meaning in the knowingness of the readers. Additionally, definitions come equipped with inherently subjective words like "reasonable" in the CAAP version and "acceptable" (in the ICAO definition) which means the problem of subjectivity remains unchecked when one relies on definitions.

The deeper problem for the regulations is that if safety was provided with an authorised definition in the law, it is likely to have very little semantic warrant for the aviation reader to whom the legislation is aimed. This is because, according to the first phase of the research, it will likely be congested by the legalese so prevalent in the liability-proofing characteristics of fussy law (Section 6.7). Thus, it is likely the definition, in its unwieldy bulk, would have very little compellingness. This is not to say definitions do not have their place; they do, but this should not be to their own closeted end. Rather, a definition should be, as evidenced in Chapter 8, an open-ended introduction beckoning towards further meaning-making context, embodiment, and experience.

In Chapter 8, the ten attributes begin as definitions in the "general usage" section but then expand into the other 7 principle of meanings. In hermeneutic terms, these meaning-making principles subsume definitional safety with context, embodiment (agency,) and narrative. Additionally, the attributes, emerging as they do from the shared obviousness of an accident, provide an inclusive semantic sensibility that (hopefully) pierces the vernacular of the specialised (irony noted in the specialised sound of this sentence). This shared semantic sensibility – which is really a semantic anchoring – is expressed in the integrated safety recommendations and findings from the ATSB Airtable. Each of these recommendations hermeneutically indicate to the knowingness of the reader that there is a broader and more compelling narrative at work than a mere definition – there is, in fact, a bigger "safety story" cementing the meaningfulness of each attribute. Thus, as expressed in Chapter 8, the principles of meaning for each attribute are not just examples of meaning, they are substantiates of meaning. This is in keeping with the hermeneutic circle where meaning creates, and is created by, the ongoing iterations of reader-knowingness, reader-experience, and textual engagement.

One might make a point here that perhaps safety could just be expressed through story after story. While this might be, and is in fact already, a good strategy for human factors courses, it would be highly impractical for day-to-day operations. The ten attributes instead provide a balance between lengthy narrative and cursory denotation. They do this by encapsulating a workable concept of safety without decoupling the embodied and narrativised accident experiences. Thus, the attributes can be considered as "optimally nested" because they avoid non-specificity and the opposite extreme of semantic bulk.

This leads to the next implication which is that no term, and no concept, is an island, instead each is, to re-join Gadamer from Chapters 2 and 3, fusing and fused with other readerly concepts. Or, to use more functional terms, nested and nesting in their meaning-making.

9.4 Implication 3: The Nestedness of Safety

Recall from Chapters 3 and 4 that meaning-making is a fusion of a reader's knowingness and the text (Gadamer, 2013). Thus, words like safety, with a large semantic range, also have a large readerly horizon. This means the reader's knowingness can generate a large swathe of meanings from the fused or "nested" meanings that are, in essence, meanings within meanings. These project their own world in their interactions with the preknowingness of the reader. Balkan (1990) handily draws attention to the idea of nestedness as a "rich cluster of interrelated concepts" (p. 1677) which, in turn, intimates the structuralist idea from Section 6.3 of interpretation as an emergent quality from fields of meaning. Nestedness in Chapter 8 can be found for each attribute under the heading "Indicative Nested Concepts" and is one of the principles of meaning for each of the ten attributes. Nestedness highlights the meaning-making ways in which interrelated concepts naturally nest within each of the attributes.

For example, in Section 8.3.5, situational attentiveness has nestings of communication, workload-management and distraction-management. Effective communications feed situational attentiveness. Workload-management frees or focuses attention. Distraction-management prioritises the direction of attention and so on. No doubt there are many more nested concepts which could be identified, but these, and the others in each section of Chapter 8, are enough for proof of concept.

The ten attributes thus provide a reality-based nestedness to the broader concept of safety. They do this in Chapter 8 by, in totality, cementing safety as a cluster of embodied meaning-making concepts from the ATSB narratives. The hermeneutic circle is at work here where the meaning of the totalising whole (safety) is fused to the nested and nesting parts (the ten attributes, the ATSB narratives, the indicative nested concepts and so on). What nestedness shows is that one should be suspicious of anyone who implies safety can be effectively distilled into a mere definition. That is not how meaning-making in everyday life works as the nestedness sections in Chapter 8, as well as the definitionalism section above, make clear. Instead, safety in the knowingness of a reader is shaped by clusters of interrelated words and concepts as well as meanings within meanings. This leads naturally to the idea of consilience in safety meaning-making.

9.5 Implication 4: Safety in Consilience

While nestedness (see previous section) gives safety semantic depth, the consilience of meaning provides safety with semantic width. Just as reality is an integrated whole, so too hermeneutics – the study of the interpretation of reality – expresses the importance of the totalising whole. Attention is given to the consilient aspects of each attribute in the analysis in Chapter 8 under the heading "meaning-consilient attributes". For example, from Section 8.3.5, situational attentiveness has the following consilience:

- Procedural-maturity which facilitates ordered, memory-assistive actions thereby freeing cognitive space for continued situational attentiveness to dynamic and emerging threats.
- Vocational-proficiency which enables practiced, confident operation of systems and sub-systems as well as an understanding of the strengths and weaknesses of such systems in various contexts. This prevents the unnecessary consumption of cognitive capacity which can then be better

preserved for dynamic and emerging threats.

- Decisional-agility where the ability to respond to a changing situation, as well as being attentive to it, empowers further attentiveness situationally. Decisional agility is also enabled by cognitive capacity which means procedural-maturity and vocational-proficiency, things that optimise the cognitive space, are also consilient.
- Organisationally-hindered where excessive task-demands, inadequate preparation, inadequate training, and deficient equipment – coupled with unrealistic expectations from management – compel an agent into situations where workload is unnecessarily high, option-generation is low, and attentiveness is compromised.
- Situationally-self-unaware where an agent is unaware of, or ignores, their own limitations, and thus ends up in situations for which they are not adequately prepared or equipped which further degrades situational attentiveness.

The examples given in Chapter 8 are termed as indicative in recognition of the fact those listed are not exhaustive. This indicative consilience is intended, as for the nestedness above, to both demonstrate and generate safety meaningfulness. The intent is that as a reader engages with the demonstrated consilience, and as they recognise the width of meaning to safety, their preknowingness of safety is substantiated and expanded.

There are several important implications to consilience which are evident from the Airtable analysis in Chapter 8. The first is that it is not isolated parts of safety that make a company or an individual safe. Instead it is the consilient sum of the parts. To put it another way, it is not situational attentiveness alone that generates safety.

Nor is it vocational proficiency, decisional reliability, nor any individual attribute that generates safety. This is important to keep in mind especially considering the way aviation tends to categorise, compartmentalise and taxonomise which, in turn, tends to dilute a totalising meaningfulness of safety (irony noted in just such a dynamic occurring in this sentence). Such dynamics are evident from the very first time an aviator encounters the learning environment. Technical knowledge is broken down into various categories (engines, airframe, controls etc.) which, while helpful in the learning process, can make it difficult to understand how the systems work in totality and how emergent interactions might occur.

This atomistic tendency is further cemented in accident and incident investigations where, amongst the various taxonomies such as the Harmonisation of European Incident Definitions Initiative (HEIDI), Safety Management International Collaboration Group, (SM ICG), Confidential Human Factors Incident Reporting Programme (CHIRP), Aviation Safety Reporting System (ASRS), Threat and Error Management (TEM), Human Factor Analysis and Classification System (HFACS), ATSB Accident and Incident Taxonomy System (SIMMS) and ICAO Accident/Incident Data Reporting Program (ADREP) taxonomies (Stoji et al., 2015); one almost needs a taxonomy for the taxonomies. More significantly though, one may filter most of these taxonomies to incredibly granular (and, it must be said, non-standardised detail), but one is hard pressed to find the big answers to the big questions.

For example, a trainee reading and watching CASA's human factors training packages (CASA, 2019a) will notice the big safety themes of "Safety Culture", "Human Performance", "Decision Making", "Situational Awareness" and so on. However, if they wanted to examine these themes within the aforementioned taxonomies to see how many are causal and to what extent, they would be hard-pressed to do so. This is because categories are either too generic e.g., no subcategories for "Human Factors" in NASA's ASRS, or too granular; the dozens of sub-categories in the SIMMs manual used by the ATSB – which, ostensibly, has already been simplified. (ATSB 2018, p. 6). Alternatively, one might want to search for the answer to a simple but important question such as "what is our biggest threat", but that too will be obscured by the detail. And if one wanted the answer to an even more important question such as "is this safe" (perhaps in relation to a particular circumstance or practice), it is highly unlikely one will find the answer in the taxonomised complexity.

This over-realised categorisation, and its comprehensive missing of the big points of safety, could well be called the tyranny of the taxonomy. The tyranny is in the artificial forcing of reality into sections, sub-sections and sub-sub-sections that cannot realistically represent the totalising whole. "Atomistic" is a good descriptor here, referring to the way the tyranny solely conceptualises reality in its "distinct, separable, and independent elementary components" (Oxford University Press, 2015). The problem with the atomistic approach to "knowing" safety is the same problem with an approach that assumes one knows humanity because they know the dissected parts of a human cadaver. The true nature of humanity, and of safety, is not just known by its components, but by the emergent unity of all the parts alive and working together.

The problem of atomism is of course is not just peculiar to aviation. Knowledge is, in modern times, well and truly de-generalised (Siegel, 1991, p. 18). This makes the consilience insight even more important to aviation safety – especially when, from a hermeneutic perspective, the "big picture" is the picture of reality as we usually interpret it. Reality is not interpreted in categories; it is interpreted in totalities. Pilots do not fly by identifying individual trees on their moving map displays, they fly by identifying big-picture forests, lakes, and terrain. Nor are they taught, when learning to navigate, to go from small to big. Rather, they must go from the big features to the small to make navigational sense of the world. As for navigation so for safety: any approach to safety should provide a consiliating, big-to-small picture that coheres the various interacting parts into their reality-based totality. There is nothing inherently wrong with attempting to taxonomise safety, but one should always be aware of its limitations in being able to remain realistically (totalisingly) relevant. This is where the ten attributes, as nested and consilient features of safety, offer a totalising, reality-connected conception of safety without resorting to reductionism. The concept of consilience is illustrated in Figure 9.2 below:

Figure 9.2

The Meaning-Consilience of Safety

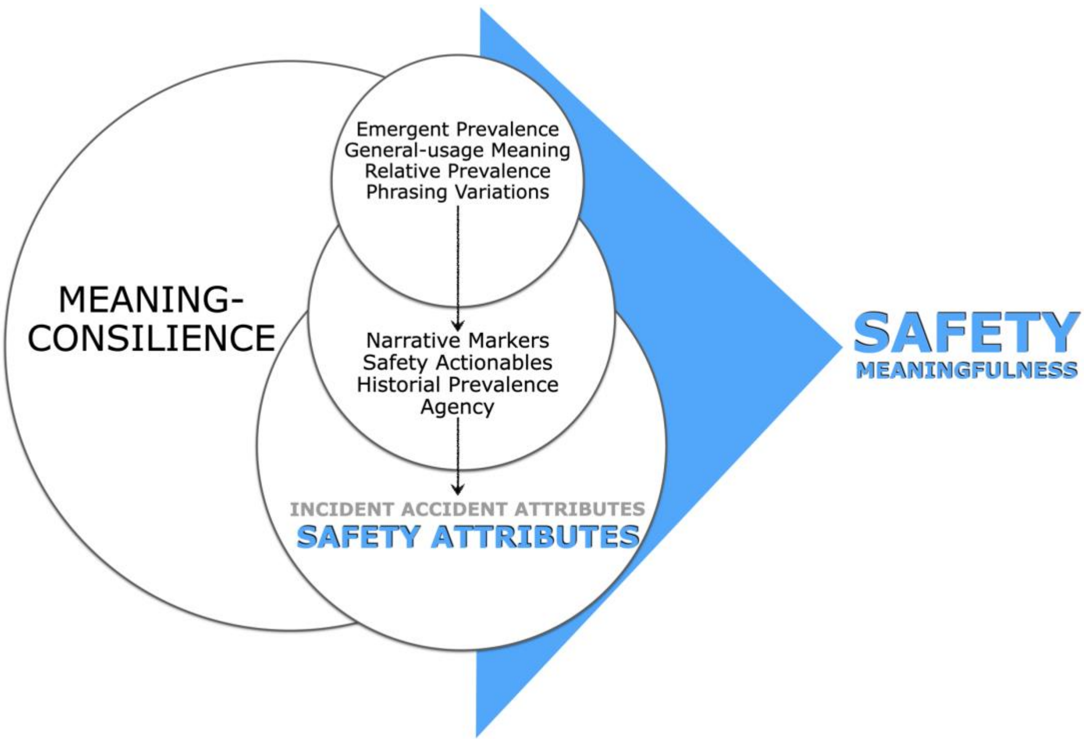


Figure 9.2 shows the consilience of safety meaningfulness in this thesis (see also Chapter 7). It begins with the smaller circle of general-usage descriptors, relative prevalence, and phrasing variations. It then expands to the fused circle of narrative markers, safety actionables, historical prevalence and responsible agents. The consilience of these meaning-makers then fuses to produce the safety attributes and ultimately the conception of safety substantiated by this research. It is thus the totality of the meaning-making movements, not general definitions, where reality-based safety meaningfulness resides.

Of course, an objection at this point might well be that the ten attributes are merely another taxonomy but, as can be seen in Chapter 8, this is not the case. First, and the terminology is very intentional, the attributes are called incident and accident *attributes* because they are intrinsic characteristics emerging from actual incidents and accidents (followed by, in antithesis, the emergent safety attributes). Second, the attributes emerge from, and express in writing, embodied experiences of safety (and unsafeness) where meaningfulness is not just a generally-used definition alone, but a nested consilience of accident narratives. Thus, one should not, when reading each general-usage introduction to each of the attributes in Chapter 8, take that as the "meaning" of the attribute. This is merely the introduction to the narratival, nested and consilient meaningfulness that follows (i.e., the embodied and experiential meaningfulness).

To summarise consilience, a reader's preknowingness is activated interactively by the ten attributes with their general usage meanings, narratives, nestedness, consilience, responsible agents, and historical prevalence. This then acts to concretise safety meaningfulness in a reality-based manner: the reader's own preknowingness of safety expands and deepens into a knowingness infused with the realities of incidents, accidents, and their emergent safety attributes.

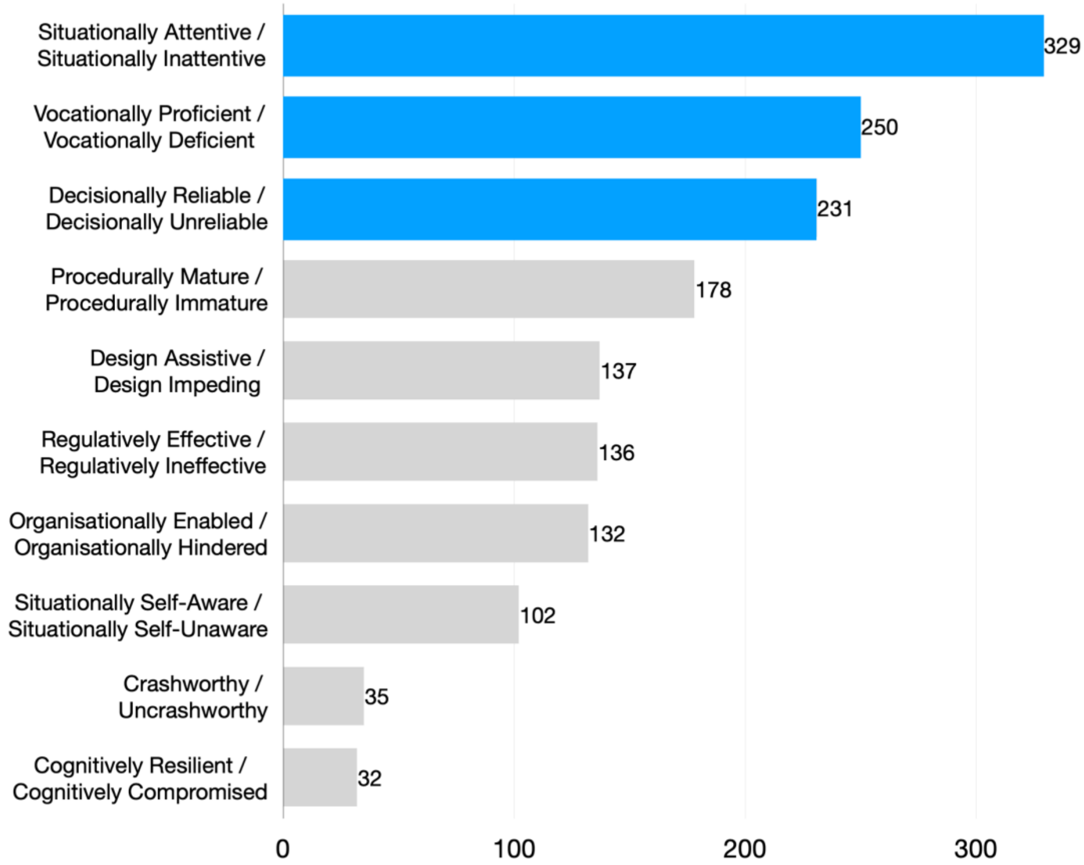
9.6 Implication 5: The Safety of the Royal Three

Safety consilience does not mean all the attributes have an equal quantitative impact on the totality of safety. The attributes certainly have their own distinct qualitative influences but the findings of Chapter 8 also show, in the relative prevalence of each attribute, that there are significant quantitative differences in the attributes. For example, the ATSB Airtable (2021) demonstrates the situational attentiveness attribute is the most prevalent of the ten (329 occurrences out of 391 investigations) with the cognitive compromise attribute the least prevalent (32 occurrences). A key qualitative implication is that three attributes are far more pervasive and influential than others. This idea is conceptualised as the "royal three".

The royal three refers to the attributes of situational attentiveness, vocational proficiency, and decisional reliability which, as can be seen in Figure 9.3 on the next page, are the most frequently occurring of the safety-attributes in the database. They are also, across the period 1968-2021, the most consistently appearing with an occurrence rate that remains relatively unchanged over some 50 years.

Figure 9.3

The "Royal Three" attributes



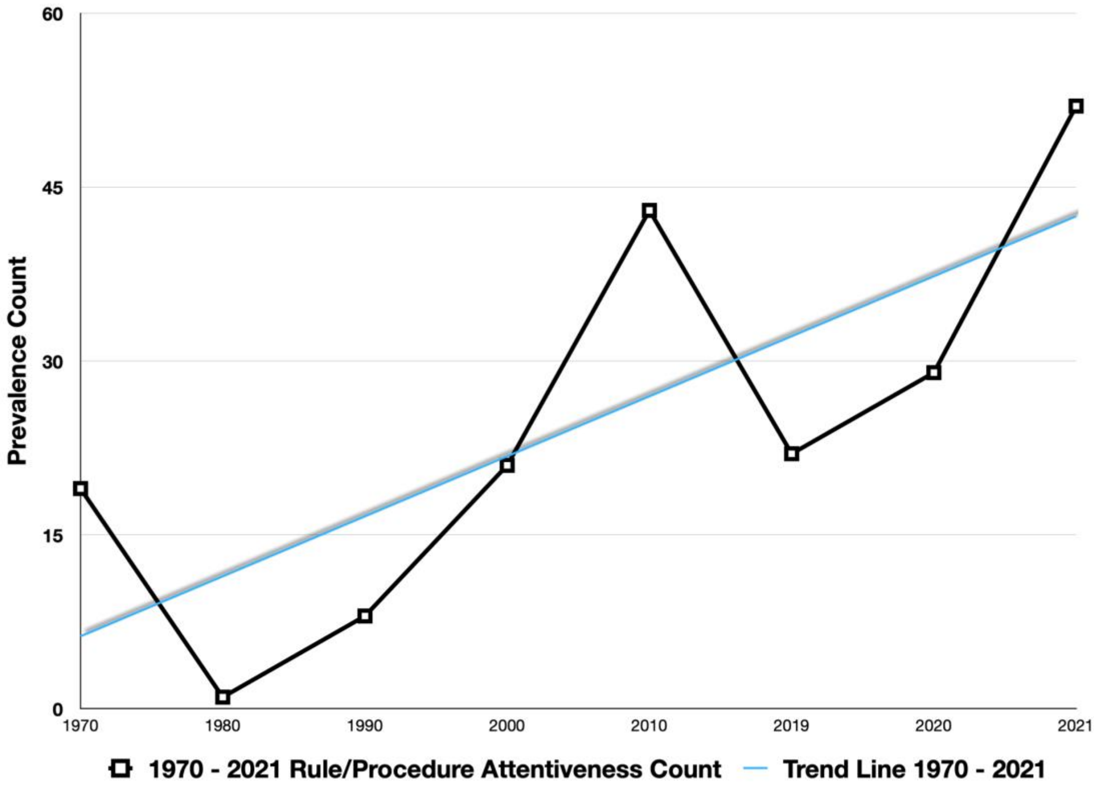
The pervasive presence of the royal three suggests, if the safety actionables from the 391 accident and incident investigations are any indication, that these three attributes should receive the most regulatory and procedural attentiveness. This will be further researched in the future, but what can be said now is that liability-proofing not only potentially produces excessive and congested regulations, much more importantly, it potentially creates a significant distraction from the importance of the royal three.

To illustrate, consider the question of what the easiest response might be after an incident – where easiest can generally be taken as the cheapest or shortest fix. Is it to fix situational attentiveness, vocational proficiency, and decisional reliability? These should be the "go to" places (or at least mandatory stops along the way) given their prevalence, but the reality is these can often be hard to quantify into actions that lawyers might be satisfied with. Moreover, solutions that relate to these three key attributes, particularly training hours and upgraded equipment, require significant finances and time. Far easier then, to demonstrate one has "done something", by writing another rule and procedure, or rewriting that rule and procedure, or reminding staff of the importance of that rule or procedure. Thus, when asked by follow-up investigations or auditors "what has been done", one can say "another rule written, another procedure created". This can be said, ironically enough, while pointing at an ever-growing regulatory thickness in the hope it is proportional to the thickness of one's safety margins.

The regulatory growth consequent from liability-proofing has already been evidenced in Chapter 5 but consider the ATSB Airtable (2021) where the same trend is obvious. Sections 8.6.8 and 8.8.8 in the previous chapter have already shown a sharply increasing prevalence of the procedurally-mature and regulatively-effective attributes, but what is not shown are two other counts from the ATSB Airtable (Figures 9.4 and 9.5 below). These are the counts of "rule or procedure attentiveness" and "rule or procedural change". These further demonstrate an ever-increasing regulatory and procedural reflexivity to accidents as shown below.

