

A Study Exploring the Hiring Manager's Perception of
Personality Assessments in Pilot Selection.

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Abstract

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in
Pilot Selection.

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The aviation industry is changing due to 'economical, technical and societal' influences (Hoermann, Kissing and Zierke, 2009, p.1). Pilot recruitment is experiencing substantial growth, resulting in selection systems being the target of 'continuous process improvement and cost-benefit analysis plans' (Damos, 2014, p.99). Traditionally, pilot selection focused heavily on results from the 'test battery' that included ability and personality assessments. The test battery was created as a result of a job analysis that identified the key skills and attributes of the ideal candidate.

A gap in literature has been identified pertaining to 'stable personality traits that can affect performance in pilots' (Fitzgibbons, Davis and Schutte, 2004). There is a renewed focus on the possibility of personality assessments having the ability to predict performance. Motowidlo, Borman and Schmit (1997) describe the theory of job performance as 'behavioral, episodic, evaluative and multidimensional' (p.1). They define occupational performance as 'the aggregated value to the organisation of the discrete behavioral episodes that an individual performs over a standard interval of time' (p.1).

To address the problem regarding personality and its affect on performance a qualitative approach was taken to conduct ten semi-structured interviews with pilot hiring managers who have used personality assessments in selection. The aim is to compare their experience and knowledge of personality traits that are predictive of performance in a multi-crew environment with a view to creating a model of personality traits associated with high performing pilots. McCrae and Costa (1985) Five Factor Model (FFM) of personality has been chosen to base the discussion on and provide a general taxonomy for the language used to describe personality. Street and Helton (1993) confirm that the FFM has universally been identified as the best model for pilot selection by many researchers. The study will also explore the issue of social response distortion (SRD) or faking as it is referred to in self-reported personality assessment.

This study confirms personality assessment has a greater perceived predictive validity than that quoted in literature and is given equal weighting to cognitive ability amongst hiring managers once the essential criteria has been met. The findings suggest that there is no single 'pilot personality' and that employee fit is just as important as personality type. The study identified a model of essential pilot personality traits that were linked to performance from the hiring manager's perspective. The findings also confirmed that SRD (faking) does not appear to invalidate the psychometric properties of the assessment and the FFM is a robust model on which to base pilot selection.

Note: 1. For the purpose of this study it is assumed that applicants have met the essential criteria and reached the required standard in all assessments, personality traits will only be discussed. Note 2. The opinions expressed here are the personal views of the researcher and the respondents and do not represent their airlines.

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Glossary

AB-INITIO=Pilot Commencing Training from the Beginning

BPS=British Psychological Society

CAA= Civil Aviation Authority

CRM= Crew Resource Management

FAA-FCL= Federal Aviation Administration Flight Crew Licence

FFM=Five Factor Model of Personality

FTO= Flight Training Organisation

HRM=Human Resource Management

IATA= International Air Transport Association

JAA-FCL= Joint Aviation Authority Flight Crew Licence

NASA= National Aeronautics and Space Administration

NEXTGEN= Next Generation Air Transport System

NOTECHS=Non-Technical Skills

SRD= Social Response Distortion (Faking)

SESAR= Single European Sky Air Traffic Research System

SMIE=Subject Matter Industry Experts

SOP=Standard Operation Procedure

Introduction

1.1 History on the use of Psychometric Tools in Pilot Selection

Since World War II the recruitment and selection of pilots both in commercial and military arenas has received considerable attention and debate by aviation psychologists and human factors experts according to Damos (1995). The test battery is composed of a number of tests consisting of ability and personality assessments. It has been a consistent staple in the tool kit for pilot selection and has remained mostly unchanged over the last 70 years (Turnbull, 1992). Damos (1995) clearly points out that the complacency and consistency of the test battery is not based on a solid theoretical background or built on rigorous research and elements of it also appear to provide low predictive validity typically ranging from .15 - .40 (Hunter and Burke, 1994 and Carretta, 1992). Wingestad (2005) describes 'predictive validity' as 'a statistical correlation coefficient ranging from .00 to 1.00, where 1.00 expresses a perfect positive correlation' (p.4).

1.2 The Recruitment and selection of pilots

In aviation recruitment and selection there has been immense focus on the recruitment and selection of pilots both for commercial and military operations. Commercial aviation goals tend to focus on safety, cost and customer satisfaction (Carretta, 2000). The military's goals are somewhat different and focus on 'mission-readiness pilots', avoiding loss of life and reducing training costs (Carretta, 2000, p.1). Traditionally the selection of ab-initio pilots (a Latin term meaning from the beginning) and direct entry pilots (qualified with an appropriate licence to fly commercial aircraft) focused heavily on scores from a number of assessments in the 'test battery' or psychometric assessment. Examples included verbal, numerical, spatial, psychomotor and personality tests. Internationally, the use of such tests and the variety used varies immensely (Schuler, 2000). Their purpose in selection is to measure 'technical aptitude and training to technical proficiency' (Chidester, Helmreich, Gregorich and Geis, 1991, p.26). Damos (1996) views this rationale as a problem in the industry,

basically because the evidence suggests that test batteries are better at forecasting training potential and performance rather than operational performance the latter being regarded as the ultimate goal in pilot selection.

1.3 Why use psychometric tools?

The main purpose of using psychometric tools in recruitment and selection is to identify the best candidates from the selection pool. By using tools to measure certain abilities (i.e. IQ, general mental ability, psychomotor skills or cognitive ability) and psychological characteristics (i.e. personality traits) the ultimate aim is to predict the future performance of pilots both in training and in flying. Martinussen (1996) believes that personality and interpersonal skills are important for 'safe flying' but suggest that it is very difficult to measure them. In her meta-analysis (1996) personality yielded the lowest correlations with pilot performance

($r = .14$) when compared to previous training experience ($r = .30$) and cognitive tests ($r = .24$). She bases this theory on two facts, firstly most personality assessments are 'self report' and candidates can create an impression to become more 'socially desirable' and secondly because most personality assessments were intended for the 'clinical population' (p.14). There is a considerable body of evidence suggesting that 'measures of cognitive ability and personality are powerful and efficient tools for predicting performance' and based on meta-analytic research the mean validity of combining both tests deliver results in the range of $r = .65$, which is a striking result (Hirsh, 2009, p.755) when compared to IQ or personality results in isolation.

This study will predominantly focus on the Five Factor Model (FFM) of personality and their sub facets (see Appendix A) used to measure personality in pilots. The FFM dimensions of personality underpin most personality assessment tools, Schmitt et al, (1998); Barrick and Mount, (1991); Tett, Jackson and Rothstein, (1991); Ghieselli and Barthol, (1953) all believe personality assessment has a place in selection and assessment regardless of it's troubled past when it was in or out of vogue (Hogan, 2005). Hormann and Maschke and

Pescena (1997) have positively correlated pilot's operational performance to interpersonal skills. Gunion and Gottier (1965) argue about the effectiveness of personality testing in selection and are more cynical about the benefits of it. It is also worth noting that Hoel (2004) affirmed that there is very little evidence cited by human resource practitioners and recruitment consultants on the 'validity of personality tests for predicting job performance' considering that Faulder (2005, cited in Rothstein and Goffin, 2006, p.156) found in Great Britain the highest ranking companies were using it to make selection decisions. The business case for laying solid recruitment and selection foundations down and investing in a robust, selection and assessment strategy is compelling with all airlines interested in making predictions 'about the future performance of their pilots and the suitability of first officers for a promotion to command' (International Air Transport Association, 2012, p.14). And yet, in an on-line survey by IATA (*Guidance Material and Best Practices for Pilot Aptitude Testing, 2012*) that reviewed industry selection systems it was found that 'only a minority of airlines have a specific selection system in place that is structured and scientifically-based' (IATA, 2012, p.1).

1.4 The gap in literature

It will also attempt to address the gap in literature about 'stable personality characteristics' such as interpersonal skills 'that may influence crew performance and error management' in pilots (Fitzgibbons, Davis and Schutte, 2004, p.1). According to Helmreich (1987) there are certain variables in a pilots performance that are very difficult to change, namely personality and ability, therefore he feels that it is perfectly reasonable to base selection decisions on personality traits that are related to interpersonal skills. This fact is backed up by research by Hormann and Maschke (1996) when they highlighted the 'influence of personality....on performance' was limited during training but a lot more important post qualification (p.172). They focus on the traits of a qualified pilot and suggest that as pilots they need to be in possession of management skills and team skills and how these qualities relate to interpersonal skills. The interpersonal skills associated with good Crew Resource Management (CRM) behaviors are far

superior when selected in initially when compared to just training CRM skills when a pilot commences in an airline.

1.5 Industry analysis

The 100th anniversary in commercial aviation was celebrated on January 1st 2014 and marked an important milestone in the industry. According to Appelbaum and Fewster (2003) this arena is an ‘extremely competitive, safety-sensitive, high technology service industry’.....focused ‘on people, employees and customers’ (p.1). The industry is a vital part of the global Gross Domestic Product (GDP); it supports ‘57 million jobs and \$ 2.2 trillion in economic activity’ (International Air Transport Association, 2013, p.4). Alan Joyce (2013) Chief Executive Officer (CEO) in Qantas Airways and Chairman of IATA exemplifies the enormity of the scope of aviation while supporting tourism and international business. He confirmed that aviation transported ‘three billion passengers and 47 million metric tons of cargo in 2012’ (cited in IATA, 2013 p.4). It is a crucial trading link for both developed and expanding economies and facilitates international business transactions in a global economy.

1.6 Industry challenges

The environment is extremely challenging and commercial airlines are finding it increasingly difficult to trade in the marketplace and increase their bottom line revenues. According to Tony Tyler (2013) Director General and CEO of IATA in 2012 the industry delivered an ‘aggregate profit of \$ 7.6 billion on revenues of \$ 638 billion with a 1.2% profit margin’ (cited in IATA, 2013 p.6). Aviation costs are high, net profit margins are low and in the region of 1% to 2% which is deemed an inadequate return for investors in such a high risk environment (IATA, 2013).

With the rise of low cost travel, open skies policies and severe cut-throat competition, European airlines are struggling to stay alive. Europe saw the failure

of over 30 airlines during the period of economic decline in 2008/09 and this pattern still exists today to a lesser degree with another four airlines failing between 2011/12 (CAPA, 2012). Internationally a similar situation exists with the loss of the flagship carrier Canadian Airlines and others who also filed for bankruptcy (Jayanti and Jayanti, 2011). Airlines are constantly working on the value chain with governments to regulate and ensure policy is in place to deliver sustainability in terms of their safety, security and environmental goals. With the backdrop of soaring fuel prices, \$113.00 a barrel (Market watch, 2014), this in fact accounts for half of an airlines operating costs (Technology Quarterly, 2011) airlines are constantly trying to increase efficiency by reducing their fuel intake with energy efficient aircraft and fuel saving initiatives that have knock-on effects on reducing the amount of carbon emissions and fuel expenditure.

While accommodating rapid growth, airlines are severely challenged by an inefficient air traffic control system and infrastructure that impedes their progress and development. They also perceive themselves as having no control over the situation because ‘one of the biggest issues the airlines face is that a major part of their cost structure is out of their control and really controlled by the governments of the world’ (Knittel, 2011, p.2 cited in CIT, 2011). *Next Generation Air Transport System* (NextGen) in the United States of America and *Single European Sky Air traffic Research system* (SESAR) in Europe are large scale industry-government programs working together to drive technology, performance and efficiencies in the air (Hoermann, Kissing and Zierke, 2009, p.2). To facilitate the growth and the advancement in technology it has been forecasted that there will be major demand for new aircraft, new runways and new airports. The National Aeronautics and space Administration (NASA) are working with industry and governments to make travel efficient and economical possible for all stakeholders including the passengers, environment and the industry (NASA, 2013).

The International Civil Aviation Organisation (ICAO) is the United Nations ‘specialised agency’ it develops international standards and recommends changes to improve global aviation safety. The commercial aviation industry has never

been so safe, it has seen the global accident rate decrease by ‘13%, from 3.2 accidents per million departures in 2012 to 2.8 accidents per million departures in 2013’ (ICAO, 2014 p.4). The industry and governments are collaboratively working on driving aviation security and implementing improvements to the risk based data driven security procedures they employ. They achieve this by collecting and analysing information and risk ‘Passenger Information (API) and Passenger Name Record (PNR) programs to aid border security. Information of this kind is a crucial tool in the fight against terrorism and illegal activity’ (IATA, 2012, p. 22).

Climate global emissions (CO₂) are rapidly growing at about 4% annually and the aviation industry is responsible for 5-14% of man-made climate change (Carbon Market Watch, 2013). The industry strategy for controlling climate change and achieving carbon neutral growth (CNG) is focused on improving technology, systems and fuel efficiency. According to Tyler (2013), IACO is working with governments and their aim is to cut net emissions in half by 2050 and drive environmental sustainability (IATA, 2013).

Other challenges facing the aviation industry are the rise of low-cost airlines, environmental risk, the hazardous nature of the pilot’s role and technological advances in aircraft. The aviation industry has always been extremely regulated and these regulations were sometimes responsible for stunting the industries’ economic growth. IATA has striven for policies that have permitted fairness and equilibrium across the industry in terms of market competition, passenger and employee rights (IATA, 2013). This has resulted in deregulation and has allowed airlines forge new partnerships and mergers. A prime example was joining US Airways and American Airlines, the largest airline in the world).

1.7 Survival measures adopted by the airlines

Mergers are seen as a responsible reaction for deregulation (Kumar, 2012). The reasons airlines choose this method is mainly for financial survival, profitability, market accessibility and to reduce capacity on different routes (Kumar, 2012). Some of these mergers have been unable to mix corporate cultures resulting in

morale challenges for airline staff and customers (Cohn, 2005) Most commercial airlines are being forced to do 'more for less' which is raising 'fresh concerns about air safety' (Salas, Jentsch, and Maurino, 2010, p. 293-294). In the midst of the worldwide recession, airlines have had to drive costs down and enhance their revenue streams with ancillary revenue (non-ticket related revenue). Value propositions such as on-board merchandising and baggage charges have become increasingly important. The return on capital invested in this sector was in the region of 4% which was well below the normal returns for an industry with such a high risk profile (IATA, 2013). Following the effects of 9/11 airlines have engaged in transformational programmes, CEO's for example Alan Joyce (2013, Qantas) have been responsible for 'reshaping their business, reengaging employees and revitalising customer service' (Qantas, Cost Cutting Programme, 2014; cited in IATA, 2013, p.5). Downsizing 'has become a favoured business strategy in the troubled aviation industry' and led to almost every 'major US airline' declaring 'bankruptcy and over 200,000 airline employees losing their jobs including over 14,000 pilots' (Fraher, 2013, p.109-126).

1.8 The human error problem

'Human error' has been quoted as the cause of most aviation related accidents and incidents (Rantanen, Palmer, Wiegmann and Musiorski, 2005). Lautman and Gallimore (1987) conducted an industry analysis on 93 aircraft losses that occurred between 1984 and 1997 and concluded that over 70% were a result of 'pilot deviation from basic operational procedures' (p.2). There are many factors that contribute to deviations from operational procedures. According to Strauch (2004) they include the other crew, environmental factors, the machinery or equipment being used, different cultures holding different beliefs. To mitigate the risk of deviation, standardisation of procedures (SOP's) plays an important role in safety according to Decker (2001). However a certain amount of ambiguity still exists. He believes that this indistinctness occurs may occur when following 'Rote' procedural actions (checklists) and SOP's may possibly prevent getting the job done (p.381). For a safe operation he argues that operators (pilots) must interpret procedures to suit the circumstances or the situation they find themselves in and that 'procedures themselves can never fully specify' the job

(2003, p. 235) or the actions that are required. Therefore, it is the pilot's interpretation of the situation and the actions required, that are not specified in SOP's that can generate a safe operation and not the procedures on their own (p.382).

Considering Lautman and Gallimore's (1987) industry analysis most accidents were attributed to problems with aircrew coordination and ineffective communication. According to Appelbaum and Fewster (2003) 'interpersonal skills and not technical skills are viewed as critical success factors for pilot performance and safety' (p.3). Literature has highlighted that ineffective interpersonal, communication and crew coordination skills are some of the attributes that could negatively affect a pilot's performance. The industry as a whole is aware of this problem and has tried to address it with CRM training initiatives. However they failed to adequately address the issue of 'stable personality characteristics that may influence performance' and drive certain undesirable behaviors in pilots (Fitzgibbons, Davis and Schutte, 2004, p.1).

1.9 Growth verses the pilot shortage

The global commercial aviation industry is currently experiencing rapid and accelerated growth due to passenger demand for connectivity. Aviation could be defined as 'connectivity on a global scale' according to Siim Kallas, Vice President of the European Commission (Kallas, 2014). The International Air Transport Association (IATA) forecasts that world passenger numbers will increase by '31% from the 2.98 billion that airlines carried in 2012' (IATA, 2013, p.1). The reality of the situation is that passenger numbers will increase by '930 million' more over the next five years (Kallas, 2014; IATA, 2013, p.1).

