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The predictive power of assessment for **pilot selection**

This White Paper explains how airline recruiters can now select pilots by predicting which candidates will safely and successfully fulfil the different requirements of the role.



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Executive summary

This paper explains how airline recruiters can now select pilots by predicting which candidates will safely and successfully fulfil the different requirements of the role. It examines the specific abilities, competencies and personality required by pilots and it explains how to assess for these attributes using psychometric tests at an early stage of the recruitment process. The paper also reveals the physical and mental fitness needs of pilots.

Building on existing research and empirical findings from new validation studies, it introduces a new competency model which will help airline recruiters to select pilots who can cope with the tasks required before, during and after each flight, manage the crew and ensure the safety of all passengers and crew members.

As well as the practical skills required to fly an aircraft, the paper highlights that pilots need:

- Interactive competencies (leadership, teamwork and interpersonal skills to manage the crew and cooperate with control towers, ground crew, air traffic control and flight dispatchers; the ability to give clear guidelines, resolve conflict and take charge in the event of threat, error or misfortune).
- Operational competencies (safety orientation; situational awareness; the ability to detect and manage errors; decision-making; planning and organising as well as customer and commercial orientation).
- Motivational competencies (self discipline; self management; assertiveness; resilience; drive; stress resistance and self development).

These competencies can be evaluated by assessing the general mental ability and specific cognitive abilities of candidates. Aptitude tests that measure aspects such as inductive and deductive reasoning, spatial orientation, precision and numerical reasoning should form part of pilot selection. Different tests will be required depending on the level of the pilots being assessed, for example captains or first officers.

The paper highlights that personality has become a valid predictor of performance for pilots. When personality characteristics are combined with simulator results and flying experience prior to employment, the job success of pilots can be predicted with 79.3% accuracy.

Pilots need to be able to remain calm in monotonous and sometimes stressful situations, make quick and sound decisions under pressure, persist in the face of difficulty and keep control of their emotions. They need certain qualities, for example they have to be tough-minded and independent. Also the captain's personality has a significant impact on the motivation and performance of the crew. When selecting pilots, you should therefore assess the personality of candidates to ensure they have what it takes to master the tasks and challenges they'll face in the role. Successful pilots score high on the interpersonal scales of a personality questionnaire and low on the emotional scales.

In addition to work-related assessments, other determinants of behaviour – such as a pilot's mental state, their physical health and sleep or food deprivation – need to be assessed to avoid impulsivity and hazardous actions. For example, Andreas Lubitz, the co-pilot who deliberately crashed a Germanwings aircraft in the French Alps in 2015, had previously been treated for depression. To be a pilot requires considerable psychological and personal resources, so it is vitally important that airlines appoint a clinical psychologist to test and retest each individual's health and well-being throughout the job.

Finally, the paper introduces a validated competency model for airline pilots, detailing the interactive, operational and motivational competencies required in the role.

Introduction

When we board an aircraft, we entrust our lives to a complete stranger. Hardly any other job is associated with so much responsibility. That's why it is so important that pilots have the abilities and characteristics that are needed in order to deal with all the challenges they might face before, during, and after flight. Selecting the right people is therefore highly important.

This requires a detailed analysis of a person's competencies and abilities. As ability and personality have been found to predict job and flying performance (Hunter & Burke, 1994; Schmidt & Hunter, 1998), online tests provide an opportunity to assess a candidate's abilities, competencies and personality at an early stage. By excluding those who do not meet the requirements, an airline can save considerable time and money in the selection process.

cut-e is a specialist partner for pilot assessment, with wide experience working with clients such as Emirates and Etihad Airways in the Middle East, easyJet in Europe and Scoot in Asia. One of our airline clients claimed that after implementing our online assessments, the success rates in their simulator evaluation increased from 60% to 95%.