Figure 9.4

Rule/Procedure "Attentiveness" 1968-2021



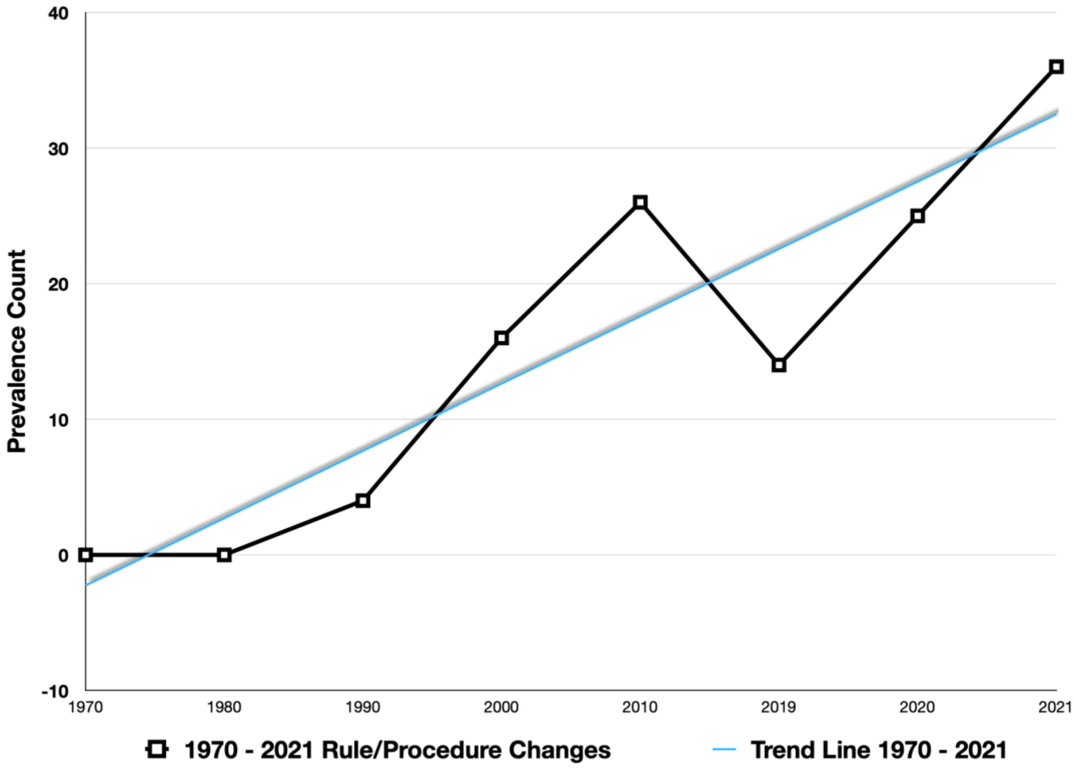
Note. From Column 36 of the ATSB Airtable Database (2021).

In the first figure, Figure 9.4 above, the content-count of rule and procedure attentiveness is the number of times accident-attributes directly speak of, or imply attention to, rules or procedures within the investigation (see Appendix C for further details on the methodology and in particular the description for columns 36 and 37 of the ATSB Airtable). The numbers are a count of whenever a recommendation was made to change or review a rule or procedure.

As can be seen, a preoccupation with rules and procedures has grown disproportionately over the last 50 years compared to consideration for the royal three in the form of situational attentiveness, vocational proficiency, and decisional reliability. These have remained relatively stable in their prevalence.

Figure 9.5

Rule/Procedure Change-Recommendations 1968-2021



Note. From Column 37 of the ATSB Airtable Database (2021).

In the second figure, Figure 9.5 above, a similar trend to Figure 9.4 is noted where recommendations to change rules and procedures, or to create new rules and procedures, are rapidly increasing. All of this shows that the regulatory reflex towards ever more rules and procedures has grown dramatically over the last 50 years.

The plots in Figures 9.4 and 9.5 include regulations (from the regulator) and procedural changes (by operators), which means they involve potential word-counts far above the 1.8 million words of core regulations shown in Chapter 5. The procedural changes would, over and above the regulations, be adding many more multiples of words to company operations manuals, SOPs, training manuals, Safety Management System manuals, Quality Management System manuals, Flight Manuals and so on. It is anticipated future analysis of such company documents will reveal this dynamic (see Chapter 10) but even now, given the regulatory word increase, and given the trajectory of the plots above, one can confidently assume extremely large word-count increases for individual companies. This correlates strongly with the findings from Chapters 5 and 6 regarding the tripling of the regulatory word-count. It also correlates with an accident rate that has not decreased and has, in fact, slightly increased. Putting all this together, a strong case can be made that there is a regulatory and procedural overreaction to incidents and accidents.

The implications of bulk-legislation to safety meaning-making have already been expressed in Chapters 5 and 6, but another arises. This is the implication of secondary risks disproportioning principal risks. An example of this is seen in the disproportionate number of legal words addressing the risk of fatigue. In the year 2000, the fatigue regulation was CAO 48.0 with a word-count of 7129 words (see Appendix D, Figure D1). In 2021, the extant regulation, CAO 48.1 (Instrument 2019), was 35,087 words with a CAAP at 43,235 words and a plain English guide at 27,657 words. This puts the total word-count for fatigue legislation in 2021 at 105,921 words and raises serious questions as to what has justified the 1,386% increase. Some might say there are industry-specific safety reasons for the regulatory increase. This might then prompt one to look for something like an increasing and worrying fatigue-related accident or incident rate. Alternatively, one might look for a compelling safety case from a peer reviewed academic source justifying the 105,000 words of fatigue-related legislation. Notably though, one cannot find a compelling safety-related case based on such rationales. This is because no such safety case exists. The fact is the number of fatigue-related incidents and accidents, compared to the royal three, is exceedingly low.

The low prevalence of fatigue-related incidents and accidents is reflected in the ATSB Airtable Database (2021). Fatigue is nested in the cognitively-compromised attribute along with other cognitive-compromising conditions such as those relating to drugs, stress, alcohol and so on. In Section 8.12, the cognitively-compromised attribute is the least most prevalent at a count of 32 (8% of the total count for the ten attributes). Additionally, over time, there is only a slight increase in the cognitively-compromised attribute. Moreover, when the results are filtered for fatigue-specific investigations, only eight reports out of 391 mention fatigue and only two involve fatalities. This is literally a rate equating to 1/100th of 1% and yet has incurred a 1,386% increase in regulatory words.

The key point is not that such words are bad in and of themselves. The key point is that when there is a fixation on one lesser risk over the totality of primary risks, the lesser risk consumes attentiveness to the detriment of everything else. The words, data, data-crunching, meetings, reports, audits, surveys, and so on that are dedicated to fatigue-risk, mean far less cognitive bandwidth for regulatory and industry managers trying to process the totality of other risks. Again, this is not to say fatigue management in the form of CAO 48.1 is bad, just that it is not the only factor and certainly not the most dangerous factor. It should not, therefore, in the name of safety, be allowed to consume resources at disproportionately greater rates than those indicated by primary risks.

The issue of regulatory disproportionation grows more serious when one considers the significant indications that, as the regulations continue to upsize, genuine threats are not receiving the regulatory attentiveness they deserve. Consider these contemporary examples. Through 2020 and 2021, CASA required aeromedical helicopter companies (amongst others), to update their Fatigue Risk Management Systems (FRMSs) to comply with Appendix 7 of CAO 48.1 or, alternatively, adopt an appendix from CAO 48.1 (CASA, 2019b). This meant operators had to assimilate and practically apply the 105,921 words mentioned above despite most having effective FRMSs already in place under the old instrument. At the same time, CASA released CASR Part 133 "Air transport and aerial work operations" (2021). Much of Part 133 features helicopter performance-class planning legislation (which apparently addresses the risk of rotary wing engine failures over urban areas). This was done because another regulator (the European Aviation Safety Authority - EASA) had similar legislation in place and Australia's obligations under the ICAO SARPs ostensibly required it (CASA, 2021g).

One might have expected a pattern of engine failures and near-hit incidents over built up areas to have prompted the legislation, but no such evidence or safety case was put forward by CASA. This is because no such compelling evidence exists. This fact did not prevent the new CASR Part 133 from imposing an extra 82,748 words of regulatory and supporting materials upon AOC holders. This includes Part 133 itself at 17,273 words, the accompanying MOS at 42,421 words and the AC at 23,054 words. Heads of Flying Operations (HOFOs) everywhere are, at the time of this writing, busy multiplying more and more procedural words of their own so that their operations and training manuals are compliant. While aeromedical HOFOs everywhere have been rewriting their FRMSs and expositions to comply with the new legislative words of CAO 48.1 and Part 133, a real threat seems to have gone unaddressed by the regulator. This threat emerged from the ATSB over the same period the new CAO 48.1, CASR Part 91, Part 119 and Part 133 regulations emerged from CASA (2018-2021).

The threat was a pattern of serious near-accidents involving Controlled Flight Into Terrain (CFIT). These near-CFIT incidents involved single-pilot, medical transport helicopters and were recorded in the following ATSB (2021b) investigation reports: AO-2021-022, AO-2021-018, AO-2020-038, AO-2020-031 and AO-2018-039. One might have expected that the pattern and the seriousness of such incidents would have prompted a regulatory response such as a temporary restriction on NVG winching or, for high-demand tasks, a requirement for two pilots, yet no such response was forthcoming. Especially concerning, when a public regulatory response does eventuate, it will be contending with some 1.8 million words of core regulations as well as the recently released 200,000 words of fatigue management and performance-class planning legislation. Significantly, at the time of writing, none of the near-CFIT incidents are implicated with fatigue or engine-failure risk – the risks with which CAO 48.1 and CASR Part 133 have been so consumed. Equally significant, while the near-CFIT risk goes unaddressed, there are still no indications from the regulator that CAO 48.1 and CASR Part 133 are addressing credible risks in a proportionate way.

It is worth mentioning here that none of this is meant to deride the efforts of individuals at CASA as though they are deliberately "deaf to the appeals" of industry (Australian Flying, 2020, p. 1). Instead, the key point is that liability-proofing and its mass of regulatory materials is likely to detrimentally affect any human being with finite cognition. It is not, therefore, a case of the regulator being deaf as it is of the regulator being overwhelmed and overloaded – and an overloaded regulator, like an overloaded pilot, is a regulator likely to, in terms often seen in accident investigations, lose situational awareness. This seems to be what is happening in the examples given above – a breakdown in the regulator's industry-wide situational awareness. In any case, the failure of a proportionate regulatory response noted above further evidences the negative effects of excessive liability-proofing. These negative effects congest authentic safety attentiveness and lead to the next implication: the "irony of legislationism".

9.7 Implication 6: The "Irony of Legislationism"

The "irony of legislationism", to reappropriate Bainbridge (1983), is the more safety rules, the more regulatory and administrative attention these rules demand, and the less attention for everyday and emerging risks. The result is that the judgement needed to address real-time threats is at best diluted and at worst distorted by the very regulations purporting to make things safer. The effect compounds when in the regulatory congestion and excess safety is de-optioned from adaptive alternatives. This occurs when, with another layer to the irony, attention must narrow to the rule-bounded options which are often legalistically limited, more complex, and more attention-sapping than non-rule-bounded options. Judgement and decision-making are thus pressured towards a type of narrow-minded compliance and away from an adaptive resourcefulness.

Take again the example of the fatigue-regulation, CAO 48.1. The problems of CAO 48.1's 105,000 words have already been covered but consider a more granular problem. This is seen most obviously in the duty-time stipulations for "Medical Transport Operations and Emergency Service Operations" in Appendix 4B (CASA, 2019, p. 59). To determine the daily flight-duty limit (just a single number which should be relatively simple to derive), one must assimilate a total of 56 clauses, subclauses, and sub-sub clauses (pp. 59-62). Following that, when it comes to the Off Duty Period (ODP); another 20 clauses, subclauses and sub-sub clauses must be absorbed (as well as the previous 56, since ODP depends on the calculated duty time). Thus, after reading through 76 clauses, most likely at 3am or some other wearying hour, one may or may not determine the correct ODP. Regardless, it is not likely any regular human will consistently make sense of 76 individual meaning-making clauses coherently each and every time. Additionally, even if they try, more effective strategies to mitigate fatigue will become less obvious because cognition will narrow to deciphering the multitude of clauses. Moreover, the preconditions are then set for legalistic arguments over which clauses have priority and which ones do not. In the end one may well just say something like "I'm just going to do what I think is safe" with all the commensurate problems of non-consistency that then arise.

Another example of the way in which rule-bounded options create safety problems is in the recently minted CASR Part 91.267 (2022, p. 469). This regulation uses 501 words to tell aviators they break the rules if they fly below 500 feet. Out of the 501 words, there are only 61 words covering the 500 feet clause with the other 440 words telling a pilot – via some 23 clauses and sub-clauses – the various ways in which the regulation may not apply. When one turns to the Part 91 plain English guide in the hope of plain language, the clauses are reformatted into de-numbered italics but retain all of their convoluting caveats and sub-caveats (CASA, 2021h, p. 97). Thus, when one tries to operationalise the rule in an actual flight, they must process the legalised caveats and sub-caveats along with the operational demands of the flight. Hence, with the pilot's finite cognition assessing, judging, and deciding to what degree these 23 clauses and sub-clauses apply, the judgement available to the outside world is lessened.

The irony of legislationism deepens when one considers the ineffectiveness of rules to curtail, amongst other things, Controlled

Flight into Terrain (CFIT). This is evidenced by every CFIT "rule breaker" who has inadvertently collided with terrain having well and truly broken, albeit unintentionally, a legislated minima (for example, reports AO-2019-018 and AO-2020-004 from the ATSB Airtable Database). Yet, these reports, and other modern safety investigations, do not normally have as a legitimate causal factor "the pilot was in breach of low flying regulations". No such observations are made because rules can only be complied with if the crew's attentiveness, proficiency, and decision-making are uncompromised. Thus, a finding detailing the regulatory breach, albeit legally correct, would be completely ineffectual in preventing future accidents. So too, for the same reason, would any recommendation be similarly ineffective that pilots must always comply with low flying regulations. Yet that does not prevent findings intimating this very thing. For example, in AO-2017-092 (ATSB Airtable Database, 2021), the investigator commented that in high workload situations, "pilots may not be able to effectively process information or make good decisions". Of course, the inability to effectively process information must, by definition, include an inability to effectively process an excessive number of procedures and rules. Yet more recommendations, requiring more procedures and rules, were then generated by the ATSB findings in that report. Again, this is not to say rules or procedures are bad – just that too many rules and procedures are bad because they, ironically, subvert the very safety goals they purport to champion.

The irony of legislationism brings a distinct and significant contrast between the documents of the operational world and the documents of the legal world. If a pilot wants to know how to avoid breaching an aircraft limit, or how to enact an emergency procedure; it is easily found in checklists, bold-face actions, and quick reference handbooks (QRHs). In contrast, if a pilot wants to know, from the law, how to avoid breaching an icing regulation, or a low flying regulation, or any other regulation; there is no such ease of reference in the 1.8 million words of safety regulations (see again the reader's journey in Section 6.6). The contrast is significant because operational texts such as checklists and QRHs highlight that aviation is inherently complex and requires, as seen in Sections 8.3 and 8.5, high degrees of situational attentiveness and judgment. Thus, operationalised texts are designed with concision and accessibility to avoid textual congestion and distraction: regulatory texts have no such compulsion and instead tend to congest judgement with unconcise and inaccessible language (as seen in Chapters 5 and 6).

If the irony has implications at the operational frontline, it has even greater implications at the managerial levels. Consider the aviation managers whose finite cognition is consumed in large part by the logistics of regulation-generation. Also consider their change of decisional modality. Not only must they read and assimilate regulations but then, to remain compliant, they must write their own tomes in the form of ever-growing operations manuals, training manuals, SOPs and so on. The point has already been made that the reading of 1.8 million words takes attention-sapping time, but this is amplified even more by the writing, rewriting, and reviewing of company-level words to stay compliant with the 1.8 million words of core regulations.

The irony deepens further at the level of the regulator for it is the regulator that, in like manner to the operational managers, must constantly write, review, audit, rewrite, educate and enforce the ever-growing mass of regulatory materials. This represents a time-burden that far exceeds the burden placed upon readers. Vonnegut (from Chapter 5) tells us to "pity the readers who have to identify thousands of little marks on paper, and make sense of them immediately", but far more pity for those who must write (and review and audit and rewrite) these words in the first place.

A recent report entitled "CASA in Crisis" points to this dynamic when it observes of the CASA workforce:

> Understaffing, workload intensification, failures to deliver critical training and professional development, and a seemingly endless process of restructuring is stretching the workforce to its limits. Retirements, resignations, and inaction to fill vacant technical positions are putting our reputation for having one of the best safety records of any country in the world at risk. The unprecedented reduction in corporate knowledge, and resultant lack of oversight, increases the very real risk of a catastrophic accident (Professionals Australia, 2019, p. 2).

Of course, that extra burden is not the only issue. The main issue is, as for operational contexts, the compromised attentiveness of CASA personnel to deal with current and emerging threats. Just as it is important for operators to have bandwidth to enable attentiveness to the royal three, so too the regulator. It is not hard to imagine, even now, considering the sheer size of regulatory materials, unrecognised risks existing beyond the mental bandwidth dedicated to screen and keyboard. One can also imagine the change in thinking for the regulatory staff from "how can we enhance and strengthen safety" to "what new rule do we need, or what old rule needs rewriting and how can we be legally correct"? Again, this is not to say liability-proofing or rules, in and of themselves, are a negative rather that, as indicated in Section 5.4.4, there needs to be a balance – a regulatory Goldilocks zone – where neither too many nor too few rules exist. The regulatory Goldilocks zone would see rules appropriately proportionated to the actual risks of an accident and not just to the risks emanating from lawsuits.

This is not to be oblivious to the work evident by the regulator since the Aviation Safety Regulation Review (Forsyth et al., 2014). The review made the point that regulatory dynamics have "contributed to a breakdown of trust between industry and CASA"(2014, p. 98). Since then, CASA has worked to produce numerous plain English guides for various regulatory parts. Plain English guides, it must be acknowledged, are an important step towards addressing the ironies of legislationism. However, given the regulator accepts no liability for their use, and given they do not have the regulatory authority of the law itself, the reader will be constantly questioning whether the guide can be authoritative and will, in all probability, refer back to the original legislation as verification. This will, in effect, mean reading at least twice as many words to derive what should have been relatively concise, clear, and appropriate in the first place. This is especially a problem when, for example, the Part 91 plain language guide alone has some 74,000 words on top of the core regulation itself.

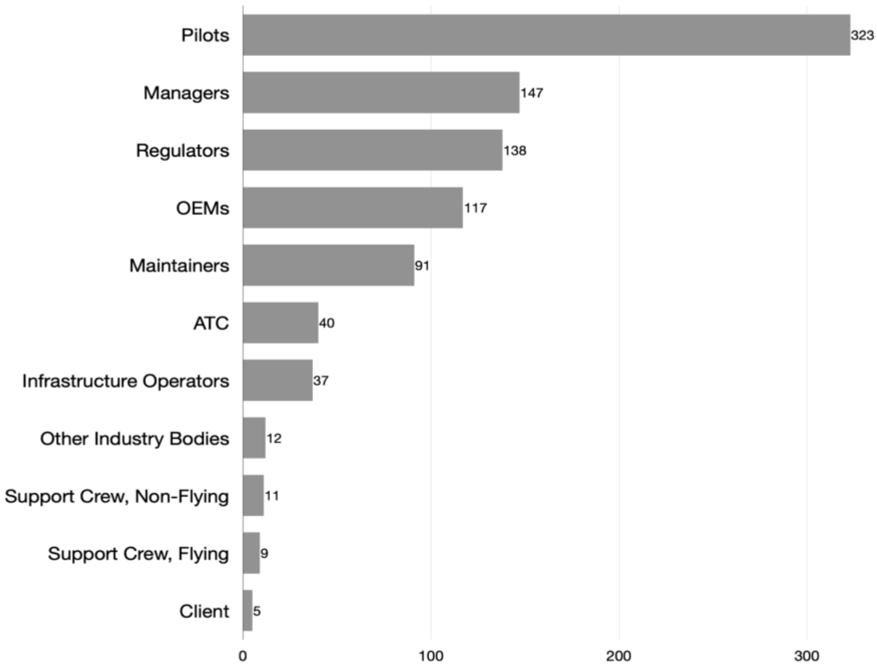
In summary, it can be seen there are strong indications an irony of legislationism exists in the current regulations. The irony leads to more head-down attentiveness to rules with less heads-up attentiveness to emerging hazards. Thus, the many operational variables, nuances, and situations that are not covered by a regulation or procedure can easily go untended while the excess of rules and procedures create their own emergent threats. Moreover, the way "safety" is conceptualised in the wake of such meaning-making leads to a narrowing of cognitive attention. In this narrow-mindedness, made so by the excess of rules and procedures, the very attributes required for safety success – situational attentiveness and undistracted judgement – are compromised.

9.8 Implication 7: Response-able Agents Matter More Than Ever

The first important point to note from the "Responsible Agents" sections in Chapter 8 is that the cliche "safety is everybody's responsibility" seems to be true (which should not be a surprise since cliches are often as true as they are cliched). The ATSB Airtable identifies the agents who have actioning power over the ten attributes across the 391 investigations. This can be seen in Figure 9.6 below where the responsible agents identified across the Airtable from 1968 to 2021 are displayed (Chapter 3 has the methodology behind this):

Figure 9.6

Responsible Agents Identified Across the Airtable from 1968-2021



Note. From Column 16 of the ATSB Airtable Database (2021).

11 responsible agents are identified in Figure 9.6. These are included because they appear more than five times in the 391 investigations curated by Airtable. These agents are very literally

those individuals "response-able"; that is, able to respond to, or having a duty to respond to an incident and accident attribute. These agents represent the answer to the questions "who could have prevented the accident from happening in the first place?" and "who can prevent it from happening again"? Very simply, these agents are the ones whose causal action, or causal inaction, could have prevented, or will prevent, accidents in the future based on the ten meaning-making attributes identified. These agents – agents of situational attentiveness, vocational proficiency, decisional agility, and the rest of the ten attributes – embody safety and unsafeness.

As can be seen from Figure 9.6 above, the greatest degree of agency is given to pilots (323). This is followed by, with a large step down numerically, to managers (147), regulators (138), OEMs (117) and maintainers (91). These five groups represent the greatest of the response-able agents which suggests this is where the greater proportion of regulatory efforts should be applied.

There is much that can (and perhaps will) be used as future research (Chapter 10) but for now the important thing to note is what is called the "consilience of agency". Consilience of agency ties into the concepts of nestedness and consilience already discussed in Sections 9.4 and 9.5 above. This describes the way in which an agent's attributes have direct and real influence on other agent's attributes which, in turn, have an aggregate influence on overall safety. Thus, the situational attentiveness (and the other nine attributes) of an engineer, a regulator, a manager etc. have immanent effects on all the various attributes other agents are responsible for – not the least of which is the pilot at the controls.

Most ATSB Airtable investigations show very clearly this consilience of agency where, ranging from OEM design-decisions to operator training programs, to ATC situational awareness and so on; such attributes affect the ability of various stakeholders to employ their own agency and their own attributes (see each "Responsible Agents" section in Chapter 8). This of course should be no surprise given aviation's preoccupation with what has become known as organisational or systemic factors in recent decades (and as indicated by the increase of the organisationally-enabled attribute shown in Section 8.9).

What is perhaps a surprising finding though, is how little accountable or responsible managers are mentioned individually as responsible agents in the ATSB investigations. Instead, generic terms such as "the operator", "the company", or a company name are used. This contrasts with the more obvious responsible agents such as pilots, engineers and air traffic controllers who are almost always identified as individuals e.g., "the pilot", "the controller", "the engineer" etc.

For example, ATSB report AO-2020-011 states "the incident highlights the importance of flight crew completing full readbacks, as well as controllers correcting any readback discrepancies immediately" (ATSB Airtable Database, 2021). In this example the flight crew as individuals, as well as the controllers as individuals, are responsible to complete readbacks or correct readbacks but notice the next responsible "agent" in the same incident: "*Singapore Airlines* issued a notice to flight crew, highlighting strategies to manage high workload situations". The hermeneutic question to be asked here is why not "*managers* issued a notice to flight crew…" Singapore Airlines, after all, is just a brand or company name not an agent capable of actioning a response. It is people – agents – who action responses, not brands or companies.