Over the next 20 years leading aircraft manufacturers Boeing and Airbus are forecasting that 498,000 new pilots will be required to cope with accelerated demand (Boeing, 2013). Giancarlo Buono, Assistant Director of Safety and Operations with (IATA, 2013) has forecasted the annual requirement of 23,000 global pilots to restock and build capability for current aircraft orders and market demand. This prediction is also echoed by the International Civil Aviation Organisation (ICAO) who predicts that annually 25,000 pilots will be required

between 2010 and 2030 to meet the worldwide shortfall (ICAO, 2011). Now the industry as a whole is forecasting a pilot shortage (Jansen, 2013) and is being forced to deliver innovative solutions in terms of how they manage their selection processes and their talent pool to combat this problem (Weissmuller and Damos, 2014). An airline hiring the right employees to give them competitive advantage is now even more critical in the wake of the pilot shortage and with so many airlines going bankrupt. (CAPA, 2012)

1.10 Rationale

Recruiting and selecting the right people is critical to organisational success. Having the ability to predict a pilot's future performance requires a rigorous approach especially in an industry where safety is sacrosanct. Hiring managers are challenged when recruiting ab-initio pilots who have no previous flying experience to draw from. Their suitability for the role is difficult to measure as a predictor of future success and can only be measured in the recruitment and selection process, during training and then again in flying performance. Individuals perform differently at work and if organisations undervalue or underestimate the individual difference in output and performance they will not benefit from the enormous commercial and strategic advantage that high performing individuals will deliver (Hirsh, 2009). Reason (1990) believes the behaviors people display at work are stable and consistent and a result of personality traits. He argues that those behaviors are not usually subject to change. He maintains that recruiting and selecting inferior behaviors, for example low conscientiousness or low emotional stability, and hoping training will teach preferred behaviors is highly unlikely.

So, how do pilot hiring managers select the best performing pilots when there are so many applicants to choose from? Scientific literature has provided an abundance of research endorsing well validated and reliable assessment tools to evaluate a pilot's performance (Damos and Weissmuller, 2014, Schmidt, 2012, Carretta, 2011 and 2000). The importance of screening unsuitable candidates out of the selection process has also been well established. The gateway to high

stakes selection processes are sometimes controlled by experience and results from a number of psychometric instruments.

According to Terpstra, and Limpaphayom (2012) an organisation should look to their Human Resource Management (HRM) practices for example recruitment and selection practices to gain competitive advantage and make an impact to their bottom line. Airlines that use a scientific selection process to select the right pilots have a higher chance of gaining efficiencies leading to increased performance and productivity in a highly competitive market place according to IATA (2012). Holling (1998) supports the same view and advocates investing in valid selection processes that will cost the organisation in the short-term but have the potential to select high performing individuals. Over time they will save the organisation in the future in terms of education and training requirements (costs associated with early cessation of training) while boosting profit margins considerably. Schmidt, Hunter, McKenzie, and Muldrow (1979) established that organisations using best practice HRM selection systems endorsed by academic research would benefit in dramatically increased profits.

Aligning HRM best practice with the achievement of business strategy is a key priority for human resources managers involved in high risk industries like aviation. Therefore crafting and developing a psychometric suite of testing 'can be seen as the cement poured into the foundations of an effective airline Safety Management System' (IATA, 2012, p. 43). Developing people 'within safe and reasonable limits is the focus of aviation psychology' and should be the focus of any airline hiring pilots. This 'requires a coordinated multidisciplinary effort' from all stakeholders involved in the recruitment, training and development of pilots (Jorna, 2011, p. 1).

1.11 The Research question

The research project principally started with a question that asked:

‘In the recruitment and selection of pilots, how much weight do hiring managers place on personality assessment when making a final selection decision?’

To address the question there were a number of subject matter industry experts (SMIE) identified for the sample. The reason for this was because of the limited availability of literature accessible to address it. The literature that existed mostly centred on pilot selection in the military (Carretta, 2011 and 2000; Arendasy, Sommer and Hergovich, 2007; Fitzgibbons, Schutte and Davis, 2004; Olbrich and Arendasy, 2004; Katz and Grice, 2006 and 2007). The military have delivered excellent research on the overall academic area of pilot selection but their research lacks a commercial focus. The researcher wanted to expand their own knowledge in the area and decided to look at the selection of ab-initio pilots and direct entry pilots. For the purpose of the study it is assumed that all results are equal in the selection system and all stages of the recruitment process have been passed. The aim of the study is to investigate if adding the personality measurement will add value for the hiring managers to the overall selection decision. The reason for this was to attempt to address the gap in literature about ‘stable personality traits that can affect performance in pilots (Fitzgibbons, Davis and Schutte, 2004). The aim of the study is to ‘understand and explain the impact’ of personality assessment for pilot selection and ‘explore the ways in which various organisations do things differently’ (Saunders, Lewis and Thornhill (2009, p.8). The aim is to examine the hiring manager’s belief in the value of personality assessment in the airlines selection system and establish if there is an alignment between research and practice. Tews et al (2011) presented a similar question in their hospitality study.

1.12 Scope and limitations of the study

The research is based solely on the perceptions of hiring managers who have come into contact with new hires prior to them joining their organisation. Exploring their beliefs in personality assessment for selection decisions. Through this study we will gain a deeper interpretation of how personality assessment has been used for selection purposes in different airlines. The objective is to see if it was a good predictor of training potential which was later linked to performance. The views expressed here are the personal views of subject matter industry experts (SMIE) and the author and do not necessarily represent the views of their organisations.

1.13 Thesis structure

The thesis contains five sections and the aim is to address the research question by taking the reader through the progressive thought process and research logic which has evolved during the research project. The dissertation starts off with an introduction describing how psychometric testing used in the recruitment and selection of pilots for both military and commercial operations. The literature review discusses the theories relating to pilot personality and performance it also discusses the implications for practice in a commercial airline. The methodology section outlines the research question, the aims and objectives of the research and the methodology surrounding the thesis. The analysis and findings section will focus on the data collected, how it was analysed and the findings that resulted. The conclusion section will summarise the results of the data collected and look for common themes or relationships in the area while discussing recommendations and limitations.

Literature Review

2.1 Introduction

This study is concerned with the non-technical skills (NOTECHS) of an airline pilot and how those skills interact with the 'environment', people, the 'machine' and the 'task' (Shappell and Wiegmann, 2009, p.255). NOTECHS are described as the ability to 'communicate, cooperate and interact with others' (Nergard, 2011, p.102) the results of which could serve as behavioral markers in the cockpit (Flin and Martin, 2001) and also form part of the recruitment and selection criteria. Nergard describes these markers as 'observable, non-technical behaviors that contribute to superior performance.....and can be observed within teams or from individuals' (Nergard, 2011, p.102). 'This 'radical shift' in thinking that a successful pilot not only requires technical skills but also requires NOTECHS resulted in a fundamental shift in attitudes amongst the pilot community according to Nergard (2011, p.102). The required shift in attitude to drive or change Crew Resource Management (CRM) skills did meet many challenges in terms of attitudes and behaviors in the cockpit but it also offered trainers and instructors opportunities to influence positive CRM behaviors that 'increased safety' according to Nergard, 2011, p.102). The Federal Aviation Administration (FAA) stated that 'CRM training has been conceived to prevent aviation accidents by improving crew performance through better crew coordination' (FAA, 1995, p. 1 cited in Kaps, Kerin-Zvi and Ruiz, 1999, p.45-46).

The literature surrounding pilot selection centres mainly on pilot selection in the military, however there has also been some published on commercial operations (i.e. Qantas Airlines test battery). The military have been responsible for conducting considerable research, development and validation of the tools used in the test battery. They have advanced the whole area of psychometric testing and endorsed it's suitability for the selection of pilots both in the military and also in commercial aviation. They achieved this mainly by conducting and publishing quantitative research. In the literature review it will become apparent

that commercial aviation has taken direction from the military and utilised their findings to support and enhance their own offerings in terms of how their recruitment and selection processes are designed. With most selection batteries being almost identical or at least very similar as noted by Stead (1991) when comparing the Qantas test battery to two U.S military batteries. The importance of personality factors that influence behaviors, performance and most importantly safety will be examined in this section.

2.2 The aviation environment challenged by a pilot shortage

During periods of growth, airlines find it difficult to keep pace with expansion strategy, 'pilot supply comes under increased pressure' (IATA, 2012, P.4) departments for example recruitment and selection, training and development are under increased pressure to deliver pilots to the business. The major recurrent challenges present themselves in a number of different forms, the on-going supply and demand of qualified pilots (hiring and attrition), retirements of experienced pilots, instructor shortages and a decrease in flight-deck experience (Carey and Nicas, 2014; Pettitt and Dunlap, 1994). In America, the Federal Aviation Administration (FAA) has levied new regulations on US airlines. The FAA has stipulated that newly hired pilots have a minimum 1,500 hours of previous flight experience; this has been increased from the previous minimum of 250 hours, which they would usually achieve during training. They have also imposed longer rest periods. This combination of new policies will drive airlines to hire 5% more staff to keep schedules going (Carey and Nicas, 2014). Besides the additional costs associated with complying with new regulations in terms of additional flying hours, this places additional demands on the recruitment team to recruit additional pilots. This drives the training and development team to train more pilots this places additional pressure to an already tight market experiencing a pilot shortage.

Traditionally commercial airlines depended on the military as a major supplier of qualified pilots but this is no longer the case as the military are reducing their

forces. Personnel are choosing to remain in service, and the appeal of a military career is no longer of interest to younger generations (Buono, 2013; Jones, 2013). Darby (2014) a US aviation consultant advising on pilot-hiring trends and has suggested that some regional airlines in the US are reducing their schedules and lowering the entry standards because of a pilot shortage. He states that airlines are even considering hiring candidates that they previously ruled out of the selection process based on 'criminal convictions, bad grades and training failures' (cited in Carey and Nicas, 2014, p.1). For an industry with safety being its number one priority, these actions could be regarded as reckless.

2.3 The nature of a pilot's role

To better understand the nature of a pilot's role a job analysis is required. The Fleishman Job Analysis Survey (F-JAS) has been used by Goeters (1997) and others to identify the key components and essential criteria 'that underpin expert performance on the job' as a pilot (Monfries and Moore, 1991, p.25). Goeters (1997) examined the areas of knowledge and skills, cognitive, psychomotor, physical, sensory and interactive/social skills to determine which factors had the highest relevance for performance in the role. While he acknowledges that cognitive and psychomotor skills are a key requirement for the pilot role, he concluded that the most relevant and highest rated factors were Interactive/Social Skills as illustrated in table 2.1 ('77% of all scales in the area were rated relevant or very relevant' p.104-105). He also noted that leadership is one of the interactive social skills that showed the highest mean difference between Captain and First Officer. This is consistent with the different levels of responsibilities associated with the roles. He acknowledges the difficulties associated with measuring these skills with only a few reliable and validated assessment tools such as 'personality questionnaires, some interview techniques and assessment centres' that can adequately measure the Interactive/Social skills (p.106).

Table 2.1

To which extent is the factor relevant for the work of airline pilots in general

Average Ratings	>3	>4	>5	>6
Interactive Social Skills	Below normal	Normal	Relevant	Very Relevant
			Situation Awareness	Stress Resistance
			Leadership	Cooperation
			Self-Awareness	Communication
			Resistance to Premature Judgment	Decision Making
			Flexibility	
			Resilience	
			Assertiveness	
			Motivation	
			Social Sensitivity	
			Oral Fact Finding	

The factors in each cell are grouped by average ratings: highest rating = highest position in the cell.

Source: Adapted from: Goeters (2004) Aviation Psychology: Research and Practice (p.104-105)

2.4 Threats and Errors

A pilot's role has become more demanding with advancements in automation and technology (Dahlstrom, 2008). The introduction of technology in to the cockpit was supposed to reduce the pilot's workload and increase safety. In actual fact it is argued that it adds additional mental workload (Cuevas, 2003) coupled with additional opportunities for human error that can ultimately affect a pilots performance according to Billings (1997). Billings (1991) advocates using the human centered model: keeping the human in the loop at all times and not just relying on automation in the cockpit. He suggests that automation denies the pilot involvement with the system and this can in fact lead to serious deficiencies in the pilot's performance over time. They may become over reliant on automation and as a result their handling skills may deteriorate which could have serious consequences when automation fails and they are required to deal with the fallout because the pilots are the last line of defence. This fact is backed up by 'sound empirical evidence' according to Billings who highlights a number of accidents and incidents including Northwest MD-82 at Detroit and a Delta B727 at Dallas that were a result of over reliance on automation (1991, p.4-5).

Everyday pilots must perform in high workload and stressful situations under time pressures. Not only are they exposed to environmental factors for example noise and turbulence. They are also exposed to the psychological factors associated with the role for example stress (Cuevas, 2003) and fatigue (Wiegmann and Shappell, 2001). Personality disorders and emotional influences can also affect a pilot's performance. James Butcher (2002) an eminent Professor of Psychology at the University of Minnesota and has 40 years experience in this area. He emphasises exercising caution during the recruitment and selection process and throughout the pilot's career. He has also called for more research in the area because airlines are not taking this fact into consideration and should be looking for tell-tale signs that signal unsuitability for a highly responsible role in aviation. There are a number of opportunities for threats resulting in human error 'Human error is now the principal threat to flight safety' according to Harris (2014, p.1).

2.5 Pilot Role Perception

Nergard, Hatlevik, Martinussen and Lervag (2011) used a qualitative and quantitative study to assess 174 pilots and their personal perception of desirable 'non technical skills' (p.101). The results confirm that there were at least four personal attributes that pilots would see as desirable non-technical skills: 'knowledge, flying skills, crew resource management (CRM) and self awareness' (p.101). Following this Nergard (2011) states that a suitable pilot must have 'insight and thorough understanding of oneself, the aircraft and the system' (Nergard, 2011, p.104). This is consistent with Chidester, Helmreich, Gregorich and Geis's (1991) view that capable pilots have the ability, coping strategies and personality to cope with demanding conditions and their performance is a 'product of skill, attitude, and personality factors' (p.25). Maschke and Goeters (2000) demonstrated that personality requirements are even more important than technical requirements when a first officer is being promoted to captain. This is because as a captain the requirements for the role are different in terms of the levels of leadership and interpersonal skills required to operate successfully.

In recent analysis of data gathered by NASA using The University of Texas Cockpit Management Attitudes Questionnaire (CMAQ) and the Flight Management Attitude Questionnaire (FMAQ) 30,000 pilots were assessed psychometrically. The sample consisted of captains, first and second officers over a fifteen-year period across international airlines they were compared to professionals in the medical field. It was clear to see the psychological effects on pilots when the following statement was put to them: 'Even when fatigued, I perform effectively during critical times' only 26% of pilots agreed with it, in comparison to 70% of attending surgeons in the same analysis. Fraher (2013) exposed similar results in her study on the impact of downsizing on high-risk teams (commercial pilots). These pilots reported increased errors, 'and stress resulting in a decrease in morale, and organizational commitment' compelling evidence of the 'high price tag for employees and their work teams' in high-risk

roles where 'open communication, and coordinated teamwork' were critical components of a successful and safe operation (p.109-126).

2.6 Ineffective crew interaction

O' Leary (2002) believes that 'as technology improved human failure became more recognisable' (p.1). Multi-crew cockpits were designed to improve safety and reduce the individual pilot workload (Foushee, 1984). During the 70's a number of accidents for example 1977 KLM 4805 Tenerife runway collision with Pan Am 1736 with 583 fatalities were attributed to crew coordination errors (Weick, 1990). When accidents were investigated following analysis of cockpit voice recordings it was discovered that accidents did not result from inadequate crew handling skills, lack of technical skills or a malfunction of aircraft or systems. It was revealed that they were a result of ineffective 'interpersonal communication' amongst the crew and other parties that ultimately led to unproductive teamwork, lack of situational awareness and inability to deal effectively with the situation they found themselves in (Royal Aeronautical Society, 1999). According to Monfries and Moore (1991) a breakdown in crew coordination ('the ability to work effectively in a team/ crew', cited in Flin, Martin, Goeters, Hormann, Amalberti, Valot and Nijhuis, 2003, p.100) or a lack of interpersonal communication was the consistent trend attributed to most accidents in commercial and military operations that resulted in both fatal and non-fatal consequences. This is supported by research by Goeters (1995) where he sampled almost 200 experienced pilots and concluded that almost half of the problem cases he examined were somehow connected to interpersonal deficiencies and not technical issues.

Mixing crew with technology was described by O'Leary (2002) as a 'dangerous cocktail' (p.1) and he believes that we can't change the 'human condition' but we can better understand the factors that affect 'under-performance' (p.1) and mitigate the risk. So, as a result ineffective crew were the target of interventions

such as human factors training otherwise known as Crew Resource Management (CRM) to improve safety and operational performance.

To mitigate the risk and improve interpersonal skills Goeters (2004) believes the industry has two choices to make. Firstly they can 'select in' the right interpersonal skills and or secondly they can 'train up' the required skills. Helmreich (1987) disagrees with this approach and believes that it is better to select in the required personality traits and or interpersonal skills rather than train them up because personality is stable and unlikely to change. In response to this phenomenon the industry had to come up with a solution that could intervene to effectively deal with ineffective crew coordination. They introduced a training intervention called Crew Resource Management (CRM). The Civil Aviation authority has described CRM as the 'cognitive and interpersonal skills needed to manage the flight within an organized aviation system' (CAA, 2006, p.1). This training is not categorically concerned with the technical skills of a pilot but is more focused on the non-technical skills (NOTES) such as 'cognitive and interpersonal skills' that are vital for the promotion of 'safety' and to 'enhance the efficiency of flight operations' (CAA, 2006, p.1).

2.7 Crew Resource Management and Pilot Personality

Crew Resource Management (CRM) was introduced to 'train aircrews as a way to use all available resources, equipment, people and information by communicating and coordinating as a team' (Salas, Burke, Bowers and Wilson, 2001 p. 642). The National Aeronautics and Space Administration (NASA) have revealed that none of these interventions 'consider any stable personality characteristics that may influence crew performance and error management' (2004, p.1). NASA commissioned quantitative research from Fitzgibbons, Davis and Schutte (2004) to ascertain if there was a generic pilot personality that could be linked to performance and measured so that a pilot profile could be created. They analysed results from NEO-PI-R personality assessment based on the FFM from 93 commercial pilots to ascertain if there was a pilot personality or profile and how that interacted with the different variables in the aviation domain. Their

aim was to see if personality factors influenced crew performance. They concluded that there was a particular personality profile that could influence crew performance and had a significant influence on safety but have called for more 'study to confirm their conclusions' (Fitzgibbons, Davis and Schutte, 2004, p.6) because this was only an exploratory study that contained certain limitations it was not based on an 'empirical investigation' (p.6). Their research suggests the key attributes of the sample they tested and define the pilot profile as: 'emotionally stable' very conscientious, high in deliberation, achievement driven, competent, trusting, straightforward and assertive' (Fitzgibbon et al, 2004, p.8).