This paper examines the issues around assessing pilots, including factors that are important for training and actual flight performance. We have compiled theoretical considerations and empirical findings with the results of validation studies that we have conducted in conjunction with our airline clients. We discuss which general and specific abilities are relevant for pilots and how they can be assessed. We introduce our competency model for airline pilots that we developed based on literature research and empirical findings. This competency model comprises the competencies that are essential for pilot performance – Threat and Error Management and Crew Resource Management – and was validated with performance data from various airlines. Finally, we outline the benefits of implementing an online test battery that will measure a candidate's abilities, competencies and personality, to help you assess their suitability for the important role of a pilot.

Background to this study

Flying an aircraft is a complex and difficult matter. Due to technical improvements, the main task of a pilot is no longer to fly and navigate the airplane manually, but rather to monitor and control the instruments and displays and intervene if necessary. Technology has therefore changed the role of a pilot.

Pilots are also responsible for the safety of the crew and the passengers. They need to monitor gauges, collect, analyse and evaluate information and react to malfunctions if they occur. To fulfil the role, a pilot needs to cooperate with control towers, ground crew, air traffic control, and flight dispatchers. Thus, a pilot has to have several abilities. Another task is leading the crew. The captain briefs, informs, directs and evaluates crew members, solves conflicts when necessary and ensures rule compliance for all crew members. Specific competencies are therefore required as well.

So, on one hand, there are characteristics that are stable over time, such as personality traits and ability. On the other, there are situational determinants of behaviour, such as the pilot's mental state and their physical health.

If we know the competencies and abilities a pilot needs, can we predict how people will perform in the role of a pilot?

There is empirical evidence showing that ability tests and personality questionnaires can significantly predict flying performance during training, as well as the actual flight (Hunter & Burke, 1994; Ree & Carretta, 1996; Bartram, 1995; Hörmann & Maschke, 1996). When assessing pilots with the help of ability tests and questionnaires, it is important to look at what we want to predict. In cadet or trainee pilots, this is whether or not they will successfully pass

all stages of their training. In trained pilots, we want to predict whether they will fly safely, even if situations become challenging. But tests or questionnaires, which may predict a candidates' initial training performance, may have no predictive validity for experienced pilots.

Most investigations focus on training performance, as data of actual flying performance is difficult to gather. That is, accidents are (happily) so infrequent that they do not lend themselves as a good criterion. Thus, when reviewing the results of investigations on the predictive power of ability tests in pilot selection, one has to consider the target group, as well as the criterion used – training performance or actual flight performance.

Let's start by looking at abilities, before examining personality characteristics and other situational determinants both from a theoretical and from an empirical point of view.

A pilot's abilities

Cognitive ability refers to what pilots *can* do, rather than *how* they undertake their job. It covers aspects of the practical skills required to operate an aircraft as well as the skills of communication. Airlines must ensure that every pilot meets the basic psychological requirements that are essential to manage the job demands of a modern multi-pilot cockpit.

Theoretical considerations

One of the most important things is to identify exactly what a pilot does and to develop a selection battery on the basis of the skills and abilities required in the role. So first of all, we need to know which tasks pilots have to perform. As stated earlier, the tasks of pilots are complex and involve flight control, management responsibilities, responding to transportation emergencies or choosing optimal transportation routes or speeds. A job analysis of airline pilots by an extended Fleishman-Job Analysis Survey F-JAS (Goeters, Maschke & Eißfeldt, 1997), as well as the O*Net reveals a number of abilities that are highly relevant for pilots. Table 1 summarises these.

