

AVIATION SAFETY

Spotlight

03 2015



What's your chronotype?

Understanding the biological and behavioural patterns when people feel and perform at their best

Foreword

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Correspondence, or enquiries regarding magazine distribution, may be addressed to:
The Editor,
Aviation Safety Spotlight,
DDAAFS F4-1-047,
Defence Establishment Fairbairn
28 Scherger Drive, Canberra, ACT 2600

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paul.cross@defence.gov.au

Times are changing in Aviation Safety – a new Director, introduction of SFARP and the replacement of DAHRTS with a far more user friendly and capable tool.



I am excited to be appointed the new Director Defence Aviation and Air Force Safety and you can expect me to engage with you all on a regular basis through unit visits, emails and presentations.

The move to SFARP from ALARP forces us to think of risk, not in terms of 'low good to go', but in how we manage the risk and its acceptance at the right level, which is fundamental to air power capability.

The DAHRTS Replacement Project is funded, underway and is expected to be delivered by September 2017. DDAAFS is also investing in a training and education package that will see some of our members on web-based tutorials. I thank you all for the extensive co-operation and consultation through user groups from your organisations that has defined what we want out of the program. The DAHRTS replacement cannot afford to fail, so I seek your professional endorsement over the next two years, regardless of your position in the organisation, to remain engaged and embrace the product. Your acceptance will help the young, and not so young, aviators to accept what will be a big change for them. The message for all of us is, the culture remains the same – only the tool is changing.

Enjoy this edition of *Spotlight*.

GPCAPT Paul Long
Director,
Defence Aviation and Air Force Safety



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THE SNAPSHOT SURVEY:

An x-ray view

By Mr Ryan Cooper and LTCOL Gerard J Fogarty
Directorate of Defence Aviation and Air Force Safety

“Fantastic, another survey with a clear purpose that will be used to drive positive change in my workplace!”

The statement above would make a great banner to herald the introduction of a new survey but it would be rather lacking in credibility. In reality, our reaction to an invitation to participate in a survey is usually quite the opposite; hence the phrase “survey fatigue”. Survey fatigue describes the phenomenon whereby the willingness of people to complete surveys plummets as the number of surveys increases. The lack of enthusiasm underlying the phenomenon can also be driven by doubts about the capacity of the survey to contribute to meaningful change.

The annual DDAAFS Snapshot Survey program was introduced in 2013 in an effort to strengthen the organisation’s surveillance of safety culture. With nearly 9000 respondents and the release of more than 160 individual reports to commanding officers, the 2015 Snapshot Survey could be viewed as a success. However, success is not measured by reaching reporting targets. Rather, success will ultimately be determined by the ability of the survey to support command decision-making and action where it counts.

Another key element of the survey-fatigue solution relates to establishing a clear purpose and building confidence in the fundamentals of the survey instrument, including what it measures and how its measures can be used. This article will outline the model upon which the Snapshot Survey is based and illustrate some of the immediate benefits of the data collected.

The pros and cons of surveys

Organisational surveys are often considered a nuisance because they take time to complete, their purpose is not always clear, and feedback is not always forthcoming. But they have their strengths too. From a commander’s perspective, they are a quick and economical way of obtaining information from a large number of people on a range of topics concerning the work environment. From an employee’s point of view, a survey offers a means of expressing views on the topics being surveyed. If enough fellow-employees think the same way, strong messages will be delivered to management.

Not quite so obvious are the longer-term benefits. Information supplied by respondents forms part of a database that can be used to track progress, make comparisons, and perhaps answer questions that were not so important

when the survey was designed. Well-designed surveys are useful at the time of administration and for a long time afterwards. They are based on models of organisational functioning that are intended to capture most of the factors that drive individual and organisational performance.

The annual Snapshot Survey is an example of an organisational initiative that has both immediate and long-term benefits.

Organisational model underlying the Snapshot Survey

The Snapshot Survey is based on the Job Demands-Resources (JD-R) model. The JD-R was first proposed by Demerouti et al. (2001). The model proposes that there are two basic sets of forces acting on the individual in a work setting. The first set is called job demands.

