A model for integrating technical skills and NTS in assessing pilots’ performance

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Abstract
Research into non-technical skills has assisted in developing understanding of their use in commercial aviation. However, assessing these skills continues to present difficulties. This paper describes qualitative research involving five experienced airline check captains, to determine the criteria they use to assess pilots undergoing promotion to airline captain. The findings showed differential emphases on the criteria used during assessment. Flying skills, situational awareness and decision making were found to be essential, whilst aviation knowledge, management and communication assisted in maintaining these essential skills.

Background
For many years, the training of pilots has focused on the development of flying skills and aircraft general knowledge (Mavin & Murray, 2010). These skills, frequently referred to as ‘technical skills’ (Flin, O' Connor, & Crichton, 2009, p. 1), have been influential in aviation safety (Johnston, Rushby, & Maclean, 2000). In addition to these skills, improvements in aircraft systems, such as the jet engine, have played a significant role in the high safety levels that aviation boasts today. However, these improvements have meant that an increasing proportion of accidents are now being attributed to human causes (Helmreich & Foushee, 1993). Non-technical skills (NTS), such as decision making, situational awareness, and teamwork, play a greater role than technical skills in commercial airline accidents (Helmreich & Foushee, 1993; Helmreich, Merritt, & Wilhelm, 1999). There is, therefore, a mismatch between traditional training of pilots and accident causation.

In order to address this mismatch, NTS are being incorporated into aviation training programs. In assisting with incorporating these skills and improving understanding of their function and importance, research has been conducted into NTS, such as situational awareness (Endsley, 1988, 1994, 1998, 1999; Endsley & Robertson, 2000), decision making (Flin et al., 2009; Klein, 1993, 2008), communication (Hawkins, 1987; LePlat, 1991), management (Abbot, 1993; Schute & Trujillo, 1996) and teamwork (Salas, Burke, & Stagl, 2004; Salas, Wilson, Burke, Wightman, & Howse, 2006). In the last decade, the aviation industry has moved towards assessing NTS. The most widely recognised metric was designed in Europe under the banner of NOTECHS (Flin & Martin, 2001). It divided into categories, identifiable NTS such as cooperation, leadership/management, situational awareness and decision making, with each category further divided into elements. NOTECHS utilised a criterion-based method of assessment, which measures performance against pre-specified criteria (Linn & Gronlund, 1995). For example, the elements within NOTECHS were further specified through ‘word pictures’, describing good and poor performance. This approach to assessment assists in assessing individuals against known criteria, independent of others’ performance (Sadler, 2005). However, Sadler (2005) has argued that no grading system completely encompasses specific skills; rather, an assessor must make best-fit judgments.

Recently, Australia instigated a draft ruling, which would require that NTS assessment be implemented into airline operations. However, this ruling has been delayed, with one reason cited that the current approaches to NTS assessment are ‘overly prescriptive’ (CASA, 2009). The implementation of NTS assessment metrics into airlines operation appears to have encountered difficulties. At present, approaches to assessing NTS have seen the grouping of skills into smaller clusters, with specific criteria developed for each. However, Sadler (2009) has argued that using a comprehensive criterion-based measurement system for assessment only allows performance to be better articulated; it does not facilitate a focus on the standard of the performance that is required. The required standard can only be clearly identified when the criteria for achievement of the standard, and relationships between criteria, are understood. This paper presents research that investigated the criteria that are used during assessment for promotion to airline captain. The study did
not attempt to further fragment pilots’ skills, but identified the criteria that assessors in airlines use to
determine if a pilot has reached a necessary minimum standard for promotion to airline captain.

Method
The research methodology used was the descriptive phenomenological psychological method (Giorgi &
Giorgi, 2003). Phenomenology sets out to describe how we experience aspects of our world, as completely
and faithfully as possible. A main focus, then, for phenomenological research is developing detailed
descriptions of these experiences. In the study reported here, interviews were the main data collection
instrument, with a focus on description rather than explanation. The research involved interviews with five
experienced airline check captains who represented three Australian airlines. The check captains varied in
years of experience from 17 to 29 years in the position of check captain.

Results
The findings, derived through substantial qualitative analysis, showed that a hierarchy of technical skills and
NTS were used to ascertain if pilots had reached a minimum standard for promotion to captain. Figure 1
depicts a model for assessing pilots’ performance (MAPP) based on this research. It shows situational
awareness, decision making and flying skills were found to be essential, with little leniency given on these
skills during assessment. Technical knowledge, management, and communication were considered to
support the achievement of the essential skills, so they are referred to here as enabling skills. Additionally,
the effectiveness of the MAPP has been assessed in trials with check captains from two major airlines, with
positive results.

Discussion
While check captains are aware of the importance of both technical skills and NTS in assessing pilots’
performance, current metrics do not clearly explain how these skills are related to each other or the emphasis
placed on them during assessment. This research shows that not only should these skills be integrated in
assessment of pilots’ performance, but it suggests a way in which this integration can be achieved. For
example, technical skills assessment forms already have detailed criteria, which can be integrated with
NOTECHS criteria. This integration aligns with the realities of what occurs during the assessment process.

Whilst the integration of criteria may be of assistance, an added complication in the assessment of NTS is
the discrepancies in judgements made by assessors. For instance, research by Brannick, Prince, and Salas
(2002) showed that although final grades awarded to a first officer may not differ between check captains,
the reasons given for the final grades may vary, including judgements made about assertiveness, SA, or
decision making. In addition, Goldsmith and Johnson (2002) showed some inconsistency during assessment
between, and within, airlines. The research described in this paper has implications for addressing these
discrepancies. Firstly, it is important that assessment of pilots gives sufficient attention to both technical
skills and NTS. Secondly, assessments may now highlight those skills seen as essential (see Figure 1), with
due attention to enabling skills. If all airlines placed emphasis on essential skills in assessment, while also
ensuring required standards in enabling skills, a higher level of consistency in assessment could be expected
between and within the airlines. While the findings may improve consistency during assessment, it may also
aid in the development of assessment scenarios.
An important task for training managers is the development of appropriate simulator assessment scenarios. Currently, multiple scenarios are used to assess both technical skills and NTS. These scenarios, commonly referred to as event-sets, can be designed to train and/or assess both technical skills and NTS. While shorter event-sets have been shown to result in greater consistency in assessment (Seamster, Edens, & Holt, 1995), however, in some cases, these do not measure NTS as effectively as longer event-sets (Baker & Dismukes, 2002). This research points to two ways in which the development of event-sets may be improved. Firstly, during design of event-sets, the development team could emphasise the three essential skills in training and/or assessment scenarios, with sufficient attention to the enabling skills. In other words, the focus in the event-sets would be on complex flying skills, situational awareness and/or sound decision making processes. Secondly, extended assessment scenarios, involving fewer and larger event-sets, could be used in assisting and requiring assessors to collate the performance in making final judgements. While longer scenarios may be more complex to judge, during the airline trials the MAPP assisted check captains to make improved judgments about pilots’ performance by maintaining a focus on essential skills, while also considering enabling skills.

Conclusion
This research has sought to clarify the importance of, and relationships between, technical skills and NTS in assessing pilot performance. The findings have lead to a model that may assist in future design of training and assessment tools in aviation.

References