2.8 Changing pilot behavior and attitude with CRM training

Unfortunately following a review of jet transport accidents from 1968 to 1976 the evidence suggests that the CRM initiatives has failed to decrease the amount of accidents related human error that caused poor coordination among the crew in the cockpit (Fisher, Phillips and Mather, 2000; Salas et al, 1999; Cooper, White and Lauber, 1979). In multi-crew cockpits qualities such as 'management skills and effective team performance' are required but are not adequately supported by 'traditional pilot training' (Horman and Maschke, 2006, p.172). Diehl (1991) a flight accident investigator expert believes that CRM initiatives must be introduced and reinforced regularly during a pilot's career, initially during flight training, reinforced during recurrent training and again during command training. These non-technical CRM skills are trained and checked regularly during a pilot's career according to Goeters (2004, p.144). The NOTECHS (non-technical skill) is principally an evaluation framework for assessing the following competencies: 'Co-operation, Leadership and Managerial Skills, Situation Awareness, Decision Making' (Flin et al, 2003, p.98). All of the competencies or behaviors associated with NOTECHS are under- pinned by communication skills and are assessed by using behavioral markers (descriptions of optimum and negative behaviors, Flin et al, 2003).

Therefore, while individual performance is important in the cockpit more attention needs to be placed on multi-crew performance and factors like personality or interpersonal characteristics that can have an effect on crew

coordination. Following a number of accident investigations in the 1970's the U.S FAA. and Europe's JAA (the regulatory bodies that govern aviation) have mandated that all commercial pilots require CRM training. In implementing this across the industry, its main purpose was to improve performance in the cockpit by changing attitudes and behaviors not consistent with good CRM. It was envisaged that by increasing the use of non-technical skills such as cognitive and social interpersonal skills (Flin and Maran, 2004; Sexton, Thomas and Helmreich, 2000) in the day-to-day operation this would in fact generate improved teamwork and safety. There are a number of reviews where CRM failures were contributory factors to accidents (see Chidester, Helmreich, Gregorich, & Geis, 1991; Gregorich, Helmreich, & Wilhelm, 1990; Leedom & Simon, 1995). Salas, Burke, Bowers, Wilson, (2001) used D. L. Kirkpatrick's (1976) framework to assess the efficiency of CRM training programmes. They concluded that in aviation while it did generally affect positive learning and behavioral change in individuals, there were still limitations as they could not ascertain if it affected an airlines bottom line which is safety (p.1). Chidester et al (1991) concurs with this view and offers reasons for it: 'Personality appears to set some limits, is stable over time, and resistant to change....we must acknowledge some limits on the ability of training to achieve optimal team performance' (p.41). In research, Martinussen (1996) concluded that personality measures were not predictive of crew performance. Interestingly Martinussen and Torjussen (1998) found a Scandinavian military aviation sample using two personality measures but only one was predictive of performance.

2.9 Human error in aviation

Personality assessment should be taken very seriously in the selection and assessment of pilots as personality has been 'predictive of occupation criteria' in terms of situational 'mishaps and accidents' (Carretta, 2011, p.7). The human performance framework in aviation usually consists of 3 critical components, 'the human operator, his or her task and the environment or the context in which the task is performed' (Rantanen, Palmer, Wiegmann and Musiorski, 2006, p.1221-1222). Reason (1990, p.17) defines human error as 'planned actions that fail to achieve their desired consequences without the intervention of some

chance or unforeseeable agency' (p.17). Human error has been quoted as the cause of the most negative aviation related accidents and events (Rantanen, Palmer, Wiegmann and Musiorski, 2005) usually resulting in the loss of life. Holden (2009) supports the theoretical view 'that accidents are caused by multiple factors and occur due to complex interactions of numerous work systems elements, human and non-human' (p.1). Lautman and Gallimore, (1987) conducted an industry analysis on accidents in order to understand the factors that contributed or caused accidents. They investigated over 93 hull losses between 1977 and 1984 and concluded that over 70% of accidents were attributed to problems with the 'human system failure' (Cook, 1995, p. 26) that is the pilot or the crew. They attributed 33 per cent of accidents to pilots deviating from operational procedures resulting in ineffective aircrew coordination and communication. Duke (1991) reports a similar result in his analysis of turbojet accidents and confirms that 69 per cent were attributed to crew not following procedures. A prime example of such a breakdown was when the United 173 flight in 1978 crashed because of a fuel problem that had been overlooked and had not been effectively communicated amongst the crew. This exemplifies the impact of ineffective teamwork and communication in aviation (Cooke, 1995).

Amalberti, Paries, Valot and Wibaux (1998) outlined the effects of human error at the organisational level and warned that this also has the potential to rise to over 90%, a very disturbing statistic in a safety critical industry. This cause and effect framework appears to be the 'industry norm' and Holden (2009) suggests that this belief is hard wired in people's psychological makeup and alludes to the fact that 'to blame is human' (p. 2-9). This consolidates the traditional view of human error that consumed the industries attention for a long time. Sidney (2000) an aviation safety expert criticised it for postulating that:

'Human error can cause accidents; complex systems are basically safe, were it not for the erratic behaviour of unreliable people in it; human error comes as an unpleasant surprises. They are unexpected and do not belong to the system, nor do they originate there, errors are introduced to the system only through the inherent unreliability of people' (p.6).

Dekker (2000) contradicted this view and went on to summarise the industries contemporary view of ‘human error’ and acquiesced that ‘systems are not basically safe; people are central to creating safety; their errors are indications of irreconcilable goals and pressures farther up-stream’ (Dekker, 2000, p.9). He believes that even in the modern day the old view is being reinforced and there is far greater focus on human error and not enough on defective systems. To put this into context he believes that there are contradictions between safety and organisational goals and that the human operators (crew) have to grapple between ‘protection and production’ by making ‘daily decisions and trade-offs with regard to ‘on-time performance, fuel and customer comfort’ (Dekker, 2000, p.10).

Human error has baffled and ‘vexed’ human factors experts and aviation psychologists over the years principally because of the ‘diversity of the human factors’ (Weigmann and Shappell, 2009, p.253; 2003 and 2001) which have effected human performance. The different variables and their interactions have created much confusion for the human factors experts (Rantanen, Palmer, Wiegmann and Musiorski, 2005) resulting in a number of different taxonomies being made available to identify and describe human error in aviation. There have been calls in the industry for a common methodology and Weigmann and Rantanen (2003) advocate using (Weigmann and Shappell’s, 2003) classification system to group human errors in aviation.

Table 2.9.1 Weigmann and Shappell’s, 2003 error classification system

Components	Error classification
Environment	e.g., the control of temperature, noise, vibration, lighting.
Human	e.g., personnel selection, incentives, training, teamwork, communication.
Machine	e.g., engineering design, capacity.
Task	e.g., ordering or timing of events, procedures, and standardisation.

Source: (Shappell and Wiegmann, 2006, p.1)

They used this framework to examine a number of advanced technologies (i.e. from energy-absorbing seats to synthetic vision aids) developed by the National Aeronautics and Space Administration's (NASA) Aviation Safety Program (AvSP). It was concluded that NASA's interventions 'appeared to target the machine rather than the human, environment or task' (Shappell and Wiegmann, 2009, p.255) which was not the ultimate goal they had in mind.

According to (Shappell and Wiegmann (2009) the accidents associated with human error have remained stable since 1990, suggesting that safety interventions and recommendations have had little effect on reducing the incidence of human error affecting human performance. This may be the result of there being a very low rate of civil accidents and the difficulties associated with trying to measure something so small according to Flin et al (2002). The military have reported a different outcome reviewing US Navy A-6 Intruder fighter bomber crew following the introduction of CRM and aeronautical decision making (ADM) training, they have seen their accident rate decrease by a massive 81% (Diehl, 1991). Stoop (2002) believes that safety interventions and recommendations are good at solving single stand-alone problems (i.e. technical, mechanical) but when it comes to entire system problems (i.e. human error, communication and organisational failure) they are not so robust. This view is also supported by Shappell and Wiegmann (2009) who believe that 'human-centred interventions might be overlooked or at least virtually overlooked or at least underutilised' when it comes to human error and accident prevention (p.259).

2.10 Interpersonal Communication Skills

The majority of research on interpersonal skills in aviation has been conducted in order to evaluate the effect of interpersonal skills in a multi-crew cockpit relevant to both commercial and military operations. A lot of the literature on pilot selection has focused on interpersonal communication skills as being a key requirement of good operational performance. This has stemmed from the fact that automation is increasing fast (glass cockpit and flight management systems), causing changes in how the pilot operates in the role (higher workload that requires more communication). The resulting change requires a 'change in human behavior' not just in the cockpit. This attitude change is also required from outside with the inclusion of 'cabin crew, maintenance air traffic control and managers' (Monfries and Moore, 1999, p.21-p.22). Crew coordination (teamwork) and communication is the foundation of a safe and efficient operation. To promote these behaviours, the industry has taken active steps (CRM training) but these initiatives do not acknowledge stable personality traits such as communication and interpersonal skills that influence behavior and performance (Fitzgibbons et al, 2004).

Carretta (2011) highlights some of the most important traits currently not being measured in the U.S Test of Basic Aviation Skills (TBAS) and the Air Force Officer Qualifying Test (AFOQT) when assessing pilot training aptitude. The highest rated personality constructs not measured are 'Interpersonal/Personality (Integrity, assuming responsibility, cooperation, decisiveness) Communication Skills (listening and reading comprehension, oral and written expression), and Prioritization/Task Management' (Carretta, 2011, p.7). Hormann and Maschke (1996) propose that these unmeasured traits are critical to good occupational performance and should be present from the beginning, because the formation of 'these qualities is insufficiently supported by traditional pilot training' (p.172). According to Monfries and Moore (1999) personality tests have been 'designed to assess stable personality traits' but they have also 'been used to assess interpersonal skills' (p.24). They believe that personality traits are more stable

but interpersonal skills are more likely to change over time, this may contradict the validity of personality testing if used to assess interpersonal skills.

It is interesting to look outside the aviation models and look at the psychosocial model described by Hollis (1997) and derived from Freud's work on the psychoanalytic theory. This theorised that not only internal factors should be considered when trying to understand how people cope with the every day stresses of life but consideration should also be given to the external every day pressures. Putting this into perspective in the cockpit, certain behaviors are a result of certain personalities. Gilkey and Greenhalgh (1986) generalized that 'personality traits are labels that summarise those patterns' of behaviors (p.245-246). Their example of an 'an aggressive individual' demonstrates that the individual will always be aggressive whether it's 'behind the wheel of a car' or flying an aircraft. Their generic example demonstrates that those traits become 'predispositions' of the person's personality and it's what 'comes naturally to individuals' (p.245-246), people will always be inclined to revert to type especially when they find themselves in stressful situations. Chidester, Kanki, Foushee, Dickinson and Bowles (1990) corroborate with this finding based on their research when they identified three clusters within the pilot group and has referred to this one as 'Negative Expressive' because they show more elevated scores on verbal aggression than most other pilots.

Looking to the social work arena and focusing on social relationships which are based on the 'knowledge, skills, values and qualities that a social worker brings to the work and the quality of the relationship that is created' (Trevithick, 2003, p.164). Those key attributes are very similar to pilot attributes according to Salas, Wilson, Burke and Wightman (2006). Hollis (1997) suggests that social relationships are perceived as:

'An attempt to mobilize the strengths of the personality and the resources of the environment at strategic points to improve the opportunities available to

the individual and to develop more effective personal and interpersonal functioning' (p.1308).

If social relationships or interactions are not feasible from the psychosocial perspective then incidents or accidents can happen if there is a failure in 'group dynamics and interpersonal communication' (Wiegmann and Shappell. 2001, p. 348).

Helmreich and Foushee (1993) propose a psychosocial perspective in aviation and believe that the environment and the quality of the relationships amongst its members directly influence pilot performance. This takes into consideration the 'personalities and attitudes' of the individuals within the group (Wiegmann and Shappell. 2001, p 348). They focus on the importance of 'social and interpersonal' characteristics of humans and how this relates to performance. Their view is that these factors have been overlooked in aviation especially in human error analysis frameworks. Their Human Factors Analysis and Classification System (HFACS, 2002) is used in the industry as an error analysis and classification framework. An industry-wide study confirmed that over 70% of accidents are attributable to problems with aircrew coordination and ineffective communication (Lautman and Gallimore, 1987).

Hormann, Manzey, Maschke and Pescena (1997) acknowledge the importance of interpersonal skills in pilot selection and it's relevance to performance. During a selection process, they demonstrated that a relationship between high scores on the interpersonal dimension of empathy was also related to high scores on crew coordination and performance. This is an important development for aviation recruitment and selection. It highlights an area that may not be measured to the extent that it deserves. Hackman and Morris (1975) believe that when selecting staff for group interaction and providing them with the right training (interpersonal training and awareness) and tools (error identification processes) they can be encouraged to deliver more effective performance than that of an individual. It will result in a 'higher quality product-or will at least lessen the

chances that the product will be grossly defective' (Hackman and Morris, 1975, p. 2) which could have serious consequences for all involved. In reviewing the literature there appears to be a scarcity of qualitative research relating to personality traits that may influence interpersonal communication in multi-crew cockpits. Reviewing this at a micro level that ultimately focuses on individuals and their interactions with each other in the flight operations arena (Appelbaum and Fewster, 2003) the area continues to be researched from the military perspective but appears to have been under investigated by the human factors experts and the aviation psychologists involved in commercial aviation.

2.11 Personality evolution and factor analysis

McDougall (1932) who was responsible for the first issue of Character and Personality now known as 'The Journal of Personality' spoke about trying to organise the language used to describe personality in order to define taxonomy of personality attributes (Mc Dougall, 1932, p.15). He was successful in creating a five factor analysis, namely 'intellect, character, temperament, disposition and temper' which would describe individual differences in personality (Mc Dougall, 1932, p.15). Factor analysis has been used in many studies to identify variables in personality and the relationship those variables have with performance (Schmitt et al, 1998; Barrick and Mount, 1991; Tett et al, 1991; Ghieselli and Barthol, 1953). Years later, many other authors namely Norman (1963); Jensen (1958) and, succeeded in putting a theoretical structure on personality so we can better understand the language used to describe it.

Gordon Allport, a renowned American psychologist was one of the pioneers who focused on personality and was responsible for identifying thousands of personality traits. Psychologists such as Raymond Cattell (1946) condensed these to a more manageable 16 Personality Factors analysis which he named The 16 pf questionnaire. It measured 16 primary factors and 8 secondary factors (traits) and represents one of the most robust and respected models on factor analysis that

describes the complexity of humans and their behaviors by providing definitions of different personality traits and how they relate to one another.

2.12 The Five Factor Model

Costa and McCrae's (1985) Five Factor Model (FFM) of personality was developed from the 16 pf. Street and Helton (1993) confirm that the FFM has been identified as the best model for pilot selection by many researchers. Costa and McCrae's NEO-PI-R (1992) personality inventory is grounded in the (FFM, Appendix A). It comprises of the following five broad measurements, openness, conscientiousness, extraversion, agreeableness and emotional stability (Costa and McCrae, 1985). In aviation the FFM has been very 'helpful in identifying the personality traits of aviators' (Grice and Katz, 2006, 2007, p. 2). The Big Five and the FFM are 'used interchangeably' and usually denote FFM relating to Costa and McCrae's NEO-PI-R (1992) questionnaire responses and Big Five denotes associations with theory such as Goldberg (1990). For the purpose of this study the FFM will represent any research relating to the five broad dimensions of personality.

The NEO-PI-R is a self-report personality assessment tool containing 240 questions relating to personal behavior. Each statement must be rated on a scale of 1-5, (1) disagree, (2) slightly disagree, (3) neither disagree or agree (4) slightly agree and (5) agree (Costa and McCrae, 1992). It is grounded on the FFM of personality and it is one of the best scientific theories of personality in the field. Hogan and Holland, (2003) suggest that it provides structure and form to the 75 years of factor research ranging from the first principals of personality descriptors acknowledging the difference in individuals to Goldberg Big Five broad personality inventory (1990).

This corroborates with a meta-analysis by Barrick and Mount (1991) where they examined the relationship of the FFM to assess if it could predict performance in a number of occupational groups. Hough and Ones (2001) acknowledge Tupes

and Christal's (1961) investigation of personality trait measurements as a key contribution to the underpinning of the FFM. Hogan and Holland (2003) and Barrick and Mount (1991) also state that it is a robust model for 'testing hypotheses relating individual differences in personality' to selection, occupational performance and training (Barrick and Mount, 1991, p. 23).

2.13 Consistency of Descriptors

Both in military and commercial aviation there have been many different personality instruments used to measure aviator personality traits and they have been successful in doing so. However, there haven't been enough empirically-validated studies using the same instrument. This causes confusion because the same attributes or descriptors are not being measured in the same context and 'different personality instruments have yielded results that can be confusing or difficult to interpret in relation to occupational performance, especially since these instruments were designed for a clinical population with psychopathology' (Grice, and Katz, 2007, p.2 ; Carretta, 2000).