Job demands refer to those physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological (cognitive and emotional) effort and are therefore associated with certain physiological and/or psychological costs. Examples are a high work pressure, role overload, poor environmental conditions and problems related to reorganization. (Bakker et al., 2003, p. 345)

The Job Stressors and Negative Organisational Behaviour scales in the Snapshot Survey are measures of job demands.

The second set of forces acting on the individual is called job resources.

Job resources refer to those physical, psychological, social, or organizational aspects of the job that are either/or: (1) functional in achieving work goals; (2) reduce job demands and the associated physiological and psychological costs; (3) stimulate personal growth and development.

Autonomy and organisational support are two examples of current Snapshot Survey scales that would be classified as measures of job resources. In essence, job demands put the individual under pressure and job resources – for example, autonomy – help the individual to deal with that pressure.

Autonomy is an important component of job resources because the sense of freedom

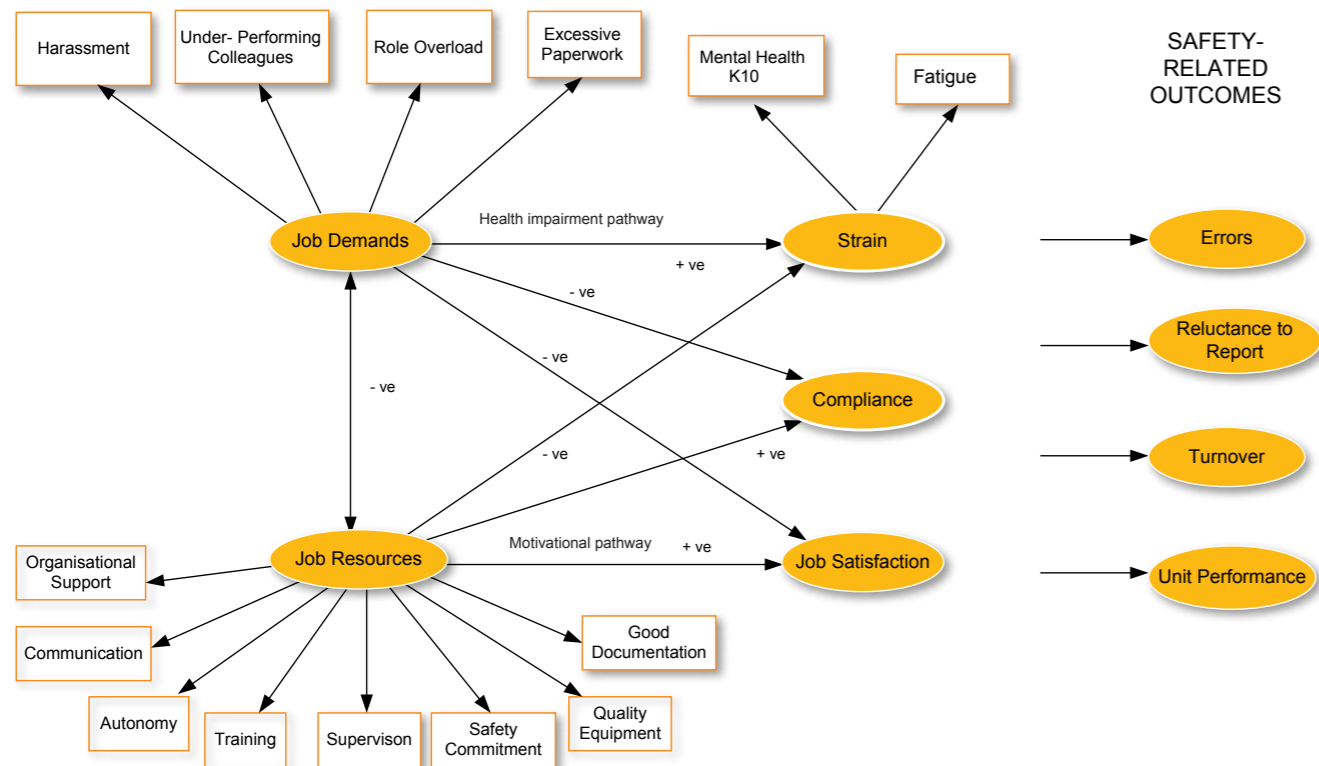


Figure 1. Job Demands-Resources Model (JD-R)