Ability	Explanation
Time sharing	The ability to shift back and forth between two or more activities or sources of information (such as speech, sounds, touch, or other sources).
Spatial orientation	The ability to know your location in relation to the environment or to know where other objects are in relation to you.
Perceptual speed	The ability to quickly and accurately compare similarities and differences among sets of letters, numbers, objects, pictures, or patterns. The things to be compared may be presented at the same time or one after the other. This ability also includes comparing a presented object with a remembered object.
Control precision	The ability to quickly and repeatedly adjust the controls of a machine or a vehicle to exact positions.
Speed of closure	The ability to quickly make sense of, combine, and organise information into meaningful patterns.
Oral expression	The ability to communicate information and ideas in speaking so others will understand.
Category flexibility	The ability to generate or use different sets of rules for combining or grouping things in different ways.
Information ordering	The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules (e.g., patterns of numbers, letters, words, pictures, mathematical operations).
Inductive reasoning	The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).
Number facility	The ability to add, subtract, multiply, or divide quickly and correctly.
Selective attention	The ability to concentrate on a task over a period of time without being distracted.
Deductive reasoning	The ability to apply general rules to specific problems to produce answers that make sense.

Table 1. Summary of abilities that are relevant for pilots based on a Job analysis of airline pilots by an extended Fleishman-Job Analysis Survey F-JAS (Goeters et al., 1997) and the O*Net

From this, we can see that the job of a pilot requires general cognitive abilities, such as inductive reasoning and deductive reasoning, as well as more specific abilities, such as spatial orientation and control precision. A test battery for selecting pilots should therefore include tests that measure exactly these abilities. But what about the empirical side?

Empirical evidence

A lot of research has been done in the field of ability tests in pilot selection and as already stated there is considerable empirical evidence showing that aptitude tests can significantly predict individual differences in flying performance during training and the actual flight (Hunter & Burke, 1994; Carretta & Ree, 1994; Ree & Carretta, 1996). The literature on ability and pilot performance reveals contradictory findings regarding the predictive power of general mental ability and specific abilities. That is, Ree and Carretta (1996) found that general mental ability can predict different pilot criteria, including measures of training performance and actual flight performance. The authors investigated U.S. Airforce Pilot Selection tests and concluded that the validity of the different ability tests was mostly due to their measurement of the common g-factor. But when additionally including specific abilities in the analyses there was only a small change in the predictive power.

On the other hand, there are the results of a meta-analysis by Hunter and Burke (1994) who reviewed pilot validation studies conducted between 1940 and 1990. They found that specific cognitive abilities, such as spatial reasoning, numerical reasoning or mechanical reasoning were better predictors of pilot training success than general mental ability. The results of the meta-analysis by Martinussen (1996) are similar. The author analysed the validity of different predictors on pass/fail in training as well as pilot skills. The analysis revealed that specific cognitive abilities (.24) were better predictors than general mental ability (.16). However, previous training experience was even more important (.30). Thus, for experienced pilots previous training experience is the best predictor of performance, followed by cognitive ability tests. For pilots without previous flying experience there is no such data, so for this group cognitive ability is the best predictor of performance.

Directly related to this is the question what effect age has on pilot performance. It is a well-known fact that fluid intelligence, or sensory motor and reasoning ability, declines with age. Thus, will older pilots still be able to perform as well as younger ones? Studies indicate that expertise can compensate for the effects of age-related cognitive and sensory-motor decline (Taylor, Kennedy, Noda, & Yesavage, 2007).

The different results in the two different lines of research mentioned here might be due to the different samples that were investigated. That is, while and Carretta and Ree (1994), as well as Ree and Carretta (1996) investigated only Airforce pilots, the meta-analyses by Hunter and Burke (1994) and Martinussen (1996) considered pilots in general. Moreover, the results support our theoretical considerations that both general mental ability, as well as specific cognitive abilities are important for and can predict flying performance. Thus, aptitude tests that measure both general mental ability and specific cognitive abilities should be the method of choice in pilot selection.

Ability tests

Besides our standard ability tests, e.g. on deductive reasoning, *cut-e* has specifically designed online tests to assess the important abilities of pilots. Table 2 depicts the abilities that are relevant for pilots, as well as the respective tests that measure these abilities.