The aim of this research is to identify a taxonomy of personality facets that are linked to performance from hiring manager's perception. It will also provide a common language to describe the personality attributes that separates candidates in the pilot selection process. It is hoped that it will identify the personality characteristics affecting the utilisation of non-technical skills and interpersonal communication on the flight deck. The reasons for doing this are two-fold. Firstly, if psychometric testing is correctly implemented into the overall selection process it can contribute to considerable cost savings in terms of poor training performance and candidates failing assessments. Secondly by selecting the right people and having the ability and language to quantify and describe the desired behaviors it will enhance the overall safety within the airline by screening out unsuitable candidates early in the process and then recruiting high performing pilots who can help an organisation achieve its key objectives. In the market there are an abundance of personality tests to choose from. It is almost

impossible to compare and contrast these because they are often measuring different dimensions of personality in different samples for different roles. Barrick and Mount (1991) believe for this area to advance there must be 'an accepted classification scheme for accumulating and categorising empirical findings' (Barrick and Mount, 1991 p. 23).

2.14 The Pilot Personality Profile

Many studies have been conducted to ascertain if there is such a thing as a 'Pilot Personality' and the consensus among academics is that there is (Grice and Katz, 2006). It is a very unique personality and one that is different to the normal population but consistent across background and circumstance (Fitzgibbons, Davis and Schutte, 2004. p.6). This section will provide an outline of the literature consulted on pilot personality.

Chidester, Helmrich, Gregorich and Geis (1991) define personality traits as 'stable, deep seated predispositions to respond in particular ways' (p.27). The behaviors an individual displays at different times and across situations are a result of stable personality traits. Chidester et al (1991) believe that 'desired behaviors' are stable and 'training is unlikely to produce desired change' (p.27). It is only by selecting in the desired personalities that desired behaviors can be achieved and reinforced by training (Chidester et al, 1991).

Chidester et al (1991) identified two essential dimensions within personality which can predict team performance (crew coordination) in aviation. The first is 'instrumental traits relating to achievement and goal seeking' and the second is 'expressive traits relating to interpersonal behaviors, sensitivity and orientation' (cited in Fitzgibbons et al, 2004, p.1). Shinar (1995) identified three stable personality traits in pilots related to performance. A high need to achieve, resilience, self awareness and confidence to experience success (Fitzgibbons, Davis and Schutte, 2004. p.1). Bartran (1995) found similar results when he

examined UK Army Air Corps pilots and found that those who successfully passed training were more emotionally 'stable, tough-minded and independent' than those who were unsuccessful (cited in Fitzgibbons et al, 2004, p.1). Picano (1991) also studied military pilots and identified three quite different personality types within the group. The most widespread personality type was very outgoing and liked affiliation, their preference was for logical and structured problem solving with attention to detail. The next group consisted of pilots who were 'emotionally controlled, inhibited, apprehensive and socially retiring' they require a controlled environment that was predictable (cited in Fitzgibbons et al, 2004, p.1). The final group were 'independent, competitive and decisive' (cited in Fitzgibbons et al, 2004, p.1). These results indicate that pilots can be classified according to type.

Another study conducted on 77 US Army rotary wing pilots by Grice and Katz (2006) confirmed a particular profile and also went on to identify different profiles across different mission platforms for example, attack, scout, cargo and utility. The results of this study were not consistent with other results which confirmed previously that military pilots were different to the general public (Fitzgibbons et al, 2004, Street and Helton, 1993). In fact the opposite resulted; it showed that the 77 US pilots had personalities similar to the general public. They scored 'low to average across the five factors' this confirms a personality that is 'moderately social and goal orientated, active, warm and cooperative, dependable and private (Grice and Katz, 2006, p. 26). While this stereotypical military pilot (risk-taker and eccentric, Grice and Katz, 2006) may have some 'face validity' according to Martinussen (1996, p.2) but in reality appears to be only a figment of our subconscious or imagination, probably planted there from movies such as Top Gun in the 80's starring Tom Cruise as the Maverick.

Fitzgibbons et al (2004) conducted a study on 93 pilots to validate these results. They used the NEO-PI-R personality inventory (based on the FFM, Appendix A) to measure the different personalities and compared the results to the general population. The results indicated that pilots were emotionally stable (60%),

almost half of them reported being extroverted (42%), openness and agreeableness appeared very similar with near normal distributions and conscientiousness was scored high or very high (58%) on this dimension indicating that as a group they were a highly conscientiousness group.

Therefore, Hormann and Maschke (1996) believe it is perfectly reasonable for any airline recruiting pilots to examine the personality characteristics of applicants by using validated personality testing. It is generally accepted that personality can influence behavior 'at different times and in different situations' it can also 'place an individual at greater risk of accident involvement' (Hunter, 2005, p.23) Therefore personality assessment needs be integrated into the 'test battery' that forms part of the selection process for pilots.

In literature there are a lack of studies containing cognitive and personality correlations in experienced pilots however there are some available for ab-initio pilots but they don't continue to assess the pilot for the duration of their career which is usually 30-40 years. This is unfortunate because it would provide rich data for the research and development of pilot selection models and training outcomes in aviation.

2.15 Personality and cognitive ability as a predictor of performance

The main focus in literature has been on how pilots were recruited, the methods used and the predictive validity of those methods. Another area academics focused on was the relationship between personality and cognitive ability and how this related to performance. Tett et al, (1991) believed that general cognitive ability could predict job performance and this was relatively easy to measure and could be generalised and validated across different roles. But it was more difficult to measure personality and it was irrational to generalise personality and validate it across different roles (Tett et al, 1991). The purpose of testing is to ensure that potential employees, if selected are a suitable fit and have the

capabilities to perform in the role. It is also essential to be able to predict their success during initial training and if they have potential for promotion to command, management or leadership roles in the future (Hormann and Maschke, 2006).

Universally FFM personality assessment has been accepted as the best predictor of performance and ‘the greatest potential for pilot selection and training research’ (Street and Helton, 1993, cited in Fitzgibbons, 2004 p.3). However most of the meta-analysis investigated has focused on the broad dimensions for example openness and agreeableness and not on the sub-facets like values and trust (Appendix A). Having a narrower approach may yield some interesting discoveries in terms of performance. Hurtz (2000); Rothstein and Goffin (2006) are in agreement on this aspect. This would also help build a universal framework in terms of matching the right people to the right roles especially in pilot recruitment.

Gunion and Gottier (1965) reviewed and investigated numerous meta-analytic research studies, exploring the relationship of personality and performance. Their argument concluded that there was little evidence of such a relationship and that personality measures have no place in selection and assessment. They based this conclusion on the fact that only 37% of studies used predictive validity and from them only 10% reported validity coefficients greater than zero. This early view has been also been supported by Block (1995) and Hogan (1986) who have all challenged the Five Factor Model and its relationship to performance.

According to Patterson, Lievens, Kerrin, Zibarras and Carretta (2012) who argue this view on selection and state that ‘the best prediction of performance outcomes is a combination of all methods’ for example ‘multi selection instruments’ such as situational judgement exercises (Patterson et al, 2012, p.1). They also advocate the value of testing non-cognitive behaviors like interpersonal skills for high risk professions for example in medicine (Patterson et al, 2012, p.1). This trend has also been adopted by the European Space Agency when recruiting

astronauts in 2008/2009. One element of their selection process included personality testing to test interpersonal behavior and assess adaptability and 'tolerance towards different cultures' in an enclosed space (Maschke, Oubaid and Pecena, 2011, p.1). This working environment has some similarities to that of a multi-crew cockpit.

Personality assessment has always been just one part of the pilot selection process, but a very important one. An amalgamation of cognitive ability and personality offer the best predictions of job performance. Therefore according to Schmitt (2013) 'a combination of the two will produce superior predictions of job performance' (p.2). There have been numerous meta-analytic studies produced investigating well validated personality assessments in the selection of pilots. They have all delivered quantitative analysis by providing a number of taxonomies to describe pilot personalities and its relation to performance and safety

2.16 Performance-personality relationships

Performance-personality relationships have been the focus of many meta-analytic studies over the last twenty five years. Their main emphasis was on the relationships between the Five Factor Model of personality and how it related to job performance (Barrick and Mount, 1991). The personality traits examined were openness, conscientiousness, extraversion, agreeableness and negative affect or emotional stability as it is better known. OCEAN is the acronym commonly used to describe this taxonomy of personality traits. Ghiselli and Barthol (1953) conducted a meta-analysis on 113 organised studies examining the relationship personality- performance relationship for different occupational groups. Salesmen and clerks were some of the roles they focused on. They conclude personality was a good predictor of performance especially in sales.

In the organisational setting, individuals perform differently. Personality theory has evolved substantially as a predictor of job performance especially since 1990 when there were a number of influential meta-analytic studies conducted to review the personality- performance relationship (Barrick and Mount, 1991 and Tett, Jackson and Rothstein, 1991). Following those studies Barrick and Mount (2003) conducted a review of all 16 meta-analytic studies and they agreed personality assessment has a place in the selection and assessment model. However, Hogan and Holland (2003) still argue about the fact that there is no 'agreed theoretical account' for its success (p.3) They use meta-analytic processes identified by Hunter and Schmidt (1990) to apply Hogan's Socioanalytic Theory (1983) to work-related performance. This theory is based on individual differences relating to an individual's identity and reputation that affect occupational performance and career success. Hogan and Holland (2003) provided a good description of the differences 'reputation describes a person's behavior; identity explains it' (p.4). The two generalisations they make are that people want to get along in the group but also want to get ahead in terms of status. They speak about 'people who cannot get along with others and who lack status and power' having 'reduced opportunities for reproductive success' (Hogan and Holland, 2003, p.3). They conclude that in general terms and not pilot specific terms, reviewing a number of meta analytic studies that it is possible to predict performance when performance assessment moved from 'general to specific criteria' (p.1) following job analysis. The results from the FFM can be used to assess a person's 'effort to gain approval and status' (Hogan and Holland, 2003, p.4).

Their observations highlight three key contributions to the debate, firstly performance can be rated by the Five Factor Model regarding people getting along or getting ahead, secondly the predictive validity of performance criteria increases when it moves from overall performance to measuring specific job related personality constructs and finally measures of emotional stability are more strongly correlated with occupational performance than previously thought (Hogan and Holland, 2003). This is an important contribution for pilot selection in a multi-crew cockpit, where occupational performance can be measured based

on crew performance or teamwork as the criterion. Getting along and getting ahead are both of equal importance, getting along requires the following traits, agreeableness, emotional stability and most importantly conscientiousness, getting ahead requires extraversion, openness and emotional stability according to Hogan and Holland (2003). This correlation with personality and performance becomes extremely important when they have 'over learned the basic procedures' associated with flying and the 'honeymoon' period has ceased (Hormann and Maschke, 1996, p.172). In time a pilot's values, attitudes and motivation may change which in turn will influence the behavior of that employee and the overall crew operational performance.

2.17 High-stakes recruitment and selection of pilots

In commercial aviation, there are high stakes involved in pilot recruitment, not just in terms of public safety but also in terms of training, operating costs and customer satisfaction. Recruitment, selection and training have a very important role in helping the organisation achieve their corporate objectives (Carretta, 2000). Training costs for ab-initio pilots are the most expensive work-related training courses and the selection systems for assessing them have received the most academic attention. Wesolek (2007) estimated the cost of training an Army aviator in the region of \$265,000 to \$509,000 this also depends on the type of aircraft they are trained on (Wesolek, 2007). Initial pilot training in Europe is estimated at approximately £90,000 (CTC, 2013). With the unprecedented global demand for qualified pilots, larger airlines with immediate demand for pilots are now being forced to select and train their own by running ab-initio programmes whereby they train candidates from the beginning (ab-initio) of their aviation career. This is a very expensive and quite a risky strategy (approximately, '£89,900 for two years training' CTC, 2013) because not everyone selected to train will succeed and pass the training phase. According to Damos (2014) the failure rates across the industry including the military, ranges from 3% to a staggering 53.7% depending on the type of training organisation and also includes candidates failing at different stages of training and in various studies

(see Appendix for training failure rates). Carretta (2011) and Hormann and Maschke (1996) found that in this instance personality was a weak predictor of initial training performance.

This poses challenges for pilot training because when airlines invest in pilots, not only are they selecting them for ab-initio cadet and first officer positions but they are also looking for tenure and leadership potential for future command positions. Carretta (2000) believes that ‘making the right selection decisions can reduce training costs, improve job performance and enhance organisational effectiveness’ (Carretta, 2000, p.2).

Pilots are usually selected with different experience levels and in a number of ways. IATA (2012) and Damos (2003) highlights the fact that ‘structured pilot selection systems’ (consisting of a number of objective well validated and reliable assessments including structured interviews) when compared to unstructured systems (unstructured interviews, and subjective decisions based on hiring managers perceptions of the candidate) are up to 98 percent effective. But results from the IATA (2012) survey show that only a marginal amount of airlines have one in place that is structured and based on scientific evidence. Carretta (2000) believes that there is no perfect pilot selection system employed by airlines recruiting pilots. Basically, pilots are recruited at different stages in their career with different experience levels. Some are recruited with no experience or from the beginning of their career and they are called Ab-initio pilots, others are recruited after successfully completing a Joint Aviation Requirements Flight Crew License, (JAA-FCL). In Europe or in the United States of America they must complete a Federal Aviation Administration Flight Crew Licence (FAA-FCL) in an approved Flight Training Organisation (FTO) and are known as ready entry pilots. Sometimes pilots are recruited with flying experience and are known as direct entry first officers and the more experienced will have been trained as commanders and are known as Captains. After gaining experience as a first officer, becoming a captain depends on flying hours, experience, career progression and seniority if it exists in the airline they are

employed in. There are ongoing training costs associated with pilots depending on the level of training or type rating they require and the amount of regulatory training that is specified by the authorities (CTC, 2013).

2.18 The pilot selection system

The pilot selection model has evolved over the years and sometimes includes psychometric testing to include ability and personality tests, structured interviews and simulation assessment, reference checks and biographical checks (IATA, 2012; Carretta, 2000). Airlines can employ an effective selection system to screen out unsuitable candidates early in the process, for example ‘those who may not have the ability to endure the stresses of flying’ (Suen Huey, Gin- Shuh and Kung-Don, 2006, p. 776). The combination of selection methods used by airlines should be capable of predicting the long-term success or ‘the right fit’ of a potential candidate. Implementing a ‘robust and transparent aptitude system’ will determine if a pilot is capable of ‘life-long learning and training and checking which are pre-requisites of flying technologically advanced aircraft’ (IATA, 2012, P.7). The cost of selecting a bad hire or the ‘wrong stuff’ (Picano, 1991) has costs way above those associated with normal recruitment especially where life and death are concerned.

Pilot selection had traditionally focused on measuring the technical aptitude and competence of candidates (Chidester, Helmreich, Gregorich and Geis, 1991). Airlines involved in the recruitment and selection of pilots usually use a ‘pilot selection system’ some of which have been in operation since 1955 with the majority ‘becoming operational in the 1980s’ (Weissmuller and Damos, 2014, p. 99). The economic benefits of selecting the right people have been well documented in literature (Hunter and Schmidt, 1982). If an airline is selecting the ‘wrong people’ for pilot positions there are substantial costs involved not just in terms of training and safety but also during a pilot shortage, making false positive decisions for example, appointing a candidate who subsequently fails training will have financial impact on the airlines’ bottom line (Weissmuller and Damos, 2014; Risavy and Hausdork, 2011).

For pilot selection, and any other selection that requires candidates to have the ability to endure the stresses of the role (e.g. Police, Fire Officer, Air Traffic Controller) standardised personality questionnaires (e.g. NEO, 16 PF, TSS, OPQ, PCT) are commonly used. Clinical assessment is usually required for such roles that are very responsible and require emotional stability and are used to assess personality traits and review potential mental health problems. Assessments for example the Minnesota Multiphasic Personality Inventory (MMPI and MMPI-2) can be used because of its ability to detect evidence of psychopathology that would require investigation and validation by a psychologist (Butcher, 1994).

2.19 A sample of the recruitment and selection process

The selection process usually involves a number of stages involving the use of a number of selection tools (Goeters, Maschke, & Eissfeld, 2004; Carretta, Retzlaff, Callister, and King, 1998; Martinussen, 1996). The tools or instruments most commonly used by airlines in the United States are as follows; the interview (96%) followed by reference checks (93%) and then flight checks (76%). The least used instruments were simulators (17%) and clinical psychological assessment (14%) (Suarez, Barborek, Nikore and Hunter, 1994).

A full flight simulator is a machine which artificially reconstructs the flying environment for a pilot. It offers true-to-life simulations of the aircraft systems used in the cockpit with highly accurate flight controls. This tool is mainly used for a pilot's recurrent training and for research and development of systems and aircraft. It is also utilised in pilot selection to assess a pilot's ability to deal with the complexity of the role and the environment. It can be used to help the assessor evaluate trainability, the amount of training required, (IATA, 2013) ability to fly, situational awareness and has also value in terms of assessing how they interact with other crew and manage the available resources (CRM).

Structured interviews are also used to assess the candidate's suitability and competence level. Interviews are usually competency based and include an element of technical awareness and reasoning competencies amongst other criterion. An expert team including HR specialists, flight operations personnel including senior captains and quite possibly an aviation psychologist usually conducts them (IATA, 2010). Many European Airlines choose to use this model or at least some elements of it when recruiting pilots.

2.20 The psychometric test battery

In the selection of pilots it is extremely cost effective to screen and assess candidates using a number of on-line personality and ability tests. At this point in the process the costs are negligible for the airline when compared with more elaborate stages of the process including expensive interviews, group assessments and simulator assessments (IATA, 2012). Individuals perform differently at work, having the ability to differentiate and measure individual differences related to performance are important. The FFM provided taxonomy of global personality constructs that can be measured and compared to the general public (Digman, 1990). This provides a generalised approach especially when selecting and assessing pilots.