and control that comes from making one's own decisions acts as a strong counterbalance to high job demands. People feel better about high workloads if they have some say in the decisions that led to the high workloads. All of the job resources measures act in this fashion. However, if high job demands exhaust employees' mental and physical resources, burnout and lack of commitment may result.

In JD-R theory, this train of events is called the health impairment pathway. If, on the other hand, resources outweigh demands, the individual is likely to become more engaged and therefore a happier and a better employee. The lower section of the JD-R model traces what is called the motivational pathway. The Snapshot Survey version of the JD-R model is shown in Figure 1.

The model contains two broad constructs – Job Demands and Job Resources – each of which is measured by a set of scales. Separate scales have also been constructed to measure strain, compliance, job satisfaction, and the four outcome variables. Each scale contains a set of items, which are not

shown in Figure 1. The items have been carefully selected so that individual items explore slightly different aspects of the dimensions measured by their parent scales. The items within each scale have more in common with each other than they do with items that measure other scales.

These features help to ensure that the Snapshot Survey has excellent psychometric properties with all scales demonstrating good reliability and validity.

The arrangement of the scales in Figure 1 defines what is called a structural model. On the left-hand-side of the model, a total of 12 scales are included to capture the broad job demands and job resources constructs. In the middle of the model, two scales are used to capture the strain construct. The rest of the constructs in the model

are assessed by single scales bearing the same name as the construct. The constructs are all linked by arrows that indicate the direction of influence and whether the influence is positive (+ve) or negative (-ve).

A key feature of this model is the two-way arrow connecting the job demands and job resources boxes. The two-way arrow symbolises the dynamic nature of the interaction between job demands and job resources.

Although the phrase "resources outweigh demands" was used in an earlier paragraph, it is not simply a matter of measuring job resources and job demands and seeing whether one outweighs the other.

There are too many different types of demands and too many different combinations of resources for this to work. Furthermore, some types of job resources are more effective than other types at buffering the impact of high demands and generating motivation among employees.

The JD-R model was chosen as the guiding framework for the Snapshot Survey for a number of reasons.

- It comes directly from the organisational psychology literature where it has been validated repeatedly. The validation studies include some conducted in military settings (for example, Bliese & Castro, 2000). Thus, there are theoretical and empirical reasons for supposing that military job demands, moderated by job resources, will predict burnout and engagement which will, in turn, predict safety-related outcomes such as errors, reporting behaviour, performance, and retention.
- The model shown in Figure 1 covers the main points of interest for a commanding officer: How people in the unit perceive their job demands; how they rate the adequacy of the resources at their disposal; and what they consider to be the consequences of this ongoing struggle for themselves and for the unit as a whole.
- From an external perspective, using an instrument that is based on such a widely-accepted theory as the JD-R, signals that the ADF is interested in the welfare of its people as well as in their performance capabilities.

It is possible to test the validity of the model in a Defence setting. In fact, the Snapshot Survey model shown in Figure 1 has been tested using statistical modelling software and been found to fit the data.

How does the Snapshot Survey model work?

The model shown in Figure 1 can be unpacked and explained in sections. The first section embraces job demands and job resources. Both of these components contain a number of scales but the task of explaining the model will be easier if the overall demands and resources measures are taken as the starting point. These overall measures can be formed by summing all the items in the scales.

If the underlying model holds up – as it must if members of the Defence

aviation community can be expected to have confidence in the survey itself – demands and strain should be positively correlated.

Strain is measured by two variables in the Snapshot Survey model: the K10 scale and a fatigue scale. The K10 is used very widely in Defence to measure psychological distress, so for these illustrations K10 will be used by itself to represent the construct of strain.