Ability	Time sharing	Spatial orientation	Perceptual speed	Control precision	Speed of closure	Oral expression	Category flexibility	Information ordering	Inductive reasoning	Number facility	Selective attention	Seductive reasoning
Test	<i>scales mt (avi)</i>	<i>scales ndb</i>	<i>scales rt</i>	<i>scales xw</i>	<i>scales cls</i>	<i>scales lt</i>	<i>scales lst</i>	<i>scales cls</i>	<i>scales cls</i>	<i>scales tmt (avi)</i>	<i>scales cmo</i>	<i>scales lst</i>

Table 2. Abilities that are relevant for pilots as well as tests that measure these abilities

In partnership with CTC Aviation, a world leading airline training and pilot resourcing company, we conducted a construct validation study for the specific pilot tests in 2016. 99 cadets completed a selection of *cut-e* tests (*scales xw*, *scales ndb*, *scales rt*, *scales cmo*, *scales mt (avi)*, *scales tmt (avi)*), as well as the test modules of the well-established reliable and valid pilot test battery PILAPT (Kokorian, Valser & Burke, n.s.). The results showed that the (different) *cut-e* ability tests could predict all PILAPT test modules (Multiple R up to .65). These results indicate that the *cut-e* ability tests *scales xw*, *scales ndb*, *scales rt*, *scales cmo*, *scales mt (avi)*, *scales tmt (avi)* are valid measures for pilot selection. The other tests have been validated with measures of general reasoning and showed good psychometric qualities.

Our experience and data analyses show that this combination of instruments is effective but, depending on the level of the pilots assessed (e.g. first officers vs. captains), slight alterations are necessary in order to achieve the most valid prediction.

All in all, there is theoretical and empirical support showing that general mental ability, as well as specific cognitive abilities are good predictors of flying performance during training and actual flight. However, depending on the level of the pilots assessed (e.g., cadets vs. captains) slight alterations in the predictive power of ability tests can be expected. But irrespective of the role, every pilot should have the basic abilities that are required in order to be able to cope with the tasks before, during and after flight to ensure safety for passengers and crew members.

In various empirical studies, our tests have been shown to be reliable and valid measures. But besides the various cognitive abilities the job of a pilot requires, there is growing evidence that personality is essential as well. That's why in the next section we will look at the relationship between personality traits and flying performance.

A pilot's personality traits

When assessing pilots there is often a focus on mental ability. But the effectiveness of the flight-crew is actually a combination of three components: technical skills, attitudes and personality characteristics (Foushee & Helmreich, 1988; Sells, 1955). While the first studies on predictors of pilot performance failed to find links between personality and performance, evidence has grown that personality characteristics are important for pilot performance.

In this context, Maschke (2000, p. 141) stressed that "... social/interactive capabilities seem to be as important for a successful airline and controller career as mental and psychomotor (pilots) respectively sensory factors (controllers)." This is reasonable as the tasks of a pilot involve for instance leading and communicating with the crew, as well as solving conflicts when necessary. Moreover, it has been shown that the majority of air transport accidents have been caused by breakdowns in communication and workload distribution (Kanki, Helmreich & Anca, 2010; Cooper, White & Lauber, 1980). This is why Crew Resource Management (CRM) was implemented.

CRM tries to optimise interpersonal functioning by addressing topics such as leadership and decision-making. However, as personality is rather stable over time and quite resistant to change, there are limits on what we can achieve with training (Chidester, Helmreich, Gregorish & Geis, 1991). Therefore it is important to assess a candidate's personality in advance to ensure they have the competencies required to master the tasks and challenges they will face.

Theoretical considerations

Besides the various abilities the job of a pilot requires, a number of personality traits and competencies are important. A Fleishman-Job Analysis Survey F-JAS rated the competencies stress resistance, cooperation, communication and decision making as being very relevant for airline pilots in general (Goeters et al., 1997). Moreover, pilots need to show professional aviation knowledge and should be strong in the social competencies needed to practice good Threat and Error Management (TEM) and Crew Resource Management (CRM) (IATA, 2012).