Psychometric testing includes measuring dimensions of 'basic abilities', verbal and numerical ability, 'specific or operational abilities', including technical reasoning or psychomotor ability, 'social competencies' including competencies associated with teamwork and 'personality traits' that include measures of conscientiousness or extraversion (Weissmuller and Damos, 2014, p.1; IATA, 2010). This list is by no means exhaustive but it provides a narrative of the criterion used for selection purposes. It is apparent from the International Air Transport Association's (IATA, 2010) publication on *Guidance Material and Best Practice for Pilot Aptitude Testing* that criterion tested and methods used to measure it varies from organisation to organisation, depending on HR policy, practice, 'culture and fit'.

Cognitive ability testing is used in military and civilian selection. It is relatively easy to measure by using a combination of ability tests for example verbal, mathematical and spatial reasoning tests and has been shown to be well correlated with operational success. Gottfredson (1997) is in agreement with this and clearly points out that higher intelligence (g) is more positively correlated with higher order work tasks requiring ability to deal with ‘cognitive complexity’ (p.79). She states that ‘reasoning, problem solving, decision making, and other higher order thinking skills’ are not just important in academic settings but also more important in predicting job performance (p.79). Research psychologists Frank Schmidt and John Hunter (1998) have proved it is possible to show simple generalisations between different variables such as cognitive ability or personality traits and performance in a broad range of jobs. This is supported by a large body of theoretical evidence stating that aptitude tests have the ability to predict flying performance during initial pilot training (Carretta and Ree, 1994 and Spinner, 1991). Lufthansa Airlines were able to reduce their failure rates for ab-initio pilots down to 3% over several years by employing such a method (Hormann and Maschke, 1996).

Personality is more complex to measure and requires a standardised taxonomy to describe and measure traits in personality. Authors such as Schmidt and Hunter, (1998) Barrick and Mount, (1991) Tett and Jackson, (1991) all believe personality assessment has an important place in the selection process for pilots. Their conclusion followed a number of meta-analysis studies in occupational groups to investigate the relationship between personality and workplace performance and confirmed the validity of personality in selection. If personality assessment is correctly integrated into the overall selection process it can have substantial cost savings not just in terms of failure rates and turnover but also improved safety which is critical for risk avoidance. If there is a universal pilot personality in commercial aviation, it is important to find what attributes separates good employees from exceptional employees for selection purposes and career advancement.

Butcher (2002) highlights the fact that the industry is not using or taking into account personality and emotional factors which can influence performance into the overall recruitment and selection process. Even though research has confirmed that emotional stability and conscientiousness had the greatest correlation with performance (Tett et al, 1991 and Salgado, 1997). He notes some key characteristics consistent with the demands of the role ‘flying complex aircraft on tight schedules, in all kinds of weather, requires a great deal of ability, extensive experience, a clear mind, and coolness in emergency situations’ (Butcher, 2002, p.1). This coupled with the fact that most commercial flying will be performed by individuals as part of a cockpit crew, highlights the importance of being able to identify the personal attributes and interpersonal traits that contribute to optimum teamwork and crew performance under stressful or abnormal flight conditions (Luzik and Akmalidnova, 1996).

Personality measures have two main advantages in terms of assessment and selection, firstly they are reliable at predicting performance and secondly they do not discriminate against any minority groups (Hogan and Kaiser, 2008). When cognitive ability tests are used in isolation they demonstrate ethnic group differences (American Psychological Association, 2014) which could be deemed as grounds for discrimination. Selection procedures and selection tools are legally constrained in the United States and to a lesser degree in Europe. The role, the hours of work and the place of work will determine the type of selection instruments used (Bauer et al, 2012).

The military were mainly responsible for construction of the test battery and validation studies according to Martinussen (2006). Reviewing validity results for psychometric tools used in pilot selection, it is clear to see why Martinussen (1996) conducted a meta-analysis to review 50 studies. Her aim was to establish the reasons for the connection between ‘predictors and pilot performance’ Martinussen (2006, p.1). She found that the best predictors of performance was

former 'training experience' (.30) (Martinussen, 2006, p.1), however it is important to note what Stead (1991) discovered when analysing factors that contributed to the success of Qantas ab-initio pilots. The information contained in the log book (flight training hours) was of little value in terms of validating the quality of a pilot. Martinussen concluded that a combination of psychomotor and some cognitive assessments yielded (.37). When this is broken down a little bit more she reports that cognitive test (.24) psychomotor and information processing (.24), aviation information (.24) and biographical questionnaire (.23). Academic assessments produced 'the lowest mean validities .14, .16 and .15' (Martinussen, 2006, p.1). This supports a large body of evidence suggesting that combining different measures for example cognitive ability and personality results are effective at predicting performance when compared to single measures in isolation.

2.21 Social Response Distortion - Faking

There is a considerable body of research suggesting job applicants distort their scores by faking (Hogan & Holland, 2003; Hogan, 2005; Rothstein and Goffin, 2006) or trying to create a more favourable image of themselves, this is more commonly known as impression management. Personality measures are typically self-report questionnaires. They require the respondent to answer questions about the behaviors they display, the things they like doing, how they like to live their lives essentially. There is no such thing as a right or wrong answer in personality testing and responses are scored and interpreted by qualified practitioners (CIPD, 2013). The reason employers use personality tests is to allow employers find a better fit between candidates and the role being recruited for (CIPD, 2013).

In literature models on faking are discussed (e.g., McFarland and Ryan, 2000) and that try to understand a candidates faking behavior (response distortion or social response distortion (SRD) in terms of when and why they engage in it. SRD 'is typically defined as the tendency to give positive self descriptions' according to Paulhaus (2009, p.51) those who engage in (SRD) have a better chance of being selected 'in comparison with those who are honest' (Galic,

Jerneic and Kovacic, 2012, p.229). Based on evidence it is known that applicants can distort their responses in a way that is socially desirable, if asked to do so (Campion and Levashina, 2007; Viswesvaran and Ones, 1999) or at their own discretion. This results in the 'test mean, reliability and validity' becoming distorted and may affect 'selection decisions' according to McFarland and Ryan, (2000, p.1011; Raymark and Tafero, 2009). This is argued by a number of authors for example Smith and Ellingson, (2002) who insist that it doesn't. Research conducted by Hogan (2007) who supports this theory suggested that even allowing unsuccessful job applicants to retest did not result in a major improvement in mean scores. Galic et al (2012) believe that this deliberate response falsification is a major concern for employers and it is still not evident what factors prompt or motivate candidates to do so, other than creating a better impression to the employer to secure a job (Konig, Merz, Trauffer, 2012).

To better understand this faking phenomenon they conducted three interconnected studies Galic et al (2012) used the Big Five personality questionnaire (based on the FFM) scores in real military pilot cadet selection on Croatian samples. They compared the results with participants who responded honestly and participants who faked the ideal personality profile ('faking good') and participants who faked an ideal candidate description ('fake job') (Galic et al, 2012, p.238). They concluded that depending on the situation where a candidate finds themselves, real (job selection) or fake laboratory situation (fake job or personality profile) will dictate the demand for faking. Candidates in selection who are in the fake job category describe the ideal profile based on 'stereotypes' honest responding candidates in real selection inflate their positive attributes while underestimating their negative attributes (p.239).

To counteract the problem with SRD, some employers administer another personality test alongside the original one that measures 'scales of intentional distortion' its purpose is to measure the level of 'impression management' or SRD (Ellingson, Sackett and Connelly, 2007, p. 386). Candidates who score high on this are believed to be engaging in SRD.

In spite of debate and controversies surrounding personality measures with faking being the one of the biggest criticism of personality testing (Raymark and Tafero (2009) it is still recognised as an important element in predicting job performance (Rothstein and Goffin, 2006). Galic et al (2012) believes that in real selection environments applicants do engage in faking responses by not being completely honest but not to the extent of distorting them altogether. This has been challenged by Robie, Tuzinski and Bly (in press) who discovered that the majority of practitioners (70.2%) who assess personality believe that ‘faking is a serious threat to the validity’ of personality assessments a worrying statistic considering they believe an average 23.6% engage in faking (Robie, Tuzinski and Bly, 2006, p 1234).

2.16 Summary

Selecting pilots is a complex process, and goes way beyond the limitations of this paper. Psychometric testing with a focus on pilot personality measurement and personality-performance relationship has been reviewed in this section. Both aviation and HR professionals use personality testing to improve employee fit. It has also been known to reduce turnover by as much as 70 percent this would have a major cost saving and return on investment for any airline who invests in pilot development and the command process (Wagner, 2000; Goeters, Timmermann and Maschke, 1996). Personality has been positively correlated with job performance (King, Retzlaff and Orme, 2001; Siem and Murray, 1994). Research has shown that human performance can be predicted once structured aptitude testing (ability and personality) is in place with hit rates of ‘95-98%’ when compared to unstructured selection systems (IATA, 2012, p. 9).

Even allowing for disparagement concerning predictability of performance, low predictive validity and the issue of faking, self assessments personality questionnaires are still widely used in selection (Murphy & Dzieweczynski, 2005; Hogan, Barrett, and Hogan, R. 2007). Unfortunately not to the extent that it should be used in pilot selection (IATA, 2013). A disturbing thought that those

employed in such a high-risk industry may not have been adequately screened for personality disorders or deficiencies in interpersonal skills that are deemed critical for crew performance. The resulting effect could ultimately lead to a breakdown in CRM or communication resulting in human error with devastating consequences.

Literature states that the majority of aviation accidents or incidents have been attributed to human factors (Freeman & Simmon, 1991; Lautman and Gallimore, 1987). It was ascertained that ineffective crew interaction caused failures of the crew's performance (Foushee, 1984). Group performance and effectiveness in the cockpit requires group interaction (crew coordination) and a particular set of competencies namely knowledge, skills and attitudes (KSA) (Salas, Wilson, Burke and Wightman, 2006). A safe, efficient operation generates 'a need for teamwork and group decision process' (Cook, p. 27). Human operators (pilots) must have the essential social skills, attitudes and behaviors to work together in a multi-crew cockpit and communicate as a team. The traditional 'human-machine interface' pilot-aircraft must be abandoned/discarded and replaced with the 'human-human interface' pilot-crew coordination (including cabin crew, engineers, ground crew etc.), which is essential for 'flight safety and error prevention' (Weigmann and Shappell, 2001, p. 347-348).

Research Questions and/or Hypotheses

3.1 Introduction

The aim of this study is to investigate the use of personality assessments in the recruitment and selection of commercial pilots. The overall academic area is the selection of commercial pilots while reviewing personality traits as one of the selection criterion. The study will investigate the key personality traits (profile) of a high performing commercial pilot from the hiring manager's perspective. The outcome of the thesis will identify a framework of personality traits linked to pilot performance. The purpose is to identify if the assessment of personality could be enhanced with a view to improving its predictive validity in terms of stable personality traits associated with good performance in a multi-crew cockpit identified by literature and the pilot hiring manager's perspective.

3.2 The Rationale

A published industry survey on the use of psychometric testing for pilot selection necessitated this research project. The purpose of the IATA (2012) *Guidance Material and Best Practices for Pilot Aptitude Testing* (2012) was to investigate the use of selection systems in pilot recruitment. After reading the above study a seed was planted in the researchers mind to investigate the respondents (pilot hiring managers) perception of the area of psychometric testing with a focus on personality testing. Most of the questions asked in the IATA (2012) survey were answered by a yes/no option or by selecting an answer from a list of pre-defined answering categories. The concept expertly addressed the issue in the industry with integrity and with a view to improving safety in aviation. However, it appeared to lack 'the multiple realities' experienced by the respondents themselves—the 'insider perspectives' (Suter, 2011, p.344). It was also responsible for opening the 'black box' in terms of the secrecy associated with 'academic research' that Airline managers appear to withhold according to Eaton (2001, p.9) which left the researcher with more questions than answers.

Incorporated into the study will be a review of the key literature available on the use of personality assessment for the selection of pilots in commercial airlines and the military. There is a general acceptance by researchers that certain personality traits relating to the FFM taxonomy of personality, for example conscientiousness and extraversion, correlate positively with dimensions of job performance (Barrick and Mount, 1991; Tett, Jackson and Rothstein, 1991). Other research suggests that cognitive testing is a better predictor of performance in certain instances (King et al, 2013). What we do know is that personality predicts performance. Well-validated personality assessments based on the FFM such as McCrae and Costa (1985) Five Factor Model of personality traits have been effective in predicting performance in individuals and also in teams (English, Griffith and Steelman, 2004).

3.3 The Aim of the Study

The overall study objective is two-fold. Firstly using a qualitative approach to investigate the success of personality testing in pilot selection from the hiring manager's perspective in a number of commercial airlines in tandem with best practice in the industry. Secondly, the aim is to provide 'voice and subjectivity' in describing and detailing the 'authenticity of human experience' in this area, which Silverman (2010) believes is a key element for qualitative research (p. 6). The information gathered will compliment the quantitative on-line study by IATA *Guidance Material and Best Practices for Pilot Aptitude Testing* (2012) that compiled industry data about psychometric use in 'Legacy Carriers, Regional Airlines, Business Aviation, Cargo Carriers, Pilot Training Organisations, Universities with Aviation Facilities and Pilot Selection Providers' (IATA, 2012, p. 47).

The aim of this study is to capture the hiring manager's perception about the effectiveness of personality testing in pilot selection. It will also investigate their thoughts regarding the value it can add to the overall selection decision in terms of the initial quality of hire, future performance (leadership for upgrade to

command) and the unrecoverable costs (Goeters, 2004) associated with poor performance resulting in premature cessation of training. It will also discuss a candidate's potential and desire to falsify responses (SRD) when performing personality tests. According to Donovan et al (2003) 62.2% of candidates minimise their negative attributes and 55.5% overstate their positive attributes when filling in personality assessments. Exploring this issue will inform research about it's potential to invalidate the psychometric properties of the personality assessment or effects the outcome of the selection decision.

Data collected will address the gap in literature relating to stable personality traits which can affect performance by highlighting pilot personality traits associated with good performance from the hiring manager's perspective by exploring relationships and trends amongst the facets of personality and performance. The researcher has been trained as a professional interviewer and has a number of years experience in the area of pilot selection. While this could perhaps be perceived as advantageous it could also be a possible limitation due to possibility of bias from the researcher's perspective. The qualitative data will be categorised in to thematic labels for analysis.

3.4 Research Questions

The study will explore the following research questions.

1. When hiring managers review applicants for ab-initio and direct entry pilot positions how much value do they place on personality assessment?
2. Can personality assessment incorporated into the overall test battery increase the predictive validity of the overall selection system?
- ~~1.3.~~ 3. Do hiring managers validate any particular area of a pilots work performance that can be positively or negatively be affected by personality?
- ~~2.4.~~ 4. Do airlines purposefully select in a certain personality type and if so why?

3.5. Are personality traits that are predictive of a pilots performance being adequately measured throughout the pilots career?

4.6. Is the Five Factor Model (FFM) a sufficiently robust personality assessment tool fit for purpose in the selection of Commercial Pilots?

The aim of the study is to examine the traits of successful pilots as identified by the hiring managers, then an ideal pilot candidate profile will be created. This can be used at various stages of pilot selection and assessment process to identify key skills, attributes and behaviors associated with good performance in a safety critical industry. It may also highlight key constructs for example 'interpersonal and task management skills' which may be missing from the initial selection process (Carretta, 2011, p 7; Butcher, 2002).

Research Methodology

4.1 Introduction

The research philosophy undertaken to answer the research question ‘In pilot selection how much value do hiring managers place on personality assessment?’ This is discussed in this section. Saunders, Lewis and Thornhill (2012) define research as: ‘something that people undertake in order to find out things in a systematic way, thereby increasing their knowledge’ (Saunders, Lewis and Thornhill, 2012, p. 5). An interpretivist research philosophy is undertaken to conduct ten qualitative semi-structured interviews with pilot hiring managers to help explore and to gain a deeper and richer understanding of their perspective and how they make sense of the subject matter which is of course pilots and their potential performance. This approach is described by Bryman and Bell (2011) as a way ‘to grasp the subjective meaning of social action’ (p.17) and the individual differences in how people view the world around them. This would not have been possible using a quantitative approach that is concerned with measurements and statistics. Silverman (2010) demonstrates that this emotionalist model will add authenticity to the subject matter and capture the inner ‘voice’ of the respondents. Symbolic interactionism will describe the thoughts, feelings and actions of the hiring managers it will also investigate their views and perceptions of personality testing. Bell (2010) suggests that there is ‘no approach that prescribes nor automatically rejects any particular method’ in research (p.5). An inductive approach is employed to observe the respondent’s answers to the questions and to look for thematic patterns or relationships that may interact with one another. Then a possible hypothesis may be created and linked to a theory.

Grounded theory is used ‘to generate rich data, unique insights and new theoretical arguments’ (Konig, Merz, Trauffer, 2012, p.443). The data collected will be coded so it can be classified and analysed to interpret relationships and draw conclusions that can add value to the debate. By ‘using people’s stories to understand experience’ (Merriam, 2009, p.37) industry will benefit immensely by

informing the public how the industry experts make sense of the phenomena surrounding personality assessment in a safety critical environment.

Ten semi-structured interviews were conducted; Bell (2010) describes an interview as an opportunity to investigate ideas and responses, while exploring cause and effect relationships. It also offers the chance to explore the respondent's thoughts and feelings on the subject while acknowledging that this is something a survey or questionnaire can't deliver. Gee (2005) likes to focus on the language used to tell the story and the manner in which it is told with regard to the pitch and tone of the interviewee's voice. This can provide additional rich information 'that a written response would conceal' by putting 'flesh on the bones of questionnaire responses' (Bell, 2010, p161).