JD-R theory predicts that when demands are high, K10 scores should also tend to be high. Demands should also have a negative effect on compliance and job satisfaction. A second expectation would be that resources have the opposite effect. That is, they should help to keep K10 scores down and to boost compliance and job satisfaction.

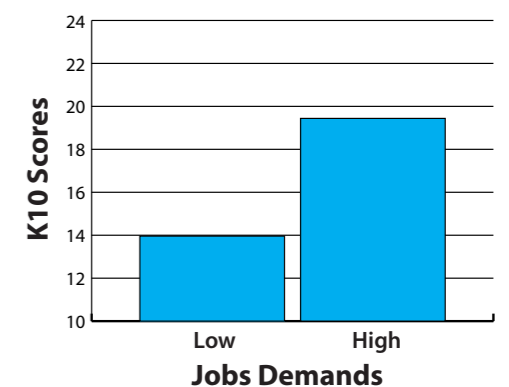
These expectations were realised in the 2015 Snapshot Survey data. The data that confirm the expectations relating to demands and strain are shown in Figure 2.

The graph in the left-hand cell shows that K10 scores move up into the Moderate Risk band when Job Demands are high. In this dataset, the graph in the right-hand cell is almost a mirror-image and shows that K10 scores are higher when Job Resources are low.

The Joint-Effect Principle

Looking at Figure 2, it would be tempting to stop the analysis at this point and simply report the job demands and job resources scores. A commanding officer (CO) could feel pleased when the demands score was low and the resources score was high. Conversely, the CO might be concerned if the demands score was high and/or the resources score was low. Focusing on either of these scores; however, would be oversimplifying things. JD-R theory not only predicts the associations shown in Figure 2, it also predicts what will happen with various combinations of high and low demands and resources scores. We call this the Joint-Effect Principle.

2a. Job Demands and K10 Scores



2b. Job Resources and K10 Scores

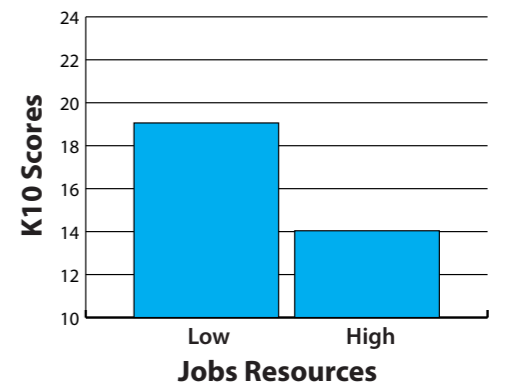


Figure 2. 2015 Snapshot Survey: Job Demands-Resources Model (JD-R) for Strain

The ability to make use of combinations of scores greatly enhances the interpretability of Snapshot Survey data. We can see the joint effect of demands and resources clearly if the respondents are divided into four groups: a) those who scored below the midpoints of both the demands and resources total scales; b) and c) those who scored above the midpoint on one but below the midpoint on the other; and d) those who scored above the midpoint on both scales. Figure 3 shows the joint effects of demands and resources on K10 scores.

The first thing to note about Figure 3 is that K10 scores rise when job demands go from low to high. We can see that change as we move along the baseline. The second thing to note is that K10 scores are appreciably higher when resources are low. We can see that change from the different heights of the left-hand column in each block. This

Influence of Resources and Demands on K10 Scores

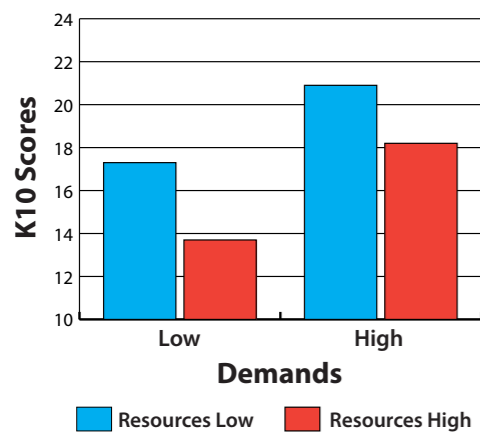


Figure 3. Joint effect of demands and resources on K10 Scores.

information could also be obtained from Figure 2. What is different about Figure 3 is that we can see the joint effect of job demands and job resources. There are four groups represented in Figure 3. The group that is reporting most strain is the one that is experiencing the high demands/low resources combination. The group that is reporting the least strain is the one that is experiencing the low demands/high resources combination. The other two combinations – high demands/high resources and low demands/low resources – have reported similar K10 scores.