In Crew Resource Management (CRM) competencies such as leadership, conflict resolution, communication and decision making are addressed, whereas Threat and Error Management (TEM) focuses on teaching pilots the limitations of human performance, as well as training them to develop skills to detect and manage error. One of TEM's underlying principles is the premise that human error is inevitable (The International Federation of Air Line Pilots' Associations, 2012). The International Air Transport Association (2012) concluded that being a pilot requires competencies, such as communication, cooperation, assertiveness, leadership, self-discipline and stress management. Table 3 summarises the relevant competencies for pilots.

F-JAS Goeters et al., 1997	CRM Flin 2010	TEM Maurino 2005	IATA 2012
Stress resistance	Teamwork	Identify risks	Communication skills
Cooperation	Leadership	Manage error	Cooperation
Communication	Situational awareness		Assertiveness
Decision making	Decision making		Leadership
	Stress management		Self discipline
			Self-critical attitudes
			Stress management
			Self organisation
			Professional aspiration level

Table 3. Overview of competencies that are relevant for pilots based on a Job analysis of airline pilots by an extended Fleishman-Job Analysis Survey F-JAS (Goeters et al., 1997), competencies that are addressed by CRM (Flin, n.s.) and TEM (Maurino, 2005) and competencies that have been found to be relevant by the IATA (2012)

Empirical evidence

Although the first studies on predictors of pilot performance failed to find valid linkages between personality traits and performance criteria, Chidester et al. (1991) argued that this was due to conceptual problems in personality and performance assessment, as well as to statistical limitations. The findings by Helmreich, Sawin and Carsud (1986) indicate that flying performance during training might be much less sensitive to personality effects than performance after a longer period of employment. The authors concluded that this "honeymoon effect" – as they called this phenomenon – emerged because during training, most individuals are motivated to do as well as possible. But as the job becomes more routine, initial motivation may decline and personality characteristics, such as intrinsic achievement motives, may become more valid predictors of performance.

This notion is in line with the findings by Maschke and Goeters (2000) who showed that the importance of personality-related requirements increases significantly from initial pilot training up to an airline captain. While technical aspects are more important in initial training, non-technical factors come to the fore as the individual gains more responsibility.

However, there are also empirical studies that did find valid links between personality traits and pilot performance. Bartram (1995) explored the predictive validity of two personality questionnaires for military flying training. He found small relationships between some personality dimensions and training outcome. That is, those who passed the training were more extravert, less anxious, tough-minded and more independent than those who failed.

Hörmann and Maschke (1996) investigated the validity of a personality questionnaire to predict the job success of airline pilots. The authors found that when assessing personality together with simulator results and flying experience prior to employment, job success after three years could be predicted with 79.3% accuracy (compared to 73.8% accuracy only through simulator checkflight and flying experience). In this context, successful pilots scored substantially higher on interpersonal scales and lower on emotional scales of the personality questionnaire.

Carretta (1989) investigated the predictive power of aptitude and personality measures in military pilot selection. The results showed that when adding information processing, psychomotor and personality tests to the Air Force Officer Qualifying Test (AFOQT), the predictive validity increased from .169 to .436.

Apart from the impact personality traits have on a pilot's flying performance, Chidester, Kanki, Foushee, Dickinson and Bowles (1990) found that the captain's personality has a huge impact on crew performance. In their study, crewmembers were grouped based on the captain's personality and they had to fly five complete flight segments across two days in a simulator. The results showed that the crews who were led by captains high in both achievement needs and interpersonal skills performed well across all segments. In contrast, those crews led by captains low on both of these dimensions performed significantly worse across all flights. Crews with captains high in achievement needs but low in interpersonal traits, initially performed poorly, but improved substantially by the fifth leg.