4.2 Pilot Test Interviews

In advance of the semi-structured interviews the researcher decided to conduct a small pilot test by interviewing one industry expert. Given their experience and operational knowledge in the area it was felt that they would help identify the structure and 'methodological rigor' required (Davis, 2007, p. 574) to answer the research questions by providing the context, tacit (unspoken) knowledge and experience in the area. The purpose of the pilot test was to identify the key themes and challenges associated with personality testing. It also provides the interviewer an opportunity to check the validity of the questions and the reliability of the answers. This respondent was firstly able to identify issues associated with selection when using personality assessments in selection. This was achieved by using a semi-structured interview with the industry expert to ascertain if the data collection tool chosen (semi-structured interview) was capable of extracting and gathering the required information to answer the research question.

Silverman (2010) approves of this approach acknowledging that the 'choice of method should not be predetermined' (p.10). The second reason for using this

collection tool was based on the fact that some hiring managers (respondents) especially those who were experienced pilots usually had some input or responsibility for safety programmes error frameworks or training and checking. With this experience, intuition and expert knowledge in tackling ‘human error’ (Wiegmann and Shappell, 2001) it had the potential to ignite and drive the semi-structured interview. This was also the best way to tap into the knowledge and most importantly the ‘intuition’ that experience brings. Suter (2011) identifies this process as an ‘emergent’ design in qualitative research methodology. This divergent (‘outside the box’) thinking is a prerequisite of good qualitative research methodology design and analysis (p.343). He also acknowledges the fact that nothing is predetermined from the outset other than a broad overview of the topic of interest, the themes or the questions being asked. Decisions about the type of data and the means of collection can be decided by the researcher once they have discovered the most meaningful course of direction that will offer them rich data to answer their questions (p. 343). The findings will design the strategy and structure of the semi-structured interviews.

4.3 Semi-structured interviews

After completing the pilot study interview in June 2014 (Appendix 2) it was evident a semi-structured one to one interview with each member of the sample would be the best method for data collection. It would offer the greatest opportunity for open and frank dialogue; the sample would not be prepared to put in writing their inner most thoughts and feelings in this area. Evidence of this was documented in the IATA (2012) survey *Guidance Material and Best Practice for Pilot Aptitude Testing*. 110 institutions logged on to answer the survey and only 12 completed it in full. This further confirms that semi-structured interviews will offer the researcher the opportunity ‘to elicit respondents perceptions’ (Silverman, 2010, p.48) about their experiences in personality testing and final selection. This area is quite sensitive and confidential and a lot of airlines don’t want to discuss their process in any great detail. Eaton (2001) commented on the research challenges in his book

Globalisation and Human Resources in the Airline Industry. He confirmed the fact that ‘Airline managers are even more secretive and defensive about academic research than those in other industries’ (p.9). Lots of airlines appear to conduct different elements of recruitment and selection processes and there appears to be no consistent generalisation (Schuler, 2002).

Initially a small number of respondents were contacted and agreed to partake in the study and were asked to nominate a colleague (snowball sampling) who matched the profile. They received an outline of the topic with a consent form. Ten qualitative semi-structured interviews (‘a conversation with a purpose’, Dexter, 1970, p.123) were conducted by the researcher with a sample (senior pilot hiring managers) from a number of different airlines (flag carrier, domestic, low cost, military) involved in pilot selection. Some were pilots themselves and some were senior HR hiring managers. The reason it was decided to combine both profiles was to investigate whether or not their views on the topic were similar or differed. The sample chosen signified an extensive range of knowledge and experience in the area of pilot selection. The respondents are very experienced in identifying good performance because they fly with different people with different skills levels every day, they assess their performance and are exposed to multiple personalities in the cockpit. The researcher has a number of years work experience in aviation and also in pilot selection and assessment. The researcher included network associates in the sample. The only necessary criterion required to be eligible to participate in the study required the respondent to have experience and responsibility for hiring commercial pilots.

Prior to the interviews, the interview questions (Appendix D) were designed by the interviewer and based on their knowledge and experience in the area. They were tested a number of times for consistency and reliability on willing respondents and tweaked accordingly. Once the interviews were set up and prior to the interviews being recorded the interviewer ensured that they had built up a good balanced rapport with respondents. This was relatively easy with the face to face interviews, but a little more challenging with the telephone interviews but it

is an essential requirement for research interviews according to Bryman and Bell (2011).

The respondents were made feel comfortable and at ease when answering the questions, the researcher ensured they demonstrated no ambiguity or bias towards the respondents. Their aim was to display the attributes of a competent professional interviewer (Saunders, Lewis and Thornhill, 2012). The interview format was quite similar for all respondents, it focused on four themes. (a) their belief in the value of psychometric testing (b) stable personality traits associated with excellent performance (c) views on Social Response Distortion and (d) any future improvements that they thought could improve the predictive validity of selection in general. The researcher controlled the interview and kept it focused but did allow the respondents freedom to discuss any other information that they felt would contribute to the debate. During the interview the hiring manager's (industry expert) experience of personality assessment was explored in line with the strengths and weaknesses of their current selection process, in terms of personality assessment and profiling. The respondents had a vast amount of experience as hiring managers in pilot recruitment and selection. The researcher felt that ideally if possible it would be beneficial to interview a number of female hiring managers because this is a male dominated industry (Davey and Davidson, 2000). It was necessary to understand if their perspective was different to a male's perspective. Some of the hiring managers will have trained as pilots initially then progressed through the ranks as managers. This experience aligns favourably with the subject matter being reviewed.

4.4 The Sample

The respondents were selected from a number of different airlines and were either senior management pilots, senior HR executives or pilot hiring consultants with experience in the use of psychometric testing for selection in commercial, military, and private aviation. They ranged in age, gender and experience (Table 4.1). The airlines ranged from international, flag carrier, European, regional and

private. The sample was selected by a process of non-probability snowball sampling following the pilot test interview. This strategy was employed because gaining access to this particular group in the industry is extremely difficult to negotiate and is consistent with Pettigrew and McNulty's (1995) assumption 'that access to elites is best achieved through other elite members' (Bryan and Bell, 2007, p.491). The researcher had to also ensure the sample would not be biased so included heterogeneous members (different backgrounds, pilots and non-pilots) in the sample.

The respondents were asked to participate in one semi-structured interview with the researcher. In preparation for the interviews commencing in July 2014 an interview schedule was prepared along with an interview guide. This was then pilot tested to ensure the structure and format was appropriate to elicit rich responses. Following the pilot test there were some minor adjustments required to the interview format before another interview commenced. A list of questions to be investigated from the hiring manager's perspective during the semi-structured interview was prepared following the pilot interview (Appendix D).

For the purposive-sampling the respondents had to have the required profile to participate in the study (responsibility for hiring pilots). They all formed part of a heterogeneous group, this was very important to the researcher because, if they were part of a homogenous group the 'information gained may be incomplete' (Konig, Merz and Stauffer, 2012, p.444). For the snowballing sampling the respondents were usually contacted by phone to discuss the research project and their suitability and interest in participation. An introductory e-mail usually followed to schedule the interview along with a briefing and ethics information sheet and a consent form. (Appendix E). Once they had agreed to the study, interview dates and times were arranged.

At the outset of the study it was felt that it would be impossible to meet each and every participant for a face to face interview because of the diversity of their locations across the globe so it was agreed that in instances like this phone calls

could address the research questions. In total five interviews were conducted face to face and five were conducted on the telephone. All interviews were recorded on a smart phone and transcribed in full following the interviews. There were also a number of field notes taken during the interviews. Interviews took place in private meeting rooms where they would not be disturbed, very similar in layout to interview rooms and close to the airport for the convenience for the respondents. The telephone interviews also took place in the same rooms. The candidates were not briefed on the questions in advance of the interviews because the researcher did not want to receive prepared or rehearsed answers. This was not the point of the exercise but they were briefed on ethics and participation guidelines including the right to withdraw involvement in the study, anonymity and confidentiality.

Prior to the interviews commencing a time and place for the meeting was agreed with the participant. Once they arrived and after the introductions a consent sheet was signed followed by a brief run through of the conditions of the interview with the participant. An opportunity was offered to respondents to ask any questions or raise any concerns they had. The participant was advised that the interview was being recorded. Then some bio-data was noted, in terms of age, gender, number of years' experience in the industry and most importantly number of years working in pilot selection. Brief notes were taken during the interview and the respondents were advised of such. They were put at ease by the researcher and the researcher was careful not to display any personal bias, propose leading questions or let the interview run over time. A number of SMIE were contacted directly or indirectly and were asked to participate but declined.

Table 4.1 The sample demographics

Respondent	Age	Gender	Years flying	Years in Pilot Recruitment	Commercial hiring experience	Carrier
Interview 1	39	M	14	7	Yes	R

Interview 2	50	M	30	4	Yes	M
Interview 3	60	M	35	26	Yes	M
Interview 4	39	M	16	5	Yes	F
Interview 5	58	F	N/A	22	Yes	M
Interview 6	49	F	N/A	5.5	Yes	L.C
Interview 7	54	M	30	25	Yes	M
Interview 8	44	F	23	8	Yes	M
Interview 9	34	M	14	3	Yes	M
Interview10	52	M	25	11	Yes	F

Table 4.1 Respondent's demographics

M: Male

F: Female

L.C: Low cost

F: Flag carrier

M: Mix of carrier, international, flag, regional, military and private carriers

R: Regional

4.5 Research Limitations

There are a number of limitations following this qualitative study; firstly there were only ten semi-structured interviews in the study. A greater number of respondents may have yielded other perspectives in relation to the personality testing of pilots. Secondly there appeared to be a lack of longitudinal quantitative information available about the predictive validity of personality testing in different airlines and how that related to a pilot's performance and career progression. Airlines appear to be looking at this now but it appears to be at an 'embryonic stage'. Some airlines are considering at what stages in a pilot's career they measure personality attributes like interpersonal communication that are critical not only to a pilots success but also to an airlines safety system, reputation and cost base. This data will take many years to collect but it is believed that this will benefit the predictive validity of the selection system, the pilot and the airline that employs them.

4.6 Ethical considerations

The researcher is a practitioner of Level A and Level B psychometrics, and bound by the British Psychological Society's (BPS) code of ethics and conduct. The principals of the BPS are grounded in respect, competence, responsibility and integrity (BPS, 2009, p.1). This provides an ethical and moral framework where 'issues and risk' for example confidentiality, anonymity, consent to withdraw at any point, protection of data captured can be assessed. Then choices can be made to 'avoid conflict and harm' to all involved in terms of their emotional, mental or physical wellbeing (Saunders, Lewis and Thornhill, 2012, p. 228). Relying on their principals to guide 'behavior, attitude and judgement' and always avoiding bias and discrimination, by not using leading questions when interviewing or giving in to personal biases when interpreting the data. Always being cognisant when dealing with sensitive information concerning people's personalities (BPS, p. 2).

The aim of this research is to deal with the research respondents in the same way as they would deal with clients by obtaining written consent prior to the study (Appendix 3 copy of letter outlining permission). Data protection legislation is complied with. A personal e-mail address will be used during the study, to manage the communications with the research respondents. The research respondents will be advised on how long the data will be held, who will have access to it and where it will be stored. The guiding principal of the researcher's research philosophy is as follows: 'Treat humanity in your own person and that of others always as an end and never only as a means' (BPS, 2009, p. 4). Treat respondents the way they would expect to be treated, as a whole person and not just for the researchers gain.

Data Analysis, Findings and Discussion

5.1 Data Analysis

The strategy used to answer the following research question 'In pilot selection how much value do hiring managers place on personality assessment' was based on grounded theory and an inductive research strategy 'linking data and theory' as described by Bryman and Bell (2011, p.13). According to Saunders et al (2012) the grounded theory method describes 'the data collection techniques and analytic procedures that it uses' (p.185) to develop a theory. Once the data was collected an iterative process was used to help develop a theory that could be tested 'against other parts of the data' (Bell, 2010, p.16) this recurrent 'weaving back and forth between data and theory' (Bryman and Bell, 2011, p.13) happens because the data collected is grounded 'from the real world' (Hayes, 2000, p.184). Potter (1997) a discursive psychologist defines discursive analysis as 'the way versions of the world, of society, events and inner psychological worlds are produced in discourse' (p.146). Discourse analysis was considered the most

suitable method to analyse the data. This method was chosen because of the fact people say things in different ways, the information they include or exclude, the words they choose to explain themselves is meant to have an effect on people. This effect will not only influence their perceptions but also impact on ones own (Bryman and Bell, 2011). This next section will describe the discursive analysis used 'for harvesting data gathered from respondents' (Potter, 1997, p.146). This will be followed by the analysis, interpretation and the meanings of the data collected from the interactions and the language used between the interviewer and the respondents (Speer, 2002). Interview transcripts were reviewed, summarised and excerpts were placed into a qualitative table in a thematic format to help add context to the emerging trends (Table 5.1 and 5.1.2). Included in the study are extensive verbatim citations to add 'flesh to the bones' and highlight the sentiments expressed by the respondents.

5.2 Discursive Analysis

Each semi-structured interview was recorded and following the interviews the recordings were used to type up full transcriptions of the interviews. These were then analysed and interpreted to see if there were any common or consistent themes emerging. Discourse analysis was used to focus on the language used during the interviews the main purpose of this was to find meanings behind the language used. The researcher could initially see five distinct themes emerging following the first couple of interviews. The themes are as follows: the perceived value of personality assessments amongst hiring managers and their ability to select applicants that would fit with their airline, the stable personality traits associated with performance in commercial airlines, personality performance relationships, universal pilot personality, the choice of assessment tools being used within the industry and the challenges associated with social desirable responding (SRD). When the initial themes were coded in a quantitative table and reviewed there were a number of consistent trends, the researcher decided to look for relationships within the area. A set of emergent themes and relationships developed that focused on the interpersonal and social skills required to become a successful pilot, the challenges associated with measuring those skills and the employee fit within the particular airline.

5.3 Findings

The discourses the hiring manager's displayed around the perceived value of personality assessments focused on a number of themes. The principal theme encapsulated the importance of interpersonal communication and social personality traits of high performing pilots in commercial airlines. The hiring manager's challenge when trying to measure those personality traits with the assessment tools available emerged as a very important theme. The findings

suggest that the hiring manager's perception and discourses of 'employee fit' with a particular airline are aligned to the airlines core values. The research suggests the applicant must have the key attributes to fit the airline and their values must be aligned with those of the airlines. It doesn't matter what type of personality they have or how well they can fly an aircraft if the fit is incorrect. It emerged they recognised that engaging a pilot with the required ability, interpersonal and social personality traits early in their career was beneficial to both the airline and the employee in terms of performance and career progression.

Stable Interpersonal and Social Personality Traits Associated With High Performing Pilots

Table 5.1: Essential Personality Traits' Model For Pilot Selection

Interpersonal	Communication	“Interpersonal conflict, interpersonal breakdown, malfunction, failure of basic
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Skills	Skills	communication skills, can and are attributed to many of the incidents and accidents” IV2 “Are they able to engage with our customers, that’s the key part of every business” Interview 9
	Honesty, Integrity and Professionalism	“There must be a sense of honesty, integrity, openness and professionalism about them” Interview 10
Crew Resource Management Skills	Teamwork	“They also need to be able to work in a team. That’s not just within the cockpit. It’s also within the cabin and also the engineering...so you’re basically looking at a team worker” Interview 3
	Demonstrating CRM Behaviors	“We are creating the expectable levels of behaviors within a framework where they can operate” Interview 7
	Performance Management	“Maybe we should give personality feedback, show them what we found and discuss if it was valid, if there was an element we were not happy about say to the person that wouldn’t go well in six years when it’s time for command, now work on that” Interview 10
	Decision Making Skills	“In the simulator, see how the person reacts, a good view of their ability to communicate and identify what’s important, seeing the basic threat and error management skills” Interview 7
	Leadership and Assertiveness Skills	“Pilots have to have the confidence to make a decision on their own” Interview 8 It’s not about aggression, its not about arrogance, its about when being able to give timely inputs when they are required and remind people” Interview 1 “They can think on their own feet and be the leader we require” Interview 9
	Situational Awareness	“It’s down to being perceptive about people, what’s going on around them. It’s the whole situation which isn’t just about cognitive data coming in through the sensors but it’s also about a sense of where they’re at in terms of what’s happening with the crew behind them, their fuel, their communications with outside” Interview 5

Emotional Maturity	Emotional Stability	“Self awareness and self knowledge and a high level of emotional maturity is absolutely critical” Interview 5
	Ability to take Constructive Feedback	“Must be able to receive critical comments and also some negative comments that may occur during training and take it on board as being a fundamental part of how they are trained, not run away from that and not clam up and close down because ultimately that’s one of the greatest threats there are in a cockpit that when a person stops communicating” Interview 2
	Ability to put Individual Difference aside	“They have to basically work with individuals who they don’t know and have to work in a professional manner and put aside any personal or political differences on a day- to- day basis” Interview 3
Personality Fit and Culture	Different airlines have different requirements	“Personality depends on the airline recruiting” Interview 7 “Discussing with the psychologists about what we are specifically looking for our airline because what our airline wanted mightn’t be what airline A, B or C needs, its about fit” Interview 1
	Cultural difference	“Recruiting in different countries, I can’t stress the cultural factors, they must be taken into account” Interview 7
	Human interaction	“I think there’s nothing like pressing the flesh and getting as much human interaction with people, you know within five minutes of an interview, people tend to put up their guard, no matter how good they are, I think the guard starts to drop and you start to actually get to see them. Don’t know if you can see that at 100 questions” Interview 1
	Employee Fit	“I suppose we are trying to make sure people are the right fit for our company, they would struggle if they weren’t the right person” Interview 9

5.4 Interpersonal Communication

The majority of hiring managers felt that interpersonal communication was the most essential requirement for the pilot's role. It was equally important to have the ability to give and receive information. 'Openness' was referred to a number of times. In most airlines it wasn't good enough to have the ability to fly and have the technical knowledge to deliver a safe operation. It was essential for a pilot to know himself and understand the behaviors that he or she displays and how that behavior is perceived in an organisational setting. The importance of having the ability to create and maintain an open relationship with people they interact with on a daily basis during the course of their duties was emphasised by the hiring managers.