What Figure 3 shows is that it can be misleading to look at either job demands or job resources by themselves. Demands will always lead to increased pressure but if resources are provided, the effect of increased job demands will be much reduced. The feedback that goes back to the CO from Snapshot Surveys always contains information on both demands and resources and it is wise to consider both scores together.

Illustrating the Joint-Effect Principle at the scale level

The JD-R principle just demonstrated at the broader construct level also applies to the scales in each section. If we take any scale from the demands section and pair it with a scale from the resources section and divide the sample into four groups using the same methodology described above, we see a pattern that is similar to Figure 3.

The combined effect of demands and resources is so strong that it can be seen even at the item level. That is, if we take an item from the Autonomy scale, such as “We are treated as responsible people”, and combine it with an item from the Role Overload scale, such as “We have trouble keeping up with our workload”, the graph of the means for the four groups is very similar to that shown in Figure 3.

The take-away message is that a CO who cannot do much about a particular job demand may still be able to manage variables such as strain and job satisfaction by manipulating a job resource that is captured by a scale or even a single item in the Snapshot Survey.

The importance of the model underlying Snapshot Survey

The Joint-Effect Principle follows from the underlying Snapshot Survey model and JD-R theory. In fact, there

are many joint effects embedded in the Snapshot Survey model and they are not confined to two-way interactions.

To explain an output variable, such as errors, we need to look at the combined effect of ALL the input variables along the pathways to that variable (see Figure 1).

There are statistical techniques, such as structural equation modelling, that make it easy to assess the effects of multiple variables on a single output variable. An explanation of those techniques is beyond the scope of this article but we can gain some idea of how they work by using the Split-Group Methodology and

extending the Joint-Effect Principle so that it combines the effects of more than two variables. The final example goes back to Figure 1 and follows three variables – job demands, job resources, and strain – to the errors outcome variable. In the 2015 data, the most errors were reported by people who were in the high demands, low resources, and high strain group. The least number of errors were reported by people who were in the low demands, high resources, and low strain group.

The Snapshot Survey model is important because, like Reason’s (1990) Swiss Cheese Model of accident causation, it highlights the fact that most errors have multiple causes, some of them associated with the individual, some with the organisation, and some because of the interaction between individuals and organisations. Unlike Reason’s model, which is very general, the Snapshot Survey identifies particular aspects of the organisation and the individual that have an impact on safety performance. The model also shows how changes in variables like job demands and job resources affect the motivation and well-being of employees, which then influence safety outcomes such as work-related errors. The true value of the survey as a management tool therefore lies in the predictive value of the model itself.

The true value of the Snapshot Survey as a management tool lies in the predictive value of the model itself as well as its capacity to identify particular aspects of the organisation and the individual that have an impact on safety performance.

Reporting Snapshot Survey data

The examples we have presented in this article used two-way and three-way combinations of job demands and job resource variables to illustrate how K10 scores change in response to changes in these input variables. There is no reason why four-way or five-way combinations could not also be used, except that such combinations are difficult to analyse and even more difficult to interpret. The fact that there is an explanatory model underlying the data does not mean that interpretation has to be elaborate. What it does mean is that there is a model and a rich literature that will allow analyses to reach different depths, depending on the capacity of the survey team, the time available, and the needs of Air Force and Defence aviation.

It is the role of articles such as this one to build confidence in an instrument by describing the model upon which it was based and by showing how various predictions generated from the model are realised in Snapshot Survey data.

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