The same genericness applies to mentions of the regulator. For example, Report AO-2019-025: "A harness instrument, commonly issued by the CASA stated that…" (ATSB Airtable Database, 2021). Again, as for companies and operators, the regulator is referred to as an entity without mentioning individual agency and yet it is not the generic "CASA" who can ultimately act but an individual agent (or agents) within CASA. This may seem pedantic, but agency at the managerial levels is important because, as has been pointed out earlier, the consilience of safety (see Section 9.5 above) means one attribute affects all the others. For example, the ATSB often mention a pilot's workload management, but workload management is consilient with vocational proficiency and vocational proficiency is directly attributable to a manager of a company creating and sustaining an effective training program in the first place (or a manager within the regulator regulating such programs).

With this in mind, and as an antidote to this semantic dilution, a reality-based approach might articulate a recommendation as something like "this incident highlights the importance of *managers* empowering flight crew to handle workload through effective training programs" or "this incident highlights the importance of *OEM managers* ensuring aircraft design enhances aircrew situational attentiveness" etc. This is especially important given Figure 9.6 above shows managers and regulators are second only to pilots in terms of actionable agency.

In many ways the de-individuation of managerial responsibility can probably be seen as a reflection of liability-proofing. This is because companies exist to, amongst other things, protect individual members from individual loss when legal action ensues. From a meaning-making perspective, this has an obvious, although perhaps unintended, consequence. Since responsible and accountable managers are never assigned clear individual actions, the sense of meaning-making consequence for a manager may be quite diluted compared to a pilot, controller, or maintainer. For frontline individuals, consequence is as real and immanent as limit-exceedance, damage, injury, and even death however for the managers, the felt threat is easily diluted not only by distance from the frontline but also by the ongoing preoccupations of profits-producing and liability-proofing. This also means it is potentially easier for managers to disproportionately re-individuate their own responsibility, in a kind of reverse-vicariousness, onto their individual staff. This would be especially likely if managerial responsibility also involves managerial culpability.

The reality-based attributes in Chapter 8 are also a necessary corrective to any "culpability fixation" on pilots alone. This is because they show the essentialness of shared responsibility across the various stakeholders (see again Figure 9.6 above for the variety of parties involved). It is not just the situational awareness, the proficiency, and the judgement (along with the other attributes) of pilots that counts in optimising safety, but also that of managers, regulators, OEM managers, maintainers and so on. Figure 9.6, collating the responsible agents in Chapter 8, represents the many accident investigations across some 50 years and 391 reports where multiple agents have had multiple opportunities – "response-abilities" – to prevent and/or respond, to accident preconditions. More importantly, it represents the many times it was not just the situational inattentiveness or decisional unreliability of pilots that contributed to an accident, but actually that of the respective managers, regulators, OEM managers, maintainers and so on.

Thus the ten attributes are a safety-call well beyond the cockpit to all of the other contemporary and responsible agents as well. This completes the discussion on the key findings from Chapter 8. The next section presents the IASA model to which the findings of Chapter 8, and indeed the thesis, are aimed.

9.9 Modelling the Findings: The IASA Conception of Safety

The final part of this chapter coheres the ten red rules into the Incident, Accident, and Safety Attribution (IASA) Model (see Figure 9.7 below). The IASA model expresses and coheres the findings of Chapter 8 and the implications discussed above.

Figure 9.7

The Incident Accident Safety Attribution (IASA) Model

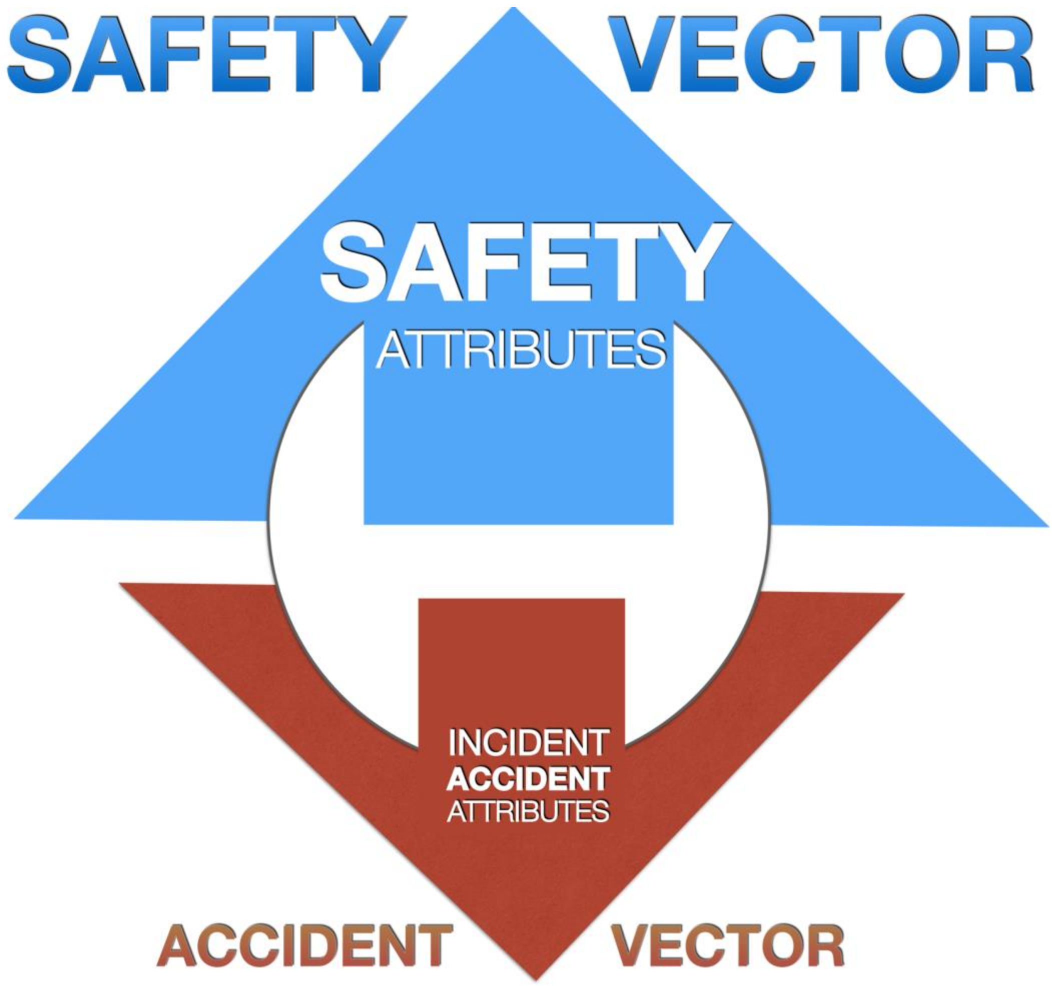
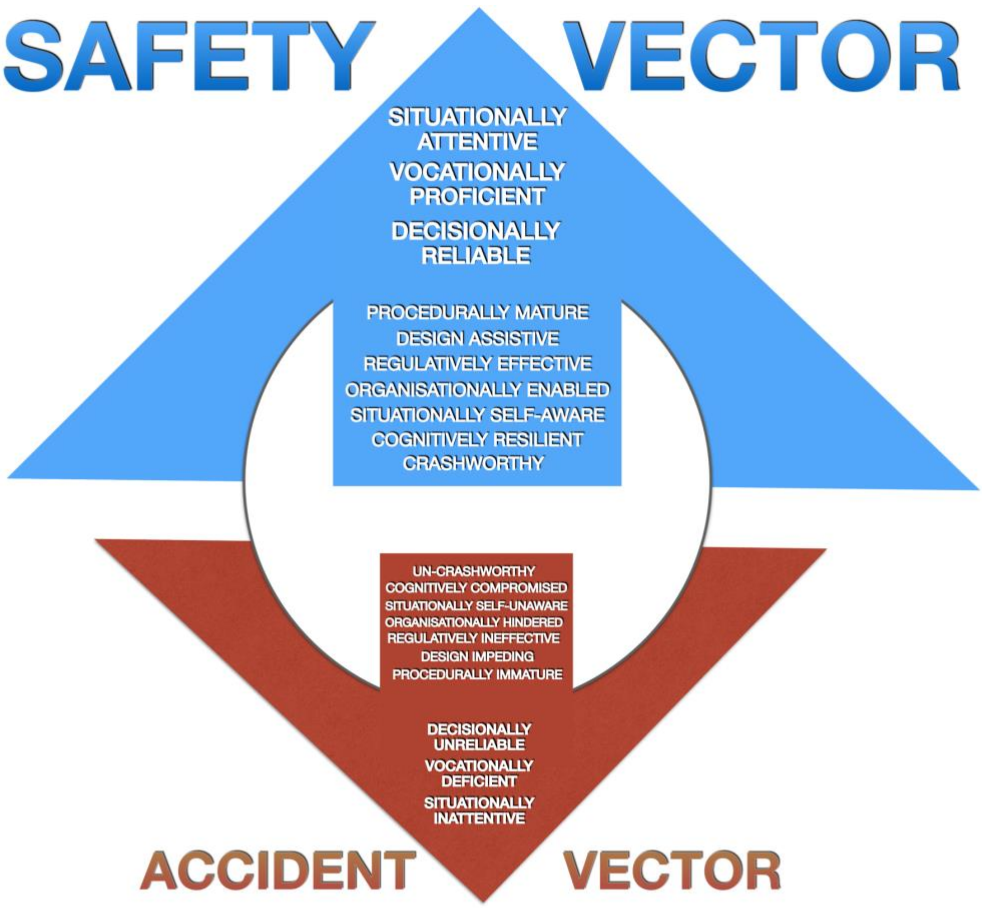


Figure 9.7 is a simplified diagram of the IASA Safety model where the ten attributes in their totality are represented as vectors: blue for the safety attributes and red for the incident and accident attributes. Thus, the model can also be referred to as the "Accident Vector" or "Safety Vector" model. The ten individual safety attributes are represented as being vectorially "resolved" into the single, and deliberately larger, blue vector while the incident and accident attributes are represented by the smaller red vector. The blue vector is shown as larger than the red to indicate safety involves maximising the blue; that is, maximising the safety attributes. At the same time, the red vector is smaller to indicate reality-based safety involves minimising the incident and accident attributes. Figure 9.8 illustrates the model with the ten attributes.

Figure 9.8

The IASA Vector Model with the Ten Attributes (the ten red rules)



Figures 9.7 and 9.8 display the attributes – the ten red rules – as existing within a circle superimposed on unresolved "vectors" in opposition to each other. The blue vector – the safety vector, or even, more colloquially, the vigilance vector – connotes safe operations (i.e., into the blue sky) as well as representing the consilient total of each of the ten red rules. In the same way the red vector (red to suggest the danger of an accident) encompasses the incident and accident attributes.

The blue and red vectors, in their unresolved forms, also represent the way in which safety is an ongoing pursuit where elements of both the red and the blue exist, to some degree, within people and organisations. This is intended to demonstrate the realism of imperfect humans at work in imperfect systems without giving up on the ideal of consistently pursuing the optimisation of the blue safety vector. In any case, if the blue is maximised and the red minimised then optimised safety will be the result.

The maximisation of the blue and the minimisation of the red in the IASA model – which is the optimisation of overall safety – is drawn from the optimisation of each individual attribute. For example, consider the situational attentiveness/inattentiveness attribute as illustrated in Figure 9.9 below.

Figure 9.9

The Situational Attentiveness/Inattentiveness Attribute

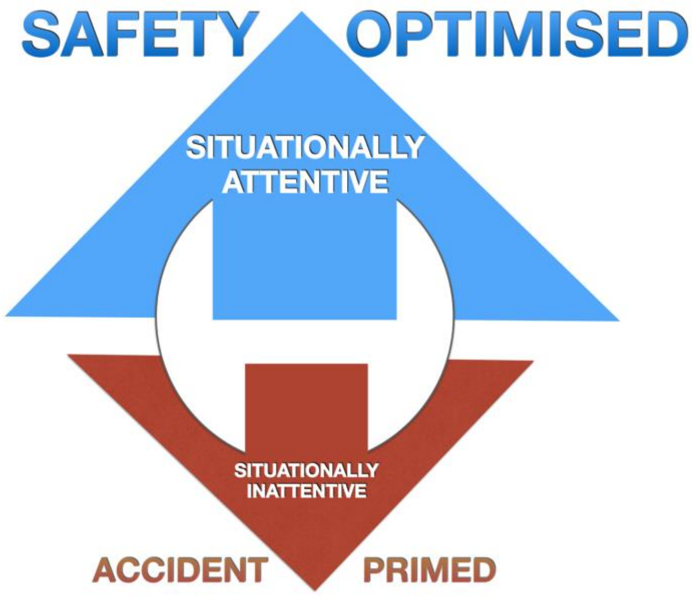
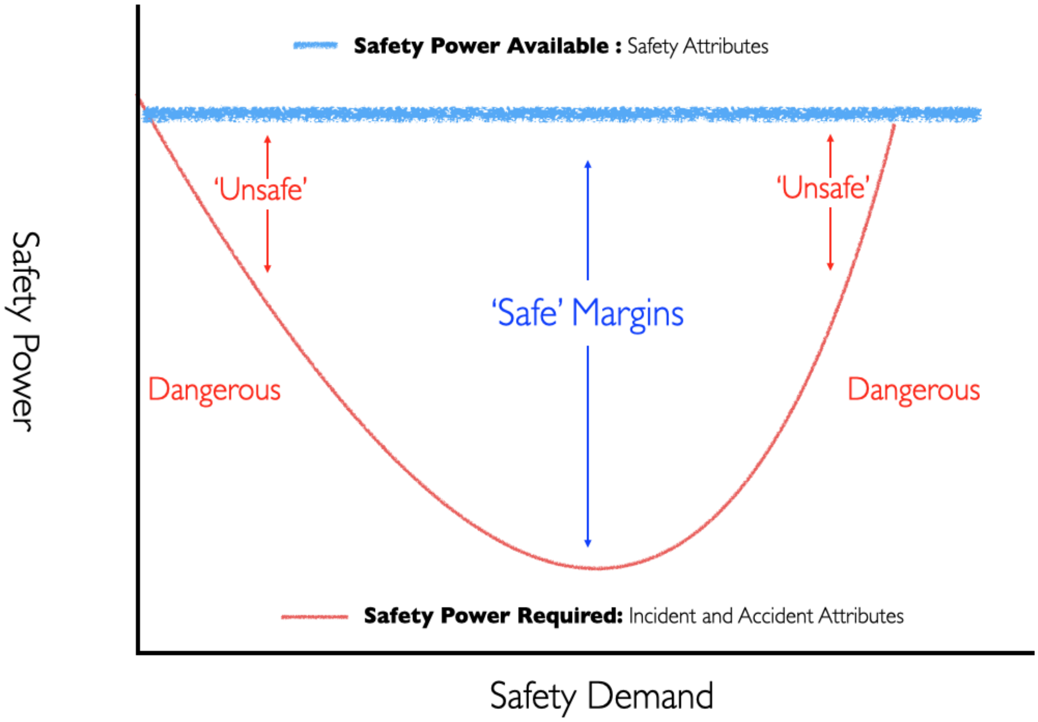


Figure 9.9 shows that when the individual blue vector of situational attentiveness is maximised, and the red vector of inattentiveness is minimised, safety is optimised. To maximise the blue, one looks to strengthen and enhance the various facets of situational attentiveness while constraining and controlling the things that detract from this attribute. The more this occurs, along with the other attributes, the more safety is assured. Again, as for the whole, individual safety is not just the avoidance of certain risks or hazards but rather the optimised state where the red vector is minimised and the blue vector maximised.

This principle of the safety vector overcoming the "weight and drag" of the incident and accident vector has an important meaning-making feature relating to the preknowingness of aviation professionals – it echoes a principle modelled aerodynamically. This is where power available must exceed power required (because of drag and gravity) for flight to occur. This principle can be seen as a guiding metaphor in Figure 9.10 where safety power available – the ten safety attributes – must sufficiently exceed safety power required (the incident and accident attributes), for a person or an organisation to be safe.

Figure 9.10

The Ten Attributes as a Guiding Metaphor: Safety Power Available / Safety Power Required



While perhaps imperfect, the power available / power required metaphor aptly illustrates the reality that safety is not the mere mitigation of risk alone but rather the power – the safety power – to meet the demand of these risks. This allows one to meaningfully conceptualise safety in a way that is usefully actionable. For example, a fatigued pilot looking at a challenging weather situation may well decide to reject the flight because the safety-power required is potentially greater than the safety power available. This prevents, thanks to the pilot's situational self-awareness, a circumstance where the pilot's cognition is overloaded and as a result situational awareness breaks down and decisional unreliability results. On the other hand, an alert, vocationally-proficient pilot may well see the safety power available as more than able to deal with the demands of challenging weather.

There are several additional features of the IASA model worth noting. First, the circle in the model is intended to represent the hermeneutic circle. The reader of the IASA model is being invited to enter this circle and to fuse their safety knowingness with the reality-based IASA concepts of safety. Second, drawn as it is from the real-world of incidents and accidents, the circle represents the idea of the reality-based context of the IASA model by connoting the circle (in its likeness to a planet) as a real-world conception of safety and unsafety. Finally, the elevation and enlargement of the royal three – situational attentiveness, vocational proficiency, and decisional reliability – are intended to connote their governing influence on safety. They are also shown at the tip of each vector to demonstrate they depend consiliently upon the attributes below them.

9.10 Summarising the IASA Conception of Safety: Eight Features

There are eight summarising features of the IASA conception of safety that represent the key findings of the research. These are:

- **The mitigation of non-semantically anchored safety conceptions (also known as motherhood statements).** IASA-safety mitigates motherhood statements about safety – statements that are "inexact, indefinite and indirect" and "without any specified plans for realisation" (see Sections 9.2 and 9.3 above). Instead, IASA safety demonstrates embodied and narrativised meaning-making that draws from safety experiences while avoiding the extremes of unwieldy narratives or reductionistic definitions. This feature of the IASA model, as pointed out in Section 9.2 above, allows optimised assimilation of actionable concepts by providing a workable specificity of safety while avoiding semantic unwieldiness.

- **The provision of actionable concepts relating to the maximisation of safety attributes and the minimisation of incident and accident attributes.** IASA safety employs a symmetry of action that seeks not only to constrain and/or control the incident and accident attributes, but to strengthen and enhance the safety attributes. One is not completely unproficient (or not); inattentive (or not); unreliable (or not); rather, one has different measures of safety at play over time. Therefore, IASA safety is not binary. It insists on gradations; that is, on thickness and width, rather than a thin red line between safe and unsafe. In the IASA model, safety is shown in Figures 9.7 and 9.8 by the blue vector being significantly larger than the red. Safety is hence the maximisation of the safety attributes and the minimisation of the incident and accident attributes. Thus, one should not ask whether organisations and individuals are safe but rather *how* safe are organisations and individuals to which the answer should be another question (but a more actionable question): how well maximised are the safety attributes and how well minimised are the incident and accident attributes – or, more simply, is the blue maximised and the red minimised?

- **The provision of a meaning-making depth to safety.** This third feature of the IASA model signposts, or at least implies, the nestedness of inhering concepts (see Section 9.4 above). The IASA model demonstrates this nestedness in each of the ten attributes in Chapter 8 and each indicative nested concept. These can then be cross-referenced to the

ATSB Airtable (2021) to further elucidate and cement the knowingness of the IASA conception of safety. In this way, binary and/or semantically shallow conceptions of safety are further mitigated.

- **The provision of meaning-making width to safety.** IASA safety indicates the consilience of influences (see Section 9.5 above) by showing the totality of influences acting to create safety (or unsafety). Consilience gives safety meaning-making width. This can be seen in the blue and red vectors being made up of – and consiliating – the ten attributes. Again, in this way, binary and/or semantically shallow conceptions of safety are mitigated.

- **The provision of proportionate attentiveness.** IASA safety emphasises proportionate attentiveness to proportionate threat; that is, it emphasises the royal three without disregarding the other seven attributes (see Section 9.6 above). The IASA model does this by showing the royal three predominating in bold print at the tip of each vector, thus emphasising their pronounced influence over the 391 investigations in the Airtable. It also insists the royal three are dependent upon the other seven attributes to significant degree. For example, one cannot be situationally attentive if one is vocationally deficient and, underneath all that, if one has not been provided with the right training (organisationally hindered) or appropriate procedures (procedurally mature) and effective regulations (regulatively effective) then the royal three will not be optimised which means safety will not be optimised.

- **The encouragement to create regulations and procedures that are neither too many nor too few.** IASA safety encourages an optimised "sweet spot" or Goldilocks zone for regulations and procedures (see Section 9.6 above). The IASA model indicates this by showing the royal three have the largest influence on safety and this means that these should have the largest regulatory attentiveness. Moreover, the rest of the ten attributes are, in and of themselves, a means of ensuring attentiveness focuses on actual factors that are key to incidents and accidents since the ten attributes encapsulate themes from the 391 investigations and the ATSB reports.
- **The encouragement to create empowered agency.** IASA safety emphasises the response-ability of agency. Each agent in the IASA model is, literally, response-able; that is, able to respond to prevent future incidents and accidents by assimilating the ten attributes. This can be tracked from the IASA model to Chapter 8 where each of the ten attributes implies specific agency (pilots, engineers, regulators, managers, ATC etc.). Importantly, IASA safety insists on comprehensive agency from managers to frontline practitioners to regulators to suppliers to manufacturers so on – not just from pilots or engineers. If managers believe situational awareness is important for their frontline crews than situational awareness must also, to be consistent, be important for them as managers. Similarly, if managers believe good judgment and vocational proficiency is important for pilots, they must also believe good judgement and proficiency is important in their own roles as managers. In the aftermath of an incident or accident, the IASA model thus insists the primary rectification – at all levels – should

be to remediate, restore and strengthen the agents who can respond to similar threats in the future – not just write another rule or procedure. Unless of course, that rule or procedure demonstrably empowers managerial and frontline agents to be more situationally attentive, vocationally proficient, and decisionally reliable. Thus, IASA safety insists, where appropriate, safety actions should not be assigned to company brand-names but to the individual positions of the individual managing agents.

- **The representation of safety as being non-static – as having movement and direction.** Finally, the IASA Model is indicative of a non-static, thoroughly active representation of safety. The vector descriptor indicates this because vectors, by definition, denote direction and movement. Thus, the IASA model is an active, ongoing *manner and way* of doing safety. It is not intended to be a fixed model in the sense of an academic theorem (though it can be used as such), instead it is a reality-based, meaningful way of seeing and assessing the safety (or unsafety) of a particular individual or organisation.

There are many other meaning-making features of safety that can be derived from the IASA safety model, but the features discussed above are considered key and are further discussed within the context of the findings, recommendations, and ideas for future research in the next chapter (Chapter 10).