“We're talking here about behind the cockpit door, the cabin crew, making sure that we have no air of superiority, similarly with ground staff or dispatchers, everyone to our loaders our re-fuelers, people who can effectively communicate to the pilots throughout the day and may be in a position to notify them of something unusual that they may see as they walk around the airplane for instance” Interview 2

Hiring managers were aware of the substantial consequences if this skill was not sufficiently present in pilots employed by them. Even without referring to the obvious and the possibility of accidents and incidents occurring. The importance of underpinning this trait was stressed a number of times in terms of the knock-on effects it may have. Hiring managers discussed a pilot's ability to give, take and act on constructive feedback. Their ability to share the workload, give timely inputs, collaborate and come to agreement to problem solve issues, follow SOP's but most importantly having the ability to question and check each others intentions and decision making, while being cognisant of the pilot and captain authority gradient or 'power difference'. The hiring managers constantly referred to professional pilots, leading by example and demonstrating a level of honesty and integrity in their daily duties.

5.5 Crew Resource Management Skills

'Teamwork' was perceived as a fundamental requirement of CRM amongst the hiring managers. They focused on two elements of behavior, they required pilots to work as part of a team and also have the capability to bring the team with them. The Captain had ultimate responsibility for leading the team the respondents centered on his/her ability to use all available resources when required. The captain, co-pilot, crew, and engineers all working together sharing a common goal, with the captain being in control and having the final say. Airlines train and promote the use of CRM amongst their crew and usually specify a certain cockpit gradient, this will determine the level and quality of communication and interaction between the crew. A lot of airlines like a flat gradient that encourages collaboration. If the captain is authoritarian this will not be conducive to an equal gradient and may result in the co-pilot being unable to speak up or contribute to the operational performance of the aircraft could result in conflict in the cockpit. They viewed having cognitive capacity (problem-solving) and situational awareness as paramount; knowing what's going on inside and outside of the cockpit is a key requirement of the role. They acknowledged having the ability to build and maintain a good team atmosphere with open communication channels, supporting and trusting each other and listening to other opinions during difficult and challenging times requires a particular set of skills.

"Conscientiousness, openness and flexibility were big ones for us"

Interview 1

"Take control of the situation, will be able to work in a team, also will be able to analyse a situation" Interview 3

The optimum skills set comprised of ability to adjust communication style to suit the situation, task and also the particular personality they were dealing with. They highlighted that this level of flexibility, people awareness and conscientiousness increases as pilots move from the right seat as first officer to the left seat as captain, when there are additional demands on them.

“Being able to adjust your own behavior and your management of individuals accordingly” Interview 10

“You can't exclude the importance of NOTECH skills for pilots because they have a massive impact on customer experience, from a CRM point of view.... we should be thinking much more broadly about them as individuals and the influence they have on others.... the difference between having a good day and a bad day is either the mood that the captain's in.... it is massively impactful” Interview 6

“It's critical that the pilot creates an open and friendly environment meaning he/she can be approached at any time and where information can be passed. Ultimately you have a captain who is a decision-maker with whom the authority lies but at the end of the day it's the team in the cockpit that contribute to all the decisions that are made” Interview 2

The importance of CRM in promoting crew coordination within a multi-crew cockpit was highlighted over and over again with all of the hiring managers. Airlines are constantly checking and evaluating CRM behaviors during regular line checks against a set of predefined behavioral markers (NOTECHS). They believed that pilots had to have a particular personality and certain abilities to demonstrate the behaviors required in a multi-crew cockpit. The key behaviors highlighted encompassed the ability to get along with others and an open style of communication that would offer an invite feedback.

5.6 Performance

Most of the hiring managers (pilots themselves) discussed operational performance and crew interactions in the cockpit between the first officer and the captain when speaking about personality performance relationships. Their perception on performance initially focused on crew coordination or teamwork

within their working environment which is the cockpit. They did acknowledge the importance of pilot personality outside of the cockpit but this was a subsequent priority in most cases. In order of importance their priorities were slightly different to the non-pilot hiring managers who had a slightly different perception on performance personality relationships. They related the pilot's behaviors beyond the cockpit door and the effects that behavior had on the customers and everyone else the pilot had contact with while performing their duties. They believed pilots in general appeared to have the perceived power and authority to set the tone and the pace of the day with the captain having the most impact on the people and the operation.

“You might not like their personality but they can do the job, personality becomes more apparent in the team situation” Interview 8

“Incidents and accidents occur less and less because of failures in technology.... interpersonal conflict, interpersonal breakdown, malfunction, failure of basic communication skills, can and are attributed to many of the incidents and accidents. On that basis, we have to be very careful and take into account, not only the handling skills, the academic skills, the intellectual skills but also the personality skills” Interview 2

“I suppose simply its essential because pilots aren't the same as everybody in every other job. There are certain personality traits that they need to have. They have to work now in what's understood to be a close working environment. So it's critical, absolutely critical, yeah” Interview 3

Some hiring managers focused on the close environment the crew work in and the challenges that brings. If there was any type of personality clash or conflict the fact that they are flying at 35,000 feet in the air means that there is nowhere for them to go. In effect it could turn out to 'be a very long working day' in a challenging environment.

“The impact of having any sort of incident or accident is very significant. Any pilot knows the implications of that. What they don't think about are the implications of their behavior on others or the implications of their ability to be able to influence even basic things like how somebody's day goes” Interview 6

The difference in perception between pilot hiring managers and non-pilot hiring managers may stem from the fact that the non-pilot hiring manager's perception and discourse is from the (layman's) viewpoint; they don't work in the cockpit. The pilot hiring managers may see the efficient and safe operation (goal driven, instrumental traits) of the aircraft, crew and passengers as their first priority when discussing performance and their behavior (expressive traits, interpersonal behaviors) as a second priority.

5.7 Leadership skills

Some hiring managers indicated pilots required a certain amount of situational awareness, confidence and leadership skills. This was a critical skill because ultimately they were looking for future captains during their selection process. Leadership skills encapsulated the ability to be assertive and ‘make decisions on their own’. Usually for the first few years operating as a first officer the training is very ‘interactive’ but when command arrives ‘you are on your own’ making those decisions. They acknowledged this skill can be developed during training and with experience. The respondents had a clear perception about the high level of confidence required to be effective in the role.

“Self confidence is not arrogance; people sometimes mistake confidence for arrogance” Interview 10

Some suggested that it may even be perceived of as an air of ‘arrogance’ by others but ultimately pilots had to have the ability to make informed decisions and lead a team of culturally diverse people on a daily basis.

“Massively, I think because as time goes on the ability of the individual to integrate themselves into the crew room and gain the respect that they need to gain from their peers but also to really provide genuine leadership to the teams on board the aircraft” Interview 6

“Once you're in command you are the senior person so you are almost like an unchecked senior consultant surgeon you very much operate in a small environment but equally you are subjected to your regular checks and simulator checks so people can develop an unassailable persona in the cockpit and yet they are vulnerable to this ongoing assessment” Interview 5

“When they move seat the pressure is on them” Interview 8

The respondents discussed the fact that while high levels of leadership skills were required as a pilot this requirement would rise dramatically when the pilot was being promoted to captain. If the required level of leadership skills were not evident then the pilot would not be put forward for command training or possibly have to repeat it. There are big implications here not just for the airline in terms of the costs associated with repeat training but also for the individual's confidence, credibility and emotional stability once rejected.

“Starting the command process again because when they got to the end of it they weren't getting through it – for many various different reasons but many of them around CRM skills, approach on the flight deck, engaging with a team and with your co-pilot. Also around the arrogance of a pilot, which means that they think that they have got the ability to be able to behave in a certain way because, they are a pilot.... Which means that because of their position it sets them apart” Interview 6

“ For command you require high levels of assertiveness and capacity, sometimes people overload themselves, its self induced, they know they have to make decisions, some people can't do that” Interview 8

5.8 Emotional Stability

All respondents agreed that pilots must be emotionally stable and have the ability to question and take constructive feedback, it is a profession whereby the pilot is continually being checked to ensure they have reached the particular standard of the airline along with any regulatory requirements being met. Training and checking captains are responsible for ensuring these requirements are being met in the airline. The recruitment and selection team are responsible for ensuring the essential ability and personality requirements have been selected to a level that will predict optimum performance in all pilots hired.

“There's a whole lot happening and self awareness and self knowledge and a high level of emotional maturity is absolutely critical. It's a profession whereby you are continually under assessment” Interview 5

“I take them all as a package and if one score is particularly high we'd look at how the others are with regard to that particular sub-facet or trait. High negativity isn't one that I think is associated with excellent performance. We train to a level of performance, a consistent level of performance, across all crews and I couldn't say that any one sub-facet of their personality was related to performance” Interview 4

From the hiring manager's perspective there are a number of personality traits associated with performance. It is not particularly difficult to differentiate between the higher order and lower order traits but a lot depends on the particular airline and what they value more. The one thing that was evident in the findings was the importance of interpersonal communication in all airlines. The behavior it generates in an airline and the effect that behavior has on all involved in the operation. The implications of ineffective crew coordination and ineffective interpersonal communication skills have far reaching consequences way beyond the interactions of the crew especially where life and death are concerned.

5.9 Employee-Fit

This importance of 'fit' emerged during the course of the conversations. While it was very important that the pilot could fly that was not really a consideration for the direct entry pilots as they had already qualified and gained experience with another airline. The issue here for the pilot hiring managers was to assess if the candidate could make the transition in to their airline, fit in and absorb the culture. In the ab-initio forum it was felt that if the applicant couldn't fly they would have been deselected earlier in the competition because of all the different screening stages. The 'fit' variable was given a very high rating amongst the hiring managers, who felt that if the candidate did not fit with their airline it was a waste less journey for all concerned. It was critical for the pilot hiring managers to

“Ensure that those coming in have the value system senior management feel is appropriate for them. You can't afford to be hands off on these things”

Interview 5

“Recruit the right people that will fit us as a company and move on and develop with us in the company” Interview 9

5.10 Distinct Personality For Different Airlines

The respondents discussed the fact that most airlines especially the larger ones have an ideal personality profile that they like to recruit from. This personality must fit with their culture and value system it operates. Most hiring managers acknowledged that the industry had changed and that there was now even a greater focus on cost reduction, passenger experience and repeat business. The successful candidate's motivation and value system must be aligned with the airlines for optimum performance.

“They must have the personality you require to fly and represent your airline, different airlines recruit different personalities” Interview 7

“I think, probably more and more, we are looking for someone who has good commercial awareness, which wasn’t always the case. I think the industry has changed entirely. It has become much more commercially focused because of the competition Interview 3

“Are they able to engage with our customers that’s the key part of every business. Are they able to go the extra mile to make sure the customers who ultimately pay our salaries are happy and satisfied with the product we produce” Interview 9

All hiring managers confirmed that there was no distinct personality type within their own airline and their pilots have different personality types. They also discussed the fact that no two individuals were the same. If there was one singular personality that they could recruit from, there would be no challenge and all pilots would be the same.

“Life would have been a lot easier usually when a group of pilots are selected they look at each other and say what the heck have we all got in common. There's generally great hilarity to discover that they're actually so diverse, there's very little in common” Interview 5

“I don’t like to think that we have absolutely one singular type of personality” Interview 5

“Not trying to hire clones or we are not trying to create clones. No two pilots, no two people, are exactly the same or have the exact same personality” Interview 4

“A mix of personalities, that’s what makes it work, I think it’s the extras and differences that make it and brings the best to the industry” Interview 9

They discussed that a mix of diverse personalities, pilots from different backgrounds and cultures bringing with them experience and knowledge enabled them achieve their goals add value to the bottom line.

**Table 5.1.2: Hiring Managers’ Perception of Personality Tools
and
their Validity and Reliability**

Personality Assessment Tools	Satisfaction	<p>“Satisfied, yes. But satisfied isn’t a very strong word, what if we can be more than satisfied if we can get a better or different product” Interview 2</p> <p>“We are guilty of...using the personality assessment for selection, then throwing it in the corner with the personnel file and not using the information in the training environment” Interview 10</p>
	Candidate Cognitions	<p>“It starts off with the desire to get the job” Interview 3</p> <p>“Success comes at a very high price in terms of pilot selection so I think it beholds us to use whatever tools will maximise effectiveness in terms of the organisation and the individual”</p>

		<p>Interview 5</p> <p>“The sorts of pressures that puts on the candidate then to say OK they didn’t like what I said the last time OK I’ll have to change it all over again so if they tried to re-manage their impression or whether they actually say well to hell with that I’m just going to be myself and answer naturally is an interesting one” Interview 1</p>
	SRD-Faking	<p>“People will answer in a way they feel they should answer... but they are written in a way that you can’t fudge them, I do trust them and only use them as a guide to dig down on a personal level” Interview 9</p>
Validity and Reliability	Tools in Use	<p>“Very useful tool but need to be used in conjunction with other elements of the process rather than being the final arbitrator” Interview 10</p> <p>“Never use it as a yes or no type tool” Interview 9</p> <p>“Absolutely essential, ‘there is no question about that” Interview 3</p>
	Of the Assessor	<p>Experienced person who has experience of not only the raw data of the test but also a fair insight into the competencies and day-to-day requirements in flight operations environment” Interview 5</p> <p>“It’s only as good as the quality of the person and the experience of the person making the evaluation” Interview 5.</p> <p>“I would personally not want to ever stand over the selection of a pilot if the psychometric or the particulars of a personality assessment were not used” Interview 5</p>

5.11 The Measurement of Stable Personality Traits

The majority of hiring managers place immense value on psychometric assessments that included cognitive and personality assessments for pilot selection. They were one element of the assessment process and usually used in

conjunction with other elements which included interviews and or a simulator assessment. All of the measures taken were given consideration before a final selection was made. It was suggested that the personality assessment provided the assessors with additional information on skills and attributes that could be difficult to measure or would not normally form part of the structured interview. This information was used to drive the interview in a way where it was possible to make predictions about the future performance and behavior of the applicant.

Some respondents felt that it was very useful for certain aspects of selection, for example when recruiting ab-initio and direct entry pilots, in effect candidates whom they had no prior knowledge about. While some respondents had mixed views or bad experiences regarding the use of it for internal promotions for example upgrades to command or to management positions. Their belief was that they already knew how these candidates performed and sometimes the personality assessment did not correlate with the candidate's performance and it left them in a difficult position.

“Between a rock and a hard place” Interview 8

This confirms the fact that not all candidates performing well in their current role may be suited for the next career progression to captain. Some felt that psychometric tests were useful in certain circumstances.

“As a filtering tool’ but their thoughts were ‘always on the people we missed’ Interview 1

“Or with candidates that were on the borderline and they couldn’t quite decide on them one way or another’ Interview 9

All hiring managers believed that cognitive and personality assessments were equally important aspects of pilot selection. Their views on the value of personality assessments were almost identical, not just because the tests were proven and validated but basically because they recognise the high risk involved if personality traits were not tested.

5.12 The Human Resource Function in Psychometrics

Many of the personality assessment tools used in the different airlines were based on the FFM. Some airlines used them mainly at the ab-initio stage or at the direct entry first officer phase of recruitment and selection. Some choose to use them again for internal promotions or upgrade to captain. The only consistency found was that they formed part of the initial entry requirements in most airlines. Some hiring managers suggested their use really depended on who was part of the management team or the selection panel at that time. A lot depended on who had the power and ultimate responsibility for recruitment in the airline, the hiring managers discussed the fact that this depended a lot on the HR manager at the time. There was some evidence to suggest that the introduction of new management structures within the airlines was sometimes perceived as an excuse to change existing pilot selection models rather than reviewing existing models and this appeared to have caused some frustrations with the hiring managers.

“The first thing they did was change everything, blow lots of money on it” Interview 7

Most hiring managers agreed that there were certain limitations with the personality assessment tools they used and it was difficult to measure some personality traits because of the tools own limitations and because of time limitations. Research suggested the tools and the selection systems were good at identifying talent, but there was a little sentiment around the fact that they may not be identifying it all and the possibility that some “slipped through the net”. Some suggested that they were only just satisfied with the output of the personality tools they were using but felt that the capability of the tools could be greatly improved. Although this was discussed in detail, there were no valid solutions offered, most hiring managers agreed that this was not their speciality and it should be left up to the test generators or aviation psychologists.

“Caused me to go out and review what is in the market place that could either be matched to our competencies, a multi-dimensional view rather than potentially a single dimensional view and I think that's where we have perhaps decided the product was great to start with but that we needed that to be more sophisticated” Interview 6

“We're getting the right talent. Well I'm not absolutely certain is that we are getting all the talent” Interview 3

They recognised that psychometric testing was a specialised function usually found within the HR department. The consensus was that assessments should only be interpreted by an experienced practitioner who had the expertise, experience and knowledge of tests being used. Some airlines had consulted with qualified psychologists to help them make informed decisions about candidates especially where large competitions had taken place. The purpose of this was to conduct a risk assessment and screen candidates for psychological problems that may affect a pilot's performance in the role. The hiring managers were very aware of the costs involved in this level of screening but their ultimate responsibility was for the safety of the airline, it's crew and it's passengers a price could not be put on this where lives were concerned.