Taken together, these results consistently show that personality traits do predict training performance and later job performance (see Maschke & Goeters, 2000; Helmreich et al., 1986). Moreover the results indicate that the captain's personality might further influence performance even of well-trained and qualified crews. Thus, it is beyond dispute that a pilot needs interactive (e.g. managing the crew), operational (e.g. planning and organising), as well as motivational (e.g. motivation) competencies. As personality traits are rather stable over time there are limits on what we can achieve with training. Therefore it is highly recommended to include measures of personality when assessing pilots.

cut-e's competency model

Based on literature research and empirical findings, *cut-e* developed a competency model for airline pilots that comprises the competencies that are essential for pilot performance. This has been validated with performance data from several leading airlines. The various non-technical skills (NO-TECHS) are depicted in table 3 in ten competencies (see figure 1), grouped into three areas: operation, interaction and motivation.

Operation comprises the competencies safety orientation, decision-making, planning and organising, as well as customer & commercial orientation. Needless to say, safety is the highest goal in the airline industry. As, according to TEM, human error is inevitable, it is crucial that pilots are safety-oriented. This means that a pilot needs to prioritise safety, takes responsibility for safety and follows rules where necessary.

Another important competency that the job of a pilot requires is decision making. There are situations in which it is crucial that pilots make quick decisions, taking into account all the relevant information and the likely implications.

Planning and organising comprises self-organisation and refers to the competency to manage one's time effectively, to monitor progress against objectives, as well as to plan tasks well in advance. This competency will likely contribute to a smooth execution of the processes before, during and after flight. Moreover, due to the huge competition within the airline sector, customer satisfaction is an important goal for every airline. Therefore, airline pilots also need to show a certain level of customer and commercial orientation.

Interaction comprises the competencies of managing the crew, teamwork and interpersonal communication. 'Managing the crew' is only relevant for captains. A captain needs to be able to delegate tasks to others according to their capability, to give clear guidelines and commands, to take charge in case of threat and error and to encourage input from others. As already stated, most accidents are due to breakdowns in communications (Kanki, et al. 2010; Cooper et al., 1980). Therefore, good teamwork and communication skills are essential. These theoretical considerations are further in line with the results reported by Hörmann and Maschke (1996) who found that successful pilots scored substantially higher on interpersonal scales.

Motivation involves the competencies of resilience, drive and self-development. Being a pilot is a demanding job with high responsibility. It is crucial that pilots can remain calm in stressful situations, persist in the face of difficulty and keep control of their emotions. This is in line with the findings by Hörmann and Maschke (1996) that successful pilots scored lower on emotional scales. This is likely due to the fact that attentional resources that are required for information processing, as well as the pilot's ability to judge might be affected and have an adverse effect on flying performance. Only pilots who are motivated can do their best every single day.

Pilots need to actively enforce self-development. Only pilots who are up-to-date with the latest developments and equipment and who know about their own strengths and areas for development can contribute to higher safety levels. This is in line with the notion by Helmreich et al. (1986) who concluded that intrinsic achievement motives are important for flying performance.

We validated this 'operation, interaction and motivation' competency model with performance data from various airlines. The results showed that the different competencies can predict training and actual job performance. As the competencies that are required for flight performance vary with experience level, there are slight alterations depending on the level of pilot assessed. All competencies can be assessed using a self-report questionnaire.

	Competency	Cadet	First Officer	Captain
operational	Safety Orientation	✓	✓	✓
	Decision-Making	✓	✓	✓
	Customer & Commercial Orientation	✓	✓	✓
	Planning & Organising	✓		
interactive	Teamwork	✓	✓	✓
	Communication Style	✓	✓	✓
	Managing the Crew			✓
motivational	Resilience	✓	✓	✓
	Motivation	✓	✓	✓
	Self-Development	✓	✓	✓

Figure 1. Competency model for airline pilots (cut-e, 2016)

Other determinants

We've seen that cognitive ability and personality traits in pilots are crucial for training and actual flying performance. But there are other situational determinants.