9.11 Conclusion to Chapter 9

In conclusion to this chapter, consider again that the first half of the research made the disconcerting point safety can be construed in markedly disparate ways by regulatory writers, regulatory readers, and indeed, the regulations themselves. Hence, for anyone who yearns to make safety actionable in a reality-honouring way, the idea that safety can be so differently construed is likely to invoke a significant level of concern. It also makes the question in the thesis title seem all too relevant –what does safety really mean anyway? More specifically, after all this research, what is a workable definition of safety? It would be very tempting to answer that a key point of the research has been to demonstrate any definitional meaning of safety will probably be severely deficient in terms of effective meaning-making. However, since aviation professionals are so acclimated to definitions the following IASA definition (albeit grudgingly) is offered:

> Safety is a state of optimisation where, as much as reasonably practicable, the best attributes of the aviation team are empowered while the worst are disempowered. The empowerment of the best attributes involves empowering, at all levels, situational-attentiveness, vocational-proficiency, decisional-reliability, procedural-maturity, design-assistiveness, regulatory-effectiveness, organisational-enablement, situational-self-awareness, cognitive-resilience, and crashworthiness. At the same time, the disempowerment of the worst attributes involves disempowering, at all levels, situational-inattentiveness, vocational-deficiency, decisional-unreliability, procedural-immaturity, design-hinderances, regulatory-ineffectiveness, organisational-hinderances, situational-self-unawareness, cognitive-compromise, and un-crashworthiness.

This working "definition" serves as a summative introduction to the IASA conception of safety. However, as pointed out above, reality-honouring meaningfulness can only come through embodied and experiential connections to the other meaning-makers expressed comprehensively in Chapter 8 and indeed, in all the observations and findings from the remainder of the research. Thus, the reality-based answer as to what safety means, is that safety is a concept hermeneutically fused with the various reality-based observations and findings of the previous chapters as demonstrated in Figure 9.11 below.

Figure 9.11

IASA as the Fusion of the Reality-based Observations and Findings in Previous Chapters

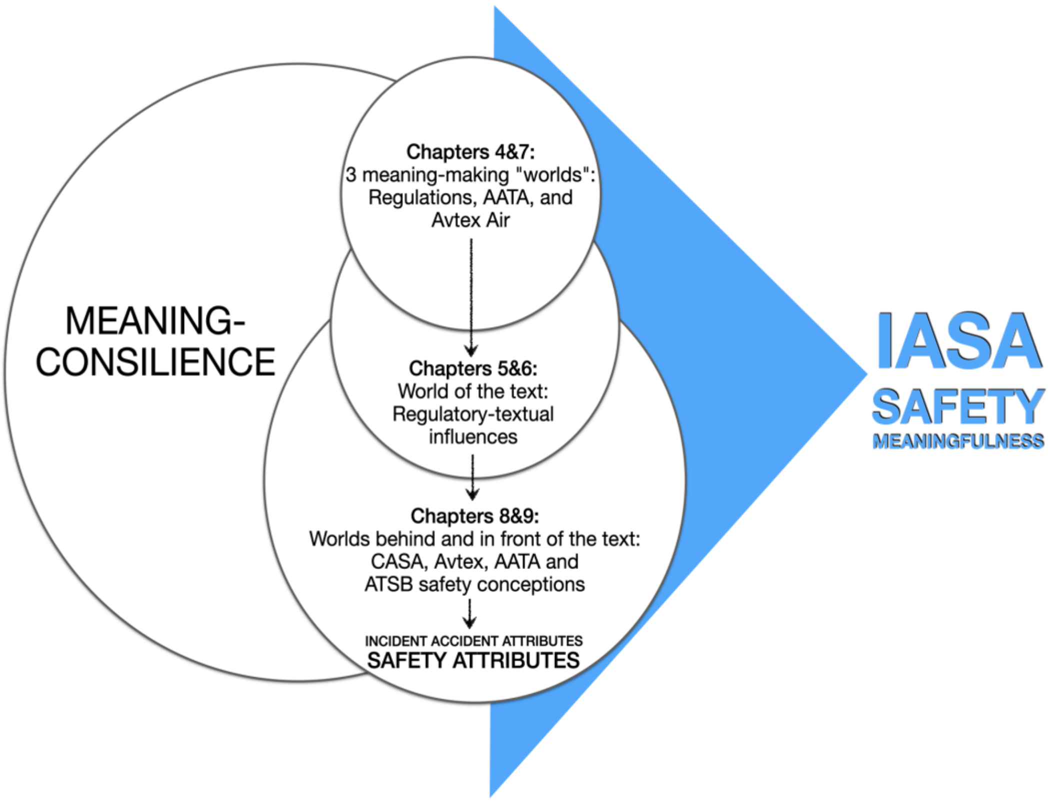


Figure 9.11 above shows how the IASA concept of safety emerges from the fusion of the three meaning-making worlds introduced in Section 3.4. In this fusion of textual and experiential meaning-

making realities, the IASA model emerges to provide a more compelling, more reality-based, and a more actionable conception of safety than that evident in the current regulatory milieu. Thus the key word "reasonable" in the "as much as reasonably practicable" IASA "definition" is meaningfully fused not to inconsistent inner conceptions of safety but to the learnings from the "rules in blood" accidents.

In summary, this current chapter has discussed and cohered various findings from previous chapters out of which has emerged the IASA conceptualisation (and "definition") of red rule safety. With safety so conceptualised, the research moves to the closing of the hermeneutic circle and the conclusion of the research in Chapter 10.

CHAPTER 10 CLOSING THE CIRCLE - CONCLUSION

Whatever safety takes resides within very special people.
Let's hope you have such people when the occasion arises.

~ James Reason

10.1 Introduction

10.1.1 The Confusing and Distracting Problem

At 7500 feet on climb-out, the Avtex Air pilot of VH-PGW (henceforth referred to as "PGW") heard the number two engine surge. The pilot, with a flight nurse on board, had just taken off on a medical charter flight. The engine surged, cut out, then surged again causing the aircraft to yaw from side to side. The right hand engine was experiencing uneven fuel flow and the resultant surging was creating what the ATSB (2012) would later call "a confusing and distracting problem to identify and manage" (p. 5).

In May 2010, one month before the incident, CASA had issued Avtex Air "a notice of proposed action to vary, suspend or cancel its Air Operators Certificate" and it was this action by CASA that led to the appeal at the AATA and the eventual suspension of Avtex's operations (*Avtex Air Appeal*, 2011, p. 5). However, the suspension was too late to stop PGW crashing on Canley Vale Road near Bankstown Airport killing the pilot and the flight nurse on board. The ATSB (2012) determined, amongst other findings, the accident occurred because:

> Following the shutdown of the right engine, the aircraft's airspeed and rate of descent were not optimised for one engine inoperative flight. In addition, spectral analysis indicated it was unlikely that the left engine was being

> operated at maximum continuous power as the aircraft descended (p. 5).

This was a sobering finding in the light of the *Avtex Air Appeal* findings. The AATA discovered Avtex Air managers had failed to provide their pilots with the vocational proficiency they needed to deal with engine malfunctions (*Avtex Air Appeal,* 2011, p. 28). As for CAR 238 and icing, where Avtex had maladapted conceptions of safety, so too for one engine inoperative (OEI) training. The result was 26 pilots were never properly trained and endorsed in the years prior to the Canley Vale accident. This was discovered by CASA in an audit in 2008 and rectification ordered in the form of remediation training. However, when PGW crashed onto the suburban streets of Bankstown some two years later, the accident pilot was one of four Avtex Air pilots who had not received any remedial training. When the retraining was finally completed on the other pilots by an approved testing officer it was noted by the AATA:

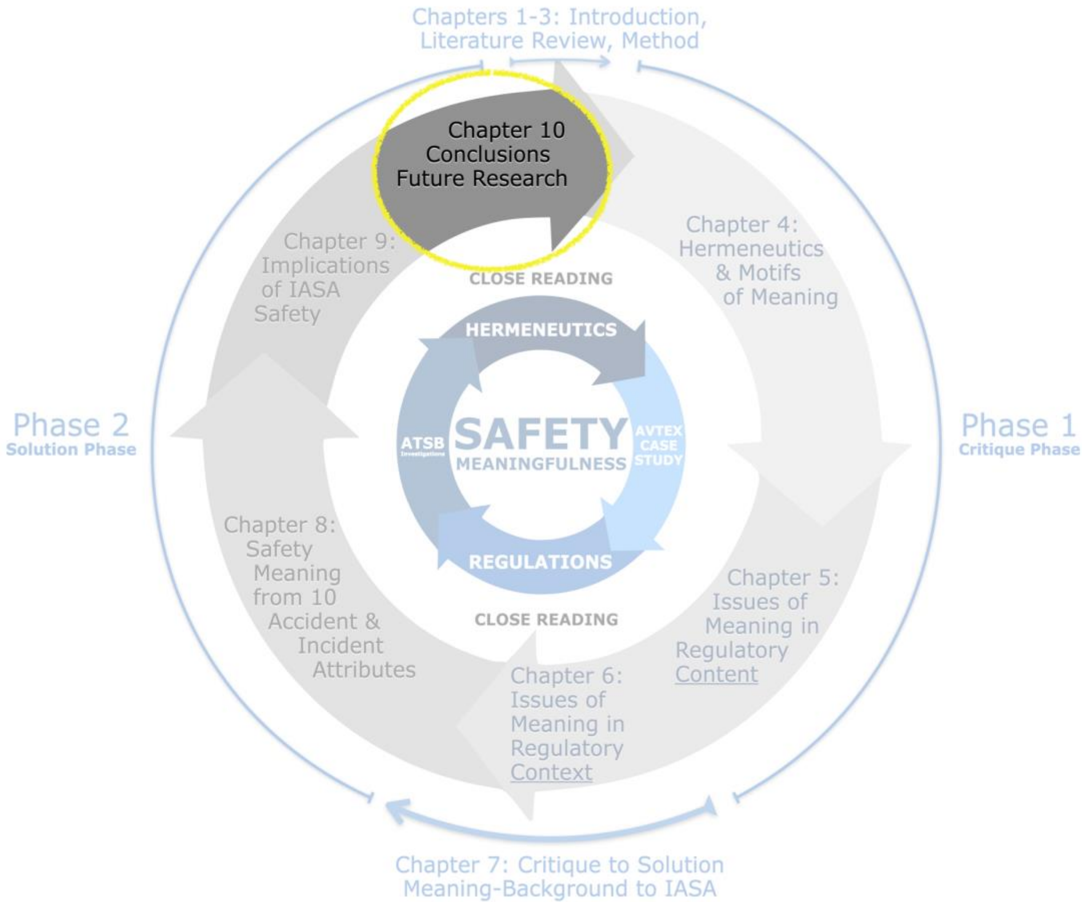
> All the pilots who she retrained were rusty and knowledge-deficient as far as asymmetric situations were concerned. She found the pilots were deficient when tested in an aircraft synthetic flight trainer and confronted with engine failures at low altitude and/or maximum weight at take-off (*Avtex Air Appeal,* 2011, p. 28).

When the Canley Vale pilot encountered "a confusing and distracting problem" a recoverable situation became deadly because the pilot did not have the necessary proficiency to deal with the emergency. His company had broken a red rule. Yet, at the AATA, the danger – the unsafety – of vocationally-deficient pilots was denied by the Avtex Air lawyer who insisted the real issue was not safety but "a legalistic approach" within which "reasonable people could differ" (p. 31). This was not as obtuse as it sounded. Up until 12 months before the PGW accident, at least according to a CASA audit, Avtex Air was "maintaining compliance" and "was operating at an 'alright' standard comparable to other operators at Bankstown" (ATSB, 2012, p. 33). Thus, if one had visited Avtex Air along with the CASA auditors they would have, in all probability, agreed with the lawyer that there was nothing significantly unsafe about the company. This prompts serious questions as to how Avtex Air could only be grounded some 12 months later after the Canley Vale accident (its third fatal accident as a company entity) What this example and the research as a whole shows is that regulatory and auditing compliance is no guarantee of safety. Companies such as Avtex Air can easily be deemed compliant while they are committing serious red rule safety breaches. According to the CASA audit, Avtex Air was "compliant" even as many pilots flew untrained for OEI emergencies. CASA also noted Avtex Air was "operating at an 'alright' standard comparable to other operators" (p. 33) yet pilots were constantly being pressured to fly in icing conditions, to fly through extended thunderstorm lines, and to ignore maintenance defects. When the "compliant" flight of PGW occurred less than a year after the audit, an unproficient pilot was at the controls and that unproficiency led to an accident. Thus, in the age of regulatory excess, the Canley Vale accident shows an aircraft can be compliant all the way to the scene of its own accident.

"How safe are the safety regulations and what does safety mean anyway?" is the title and the main focus of this research. If Avtex Air, Canley Vale, and the research findings are any indication, the answer is that the safety regulations need to be returned to authentic, red-rule accident-proofing. The research has examined how this might be accomplished even though, as shown, safety is so ambiguous for regulatory readers, regulatory writers, and within the regulations themselves. To account for this, the research has identified ten emergent incident, accident, and safety attributes from 391 safety investigations over 50 years (1968-2021). These ten red rules form the IASA model which, in turn, provisions aviation stakeholders with a shared and actionable safety concept to ameliorate the effects of safetyism, fussy law, and liability-proofing.

Figure 10.1

The IASA Vector Model as Emergent from the Research Movements



10.1.2 Aim and Aspect of the Chapter

The aim of this chapter is to invoke the last cycle of the hermeneutic circle and to bring the research to a close. The fall of Avtex Air's PGW is used as a segue to the safety-essential findings, recommendations, and future-research ideas.

10.1.3 Overview of the Chapter

The outline of Chapter 10 is:

- Section 10.2 – A word on the integration of findings, recommendations, and future-research ideas.
- Section 10.3– Circling back to Avtex Air and the four research questions.
- Section 10.3.1 – Interpretation and authority.
- Section 10.3.2 – Meaning-making / meaning-maiming.
- Section 10.3.3 – Quality-assuring textual content and context.
- Section 10.3.4 – Regulatory-reform and the ongoing potential for misinterpretation.
- Section 10.3.5 – Unmet goals of concision, appropriateness, and clarity.
- Section 10.3.6 – The fragmentation of safety by regulatory context.
- Section 10.4 – Findings in the light of the IASA model.
- Section 10.4.1 – Avoiding motherhood statements of safety.
- Section 10.4.2 – The utility of reality-based safety.
- Section 10.4.3 – The problems of regulatory reflexivity and legislative irony.
- Section 10.4.4 – The personal and collective agency of safety.

- Section 10.5 – Conclusion: So what does safety mean anyway?

10.2 A Word on the Integration of Findings, Recommendations, and Future Research Ideas

The findings, recommendations, and ideas for future research emerge from previous chapters and are thus integrated below. The findings are summarised from the research with chapter-references to allow easy cross-reference. The recommendations and ideas for future research, where applicable, are then provided directly below each finding to show the logical connection. This allows easy correlation between the findings, recommendations, and future-research ideas. It is also in keeping with the hermeneutic circle which insists findings are intrinsically shaped by, and emerge from, each other.

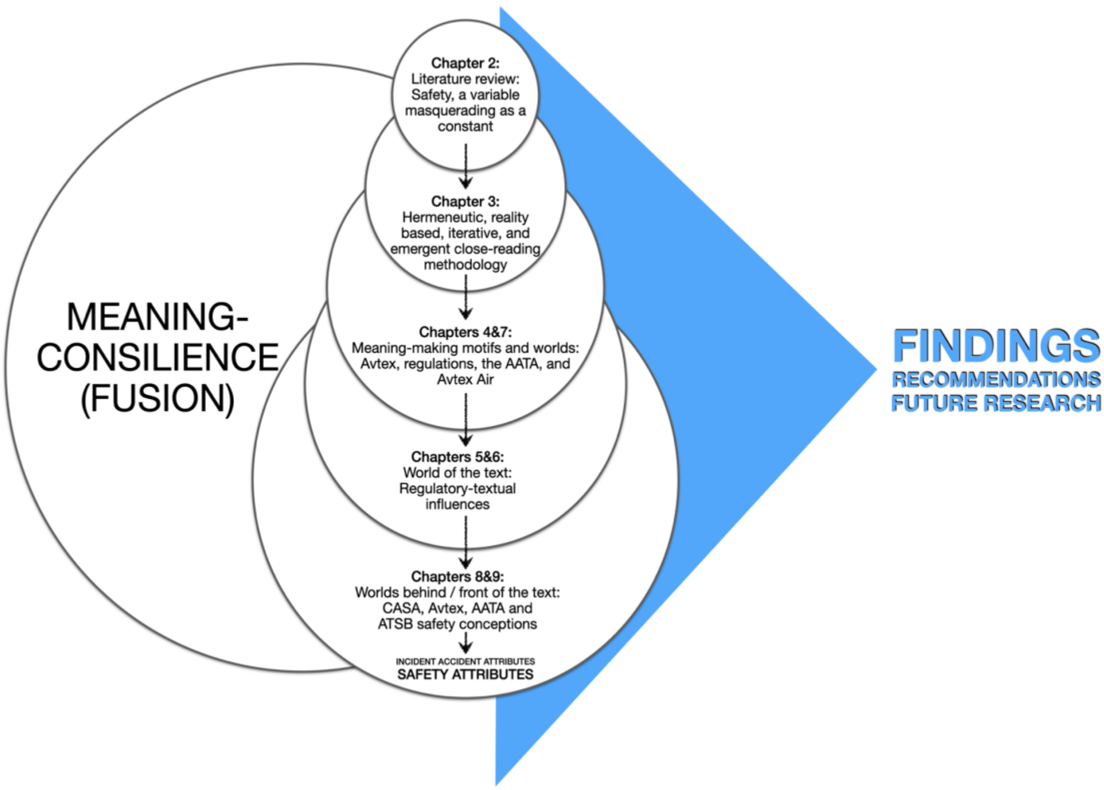
Of note, the findings, recommendations, and future research areas are expansive and broad rather than deep and narrow. This is because, as pointed out in Section 3.7 of the methodology, hermeneutics is a totalising discipline and hence the findings reflect a totalising perspective which, in turn, has led to the development of a field, rather than a focus, of research – a field that might be called, slightly tongue in cheek, "aeroneutics" (or perhaps just "aeronautical hermeneutics").

10.3 Circling back to Avtex Air and the Four Research Questions

Before progressing to the findings, recommendations, and future research section below, and as an introduction to that section, it is also worth noting this chapter emerges directly from the four research questions introduced in Chapter 1. The first research question, it will be recalled, asked what makes something meaningful in the first place? Figure 10.2 below shows that what makes something meaningful is the fusion, or consilience, of the worlds of the text and their various inhering characteristics. It also shows the research, in its totality, is itself a meaning-making fusional and consilient whole.

Figure 10.2

The Final Fusion: Emergent Findings, Recommendations and Future Research



These consilient characteristics were examined hermeneutically and a meaning-making methodology, also based on hermeneutics, was used to express and substantiate a meaningfulness of safety throughout the research. This began by asking the second research question which was how is meaningfulness conveyed textually? The answer was five textual content and context attentives to meaningfulness; namely, the attentives of the representational, the dictional/syntactical, the situational, the modal, and the material. These five textual attentives both prompted and answered the third research question which was how well do the textual characteristics of the regulations meaningfully convey their own safety requirements?

The answer was that the safety regulations, because of their legalistic and liability-proofing characteristics, tend to subvert their own textual goals of concision, clarity, and appropriateness. Additionally, because it was shown the regulations nowhere compellingly made meaning of safety in a way that could be shared and standardised to the satisfaction of various aviation stakeholders, the fourth research question emerged: if safety means different things to different people, how might safety be more objectively, compellingly, and actionably conceptualised? This led to the second phase, the solution phase, of the research where an emergent meaning-making methodology led to an accident-derived concept of safety substantiated by the formation of the ten attributes and the IASA model. The IASA model, it was shown, is intended to provide a more compelling, more reality-based, and a more actionable conception of safety than that currently provided by the regulations.

A final question then, tying all the other questions together, seems best as one of application: how can aviation safety regulations, and the safety regulator, better provide industry with a type of meaningful safety that really matters? More specifically, how can the regulations and the regulator better provide industry with the accident-proofing safety required by the *Civil Aviation Act 1988* to "maintain, enhance, and promote the safety of civil aviation, with *particular emphasis on preventing aviation accidents and incidents*" (p. 11). To answer this question, and to summarise the research, 10 findings, recommendations, and future-research ideas are presented.

10.3.1 Interpretation and Authority

10.3.1.1 Finding 1: Meaning-making, not black and white print, is convictional and authoritative.

If future PGW-like accidents are to be avoided, the key hermeneutic finding from Chapter 4 should be emphasised – it is not the regulations themselves that are ultimately actioned, it is their interpretation. This is because aviation readers are meaning-making agents legitimising, or de-legitimising, interpretative consent to bring about a convictional, and compelling "final" meaning.

Chapter 4 showed that the influence of the text itself, with the imbued meaning of the author, does not operate singularly as a reading occurs. Instead, numerous other influences participate, modify and condition meaning – and these influences all have varying degrees of convictional power. Three main influences were identified in Chapter 4 and developed in subsequent chapters: the profits-producing motif, the liability-proofing motif, and the accident-proofing motif. In Chapters 4 and 5 it was found there were significant indications the profits-producing motif was supplanting safety at Avtex Air. In the same chapters, it was found there were strong indications a liability-proofing motif was at work in the safety regulations which, to this day, continues to dilute compelling conceptions of safety.

10.3.1.2 Recommendation

Given the various meaning-making motifs at work in aviation, it seems legislative managers within CASA and the ATSB should look to better monitor the downstream, post-publication effectiveness of regulatory texts. This enhanced monitoring could include the following:

- Anonymous surveys sent to licence-holders a set time after receiving said licence. These would have reality-based scenarios requiring applied interpretation of existing and/or new regulations. In like manner, a set time after new regulations are issued, a similarly styled survey could be utilised. Such surveys would also involve a post-implementation review process with regulatory writers reflecting upon possible opportunities for improvement.

- The ATSB taxonomy including a category for legislative or procedural misinterpretation.

- Regulators and investigators trained in basic hermeneutic/meaning-making principles. This is especially important because the misinterpretative trends noted in Chapters 5 and 6 show an increasing potential for recurrence as legislation continues to rapidly grow (as it has over the last 20 years).

10.3.1.3 Future Research

Future research would involve the rationalisation of the surveys and taxonomised misinterpretations suggested in 10.3.1.2 above for overall effectiveness. This would be with a view to identifying better methodological methods to identify misinterpretative patterns and, if proven effective, such methods could be used by future consistency and standardisation panels (see 10.3.3.2 below).

10.3.2 Meaning-Making / Meaning-Maiming

10.3.2.1 Finding 2: Texts are symbols, arranged according to codified conventions, that contain both meaning-making and meaning-maiming potential.

Chapter 4 introduced, and Chapters 5 and 6 expanded upon, the hermeneutic truth that textual meaning is both expressed and limited by its textual characteristics: it has both meaning-making and meaning-maiming potential. Additionally, because of the "preknowingness" a reader brings to the text, there is always the potential for maladapted meaning-making even if the text happens to be extremely well-written. Therefore, writers and readers must maintain a healthy awareness of the inhering and representational characteristics of written language. Otherwise, pilots, regulators, managers, and other stakeholders will continue to find themselves with the same vocabulary of safety but a manifestly different dictionary.

10.3.2.2 Recommendation

As for education around other aviation threats, individuals or managers of companies should consider education around basic hermeneutic/meaning-making principles as a part of human factors training. This should be aimed at both the readers and authors of safety-essential aviation texts.

10.3.2.3 Future Research

Future research would see the development of a hermeneutic/meaning-making training-needs-analysis and curriculum. This would be tailored to various stakeholder groups based on the varied levels of authorial or readerly interactions.

10.3.3 Quality Assuring Textual Content and Context

10.3.3.1 Finding 3: A text is designed to produce an author-intended outcome, and this should be quality-assured in some way.

A safety regulation is intended to mediate authorial intent and produce an author-intended outcome of safety but, as seen in Chapter 5, this outcome can be confused by regulatory-textual characteristics. The content-characteristics of syntax and diction, held against the Act's own self-stated syntactical and dictional principles, strongly suggested the stipulations relating to "concise, appropriate and clear" have not been met (*Civil Aviation Act 1988*, p. 14). It is therefore important to quality-assure regulatory effectiveness independent of the regulator. This is because the research shows strong indications the safety regulations are not meeting the safety needs of industry and instead have been subverted by liability-proofing concerns.

10.3.3.2 Recommendation

The FAA has what is called the Aviation Safety Consistency and Standardisation Initiative (Federal Aviation Authority, 2021). This joint-initiative involves industry participation and seeks to highlight regulatory ambiguities and inconsistencies. This initiative should be investigated by managers at CASA, in consult with industry, for its viability in the Australian context. This is especially important considering the rapid growth of regulatory words over the last two decades and the indications this growth continues unabated.

10.3.3.3 Future Research

Numerous style guides and clear-writing guides provide principles for effective textual communication. This is along with several online tools that provide assessments of the clarity (or otherwise) of a text. Future research could assess the viability and effectiveness of these tools and then apply them – in an aviation-customised (an "aeroneutic") way– to aviation texts (for example, to regulations, operations manuals, training manuals, technical manuals, and so on). This would be with a view to improving readability and useability. These assessments could be used by future consistency and standardisation groups or by AOC stakeholders.

10.3.4 Regulatory Reform and the Ongoing Potential for Misinterpretation

10.3.4.1 Finding 4: The dictional and syntactical features of CASR Part 91.710 – the "new" CAR 238 – do not help to clarify the point of contention at Avtex Air.

CAR 238 was examined exegetically in Chapter 5 via the close-reading. Syntactical and dictional observations were made indicating numerous areas of misinterpretative potential. An alternate version of the CAR 238 regulation was written out of these observations – shortened and clarified – to address the point of contention raised by Avtex Air (whether one could "have a look"). CAR 238 was contrasted with the new CASR Part 91.710 where it was discovered this Part had increased its word-count by 62% from CAR 238 and yet failed to clarify the contention. In fact, the new Part 91.710 currently contradicts the ruling of the AATA. This is despite the new Part 91.710 being completely rewritten and provisioned with a plain English guide (which also does not clarify the point of contention). More broadly, in like manner to CAR 238 and Part 91.710, numerous other regulations were identified as creating significant potential for ambiguity; namely, CAO 48.1, CASR Part 91.267, and CASR Part 133 (see Section 9.7).

10.3.4.2 Recommendation

Ambiguity-potential of regulatory texts seems to be relatively unexamined until appearances like those at the AATA or in other legal contexts such as coronial inquests. It is assumed non-public documents of enquiry or complaint to CASA and/or the ATSB would provide further indications as to the extent of ambiguity-creating regulations. It is recommended managers at CASA and the ATSB review these, and other potential sources of misinterpretative indicators, for patterns of broader learning. This could be done in concert with the above recommendations and/or future research.

10.3.4.3 Future Research

CAR 238, CAO 48.1, CASR Part 91.267, CASR Part 91.710, and CASR Part 133 were used as meaning-making and meaning-maiming examples within the research, but a broader analysis was outside the scope of the thesis. Future research would broaden this sampling to other regulations. Additionally, tailor-made exegetical metrics could be created to further aid analysis of regulatory materials against the Act's goals of concision, clarity, and appropriateness. These could be derived from the sources in 10.3.3.3 above but also the government's own *Plain English Language Manual* (Office of Parliamentary Counsel, 2013) and the *Reducing Complexity in Legislation Manual* (Office of Parliamentary Counsel, 2016). These metrics would also include methods for inter-rater reliability and consistency.

10.3.5 Unmet Goals of Concision, Appropriateness and Clarity

10.3.5.1 Finding 5: Various counts relating to regulatory concision, appropriateness, and clarity indicated these goals were not being met.

To determine concision, appropriateness, and clarity, as required by *the Civil Aviation Act 1988,* several content-counts were conducted. The first, to determine concision, involved a comparative word-count of legislation (2001 to 2021). Here it was noted core regulations had increased some 242% from 545,814 to 1,864,532 words. It was also noted CAOs had increased 20% (328,814 to 395,744 words) even though CAOs were supposed be subsumed by the MOS suite in the regulatory reform program. Meanwhile, the MOS suite, added 662,257 words over the period of comparison (see Section 5.5.2 and 5.5.3). This strongly suggests the Act's concision directive has not been met.

The second content-count, to determine appropriateness, compared the regulatory increase with the total number of ATSB-recorded accidents for 2001-2019 (ATSB, 2011; ATSB, 2019). Here it was observed the accident rate has discernibly increased despite more than a threefold increase in regulatory words and the Australian aircraft fleet hours (BITRE, 2020, p. 17) remaining relatively stable (see section 5.5.4). This strongly suggests the Act's appropriateness directive has not been met.

The third content-count, to determine clarity, examined publicly available ATSB to CASA actions requesting regulatory clarifications (1997-2019). Here it was noted, from 2010-2019, these actions increased by 68% indicating such clarifications were becoming more common the more regulations increased (see section 5.5.6). This indicates the Act's clarity directive has not been met.

10.3.5.2 Recommendation

It is recommended managers at CASA commission a study to determine the "safety-ceiling" of regulatory word-counts. This should begin with an examination of which regulations are supported by modern evidence-based safety-cases (perhaps empowered by the ten red rules that are, to this end, designed to be used as safety-clarifying terms of reference as seen in Section 9.2). Extant regulations, if not supported by a safety-case, should be further examined to establish the accident-proofing legitimacy of their regulatory genesis. This is especially important because of the safetyism and liability-proofing tendency evidenced in Sections 6.6 and 6.7. This, it will be recalled, was the "fussy law" tendency of bureaucrats and law-writers, removed from frontline safety concerns, towards overregulation that then, albeit unintentionally, dilutes and congests accident-proofing safety goals.

10.3.5.3 Future Research

The 242% increase in regulations over the last 20 years (and their continued increase) suggests there is a functional assumption by the regulator at work: unlimited readerly capacity to assimilate and apply the ever-growing regulations. Future research would look to apply existing psychological research (or create new research) to establish the amount of regulatory materials humans can meaningfully recall and apply in aviation contexts. This research would consider the cognitive capacity of operational managers, regulators, and frontline practitioners and the effects of regulatory excess on decision-making in these contexts. It would also, via surveys and other means, account for current managerial time expended upon regulatory upkeep. This time could then factored into management of change assessments and costings.

An additional trajectory for future research in this area would identify which rules have emerged from, or are designed to prevent, genuine accidents and are, as Kern puts it, the "rules in red" (Kern, 2009). This research could also establish a methodology for determining the red-rule safety of proposed legislation in the future.

10.3.6 The Fragmentation of Safety by Regulatory De-Contextualisation

10.3.6.1 Finding 6: The contextual situatedness, modality, and materiality of regulations fragments a compelling concept of safety.

Having established the meaning-making implications of textual content for safety in Chapter 5, the research moved to Chapter 6 and contextual implications. Here the legal-contextual characteristics of safety regulations were examined to determine whether they provisioned a compelling conception of safety. This was considered important since the regulations themselves, through the Act, self-statedly express safety as their goal. Three contextualities were identified and applied to Avtex Air and CAR 238: the situational, modal and material.

First, in the case of situational contextuality in Section 6.3, it was shown the structure of CAR 238, and other legal texts, have no contextual flow. Instead, CAR 238, and its successor CASR Part 91.710, have non-related textual surrounds such as ICAO minimum runway lengths and pre-flight planning requirements. Without meaningfully connected textual surrounds, the framing of safety necessary for compelling meaning-making, and so necessary for the regulation's own goal, becomes fragmented leaving readers influenced by a horizon of subjectivity.

Second, for modal contextuality, Section 6.4 showed how the punitive modality of aviation regulations jars with the concept of just culture. This was evidenced by CASA's own articulation of just culture where "people are not punished for actions, omissions or decisions" while – justly – "gross negligence, recklessness, wilful violations and destructive acts are not tolerated" (CASA, 2021b). This clashed with the dictates of strict liability which insists "intent, knowledge, recklessness or negligence" *need not be* considered. This tension makes it hard to see how just culture can truly be achieved within the modalities of criminal code and strict liability. It also makes it hard to see how such a tension helps achieve the safety goals of the Act. Instead, as noted from the Aviation Safety Regulation Review (Forsyth et al., 2014), the modal contradiction contributes to industry confusion, dissatisfaction, disharmony and a breakdown of trust (p. 98).

The final contextual feature was that of materiality in Section 6.5 where it was shown the textual aesthetics of regulations have a negative influence on meaning-making. Here it was demonstrated, via a reader's journey, that the de-narrativised and scattered legal forms of the regulations – each with their own isolated clauses, sub-clauses, and sub-sub clauses – made compelling meaning-making extremely difficult. It was also exceedingly difficult to answer a simple question as to whether CAR 238 or Part 91.710 was the entirety of one's obligations regarding icing conditions and safety. This was shown in Section 6.6 by tracing a reader's likely trajectory through the various CASA regulations and guidance materials and being constantly hindered by references to higher order references, lower order references and/or newer-order references.

10.3.6.2 Recommendations

The contextual analysis of regulations led to the conclusion safety, as a concept in the regulations, is fragmented, compromised, and de-legitimised. Regulatory safety; that is, safety as an emergent concept from the textual characteristics of the regulations themselves, is uncompelling. Simple contextual recommendations for regulatory managers at CASA are as follows:

- In concert with the recommendations above, seek to reduce and rationalise regulatory word-counts and unify the various regulations (CAR, CASR, CAO, and the MOS suite) into functionally contexualised, single-source documents targeted at already identified industry sectors e.g., aerial work, medical transport, scheduled public transport, maintenance, continuing airworthiness etc. These single-source documents could be called "Current Regulations for Aerial Work Operations", "Current Regulations for Medical Transport Operations", "Current Regulations for Scheduled Public Transport Operations" and so on. The structure of each of these documents should be driven by the goal of ensuring each is a true "one stop shop" for regulatory readers not, as shown in Section 6.6, the unrequited promise of one.

- The unified current regulations should be a modern document, in plain English, optimised for electronic use and featuring hyperlinked in-text references to other parts of the document, and/or guidance materials, and/or other relevant regulations, as well as a hyperlinked master index. An additional benefit to this unified PDF would be greatly enhanced word-search functionality. This is currently frustrated by multiple regulatory documents existing over multiple PDF files in multiple locations.

- The unified current regulations suite should also include, where appropriate, hyperlinks to the "why" of the regulations – the "why" being the relevant safety case for each regulatory set.
- The creation of a regulatory "Quick Reference Handbook" (QRH). This would exist in relation to the unified current regulations document in the same way an OEM QRH exists in relation to a flight manual and would provide a distilled, quick reference, ready-reckoner for busy operators.
- The creation of "At A Glance" infographics that curate and distil key informational portions of regulatory and operational materials. This could be in the form smart-device-optimised digital cards that can be swiped and zoomed to quickly find key information.

More complex and higher-demand recommendations are as follows:

- A safety case is commissioned by CASA managers and the Office of Parliamentary Counsel demonstrating the effectiveness (or otherwise) of criminal-code, strict liability, and current litigious modalities in preventing accidents and serious incidents. This case should seriously consider why safety regulations cannot simply exist in the same manner as the more concise, more clear, and more appropriately worded plain English guides already published by CASA. In any case, CASA should seriously consider why it does not accept liability for the use of the guides in the same way as it accepts liability for the original regulations. This failure to accept responsibility for its own plain English guides now means aviation professionals are simply forced to read both the plain English guides *and* the original regulations. This adds to the already onerous task of reading and understanding the regulatory excess evident in the already existing 1.8 million words of core regulations and the 66,000 words being added every year (see again Section 5.5).

- In parallel, a safety case (with the same terms of reference) is carried out by selected industry representatives. On completion each set of findings are debated before an independent tribunal and recommendations made as to the overall viability of regulations in their current form and their proposed future evolution.

10.3.6.3 Future Research

As was pointed out in the literature review in Chapter 2, Plato was the first to point out no one can come to the aid of the written word if it falls victim to misunderstanding, intentional or unintentional. At the end of the research, it seems that clear, concise, and appropriate aviation regulations are Plato's victim. Future research would establish what could come to the aid of the written word in its regulatory forms. This would look at the various interactions between the author (the regulator) and the readers and how these interactions could be optimised to provide more relevant and effective feedback cycles.

10.4 Findings in the Light of the IASA Model

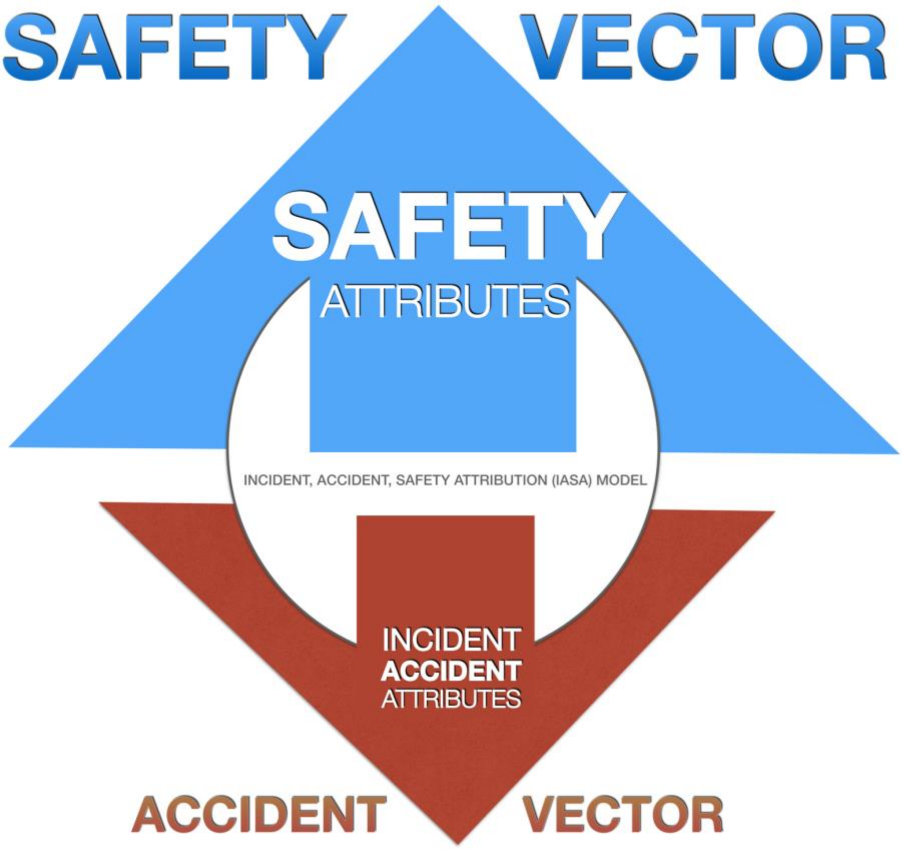
Having established the significant problems for safety within the safety regulations (Chapters 5-6), the research moved to provision a more meaning-full concept of safety. It did this via an emergent meaning-making methodology (Chapter 7) and the world of aviation accidents curated from the ATSB Airtable Database (2021). This movement led to the ten attributes and the IASA Safety Model (Chapters 8-9).

As was demonstrated numerous times in the critique phase of the thesis, maladapted conceptions of safety can prevail because no compelling and reality-based conception of safety exists to underpin the regulations. This leads to a propensity to "throw another rule" at incidents and accidents with the unspoken assumption that more rules must mean more safety. However, it was evident more rules do not lead to more safety and moreover, such rules, in excess, are subverting their own safety goals. Chapter 8 attempted to address this situation by provisioning a more actionable and more reality-based vision of safety. It did this by using the hermeneutic insight from Derrida that safety as a textual concept (as a nested opposition) exists in antithesis to the incident and accident findings. Ten incident, accident, and safety attributes from the safety actionables were then thematised from the ATSB safety recommendations (see Sections 8.3-8.12 and the ready-reckoner at Appendix F).

These red rules were underpinned by the eight principles of the meaning-making methodology in Chapter 7 and were used to construe safety in a more reality-based and compelling way than current definitional or model-based conceptions. In Chapter 9, seven key implications emerged from the ten red rules and, in iterative dialogue with earlier findings, were used to construct the IASA Model as per Figure 10.3 below.

Figure 10.3

The IASA Vector Model Reprised



Note. See Section 9.9 for a full description

The findings from Chapter 8 and 9, and the IASA model, are summarised below with integrated recommendations and areas for future research. Again, since the research is introducing a field – not just a focus – of inquiry, the scope of recommendations and future research is expansive.

10.4.1 Avoiding Motherhood Statements of Safety

10.4.1.1 Finding 7: The IASA Model expresses the necessity of reality-based safety and the avoidance of motherhood statements.

In Section 9.2 it was shown the expression of safety as "preventing accidents and incidents" in the *Civil Aviation Act 1988* had much in common with motherhood statements. A motherhood statement was presented as "a worthy concept that few people would disagree with but without any specified plans for realisation". The genericisim of safety, coupled with the various meaning-maiming characteristics highlighted in Chapters 5 and 6, made it difficult to conceptualise a compelling vision of safety in the regulations. In contrast, the IASA model infuses its conception of safety with the anchored specifics of the ten red rules emerging from actual ATSB-investigated accidents.

10.4.1.2 Recommendation

It is recommended aviation regulatory authors and readers consider their conceptualisations of safety in light of the ten red rules of the IASA model. The ten red rules can be used as indicative terms of reference in determining the degree to which regulations and procedures address these rules (since the red rules express accident-causing characteristics from actual investigations). The red rules can also be used as a reality-basis to develop a more compelling safety-case for extant and future regulations. Additionally, the attributes could be used to determine whether the proportion of regulatory and procedural word-counts is appropriate to the prevalence of the ten red rules. This would enable a courageous culling of the "rules in brown" (Kern, 2009, p. 87) and thus reduce regulatory and procedural excess.

10.4.1.3 Future Research

Future research would seek to develop, perhaps quantitatively, as well as qualitatively, the IASA model into risk management processes that can achieve the recommendations above. This would be done by using the ten red rules as a means of identifying general then specific hazards (in a big to small way – see more in

Section 9.6). Additionally, appropriate risk management proportionality could be established by the IASA model. This would be done by assessing whether the proportion of regulations and procedures address the most prevalent safety attributes of situational attentiveness, vocational proficiency, and decisional reliability.

The ten red rules also provide organising principles upon which lines of enquiry can be established when assessing the safety (or otherwise) of an organisation or individual. This could be done by determining to what extent the organisation or individual prioritises and embodies the red rules. Future research would see these lines of enquiry developed and more deeply systematised.

10.4.2 The Utility of Reality-Based Safety in the IASA Model

10.4.2.1 Finding 8: The IASA Model and the utility of a reality-based approach to safety meaning-making.

In section 9.3, it was shown that many technical definitions of safety are too unwieldy and bulky for everyday use. Others are too simplistic to truly represent the reality they are portraying. Additionally, when legalistic definitions are used, they have very little semantic warrant for non-legalistic readers. Moreover, when definitions are used as a surrogate for embodied meaning-making, and without acknowledgement of this limitation, definitionalism hinders any compelling concepts of safety.

In Section 9.4, this idea was developed into the idea of "nested" meaning-making within the ten attributes. Here, meanings within meanings were identified; that is, more specific sub-meanings subsisting within the broader meaningfulness of the attributes. This led to Section 9.5 and a similar concept that saw meaning-making as wide not just deep; that is, as consilient with other attributes.

This observation insisted the "whole picture" of safety is a reality not working in atomistic categories but rather as a totalising whole. Thus, it was shown many taxonomies of causation used by various investigative and safety bodies, while having utility in their granularity, made it difficult to establish "big picture" answers to big picture questions.

10.4.2.2 Recommendation

It is recommended aviation regulatory authors and readers consider the use of a hermeneutic and reality-based approach, such as that used to establish the IASA model, to other aviation key terms and their meaning-making explanations. This would not necessarily equate to the abandonment of definitions but rather their expansion into useful principles and attributes that better reflect the reality they are trying to express. Additionally, regulatory authors and readers ought to pay careful attention to how these key terms are being used in every-day language, as it is probable these every-day conceptions will have far more compellingness than specialist definitions. To this end, the ten attributes could be used as parallel schemata for organisations. This would serve to clarify and prioritise the metrics provided by modern SMS/QMS data during managerial meetings.

10.4.2.3 Future Research

Future research would seek to establish the effectiveness of current conceptions of safety compared to the ten attributes. Contemporary conceptions of safety appear in such publicly available documents as safety policies and safety-management position descriptions. Efforts have begun to collect these documents where they are publicly available and future research will contrast these with the ten attributes (with the ten as a comparative metric of reality-based safety). This will be done against the content and context of these documents in like manner to the textual analysis in Chapters 5 and 6. Future research would also seek to "road test" (flight test) the ten attributes as a useful data gathering and presentation methodology for aviation organisations.

10.4.3 The Problems of Regulatory Reflexivity and Legislative Irony

10.4.3.1 Finding 9: IASA and the potential to moderate "regulatory reflexivity" and "legislative irony".

Using the IASA model's royal three – situational-attentiveness, vocational-mastery, and decisional-reliability – Section 9.6 demonstrated the danger of a "cognition-clogging" dynamic. This is where the regulatory excess consumes managerial and regulatory attentiveness and unnecessarily distracts from more severe threats. This was demonstrated using two regulatory examples: CAO 48.1 (Instrument 2019) and CASR Part 133 Performance Class Planning. In the case of CAO 48.1 (with a 1386% increase in word-count from the legacy CAO 48.0) it was seen from the Airtable curation only eight reports mentioned fatigue and only two involved fatalities. This equated to literally 1/100th of 1 percent of the accident attributes and yet the extremely large fatigue regulations now place an onerous burden on helicopter emergency services who are required to assimilate the regulations and update to new FRMSs. While a case might be made that tangible evidence for fatigue-related incidents is difficult to obtain, and therefore infrequently reported upon, this is an argument from absence.

The fact remains there are plenty of arguments, from the presence of tangible threats (medical transport near-CFIT incidents), that regulations are disproportionately addressing immanent threats to safety (see next paragraph and Section 9.6 for full details).

In the case of performance class planning for twin engine helicopters, no demonstrated safety case was presented by CASA in the form of accident or near-accident data involving engine failures and urban terrain. Nor was data provided detailing potential failure probabilities from OEMs, and yet another 82,748 words of regulatory and supporting documents (for CASR Part 133) must now be assimilated by HEMS operators. Meanwhile, in the last several years there have been five near-CFIT accidents involving emergency services helicopters and no apparent public action by CASA to address this pattern. Section 9.6 indicates this is due to non-essential regulations (and their liability-proofing motif) "clogging" the regulator's capacity to realistically appreciate and then act upon these real-time threats.

In Section 9.7 the "irony of legislationism" developed the idea there was a certain irony to the fact the more safety rules there were above the regulatory "Goldilocks zone", the less safe aviation becomes. This was because the more attention drawn into the gravity-well of regulatory assimilation, upkeep and review; the less attention for real-time threats. Another feature of the irony was the way safety judgement is then de-optioned to the horizons (and complexities) of the rule rather than the horizons (and the options) of reality. None of this was intended to say that rules in and of themselves are bad, but rather stakeholders should be aware of and maintain a reasonable proportionality of rules and procedures.