Mental health

One major factor is medical fitness. Besides physical health, mental health is important because it has been found that personality or psychological disorders increase the likelihood of hazardous behaviour (Hunter, 2005). In this context, the crash of Germanwings flight 4U99525 in the French Alps, in 2015, inevitably comes to mind. Co-pilot Andreas Lubitz deliberately crashed the aircraft. He had previously been treated for suicidal tendencies and had been declared 'unfit to work' but he withheld this information from his employer.

To put things into perspective, according to a 2014 study from the US, pilot suicides account for less than one percent of all aircraft fatalities (Lewis, Forster, Whinnery, & Webster, 2014). Nevertheless, it is beyond dispute that there needs to be medical assessment (both physical and mental) in addition to work-related assessment to ensure that applicants 'have no established psychological deficiencies, which are likely to interfere' with safe practice (The European Commission, 2011). Pilots must be able to remain alert and calm in monotonous and challenging situations and be able to make quick and sound decisions under pressure.

As a pilot, it can be difficult to maintain a work-life balance and social contacts. Considerable psychological and personal resources are therefore required to ensure a pilot's health and well-being throughout the job. The European Commission (2011) states that applicants 'with a mental or behavioural disorder due to alcohol or other use or abuse of psychotropic substances shall be assessed as unfit pending recovery and freedom from substance use and subject to satisfactory psychiatric evaluation after successful treatment'.

Applicants with mental disorders such as mood disorders, neurotic disorders, personality disorder, mental or behavioural disorders shall further undergo satisfactory psychiatric evaluation before a fit assessment can be made (The European Commission 2011). Some personality traits seem to be related to the development of mental disorders. That is, neuroticism, as well as low conscientiousness have been found to be related to anxiety and depression (The European Commission, 2011). Moreover, Goeters (1998, cited after Ganesh, A. & Joseph, C., 2005, p.58) suggested that candidates with traits including high anxiety and impulsiveness should be excluded. In this context, we want to stress that a satisfactory psychiatric evaluation needs to be done under the direction of a clinical psychologist.

Situational factors

Other situational determinants of behaviour are the pilot's current mental state or literally the situation they are currently in. Situational factors that which can impact a pilot's behaviour are sleep or food deprivation. These situational factors together with certain attitudes or personality traits such as impulsivity can lead to hazardous behaviour (Hunter, 2005). Thus, assessing a pilot's current mental state before each flight is likely to add to the predictions that can be made based on general mental ability and personality.

Overall, we now know a great deal about the factors that predict performance in pilots. However, the predictive power is highly dependent on the validity of the psychometric instruments used. Therefore, we constantly conduct validation studies together with our clients.

Case study

In 2016 we conducted a validation study with an airline client on selecting cadets, first officers and captains. Altogether, over 10.000 applicants completed the online assessments. For a subsample of this group we conducted a validation study. The aim of our study was to evaluate whether our instruments *scales xw*, *scales ndb*, *scales mt (avi)*, *scales eql*, as well as our personality questionnaire *shapes (management)* could predict performance of First Officers in the simulator evaluation and the assessment centre.

As the airline had already excluded candidates due to their results in the ability tests, the assessment centre pass rate was already high at 84%. Our results revealed that our ability tests and some dimensions of our personality questionnaire were positively related to the simulator evaluation result, as well as some assessment centre criteria. For example, those candidates who were more competitive performed less well in the simulator evaluation, while those candidates who followed rules, were strongly motivated to grow into a command position and enjoyed cognitive challenge performed better. Based on the results of our analyses we adjusted the scoring logic by weighting some of the assessments more strongly than others. By doing this, we could increase the pass rate of the assessment centre by 8% and the pass rate of the simulator evaluation by 11%, which equates to a very positive return on investment.



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cut-e is a world leader in the design and implementation of innovative online tests and questionnaires for recruitment, selection and development. *cut-e* helps companies identify people with the right capabilities and cultural fit to deliver optimal business results. *cut-e* carries out over 12 million assessments per year in over 70 countries and 40 languages.

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