10.4.3.2 Recommendation

In terms of aviation accidents, the IASA model provides a hierarchy of threat-prevalence. It is recommended, in like manner to recommendation 10.4.1.2 above, responses to aviation incidents and accidents are filtered through the accident-proofing hierarchy of the royal three: situational attentiveness, vocational proficiency and decisional reliability. Rules and procedures, by their very definition, are part of the aviation "system" which means they should generally be amended, enhanced, or increased if there is a systemic – not an individual – problem. "Go to" responses to accidents or incidents should not be another rule or procedure, but rather a serious look at how the royal three have been hindered in some way and how these can once again be enhanced through such things as re-training and or re-educating.

Thus, a general principle when deciding to add another rule or procedure (which is a systematised or pattern-enforcing action), would be to ask if such a rule or procedure will truly enhance situational attentiveness, vocational proficiency, and decisional reliability. Another principle would be to ask whether there has been a pattern of issues. If the answer is in the negative to one or both queries then the additional rule or procedure may well create a safety issue rather than solve it.

10.4.3.3 Future Research

The ATSB Airtable curates, as at October 2, 2021, 391 out of some 7029 accident investigations available on public record (Australian Transport Safety Bureau, 2021c). Future research will involve the continual update of the Airtable as investigations are published and, where time permits, the further curation of legacy investigations. This will be to further concretise the meaningfulness of the IASA version of safety and to further rationalise its reality-base.

10.4.4 The Personal and Collective Agency of Safety

10.4.4.1 Finding 10: IASA and the clear safety-need for personal and collective agency.

Section 9.8 identified 11 significant "responsible agents" (where "responsible" refers literally to response-able agents; that is, agents who can respond to, or action, the ten attributes). The premise underneath the investigations is that the causal actions (or causal inactions) of these agents could have prevented, or will prevent, accidents in the future. Section 9.8 also demonstrated that there is a "consilience of agency" which means that the old cliche may be old but not untrue: safety really is everyone's response-ability. Significantly pilots continue to be responsible agents far more than any other. This was followed by managers, regulators, OEMs, and maintainers.

Another finding of significance in Section 9.8 was the de-individuation of managerial agency. This referred to the fact pilots, controllers, maintainers etc. are assigned individual agency in ATSB recommendations and findings but managers are not. Instead, managerial agency is assumed by organisational names e.g., CASA, Virgin, Qantas etc., rather than *managers* of CASA, Virgin, Qantas etc. Thus, the felt threat, and the response-ability of each of the managerial agents, is semantically diluted.

Finally, in Section 9.8, the point was made a liability-proofing motif in regulations encourages culpability-fixation. This comes with obvious detriment to accident-proofing efforts because "lessons-learnt" opportunities to buttress and enhance reality-based safety are overtaken by criminal code and strict liability (which insist on culpability rather than response-ability).

10.4.4.2 Recommendation

Safety regulations, with strict liability and criminal code, are punishments looking for a crime. This is appropriate for criminals but not for aviation professionals involved in the complex world of flight where omissions occur most often because of human fallibility rather than malevolence or negligence. Additionally, rules and procedures by their very nature, can sometimes remove or restrict managerial agency in significant ways. This is beneficial when these rules and procedures are relevant, reality based, and assimilable but when they are not; responsible agency in the form of adaptiveness, creativity and innovation is inhibited. This research recommends stakeholders pay attention to the ways in which response-able agency can be empowered, enhanced, and strengthened without the addition of new rules and procedures. Additionally, it is recommended human factors training include education derived from this (and perhaps future research) focussing on safety-essential meaning-making.

10.4.4.3 Future Research

Future research will look to fully understand the features of what an IASA-based "train, trust and verify" culture might look like as a means of moving beyond a liability-proofing "rule and regulate" culture. A "train, trust and verify" culture, in contrast to the current rule and regulate culture, would be buttressed by a reality-based appreciation of safety and a "sweet-spot" of regulations and procedures. It would also look to the role of culture, conscience, and character in safety meaningfulness and how such research could be systematised into a program of cultural transformation and education.

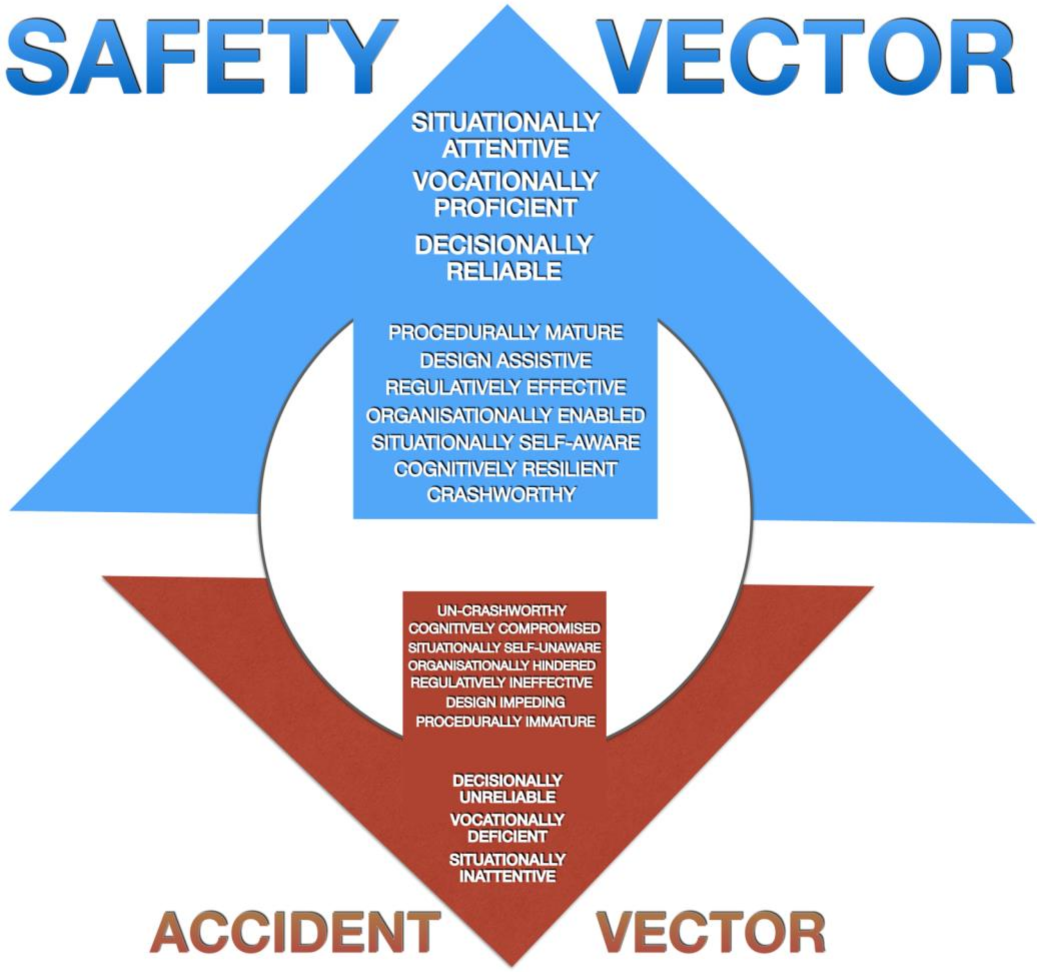
10.5 Conclusion: What Safety Means

This thesis has argued the success of the safety regulations in preventing accidents depends on a clear, compelling, and shared concept of safety. When no such concept exists, red rule safety can become diluted by profits-producing goals and congested by liability-proofing concerns. The liability-proofing motif, it will be recalled, is a safety-distorting fixation upon legal defensibility, prosecutorial potentiality, and various other legal legitimisations. The research gave examples of the way such a motif – with its legalistic excess and bureaucratic safetyism – undermines authentic red rule safety (Section 9.7) and a short autoethnographic reflection to this effect is provided at Appendix G.

All of this illustrates an essential point: regulations written without a clear and compelling meaningfulness of safety, will tend to complexity, congestion, and ultimately, to irrelevance as far as reality-honouring safety is concerned. The research has therefore proposed a reality-based concept of safety from the many digitised and publicly available ATSB investigations (1968-2021). It has used 391 of these investigations, and their safety lessons (as expressed in various safety recommendations), to establish the IASA conception of red rule safety with its ten incident, accident, and safety attributes (Figure 10.4 below). Importantly, the IASA model and its ten attributes provision reality-based, meaning-making terms of reference for current and future regulations. By examining regulations in the light of the ten attributes, it can be recognised whether the regulations have a compelling, reality-based meaningfulness of safety or not. This can be identified by examining the extent to which a regulation addresses the ten attributes which is thus to identify the extent to which the regulation addresses the 50 years' worth of red rule learnings.

Figure 10.4

Reprised: the IASA Model with the Ten Attributes / Ten Red Rules



Note. See Section 9.9 for a full description

Moreover, if a regulation is not addressing with reasonable proportionality the incident and accident attributes that occur the most frequently (the royal three), it is not reasonably addressing the most dangerous factors that bring aircraft unexpectedly down. It is ignoring red rule safety.

Plato in *Phaedrus*, some 2400 years ago, reminds us of the importance of reality-based safety over and above text-based safety. He tells us the one who trusts in the text alone has "the appearance of wisdom but not its reality" (as cited in Hackforth, 1972, p. 507). This is because, as Hackforth (1972) points out in the introduction to *Phaedrus,* only a person has "an endless capacity to express, interpret, and reinterpret in response to every challenge" (p. 507). This is something a text simply cannot do because "once let go by its author, it can only keep on repeating the same words to whoever picks it up" (p. 507). Thus, the written text is not in and of itself accident-preventing wisdom – not until it compels a person into action. This means regulatory words may have the appearance of safety but they are not the reality of safety. Hence, the existence of many words in many regulations does not equate to "knowing much" because true knowledge is extra-textual – it is knowledge applied in everyday reality.

The essential truth that safety exists in people not inanimate words is expressed in a CASA Safety Behaviours video. In the introductory video, released by the regulator in 2019, Dekker observes "we don’t understand aviation safety at all" if we fail to understand that in aviation – in the "complex, shifting patchwork of technologies and communication requirements, of pressures and goal conflicts" – it is only the "human who can hold it all together" (Dekker cited in CASA, 2019a).

Aviation history brings clarity to the importance of this truth. Before the regulatory excesses of modernity, the essentialness of humanity to safety was obvious. For example, the Wright Brothers had little to no regulatory words, and yet somehow managed to safely achieve powered and controlled flight – while lying on their stomach in an oversized kite with props driven by bicycle chains connected to a home-made petrol engine made by a friend (Crouch, 2021). Their feat was captured in the photograph at Figure 10.5 below.

Figure 10.5

Kitty Hawk, 17 December 1903

Note. From: Wikimedia Commons

Closer to home, Charles Kingsford Smith and his team managed to safely fly across the Pacific Ocean (and half the planet) in an aircraft so loud, so windy and vibrating so fiercely they were forced to communicate via scrawled notes (Blainey, 2021). They flew three marathon legs and the furthest, from Hawaii to Fiji, was extraordinarily long taking some 34 hours. For the entire journey, the crew were seated on movable wicker chairs purchased from a US department store which, in turbulence, bounced and slid around the cockpit and cabin. The flight ended on 9 June 1928 in Brisbane after some 11,585 kilometres and 84 hours of flight. Perhaps most impressively, this journey, and many others, was with Smithy suffering from severe panic disorder (Blainey, 2021, p. 8). Yet, he crossed the Pacific with few regulations, no SMS, no QMS, no audit program, no risk management plans and no Google.

Figure 10.6

Eagle Farm, Brisbane, 9 June 1928

Note. From (International News Photos, 1928)

This feat illustrates an important reality: people can be safe without the law, but the law can never be safe without people. Pioneering aviators were not perfect, but they often managed to fly safely in the most trying of circumstances with few modern benefits and even fewer modern regulations. The safety-essential truth and the truth to conclude the research is therefore this: regulations that are authentically safe will never congest, complicate, or confuse the humans at the centre of aviation who, whether they be frontline practitioner, board-room manager, or state-sponsored regulator, are very literally holding it all together. It is hoped this research, at least in a small way, is a reminder that if red rule safety is to mean anything at all, it must surely mean empowering the best of humanity while disempowering the worst.

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APPENDIX A: THE SUMMATIVE CANON

This appendix provides a collation of the summative canon described in Chapters 3 and 4. Table A1 situates the canonical authors chronologically in a timeline (~ 700 B.C.E. to present time). Authors in Table A1 appearing in bold print indicate multiple appearances over multiple references – as shown in Table A2 – thus legitimising their inclusion as part of the summative canon. Table A2 then displays the cumulative consensus as to the canonicity of hermeneutic authors as well as the references from which they are drawn.

Table A1

The Summative Canon as a Timeline

Ser	**Canonical Author (Multiple Citations in Multiple References Indicated by Bold Font)**	**Chronological Birth / Death**
1	Various Ancient Greek, Roman and Biblical Scholars	~ 700 B.C.E. onwards
2	Homer	~ 700-800 B.C.E.
3	Plato	427-347 B.C.E.
4	Rabbi Hillel Seven Rules of Interpretation	~ 30 B.C.E.
5	Aristotle De interpretatione	384-322 B.C.E.
6	Philo of Alexandria	25 B.C.E. – 50 C.E.
7	Augustine of Hippo De Doctrina Christiana	354-430 C.E.
8	Hugh of St. Victors *Didascalion*	1096-1141
9	Thomas Aquinas	1225-1247

Ser	**Canonical Author (Multiple Citations in Multiple References Indicated by Bold Font)**	**Chronological Birth / Death**
10	John Wyclif De Veritate Sacrae Scripturae	1320-1384
11	Martin Luther Commentary on Romans, Sola Scriptura	1483-1546
12	Philip Melanchthon plus various reformation thinkers...	1497 - 1560
13	Johann Conrad Dannhauer	1603-1666
14	John Milton De Doctrina Christiana	1608-1674
15	Benedict deSpinoza Seventh chapter of the Tractatus theologico-politicus	1632-1677
16	Giambattista Vico *Scienza nuova*	1688-1744
17	Johann Chladenius	1710-1759
18	Immanuel Kant	1724-1804
19	Friedrich Schleiermacher (Precursor authors not mentioned here as his thought is summative of them)	1768-1834
20	Friedrich Ast	1778-1841
21	Wilhelm Dilthey	1833-1911
22	Milton S. Terry	1840-1914
23	Max Weber	1864–1920
24	Edmund Husserl	1859-1938
25	Ludwig Wittgenstein	1889–1951
26	Emilio Betti Teoria della interpretatione	1890-1968
27	Rudolf Bultmann	1884-1976

Ser	Canonical Author (Multiple Citations in Multiple References Indicated by Bold Font)	Chronological Birth / Death
28	Martin Heidegger	1889 - 1976
29	Ernst Fuchs	1903-83
31	Hans Georg Gadamer	1900 - 2002
32	Paul Ricoeur	1913 - 2005
33	Jacques Derrida	1930-2004
34	Richard Rorty Philosophy and the Mirror of Nature	(1931-2007)
35	Karl-Otto Apel	(1922 - 2017)
36	E. D. Hirsch Key Text/s: "Validity in Interpretation"	(1928 -)
37	Jürgen Habermas	(1929-)
38	John Searle	(1932 -)
39	John McDowell *Mind and World*	(1942-)

Table A2

Hermeneutic Authors with Summative References

Ser	Summative Reference	Hermeneutic Authors (in citational order of appearance)
1	*Contemporary Hermeneutics: Hermeneutics as method, philosophy and critique*. (Bleicher, 1980)	Immanuel Kant; Wilhelm Dilthey; Emilio Betti; Martin Heidegger; Rudolf Bultmann; Hans Georg Gadamer; Karl-Otto Apel; Jürgen Habermas; Marxist Scholars: Lorenzer and Sandkuhler; Paul Ricoeur
2	*A Glossary of Literary Terms* (Abrams, 1999)	Augustine; Friedrich Schleiermacher; Wilhelm Dilthey; Emilio Betti; E. D. Hirsch; Martin Heidegger; Hans Georg Gadamer; John Searle; Paul Ricoeur; Generic Reference to Ancient Greek and Biblical Scholars
3	*The Bedford Glossary of Critical and Literary Terms* (Murfin & Ray, 2018)	Generic Reference to Ancient Greek and Biblical Scholars; Friedrich Schleiermacher; Wilhelm Dilthey; E. D. Hirsch; Hans Georg Gadamer; Martin Heidegger; John Searle; Generic reference to Reader Response Critics and Formalists (New Critics)
4	*The Stanford Encyclopaedia of Philosophy Winter 2014* (Ramberg & Gjesdal, 2014)	Friedrich Schleiermacher; Wilhelm Dilthey; Hans Georg Gadamer; Martin Heidegger; Plato (but only indirectly); Aristotle (De interpretatione); Philo of Alexandra; Thomas Aquinas; Martin Luther (sola scriptura); Giambattista Vico (Scienza nuova); Benedict deSpinoza. (seventh chapter of the Tractatus theologico-politicus); Emilio Betti (Teoria della interpretatione); Eric D. Hirsch (Validity in Interpretation); Paul Ricoeur; Richard Rorty (Philosophy and the Mirror of Nature); John McDowell (Mind and World)

Ser	Summative Reference	Hermeneutic Authors (in citational order of appearance)
5	*Dictionary of Biblical Tradition in English Literature* (Jeffrey, 1992)	- Homer; Philo of Alexandria; Generic Reference to Ancient Greek, Roman and Biblical Scholars; Martin Luther (Commentary on Romans); Friedrich Schleiermacher; Wilhelm Dilthey; Hans Georg Gadamer; Martin Heidegger; Rudolf Bultmann; Augustine (De Doctrina Christiana); John Wyclif (De Veritate Sacrae Scripturae); Hugh of St. Victors (Didascalion); John Milton (De Doctrina Christiana)
6	*The Stanford Encyclopaedia of Philosophy 2016* (Mantzavinos, 2016)	Homer; Generic Reference to Ancient Greek, Roman and Biblical Scholars; Johann Conrad Dannhauer; Friedrich Schleiermacher (see precursor authors to him); Wilhelm Dilthey; Martin Heidegger; Max Weber; Friedrich Ast; Emilio Betti; Eric D. Hirsch; Jacques Derrida; Paul Ricoeur; Generic references to non-literary scholars)
7	*The Encyclopaedia of Religion* (Harvey, 2005)	Generic Reference to Ancient Greek, Roman and Biblical Scholars; Friedrich Schleiermacher; Wilhelm Dilthey; Ludwig Wittgenstein; Martin Heidegger; Eric D. Hirsch (Validity in Interpretation); Emilio Betti (Teoria della interpretatione); Immanuel Kant; Max Weber (1864–1920); Hans Georg Gadamer
8	*Hermeneutics: An Introduction* (Thiselton, 2009)	Generic Reference to Ancient Greek, Roman and Biblical Scholars; Friedrich Schleiermacher; Hans Georg Gadamer; Rabbi Hillel (Seven Rules of Interpretation); Milton S. Terry; Philo of Alexandria; Wilhelm Dilthey; Rudolf Bultmann; Ernst Fuchs; Paul Ricoeur; Jacques Derrida; Emilio Betti;

Ser	Summative Reference	Hermeneutic Authors (in citational order of appearance)
		Augustine; Ludwig Wittgenstein; Martin Heidegger; Friedrich Ast; Karl-Otto Apel
9	*Encyclopaedia of Communication Theory* (Arthos, 2009)	Hans-Georg Gadamer; Martin Heidegger; Paul Ricoeur; Jürgen Habermas; Generic Reference to Ancient Greek, Roman and Biblical Scholars; Martin Luther; Philip Melanchthon (plus other reformation thinkers); Johann Dannhauer; Johann Chladenius; Friedrich Schleiermacher (other authors contributing but culminating in this author); Wilhelm Dilthey; Edmund Husserl; Martin Heidegger; Emilio Betti; Eric D. Hirsch
10	*Hermeneutics: Studies in Phenomenology and Existential Philosophy* (Palmer, 1969)	Generic Reference to Ancient Greek, Roman and Biblical Scholars; Aristotle; Plato; Martin Luther; Wilhelm Dilthey; Johann Conrad Dannhauer; Martin Heidegger; Hans Georg Gadamer; Paul Ricoeur; Jacques Derrida; Emilio Betti; E. D. Hirsch; Rudolf Bultmann; Friedrich Schleiermacher; Immanuel Kant
11	*A Dictionary of Critical Theory* (Buchanan, 2010)	Friedrich Schleiermacher; Wilhelm Dilthey; Hans Georg Gadamer; Paul Ricoeur
12	*The Oxford Dictionary of Literary Terms* (Baldick, 2015)	Martin Heidegger; Friedrich Schleiermacher; Wilhelm Dilthey; Hans Georg Gadamer

APPENDIX B: KEY HERMENEUTIC DEFINITIONS

This appendix provides a collation of self-stated hermeneutic definitions from the references in Appendix A above. Table B1, along with Tables A1 and A2, provide a contextualising ready-reference to situate the general and recurring hermeneutic themes as they appear throughout the research. A list of references is also provided for the collation. Obviously, the definitions are only summations of hermeneutics but nonetheless provide a reasonable introduction to key concepts.

Table B1

Collated Hermeneutic Definitions

Ser	Self-Stated Definition of Hermeneutics	Derived / Applied Hermeneutic Principle
	***Contemporary Hermeneutics: Hermeneutics as Method, Philosophy and Critique*. (Bleicher, 1980)**	
1	"The realization that human expressions contain a meaningful component, which has to be recognized as such by a subject and transposed into his own system of values and meanings, has given rise to the 'problem of hermeneutics': how this process is possible and how to render accounts of subjectively intended meaning objective…". (Bleicher, 1980, p. 13)	- **Comment***:* If meaning-making is "transposed into [the reader's] own system of values and meanings" then the value gives warrant and conviction to the reader. - **Derived/Applied Principle**: Meaning as value-driven – as authorising, empowering, and warranting conviction (see Chapter 4).

Ser	Self-Stated Definition of Hermeneutics	Derived / Applied Hermeneutic Principle
	***A Glossary of Literary Terms* (Abrams, 1999)**	
2	"Since the nineteenth century… "hermeneutics" has come to designate the theory of interpretation in general–that is, a formulation of the principles and methods involved in getting at the meaning of all written texts, including legal, historical, and literary, as well as biblical texts… In the narrow sense, to interpret a work of literature is to specify the meanings of its language by analysis, para-phrase, and commentary…" (Abrams, 1999, p. 127)	- **Comment**: Interpretation as a function of principles, methods, analysis, paraphrase, and commentary about the text itself. - **Derived/Applied Principle**: The basis of a close-reading examining the characteristics of the text (content and context characteristics) in meaning-making (see Chapters 5 and 6)
	***The Bedford Glossary of Critical and Literary* Terms (Murfin & Ray, 2018)**	
3	"Modern hermeneutics – which considers the interpretative methods leading to the perception, interpretation and understanding of texts (and their underlying organising principles, or codes) – is grounded in the terminology and strategies of modern linguistics and philosophy". (Murfin & Ray, 2018)	- **Comment**: Interpretation as a function of perception, interpretation and understanding; that is, of how understanding itself is conceptualised in the first place - **Derived/Applied Principle**: The concept of preknowing as well as the hermeneutic circle (see Chapters 4, 5 and 6)

Ser	Self-Stated Definition of Hermeneutics	Derived / Applied Hermeneutic Principle
	***The Stanford Encyclopaedia of Philosophy Winter 2014* (Ramberg & Gjesdal, 2014)**	
4	- "The term hermeneutics covers both the first order art and the second order theory of understanding and interpretation of linguistic and non-linguistic expressions. As a theory of interpretation, the hermeneutic tradition stretches all the way back to ancient Greek philosophy… Later on, it comes to include the study of ancient and classic cultures… It is no longer conceived as a methodological or didactic aid for other disciplines, but turns to the conditions of possibility for symbolic communication as such…We cannot really understand ourselves unless we understand ourselves as situated in a linguistically mediated, historical culture. Language is our second nature" (Ramberg & Gjesdal, 2014, p. 1)	- **Comment**: Interpretation as a focus on understanding as situated in a "linguistically mediated historical culture…". - **Derived/Applied Principle**: Preknowing and knowingness shaped by these dynamics (see Chapters 7 and 8 where safety shaping effects from the ATSB are taken as having meaning-making influence)
	***Dictionary of Biblical Tradition in English Literature* (Jeffrey, 1992)**	
5	"Hermeneutics inquires into the conditions under which the interpretation of texts or symbols is valid, productive or simply	- **Comment**: Interpretation as controlled (i.e. institutionalised) formulations and principles.

Ser	Self-Stated Definition of Hermeneutics	Derived / Applied Hermeneutic Principle
	possible. Traditionally biblical hermeneutics formulated principles which would facilitate responsible, appropriate, and controlled interpretation of biblical passages. In recent years, however, hermeneutics has broadened considerably in scope. The focus is no longer simply on technical interpretative procedures but on the very process of understanding... to the purposes and horizons of the reader. (Jeffrey, 1992, pp. 347-349)	- **Derived/Applied Principle**: CASA and its regulations as a meaning-making influence. (see Chapters 4 and 5)

The Stanford Encyclopaedia of Philosophy 2016 **(Mantzavinos, 2016)**

6	Hermeneutics as the methodology of interpretation is concerned with problems that arise when dealing with meaningful human actions and the products of such actions, most importantly texts. As a methodological discipline, it offers a toolbox for efficiently treating problems of the interpretation of human actions, texts and other meaningful material (Mantzavinos, 2016, p. Screen1).	- **Comment**: Interpretation/hermeneutics as meaning in human action and as a tool box for treating problems of interpretation. - **Derived/Applied Principle**: Applied principles from this "toolbox" used to shape the close-reading process (see Chapter 3) and the bivalent analysis (see Chapter 8).

Ser	Self-Stated Definition of Hermeneutics	Derived / Applied Hermeneutic Principle
	"Hermeneutics" *Encyclopaedia of Religion* (Harvey, 2005)	
7	The term hermeneutics is derived from the Greek verb hermēneuein ("to interpret") and refers to the intellectual discipline concerned with the nature and presuppositions of the interpretation of human expressions. (Harvey, 2005, p. Screen 1) - The major concepts with which hermeneutics deals: (1) the nature of a text; (2) what it means to understand a text; and (3) how understanding and interpretation are determined by the presuppositions and beliefs of the audience to which the text is being interpreted. (Harvey, 2005, p. 1)	- **Comment**: Interpretation as a variety of influences acting – mediating – in totality. - **Derived/Applied Principle**: Used extensively in Chapters 7 and 8 to build the IASA model
	***Hermeneutics: An Introduction* (Thiselton, 2009)**	
8	Hermeneutics "raises philosophical questions about how we come to understand, and the basis on which understanding is possible. (3) It involves literary questions about types of texts and processes of reading. (4) It includes social, critical, or sociological questions about how vested interests,	- **Comment**: Interpretation as influences acting in totality. - **Derived/Applied Principle**: As above, Used extensively in Chapters 7 and 8 to build the IASA model

Ser	Self-Stated Definition of Hermeneutics	Derived / Applied Hermeneutic Principle
	sometimes of class, race, gender, or prior belief, may influence how we read. (5) It draws on theories of communication and sometimes general linguistics because it explores the whole process of communicating a content or effect to readers or to a community". (Thiselton, 2009, p. 1)	

***Encyclopaedia of Communication Theory* (Arthos, 2009)**

9	Considered a generic designation for interpretive criticism… It is an ontology of linguistic being, or a philosophy in which human experience becomes defined in language use. As such, hermeneutics is also a corollary to the idea of rhetorical agency, the idea that communicators act with intention (Arthos, 2009)	- **Comment**: Interpretation as existential (ontological), as experienced in language usage, with intentionality. - **Derived/Applied Principle**: Experience of accidents used to derive an existential conception of unsafeness and then, in antithesis, safety and the safety attributes (see Chapters 7 and 8)

***Hermeneutics: Studies in Phenomenology and Existential Philosophy* (Palmer, 1969)**

10	- "Literary criticism needs to seek a “method” or “theory” specifically appropriate to deciphering the human imprint on a work, its "meaning". This “deciphering” process, this "understanding" the	- **Comment**: Interpretation as interaction between understanding a text and "understanding" understanding. - **Derived/Applied Principle**: knowingness of safety, the

Ser	Self-Stated Definition of Hermeneutics	Derived / Applied Hermeneutic Principle
	meaning of a work, is the focus of hermeneutics. Hermeneutics is the study of understanding, especially the task of understanding texts". (Palmer, 1969, pp. 284-287) - "It involves two different and interacting focuses of attention: (1) the event of understanding a text, and (2) the more encompassing question of what understanding and interpretation, as such, are". (Palmer, 1969, pp. 293-295)	hermeneutic circle and building the close-reading methodology (see Chapter 3)

***A Dictionary of Critical Theory* (Buchanan, 2010)**

11	- The study of the theory and the practice of interpreting texts. It dates back to ancient times, when it was closely associated with the study of *rhetoric. (Buchanan, 2010, p. 227) - Friedrich Schleiermacher, who demonstrated that the interpretation of all texts, not just sacred texts, is problematic for essentially the same reasons, namely language's capacity for multiple meaning. His solution was to anchor meaning in the psychology of the author. Thus, Schleiermacher was the first to raise the question of authorial	- **Comment**: Interpretation as the theory and practice of interpreting texts and meaning in the psychology of the author - **Derived/Applied Principle**: The close-reading to incorporate the author as well as the reader. This done by including CASA, the regulations, and Avtex Air in an iterative close-reading through Chapters 4-9.

Ser	Self-Stated Definition of Hermeneutics	Derived / Applied Hermeneutic Principle
	intention, which would remain central to textual studies until the middle of the 20th century, arguing that it has to be understood in context (a perspective that *New Historicism maintains today). (Buchanan, 2010, p. 227)	

***The Oxford Dictionary of Literary* Terms (Baldick, 2015)**

12	- The theory of interpretation, concerned with general problems of understanding the meanings of texts. (Baldick, 2015, p. 6124)	- **Comment**: Interpretation as concerned with the general problems of understanding the meanings of texts - **Derived/Applied Principle:** As above.

APPENDIX C: ATSB AIRTABLE CURATION AND EXPLANATION OF COLUMNS

This appendix provides further background to the derivation of the ATSB Airtable Database (2021). The scope of the Airtable analysis is provided in Table C1 followed by a legend for each of the Airtable's columns. This information can be cross-referenced to the broader methodological details in Section 3.5.3 and 7.6. (Note: The final sample from the ATSB website was retrieved 24 April 2021. Any access after this date will most likely result in a different scope of samples. The ATSB website in PDF format as at 24 April 2021 is available on request).

Table C1

ATSB Airtable Scope of Analysis

Ser	Indicative Year	Chronological Scope (Report Release Date)	Report - Scope	Comments
1	2018-2021	17 April 2018 - 22 April 2021	Serial 1-154 (154 reports)	Retrieved 24 April 2021 (last sample). Includes all published reports available on the ATSB Investigation and Reports website (ATSB, 2021b) Does not include incomplete reports, balloon reports or reports assisting other agencies. Average reports per year: 45
2	2009-2010	6 May 2009 - 29 April 2010	Serial 155 - 213 (59 reports)	Comments as above but this sample retrieved 15 April 2019
3	1999-2000	16 Dec 1999 - 30 April 2000	Serial 214 - 258 (45 reports)	Comments as above. Note also during this time period the number of reports released per year increases far beyond the average for more contemporaneous period in serial 1. Thus, average from serial 1 used to establish sample size

Ser	Indicative Year	Chronological Scope (Report Release Date)	Report - Scope	Comments
4	1989-1990	28 February 1990-26 April 1990	Serial 257 - 303 (45 reports)	Comments as above
5	1979-1980	20 March 1978-22 July 1984	Serial 304 - 348 (45 reports)	Comments as above. Note outlier reports (1978-1984) included as incidents not provisioned with release date only a "approved for publication date" – but note the incident occurred within the indicative period at column 2 and so included as sample here for the indicative decade.
6	1969-1970	20 August 1968-19 June 1970	Serial 349 - 391 (43 reports)	Comments as above. 43 reports (less than sample average) due to lessening of publicly available reports however still considered acceptable as a sample (only 2 reports less than the average)

Note. The April to May period was used to maintain a calendar-correlation with dates for each year in the 2018-2021 curation. This was because the most up to date release in the Airtable at the last ATSB curation was 22 April 21 which was when data collection for the Airtable ceased

ATSB Airtable Column Legend

- **Column "0".** This column displays the Airtable serials (the row number). Note: When using filters these serials auto-update to the findings meaning if there are 50 results from the findings there will no longer be 391 serials but rather 50. To cross reference these numbers to the digital library of full ATSB reports (2021) ensure the filters are turned off.

- **Column 1.** The ATSB designated report number. Such report numbers (for ATSB reports in the Airtable) are not individually referenced in the bibliography when mentioned in the research. Instead they can be found in the Airtable and as such fall under the bibliographic reference for the Airtable as a whole (ATSB Airtable, 2021). The original reports can be accessed via the link in the bibliography (ATSB Collated Reports, 2021).

- **Column 2**. The release date of the ATSB Report. The release date is what is used to curate the reports in Table 1 above. Where release dates are not available (some older reports from the 60s and 70s) the accident date was used.

- **Column 3**. The incident date and time in local time. Where necessary this was recalculated from UTC time to better correlate with the inflight conditions and time of day / night aspects experienced by the crew.

- **Column 4**. The report URL. As at the time of writing each of these links is still active. As a backup measure each of the 391 reports were saved as pdfs and stored via dropbox at the link provided in the bibliography (ATSB Collated Reports, 2021). The file name for each report begins with the same number as the curated report in the Airtable.

- **Column 5**. The ATSB name. This was reserved verbatim for cross-referencing purposes. Thus, this column reflects the various BASI / ATSB naming conventions over the years.

- **Column 6**. A word for word capture of the ATSB web-page summary for the report. This is provided for ease of reference and allows one to quickly access various contextual details of the accident or serious incident.

- **Column 8.** A word-count for the ATSB web-page summary in Column 6 as provisioned by the word counter tool used for this and other word-counts in the research (Wordcounter.net, 2021). A comparative explanation of this tool with other word counter tools appears at section 3.5.
- **Column 9.** A succinct "what happened" excerpt for ease of reference when scanning multiple investigations in the Airtable.
- **Column 10.** Significant circumstances of the event. This includes such things as crew complements, environmental conditions and other circumstances that provide meaning-making context. These are indicative only and do not correlate to ATSB taxonomies instead using only terms of generally accepted usage (Oxford, 2016).
- **Column 10.** Significant consequences for the incident. This includes such things as hull losses, aircraft damage, equipment damage, fatalities and significant others that provide consequential provide meaning-making context. These are indicative only and do not correlate to ATSB taxonomies instead using only terms of generally accepted usage (Oxford, 2016).
- **Column 11.** ATSB attributes with raw "Incident and Accident attributes / Safety attributes" in square brackets to show connection to column 11 coded attributes (explained above with examples). Note that some of these "square bracketed" attributes do not use the exact phraseology of the coded items in column 11 representing as they do the genesis of the precise terms finalised in column 11. See derivation examples in Section 3.5.

- **Column 12**. Incident and Accident attributes / Safety attributes as explained above. These are delineated using different colours to allow easy identification in the Airtable. A full discussion of all the findings and implications of these actionables as meaning-making motifs appears in chapters 7, 8 and 9.

- **Column 13.** "Safety Message" Word-count. This is a word-count of the investigation's "safety message" as designated by the ATSB (or its equivalent when non-designated).

- **Column 14**. Total Actionable Safety Statements. This provides a count of individual statements attributed to an incident, accident, or safety attribute.

- **Column 15.** Keyword Density of the Safety Message as provisioned by the word counter tool used for this and other word-counts in the research (Wordcounter.net, 2021). A comparative explanation of this tool with other word counter tools appears at section 3.5.

- **Column 16.** Responsible Agents. This part of the Airtable identifies the agency of safety; that is, those individuals that are identified by the ATSB as being able to respond to an accident or safety actionable so identified in columns 10 and 11. Examples of this include the most obvious such as pilots, managers, OEMs and the less obvious such as infrastructure operators, clients, and passengers. Chapters 7, 8 and 9 provide greater explanations of the role of agency in safety meaning-making.

- **Column 17 - 29.** Attribute Statement Count per responsible agent. These columns curate the number of times an actionable statement is aimed at individual agents.

- **Column 30.** Number of Affirmations. This is a count of the affirmation statements for the report.

- **Column 31.** Affirmation Agents. This identifies to whom the affirmation is directed.

- **Column 32.** Law or Procedure Misinterpretation Cited? This curates, via a yes or no response, the number of times a regulation or procedure is noted as being misinterpreted.

- **Column 33.** Misinterpretative Description. This describes in more detail the nature of the misinterpretation cited in column 31.

- **Column 34**. Intentional Non-Compliance. This curates, via a yes or no response, the amount of intentional non-compliances noted within the investigation.

- **Column 35.** Intentional Non-Compliance Description. This describes the nature of the intentional non-compliance.

- **Column 36.** Rule/Procedure "Attentive"? This curates, via a yes or no response, the number of times the safety message is attentive to a rule or a procedure.

- **Column 38.** Rule/Procedure "Attentive" Description or Recommendation if Any? This column notes the nature of the rule or procedure the safety recommendation in column 35 is attentive to.

- **Column 39.** Rule/Process Change Recommended or Enacted? This column notes the number of times a rule or process change is actually recommended or enacted (not just given investigative attention as in column 36 and 37).

- **Columns 39 - 42.** These columns provision word-count data for the investigation. This includes total word-count, estimated reading time (at 200 word per minute), estimated speaking time (at 150 words per minute) and keyword density. This section uses the same word counters as previous word-count columns.

- **Column 43-44.** These columns curate pilot in command type hours and total hours respectively. (It should be noted many investigations do not include this data).
- **Column 45.** Significant Notes. This section contains miscellaneous notes considered significant for future research.
- **Column 46.** Human Factors (HF) Scenario and Study Tags. These tags are related to various human factors content and utilise a tagging system where the HF subject, for example "communications" is tagged as "communications8" to facilitate more effective future word searches through the database and elsewhere.
- **Column 47.** Last Modified and Access Time. This column records the last time the record was modified. It also generally correlates to the last time the ATSB relevant report was accessed online.
- **Hidden Columns.** There are numerous hidden columns in the air table that are either irrelevant to this research or were a part of the early research and abandoned as irrelevant at some point. They can be re-claimed in the future if required for future research.

APPENDIX D: REGULATORY WORD-COUNT TABLES 2001-2021

This appendix provides the full results of the regulatory word-count at Section 5.5.2. Inclusions are examples of the spreadsheets used to determine the counts and a breakdown of individual regulations and their own word-counts. Additional information pertaining to average reading and speaking times is provided to give further perspective. The methodology for the word count can be found at Section 3.5.4.

Figure D1

Excerpt of 2001 Regulatory Word-Count Spreadsheet

Civil Aviation Document Suite 2001	Word Count	Average Reading Time (mins)	Average Reading Time (hours)	Average Reading Time (working days @7.6hrs per day)	Average Reading Time (working weeks @5 days per week)	Average Speaking Time (mins)	Average Speaking Time (hours)
Total Regulatory Word Count 2001	**545,814**	**2729**	**45.5**	**6.0**	**1.2**	**3639**	**60.6**
Civil Aviation Safety Act 1988	23402	117	2.0	0.3	0.1	156	2.6
TOTAL Civil Aviation Safety Act 1988 as at 9 September 2000	**23402**	**260**	**4.0**	0.5	0.1	**346**	**6.0**
					0.0		
Civil Aviation Safety Regulations CASR not enacted till 2002					0.0		
Manual of Standards (MOS) not enacted till 2005							
Civil Aviation Regulations (CAR)							
Civil Aviation Regulations Volume 1	96566	483	8.0	1.1	0.2	644	10.7
Civil Aviation Regulations Volume 2	97032	485	8.1	1.1	0.2	647	10.8
Total CAR as at 21 December 2001	**193598**	**968**	**16.1**	**2.1**	**0.4**	**1291**	**21.5**
Civil Aviation Orders (CAO)							
CAO 20 Combined from sub-table to right	41746	209	3.5	0.5	0.1	278	4.6
CAO 29 Combined	20989	105	1.7	0.2	0.0	140	2.3
CAO 40 Combined	69070	345	5.8	0.8	0.2	460	7.7
CAO 43 Combined	6575	33	0.5	0.1	0.0	44	0.7
CAO 45 Combined	1354	7	0.1	0.0	0.0	9	0.2
CAO 48 Combined	7129	36	0.6	0.1	0.0	48	0.8
CAO 50 Combined	510	3	0.0	0.0	0.0	3	0.1
CAO 51 Combined	578	3	0.0	0.0	0.0	4	0.1
CAO 82 Combined	18987	95	1.6	0.2	0.0	127	2.1
CAO 92 Combined	2849	14	0.2	0.0	0.0	19	0.3
CAO 95 Combined	28509	143	2.4	0.3	0.1	190	3.2
CAO 100 Combined	25011	125	2.1	0.3	0.1	167	2.8
CAO 101 Combined	23425	117	2.0	0.3	0.1	156	2.6
CAO 103 Combined	43026	215	3.6	0.5	0.1	287	4.8
CAO 104 Combined	2305	12	0.2	0.0	0.0	15	0.3
CAO 105-107 subsumed by Part 39	1590	8	0.1	0.0	0.0	11	0.2
CAO 108 Combined	35161	176	2.9	0.4	0.1	234	3.9
CAO Total as at 1 April 2001	**328814**	**1644**	**27.4**	**3.6**	**0.7**	**2192**	**36.5**

Figure D2

Excerpt of 2021 Regulatory Word-Count Spreadsheet

Civil Aviation Document Suite 2021	Word Count	Average Reading Time (mins)	Average Reading Time (hours)	Average Reading Time (working days @7.6hrs per day)	Average Reading Time (working weeks @5 days per week)	Average Speaking Time (mins)	Average Speaking Time (hours)
Total Regulatory Word Count 2021	**1,864,532**	**9323**	**155.4**	**20.4**	**4.1**	**12430**	**207.2**
Civil Aviation Safety Act 1988	52245	261	4.4	0.6	0.1	348	5.8
TOTAL The Act 1988 accessed 5 June 21, rechecked 27 May 22*	**52245**	**260**	**4.0**	0.5	0.1	**346**	**6.0**
					0.0		
Civil Aviation Safety Regulations CASR at 5 June 21, recheck 27 May 22*					0.0		
Vol 1 Civil Aviation Safety Regulations	141694	708	11.8	1.6	0.3	945	15.7
Vol 2 Civil Aviation Safety Regulations	179880	899	15.0	2.0	0.4	1199	20.0
Vol 3 Civil Aviation Safety Regulations	78617	393	6.6	0.9	0.2	524	8.7
Vol 4 Civil Aviation Safety Regulations	110073	550	9.2	1.2	0.2	734	12.2
Vol 5 Civil Aviation Safety Regulations	104936	525	8.7	1.2	0.2	700	11.7
TOTAL Civil Aviation Safety Regulations	**615200**	**3076**	**51.3**	**6.7**	**1.3**	**4101**	**68.4**
Manual of Standards (MOS) as at 1 April 2020, rechecked 27 May 22*							
Part 21	11450	57	1.0	0.1	0.0	76	1.3
Part 42	9418	47	0.8	0.1	0.0	63	1.0
Part 45 Explanatory	1348	7	0.1	0.0	0.0	9	0.1
Part 45	2481	12	0.2	0.0	0.0	17	0.3
Part 60 Explanatory	4863	24	0.4	0.1	0.0	32	0.5
Part 60	1983	10	0.2	0.0	0.0	13	0.2
Part 61 Vol 1	15567	78	1.3	0.2	0.0	104	1.7
Part 61 Vol 2	81273	406	6.8	0.9	0.2	542	9.0
Part 61 Vol 3	58427	292	4.9	0.6	0.1	390	6.5
Part 61 Vol 4	47318	237	3.9	0.5	0.1	315	5.3
Part 65	24604	123	2.1	0.3	0.1	164	2.7
Part 66 Explanatory	3282	16	0.3	0.0	0.0	22	0.4
Part 66	33584	168	2.8	0.4	0.1	224	3.7
Part 90	8367	42	0.7	0.1	0.0	56	0.9
Part 91 Subpart 91U Explanatory	499	2	0.0	0.0	0.0	3	0.1
Part 91 Subpart 91U	11487	57	1.0	0.1	0.0	77	1.3
Part 101	50063	250	4.2	0.5	0.1	334	5.6
Part 132	7005	35	0.6	0.1	0.0	47	0.8
Part 132 Explanatory	2481	12	0.2	0.0	0.0	17	0.3
Part 139	144219	721	12.0	1.6	0.3	961	16.0
Part 139 Explanatory	17073	85	1.4	0.2	0.0	114	1.9
Part 139H	16847	84	1.4	0.2	0.0	112	1.9
Part 143	1638	8	0.1	0.0	0.0	11	0.2
Part 143 Explanatory	912	5	0.1	0.0	0.0	6	0.1
Part 145	11923	60	1.0	0.1	0.0	79	1.3
Part 147	4405	22	0.4	0.0	0.0	29	0.5
Part 149	10055	50	0.8	0.1	0.0	67	1.1
Part 149 Explanatory	13178	66	1.1	0.1	0.0	88	1.5
Part 171	4042	20	0.3	0.0	0.0	27	0.4
Part 172	38031	190	3.2	0.4	0.1	254	4.2
Part 173	24704	124	2.1	0.3	0.1	165	2.7
Total MOS	**662527**	**3313**	**55.2**	**7.3**	**1.5**	**4417**	**73.6**
Civil Aviation Regulations (CAR) as at 2 Sep 20, rechecked 27 May 22*							
Civil Aviation Regulations Volume 1	106702	534	8.9	1.2	0.2	711	11.9
Civil Aviation Regulations Volume 2	32114	161	2.7	0.4	0.1	214	3.6
Total CAR	**138816**	**694**	**11.6**	**1.5**	**0.3**	**925**	**15.4**
Civil Aviation Orders (CAO) accessed 1 April 2020, rechecked* 27 May 22							
CAO Repeal and Amendment Instrument 2014 No 1	9228	46	0.8	0.1	0.0	62	1.0
CAO Repeal Explanatory Statement	10494	52	0.9	0.1	0.0	70	1.2
CAO Repeal Supporting Material	10190	51	0.8	0.1	0.0	68	1.1
CAO 20 Combined	94846	474	7.9	1.0	0.2	632	10.5
CAO 29 Combined	12647	63	1.1	0.1	0.0	84	1.4
CAO 40 Combined	6525	33	0.5	0.1	0.0	44	0.7
CAO 45 Combined	1238	6	0.1	0.0	0.0	8	0.1
CAO 48.1 2019	35075	175	2.9	0.4	0.1	234	3.9
CAO 52 Combined	2981	15	0.2	0.0	0.0	20	0.3
CAO 82 Combined	71116	356	5.9	0.8	0.2	474	7.9
CAO 95 Combined	65876	329	5.5	0.7	0.1	439	7.3
CAO 100 Combined	45688	228	3.8	0.5	0.1	305	5.1
CAO 101 Combined	7736	39	0.6	0.1	0.0	52	0.9
CAO 103 Combined	4146	21	0.3	0.0	0.0	28	0.5
CAO 104 Combined	6088	30	0.5	0.1	0.0	41	0.7
CAO 108 Combined	11870	59	1.0	0.1	0.0	79	1.3
CAO Total	**395744**	**1979**	**33.0**	**4.3**	**0.9**	**2638**	**44.0**
Note* Rechecked using Word Count Pro Tool							

APPENDIX E: ORIGINAL DATA FOR BITRE TOTAL AIRCRAFT FLEET HOURS AND ATSB ACCIDENT RATES 2000-2019

This appendix provides the original data for the charts presented in Section 5.5.4. These charts are drawn from the BITRE fleet hours report *Australian Aircraft Activity 2019* (2020) and ATSB reported accident rates (2000-2019).

Figure E1 is an excerpt of the spreadsheet used to collate the extracted total Australian aircraft fleet hours plotted against the regulatory word count. Fleet hours equate to the total hours flown by all aircraft, less balloons, in Australia including regular public transport (RPT), Non-Scheduled Commercial Air Transport (Charter), freight, general aviation, ultralights, gliding and so on (BITRE, 2020, p. 17)

Figure E1

Excerpt of Spreadsheet 2001 - 2019 Extracted BITRE Fleet Hours compared to Average Regulatory Word-Count Increase

	BITRE Fleet Hours	Word Count
2001	2980.6	546,481
2002	2848.9	613,449
2003	2852.5	680,417
2004	2983.7	747,385
2005	3321.6	814,353
2006	3331.6	881,321
2007	3627.6	948,289
2008	3553.1	1,015,257
2009	3553.2	1,082,225
2010	3744.9	1,149,193
2011	3591.5	1,216,161
2012	3483.6	1,283,129
2013	3531.8	1,350,097
2014	3324.9	1,417,065
2015	3379.9	1,484,033
2016	3356.1	1,551,001
2017	3373	1,617,969
2018	3413.7	1,684,937
2019	3601.9	1,751,905

Note. See Figure E2 below for source data. Also of note, categories of operation changed as at December 2, 2021.

Figure E2 below is an excerpt of the original BITRE data from which Figure E1 is drawn.

Figure E2

Excerpt of Source Data for Total Fleet Hours for Australian Aircraft

Year	Total Scheduled[a]	Other VH-registered aircraft[b]	Ultralight flying	Gliding[c]	Hang Gliding[d]	Gyroplanes[e]	Total
			(thousand hours)				
1990	613.1	1 930.8	..	72.6	..	..	2 616.4
1991	692.8	1 754.7	..	74.2	63.7	..	2 585.4
1992	750.3	1 651.0	52.4	83.3	73.5	..	2 610.4
1993	781.2	1 703.9	56.8	73.0	86.2	..	2 701.1
1994	838.7	1 715.7	73.0	80.1	77.6	15.0	2 800.1
1995	899.6	1 761.3	72.0	75.9	86.4	14.4	2 909.6
1996	938.5	1 799.0	70.4	69.2	103.2	23.3	3 003.7
1997	969.8	1 839.3	75.1	68.9	102.3	23.3	3 078.7
1998	958.2	1 877.9	67.6	65.4	87.5	33.4	3 090.0
1999	963.5	1 842.2	73.9	63.9	104.6	30.4	3 078.5
2000	1 074.2	1 714.8	74.1	..	106.7	29.7	2 999.5
2001	1 044.3	1 702.9	76.5	..	120.0	37.0	2 980.6
2002	926.0	1 687.7	80.6	..	122.2	32.3	2 848.9
2003	969.0	1 645.9	84.5	..	124.7	28.3	2 852.5
2004	1 090.4	1 645.0	87.1	..	132.0	29.3	2 983.7
2005	1 144.1	1 722.8	92.9	194.7	134.2	32.9	3 321.6
2006	1 156.7	1 695.0	120.2	228.9	103.0	27.9	3 331.6
2007	1 191.6	1 831.8	138.3	343.4	94.5	28.0	3 627.6
2008	1 250.5	1 857.7	156.2	169.9	88.3	30.5	3 553.1
2009	1 241.4	1 807.5	174.3	198.4	96.0	35.6	3 553.2
2010	1 325.7	1 847.7	200.4	228.7	97.9	44.4	3 744.9
2011	1 347.4	1 771.4	198.6	126.9	98.7	48.6	3 591.5
2012	1 382.1	1 704.9	187.9	56.8	105.1	46.8	3 483.6
2013	1 410.7	1 741.8	153.5	63.6	117.2	44.9	3 531.8
2014	1 402.1	1 526.4	176.1	67.7	113.8	38.9	3 324.9
2015	1 440.0	1 552.3	167.0	66.3	110.9	43.5	3 379.9
2016	1 389.4	1 608.8	148.2	65.0	107.7	37.0	3 356.1
2017	1 427.1	1 600.4	144.0	58.0	103.5	40.0	3 373.0
2018	1 423.9	1 642.3	126.4	61.3	117.8	42.0	3 413.7
2019	1 526.3	1 719.7	142.7	64.1	101.4	47.7	3 601.9

a Hours flown by Australian (including regional) airlines on domestic and international flight stages in Scheduled operations. From August 2004 RPT freight operations are included.
b Includes hours flown in General Aviation as well as Non-Scheduled Commercial Air Transport (Charter)
c Year ended 30 April prior to 2000. No data are available between 2000 and 2004. Data from 2005-2010 are for year ended 30 June. Data from 2011 are for calendar year.
d Year ended 30 June.
e Year ended 30 June until 2005. From 2006 onwards, calendar year data are provided.

Note. From Australian Aircraft Activity 2019 (BITRE, 2020, Table 1, p. 7)

Figure E3 below is an excerpt of the spreadsheet used to collate the extracted accident rates from the ATSB.

Figure E3

Excerpt of Spreadsheet 2001 - 2019 Extracted Accident Rates compared to Average Regulatory Word-Count Increase

	Word Count	Accidents
2001	546,481	189
2002	613,449	157
2003	680,417	174
2004	747,385	159
2005	814,353	130
2006	881,321	104
2007	948,289	140
2008	1,015,257	155
2009	1,082,225	130
2010	1,149,193	211
2011	1,216,161	198
2012	1,283,129	203
2013	1,350,097	184
2014	1,417,065	276
2015	1,484,033	224
2016	1,551,001	227
2017	1,617,969	195
2018	1,684,937	231
2019	1,751,905	219

Note. See Figures E5 and E6 below for source data.

Figure E4 below is an excerpt of the spreadsheet used to collate the extracted fatality rates from the ATSB.

Figure E4

Excerpt of Spreadsheet 2001-2019 Extracted Fatality Rates compared to Average Regulatory Word-Count Increase

	Word Count	Fatalities
2001	546,481	41
2002	613,449	24
2003	680,417	35
2004	747,385	24
2005	814,353	39
2006	881,321	36
2007	948,289	23
2008	1,015,257	40
2009	1,082,225	16
2010	1,149,193	25
2011	1,216,161	40
2012	1,283,129	39
2013	1,350,097	46
2014	1,417,065	28
2015	1,484,033	31
2016	1,551,001	21
2017	1,617,969	40
2018	1,684,937	21
2019	1,751,905	35

Note. See Figures E5 and E6 below for source data.

Figures E5 and E6 below are excerpts showing the original data from ATSB reported accidents and fatalities.

Figure E5

Excerpt of Source Data for ATSB Accident and Fatality Rate 2001 - 2010 for Air Transport and General Aviation Aircraft Registered in Australia (Two Tables)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of aircraft involved										
Incidents	3,141	3,011	2,695	3,464	4,120	3,709	3,919	4,055	3,871	4,494
Serious incidents	9	10	15	30	31	16	45	47	24	33
Serious injury accidents	1	3	1	0	2	0	1	3	2	2
Fatal accidents	4	4	2	0	2	1	2	3	0	1
Total accidents	38	27	31	16	12	12	22	29	11	23
Number of people involved										
Serious injuries	4	8	4	0	2	0	1	15	3	2
Fatalities	10	12	8	0	18	2	2	6	0	2

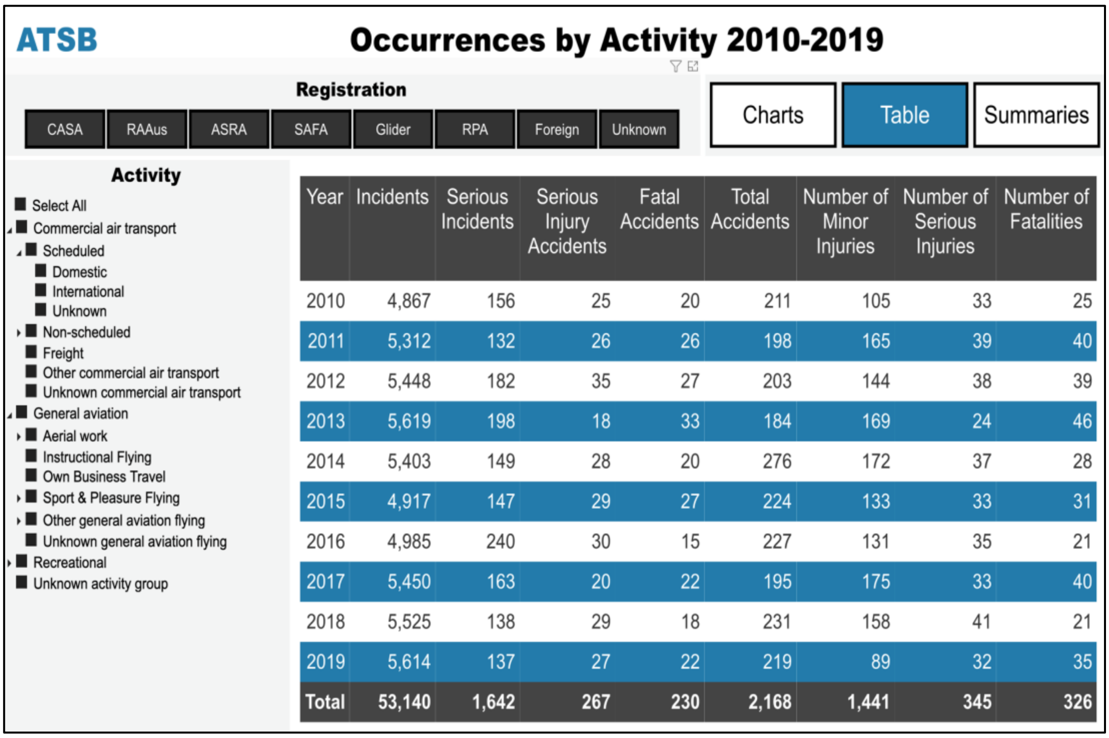
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of aircraft involved										
Incidents	2,381	2,653	2,409	2,673	3,057	3,501	3,542	3,526	3,684	3,558
Serious incidents	1	2	46	65	48	64	80	97	91	108
Serious injury accidents	16	10	11	14	4	8	7	16	10	15
Fatal accidents	18	6	13	12	16	19	12	22	16	13
Total accidents	151	130	117	143	118	92	118	126	119	126
Number of people involved										
Serious injuries	22	15	19	21	5	13	9	23	13	19
Fatalities	31	12	27	24	21	34	21	34	16	16

Note. From *ATSB Accident and Fatality Rate 2001-2010* (ATSB, 2011, p. 10 and 25).

Figure E5 above includes fatalities across all operational types and has two tables from which the total accidents and fatalities were aggregated in Figures E3 and E4. This was necessary because the ATSB did not provide a collated list of both General Aviation and Commercial fatalities until 2010. Also of note, there was a contradiction between the two 2010 accident and fatality listings provide by the ATSB reports (between the decade ending in 2010 and the decade starting in 2010). The rates from the latter were used and the difference is not considered significant to the findings of this research.

Figure E6

Excerpt of Source Data for ATSB Accident and Fatality Rate 2010 - 2019 for Air Transport and General Aviation Aircraft Registered in Australia



Year	Incidents	Serious Incidents	Serious Injury Accidents	Fatal Accidents	Total Accidents	Number of Minor Injuries	Number of Serious Injuries	Number of Fatalities
2010	4,867	156	25	20	211	105	33	25
2011	5,312	132	26	26	198	165	39	40
2012	5,448	182	35	27	203	144	38	39
2013	5,619	198	18	33	184	169	24	46
2014	5,403	149	28	20	276	172	37	28
2015	4,917	147	29	27	224	133	33	31
2016	4,985	240	30	15	227	131	35	21
2017	5,450	163	20	22	195	175	33	40
2018	5,525	138	29	18	231	158	41	21
2019	5,614	137	27	22	219	89	32	35
Total	**53,140**	**1,642**	**267**	**230**	**2,168**	**1,441**	**345**	**326**

Note. (ATSB, 2020, p. 11).

Figure E6 above includes fatalities across all operational types and is a single table, aggregated in Figures E3 and E4, and presented by the ATSB as "power BI" chart linked from the ATSB PDF version of the report.

APPENDIX F: THE IASA READY RECKONER

This appendix provides, at Table F1 below, an overview and quick reference for the ten incident, accident, and safety attributes in the IASA Model.

Table F1

IASA Ready Reckoner

	Safety / Accident Meaning-Making Attribute	No. %	Indicative Nested Concepts	Meaning-Consilient Attributes	Actionable Agents
1	Situationally Attentive / Situationally Inattentive *or Situational Attentiveness / Situationally Inattentiveness Situational Savviness" or Situationally Savvy" or "Switched On"*	329 (84 %)	Comms Workload-Management, Distraction-Awareness.	Procedurally Mature, Vocationally Proficient, Decisionally Reliable, Organisationally Enabled, Situationally Self-unaware, Decisionally unreliable	Pilots Aircraft Engineers Operators / Managers OEM and OEM support agencies ATC Regulator - ATSB Cabin Crew and Operations Support Crew Infrastructure Operators
2	Vocationally Proficient / Vocationally Deficient *or Vocational Proficiency / Vocational Deficiency Vocational Mastery*	250 (64 %)	Classroom Training, Simulator Training, General Training, Technical Knowledge,	Organisationally Enabled, Design Assistive, Decisionally Reliable. Decisional Agility Regulatively Effective. Procedurally Mature. Situational Self Awareness	Pilots Aircraft Engineers Managers OEM and Regulator ATC Support Staff - Flying Support Staff - Non-Flying Infrastructure Operators.

	Safety / Accident Meaning-Making Attribute	No. %	Indicative Nested Concepts	Meaning-Consilient Attributes	Actionable Agents
3	Decisionally Reliable / Decisionally Unreliable *or Decisional Agility / Decisional Inertia or "Professional Judgement", "Good Judgement", "Level Headed" and "Quick Thinking"*	231 (59 %)	Briefing and Planning, Checklists, Workload Management, Delegation, Flight Training, Timely Go Arounds.	Situationally Attentive Design Assistive, Vocationally Proficient and Regulatively Effective Situationally Self-Unaware Cognitively Compromised Procedurally Mature	Pilots Aircraft Engineers Operator/Managers OEM ATC Regulator Support Staff - Flying Support Staff - Non-Flying Infrastructure Operators
4	Procedurally Mature / Procedurally Immature *or Procedural Maturity / Procedural Immaturity*	178 (46 %)	Written Comms Underpinning Knowledge Consultation with the Author or SME Non-distraction Adequate Promulgation	Situationally Attentive, Vocationally Proficient, Decisionally Reliable, Design Assistive, Organisationally Enabled Design Assistive, Situationally Self-Aware, Cognitively Resilient, Crashworthy,	All Agents
5	Design Assistive / Design Hindering *(or Design Hindering)*	137 (35 %)	Standardisation of Design, OEM Recognition and Response, Classroom Training, Simulator Training, Aircraft Emergency and Technical Training, Briefing and Planning, Checklists	Situationally Attentive, Organisationally Enabled, Decisionally Reliable, Vocationally Proficient Procedurally Mature, Regulatively Effective Crashworthy	OEM and OEM support agencies Operators / Managers Regulator - FAA/CASA etc Regulator - ATSB

	Safety / Accident Meaning-Making Attribute	No. %	Indicative Nested Concepts	Meaning-Consilient Attributes	Actionable Agents
6	Regulatory Effectiveness / Regulatory Ineffectiveness *or Legislatively Effective / Legislatively Ineffective*	136 (35 %)	Open Reporting Compliance Capacity to Comply Disambiguity	Situationally Attentive, Vocationally Proficient, Decisionally Reliable, Design Assistive, Procedurally Mature, Organisationally Enabled, Situationally Self-Aware, Cognitively Resilient, Crashworthy,	CASA (formerly CAA and sometimes referenced as such in Airtable particularly in older reports); ATSB (formerly BASI and sometimes referenced as such in Airtable particularly in older reports); FAA, Transport Canada, AMSA, EASA, plus numerous others…
7	Organisationally Enabled (-ing) / Organisationally Hindered (-ing) *or Organisational Enablement / Organisational Hinderance; Culturally Enabled / Culturally Hindered*	132 (34 %)	Training Provision. Maintenance Support. Rostering and Personnel Support. Written Comms. Governance and Compliance.	Situationally Attentive Vocationally Proficient, Decisionally Reliable Design Assistive Procedurally Mature Regulatively Effective Situationally Self-Aware, Cognitively Resilient Crashworthy	AOC Holders, AMO Organisations Management Organisations within other entities such as CASA, Airservices, OEMs etc
8	Situationally Self-Aware / Situationally Self-Unaware *or Situational*	102 (26 %)	Openness Workload Management Education	Situationally Attentive Decisionally Reliable, Vocationally	All Agents

	Safety / Accident Meaning-Making Attribute	No. %	Indicative Nested Concepts	Meaning-Consilient Attributes	Actionable Agents
	Self-Awareness/ Situational Self-Unawareness "Self Savvy".			Proficient Design Assistive Procedurally Mature Regulatively Effective Organisationally Enabled Cognitively Resilient	
9	Crashworthy / Uncrashworthy	35 (9 %)	Written Communication Underpinning Knowledge Adequate Promulgation	Situationally Attentive, Vocationally Proficient, Decisionally Reliable Design Assistive Procedurally Mature Regulatively Effective Organisationally Enabled Situationally Self-Aware	All Agents
10	Cognitively Resilient / Cognitively Compromised *or Cognitive Resilience / Cognitive Compromise*	32 (9 %)	Medical Intervention Health and Fitness Support Self Disclosure Education	Situationally Attentive Vocationally Proficient, Decisionally Reliable Design Assistive Procedurally Mature Regulatively Effective Situationally Self-Aware, Organisationally enabled Crashworthy	All Agents

Note. From the ATSB Airtable Database (2021) See Chapters 7, 8 and 9 for a full analysis.

APPENDIX G: A SHORT AUTOETHNOGRAPHY

This appendix provides a moment of self-reflection as background to the thesis and a strong statement based on recent personal experiences in my field of employment (2018-2021). My field is helicopter emergency services – most recently as a frontline pilot (2021) and prior to that as the Director Safety, Quality, Human Factors and Culture for an Australian, medium-sized, East coast medical and rescue helicopter provider (2018-2021). This was on the tail-end of broader aviation experiences in frontline rescue flying, military flying, instructional flying, managerial, safety, quality, and human factors roles for nearly thirty years at practical and academic levels.

My civilian aviation career, after some 15 years in the military, correlates to the period (2000-2021) in which the huge regulatory increases occurred (66,000 words every year to a total of 1.8 million words in 2021). These regulatory word increases have spawned many millions more subsidiary words as a result. The subsidiary words are not covered in detail in the main research, but they are worth articulating here.

As Safety Director of that mid-sized HEMS company, I counted 1.5 million words of emails sent and received in calendar year 2019. I presided over an auditing program with approximately 100 annual audits and about 100,000 words worth of reports. At the same time my safety team (totalling four people) processed 35 safety reports a month equating to many more hundreds of thousands of words per year. The team also superintended the writing and rewriting of numerous manuals for various areas such as the Drug and Alcohol Management Plan (DAMP), the Safety Management System (SMS), the Quality Management System (QMS), Flight Data Management System (FDM), Fatigue Risk Management System (FRMS) and so on – as well as numerous processes and forms equating to many more hundreds of thousands of words.

In 2019, adding to the regulatory and procedural congestion, unprecedented bushfires meant an even greater escalation in governance and compliance requirements. This related to the risk management, reporting and auditing of the company's rescue and retrieval missions during the demands of an intense fire season. Then in 2020, COVID-19 increased still further the word-count as the company attempted to safely conduct aeromedical operations while "protecting" their team with many more requisite governance and compliance words. This equated to many more tens of thousands of words as reports were processed, risk management plans created, and review cycles implemented. This was an up-regulation in more ways than one and even though, at the end of it all, hundreds of thousands more words in the service of "safety" had been written, it was genuinely hard to see how such words were really serving the frontline operators.

The inherent powerlessness of excessive "safety" words became all to obvious in July 2020. While the company was undergoing a six-week International Standards Organisation (ISO) audit, we received notification one of our helicopters had nearly crashed attempting a night-rescue in Bungonia National Park. I continued to help administrate the audit while at the same time completing the Bungonia investigation which equated to tens of thousands more words generated. The Bungonia near-accident (one of the five similar near-accidents involving HEMS since 2018 mentioned in Section 9.6), and the successful ISO accreditation, clearly showed me the safety reality of words on the screen of a smart device does not equate to the safety-reality of the world. Aircraft with far bigger screens – known as windscreens – are a reminder of this.

Also of significance to me is that these near-accidents, involving colleagues and fellow professionals, very personally and very strongly, reinforced the key truth demonstrated in this thesis: despite the massive increase of regulatory words, we seem to have comprehensively missed the point (and I include myself, my industry, and the regulator in this "we"). And this leads to the strong statement: it appears we can now add regulations to the one thing we know grows incessantly to its own demise and the demise of the organism it inhabits – cancer. Because of this regulatory bloatedness, SMSs and QMSs have followed suit becoming monsters that must be fed with never-ending words from report-writing, data-crunching, audit-proofing, and document-writing that most people have no time to read to any depth let alone process and apply. Like healthy cells turning cancerous, regulations and processes, once intended to be healthy, have become self-serving cancer cells that consume attentiveness, creativity, innovation, reason and common-sense. In my experience, managers and staff everywhere are not only world-weary in a milieu of the pandemic and natural disasters, they are *word*-weary and this word-weariness consumes bandwidth for real threats such as those posed by the Bungonia incident.

Having said all that, it is not without irony I note my own 100,000 words or so writing about too many words, but that is the nature of our liability-proofing context – it begets more and more words. But at least these thesis-words are attempting to reduce word-based, brown rule safety and replace it with red rule safety. Again, this is not to say words of the law have no place. Every society, aviation "society" included, needs law and order because every society needs to be protected from criminal behaviours. However, it seems from this research that, for aviation at least, when laws grow to gargantuan and congested proportions, one gets more law and less order. If the laws about safety are to be truly safe then let them be written in truly concise, appropriate, and clear terms. Let them not complicate, congest, and confound the safety efforts of every-day responsible agents.

My hope is this research alleviates the word-weariness for regulators, managers, and practitioners by providing a confident and compelling vision of safety that can dispel the confusing fog of regulatory excess. Time will tell whether I have achieved that goal but even if I have not, I hope it will serve as an important first step. This is especially important since, if my research is any indication, safety regulations will continue to grow increasingly gargantuan as will the possibility of regulation-congested accidents.