“Controlled by HR’ Interview 9

“Left up to the ‘experts in our HR Department’” Interview 2

“There is a massive cost involved” Interview 1

5.13 Social Response Distortion (SRD)-Faking

The sample were all are in agreement and confirmed that social response distortion (SRD) is problematic when applicants are responding to a personality questionnaire. All of the hiring managers confirmed that it does occur but could

not confirm the rate of it. The hiring managers were asked directly only about (SRD) during personality assessment but many confirmed that a certain element of it also takes place during interview assessment but is easy to identify and stop at interview but not as easy during personality assessment because usually personality assessment is conducted on-line.

“Candidates ‘sometimes don’t even realise’ that they are engaging in response distortion” Interview 4

“Some times you have to go off piste to get below the surface” Interview 9

The hiring managers fully understand what motivates an applicant to engage in SRD but couldn’t offer an answer to the problem other than explaining to the candidate what the assessments were measuring or warn them that if they were not totally ‘honest’ they could be disqualified from the competition.

“They all want to put their best foot forward” Interview 5

The hiring managers discussed the fact and believed that SRD does not appear to invalidate the personality assessment because of two reasons. Firstly the tests used are particularly robust instruments and it is relatively easy to determine if a candidate is engaging in (SRD). Secondly the results can be validated very easily at interview.

“We don’t retest but we do try to examine a little bit when it comes to the interview in the assessment centre but if there are firm concerns from the output of the personality profile we would try to bring that into the interview so we would try to understand where perhaps there might be a bit of confusion over the output of their profile” Interview 6

Some airlines retest applicants and others don't. There was no evidence of consistency or best practice procedure across the industry for dealing with SRD. Employers are aware of the applicant's motives for engaging in SRD but are at a loss to know what is going on in a candidate's mind when taking a personality test, other than trying to create a better impression of themselves.

“Was the first one an attempt and was the second one a genuine effort?”

Interview 5

Hiring managers were well aware of the pressures candidates are under during high stakes selection, most of them were reluctant to re-test, and their view was that candidates would now 'fake good', knowing that the airlines didn't get what they wanted first time.

“The sorts of pressures that puts on the candidate then to say OK they didn't like what I said the last time OK I'll have to change it all over again so if they tried to re-manage their impression or whether they actually say well to hell with that I'm just going to be myself and answer naturally is an interesting one” Interview 1

Unfortunately with on-line testing without actually being in the room with the test taker it is impossible to know if they were in the right frame of mind when taking the test, if they actually fully understood exactly what was being asked of them or if they took the instructions seriously and ensured they were not disturbed while taking the test.

“The trouble with online testing is that candidates can dabble with it a bit and they may not give it their full attention. No guarantee that they've actually handled it with the seriousness that they should have so, you know, without knowing how they handled the first session, you are a little bit in the dark as to if there is an improvement of score” Interview 5

Some hiring managers felt that candidates ruled themselves out of competitions because of engaging in SRD. As employers, their hands were tied in terms of how they could provide a solution to the problem and they felt that asking candidates to re-sit the assessment was not the answer for high-stakes selection.

“Anecdotally feel that we have lost out on talent without a doubt’
Interview 2

“Would be very reluctant to second guess the profile at the end of the day” Interview 5

“I think it’s a harsh way of ruling someone out” Interview 1

5.14 Validity and Reliability

The area of validity and reliability when using personality assessments was given a lot of consideration from the respondents. Their role was to ensure the assessment was measuring exactly what it was intended to measure and the results could be validated at interview and again during the pilots, training and operational performance. The hiring managers perception of the level of validity and reliability associated with the personality assessments overall was good, in the main they did appear to trust them. They believed that it was good but not great for gaining ‘insight’ and additional knowledge on a potential pilot’s personality traits and motivation before an interview. It was quite difficult to determine the quantitative level of validity for personality testing with the respondents. However qualitative data suggested they found them highly predictable in terms of recruiting and training new ab-initio and direct entry pilots (low failure rates, improved conversion rates from assessment centres and interviews). They mainly spoke about the combination of ability and personality assessments, they used them as part of a ‘package’ they were incorporated with interviews and simulator assessments to predict future performance. Even when

asked if they favored one over the other most respondents agreed that they would not use them in isolation.

“They're proven, they're validated and a lot of research, particularly the most prominent piece of research was done by NASA that would indicate what sort of personality traits that pilots should have and that's why we use psychometrics”. Interview 4

“I have nothing quantitative but I have lots of qualitative evidence which suggests that when it comes to motivation, desire to join the airline, their ability to be able to interact with others.... we get a better sense of their ability....to really make an impression, to have the right impression, this has improved significantly as a result of the fact and we have increased our conversion rates at the testing centres, for example” Interview 6

“Both have an equal weight in a sense raw aptitude and the ability to actually take on the technical aspects and understand the technical aspects of the role but it's imperative that you have somebody whose personality also fits the profile outlined certainly for a commercial pilot” Interview 4

“I would personally not want to ever stand over the selection of a pilot if the psychometric or the particulars of a personality assessment were not used” Interview 5

“I think the personality assessment is absolutely crucial and hand on heart, I think I would even prefer to take a hunch on the cognitive side” Interview 5

5.15 Industry Requirements

Some of the hiring managers acknowledged that the personality assessment was just a tool and they would ideally like to spend more time conducting one to one or group assessments with pilots before they were selected. They were well aware of the costs involved, especially in large-scale recruitment campaigns but felt it was worth the long-term investment because they were usually looking for longevity and pilots that they could ultimately promote to future captains in a few years time.

“To see somebody’s natural state not in a state where they know they are being assessed continuously people will drop their guard and I think you will see the best part of them. So, for us to be able to take candidates in, take them on an exercise for an afternoon, keep them overnight...have another exercise the next morning.... would be of benefit to us” Interview 2

So in effect the industry is calling for more time to be spent with the candidate while assessing them. They want to see them in their natural raw state not in a performance, where they are only demonstrating their best side. Hiring managers want to see how pilots will perform in everyday situations routine normal conditions and also in non-normal situations, because potentially their ability to put into practice their training for non-normal situations is the difference between having a good day or a disaster. They acknowledged their own responsibility to predict the applicant’s suitability for a pilot role in their airline and they would continuously strive to achieve this by being open to change and assessing new strategies, tools and techniques in pilot selection.

The hiring managers who had experience of recruiting abroad for example in countries like the Middle East and Asia felt that the tools available for assessing personalities did not cater for cultural differences. They suggested that the psychometric industry should be taking this into account and build in different tolerances or norm groups to cater for these individual differences in culture, values and beliefs.

The key findings have been discussed and are presented in (Table 5.1 and 5.1.2) and summarise the hiring managers discourse and perception on the value placed on personality assessment in the selection of pilots for commercial airlines.

5.16 Discussion

The purpose of this study was to explore the hiring manager's beliefs on how much value they placed on personality assessments, which formed part of the overall test battery, or psychometric assessments in pilot selection. The findings of this research project provide evidence to confirm that hiring managers do place immense value on personality assessment that forms part of the psychometric assessment for a number of different reasons. The main reason discussed suggested it improves the quality of pilots being recruited in high-stakes selection. This supports the findings of Hirsh (2009) who confirms that combining ability and personality tests to predict performance will provide results in the range of $r=.65$. Wingestad (2005) describes 'predictive validity' as 'a statistical correlation coefficient ranging from .00 to 1.00, where 1.00 expresses a perfect positive correlation' (p.4).

The hiring managers confirmed ability and personality assessments are a reliable staple of the pilot selection tool kit and compliment a number of other assessment tools for example the interview, group assessments and in some cases a simulator assessment. The personality assessment 'gives them that little bit extra' or a 'nice little overview' with regard to stable personality traits associated with performance.

For many years pilot selection focused mainly on applicant's ability (i.e. IQ) and technical proficiency (Chidester et al, 1991) to operate the aircraft. While this is still an extremely important factor from the hiring managers perspective 'you can't have personality and no technical ability or vice versa' the industry has had to take into consideration accidents and incidents related to ineffective communication and aircrew coordination (Lautman and Gallimore, 1987).

In light of this fact the industry introduced CRM training initiatives to improve aircrew coordination with the use of interpersonal skills. 'Interpersonal skills and not technical skills are viewed as critical success factors for pilot performance and safety' according to (Appelbaum and Fewster, 2003, p.3). Astounding as it may seem 'none of these programs consider any stable personality characteristics that may influence crew performance and error management' according to Fitzgibbons et al (2004, p.1). The hiring managers have confirmed that interpersonal and social skills are weaving back

and fourth in all personality traits they have identified as stable personality traits associated with good performance. In conjunction with this they have also identified a number of values interlinked with these traits. Traits and values have different drivers in the workplace but they do affect one another, initially they were not intended to form part of the study but their significance can not be ignored. Traits have been identified as differences in people and their personalities earlier in the study and values are desirable behaviours people strive for, how they behave, how they work and how they live their lives, the values that are important to them. From the hiring managers perception a theme appeared suggesting that the airlines want to get the pilots engaged with the airline as soon as they commence employment 'I think as an airline we are looking much more at engaging with our pilots and getting them to be much more loyal to the organisation in a number of ways rather than just being loyal to their profession' Interview 6. They want to ensure pilot values are aligned with their own corporate values. If they are compatible it's a win win for all, they believe these pilots will help them achieve their corporate objectives that include growth, punctuality, customer satisfaction, revenue and most of all safety.

When questioned about the validity of personality verses cognitive assessments they rated personality equally as important as cognitive ability even though personality assessments only yielded ($r = .14$) in Martinussen (1996) meta-analytic study, it had the lowest correlations with pilot performance. Hiring managers believe many elements of a pilot's performance appear to be underpinned by the ability to communicate by using their interpersonal skills. Most hiring managers are now focussing more closely on stable personality traits, not just in personality assessments but also during interviews and group assessments which are predictive of certain levels of performance resulting in desired behaviors in the aviation environment. Research suggests that personality assessment is being used as an introduction to the applicant and then this information is validated or sometimes invalidated at the interview or group assessment. Personality assessments are being used as part of an overall package informing the hiring manager of the suitability of an applicant for their airline. This finding would be consistent with research by Helmreich (1987) who suggests that ability and personality are difficult variables in a pilot's performance to change. He believes it is perfectly reasonable basing selection decisions on certain personality traits that are related to interpersonal skills. This statement also provides credence to the fact that basing selection decisions

on attributes 'demonstrated to be the most predictive of job performance through research' (Tews, Stafford and Tracey, 2011, p.1) is an optimum selection strategy in high stakes selection.

The majority of hiring managers from a number of different airlines believed an all-inclusive approach using all of the available tools in pilot recruitment is essential to see the applicants perform at their best. Some airlines use personality assessment as one of the criterion for internal recruitment, upgrade to command and promotions and other airlines choose not to. However research confirms it is gaining momentum and rising in popularity amongst most airlines, research suggests this can be attributed to academic research for example National Aeronautics and Space Administration (NASA) and practice (observing what the rest of the industry is doing). Some evidence has suggested it had been tried out in other areas of recruitment and selection within the airlines with validated and reliable results.

5.17 Interpersonal Communication and Social Skills

The findings suggest that hiring managers consider communication and interpersonal social skills (how they interact with others) as the key cornerstone to performance optimisation for pilots. Research has suggested that at different times in a pilot's career, different levels of social skills will be required to operate effectively. As an ab-initio pilot, they are training and this requires very interactive behaviour, the ability to learn, accept feedback, deal with any training set-backs, ask questions and set high standards for themselves. Their ability to work hard, interact with their instructors and class and learn from them is an essential trait. The way they do this will be predictive of their future performance. Research has suggested that when they become a first officer, while it is important they display independent thinking, its' more important to demonstrate joined-up thinking with the captain and have the ability to collaborate with them and verbalise any issues or concerns they may have which the captain may not be aware of. The hiring managers have confirmed as the captain the group's leader a particular set of traits and skills are required for them to make the transition to command. Personality and performance can influence the performance of the crew. Research has confirmed the captain has authoritative power on the day and the way he uses that power will define their own behavior towards the crew and also the behaviors

they receive back. This will ultimately affect how successful their day is and as a result how successful the operation is.

5.18 Communication the cornerstone in aviation

Individuals communicate in many different ways, they use written and spoken words, display certain behaviours to get their message understood. Research confirmed that communication in aviation is so important because of the way individuals use their interpersonal skills. The NOTECHS (non-technical skill) framework assesses the following competencies: 'Co-operation, Leadership and Managerial Skills, Situation Awareness, Decision Making' (Flin et al, 2003, p.98). Communication underpinned all of the above skills critical for safety and passenger experience. In literature it has been discussed that there is a possibility that ineffective interpersonal communication can also 'place an individual at greater risk of accident involvement' (Hunter, 2005, p.23; Royal Aeronautical Society, 1999). The importance of such has been highlighted in a multi-crew environment by the respondents who acknowledge individual communication is important but central to that is having the ability to have an 'open door philosophy' and a participative communication style.

5.19 Honesty and Integrity

Findings suggest values such as high levels of honesty, integrity and professionalism are required from pilots. They hold very responsible positions and with that responsibility comes accountability for themselves, crew, passengers and aircraft. They are representing their airline at all times, operating in a regulatory and legal framework that requires them to operate to a required set of standards and procedures (SOP's). If they make a mistake and mistakes do happen (e.g. human error) they need to be able to hold their hand up and account for their actions.

5.20 Select or train Crew Resource Management Skills ?

Teamwork is an essential element of CRM, having the ability to coordinate a team, to work with people, build relationships and know the strengths and weaknesses of the team is fundamental especially in pressurised situations (high workload) or in the case

of an emergency. Pilots work with different people on different days and need to have the ability to build relationships and get to know people fairly quickly. They are all trained to a 'consistent level of performance' and operate aircraft to a set of Sop's, so personality, situation and task are really the only variables here. There was evidence from research that individual personality can affect individual behaviour and also crew behaviour, a lot depends on the situation that people find themselves in. This finding is consistent with Cooper, White and Lauber (1979) analysis on accidents occurring between 1968 and 1976, which attributed more than 60 accidents to crew coordination failures.

Foushee (1984) has confirmed that pilots with interpersonal issues may be the most resistance to changing attitudes with CRM training mainly because when the spotlight is on them 'they are the ones likely' to feel 'threatened' (p.276). He suggests the best solution to avoid this situation occurring is to recruit the desired individuals with 'good leadership or team function' (p.276). The respondents supported this concept of selecting individuals with the required traits. The effect and limitation of CRM training initiatives having the ability to change behaviour and attitudes has also been discussed in literature by Helmreich (1999) and Chidester et al (1991).

This is consistent with findings from Chidester et al (1991) confirming the most effective approach to the optimisation of crew coordination is a 'balance of both training and selection techniques' selecting the right pilots with the right traits and training 'crew coordination and group problem solving techniques' (p.27). Chidester et al (1991) compares variations of crew performance and suggests that crew performance may be predictable depending on personalities and the attitudes of the group.

5.21 Performance-Personality Profile

A pilot's performance has been described in literature as a 'product of skill, attitude, and personality factors' (Chidester, Helmreich, Gregorich and Geis, 1991, p.25). The hiring managers have confirmed a similar inventory of skills and personality traits consistent with Fitzgibbons et al (2004) pilot personality (Appendix H). The Essential

Personality Traits model that was the result of this study (Table 5.1) has many similarities to Fitzgibbons et al (2004) profile and also endorses Chidester's (1991) evaluation. Their perception suggests high performing pilots demonstrate the following skills in no order of preference: teamwork, decision-making skills, assertiveness, and situational awareness. They acknowledged individual performance was important but in a multi-crew cockpit the team's performance was essential to facilitate a safe and efficient operation. They train and check for CRM behaviors and expect all of their pilots to achieve standards set for them. They are ultimately creating the desired behaviors they expect and reinforcing it throughout the pilot's career. In literature this would agree with Diehl (1991) a flight accident investigator would endorse this approach, in literature he has specified his expectations and believes CRM initiatives once introduced must be reinforced regularly.

The pilot personality profile the hiring managers discussed may also correlate with Fitzgibbons et al (2004) description of a pilot's profile: 'tends to be very conscientious, high in deliberation, achievement-striving, competence and dutifulness, trusting, straightforward, active...and assertive' (p.5). They demonstrate leadership skills and situational awareness, are focused on getting the job done which is consistent with Chidester et al (1991) research that confirms personality traits correlate with crew performance. According to Fitzgibbons et al (2004) their profile is also consistent with Hormann and Maschke's (1996) and Picano's (1991) pilot personality profile. This is a prime example of the essential behaviors required to operate as a professional pilot 'professional motivation, interpersonal behavior and cooperation in a multicultural team' according to Maschke et al (2011, p.38).

5.22 Emotional Maturity

According to Chamberlain (1960), 'an emotionally matured person is one, whose emotional life is well under control' (cited in Pастey and Aminbhavi, 2006, p.66). Having the ability to understand and recognise emotions, for example fear, anxiety or anger and the effect takes a lot of self-awareness. According to the respondents it is very important for pilots to understand the impact of their behaviour and actions on others this requires certain level of skill and self-knowledge. They discussed the requirement for pilots to have a level of emotional stability whereby they had the

ability to control negative emotions in a cockpit. This was how they described emotional maturity. Research indicated there were certain times when a pilot would have to demonstrate emotional maturity, taking constructive feedback, failing a flight test or a command check. The pilot in question may require additional training but was expected to put in the effort to achieve the standard prescribed. In the cockpit having the ability to put individual difference aside and remain professional was a vital attribute. Aviation is multicultural and pilots must be considerate to the cultures and beliefs of people they encounter on a daily basis. We know that the presence of cultural difference will limit the effect of CRM training initiatives, so training should be designed with this in mind (Sekerli and Gereede, 2011).

5.23 Is there an ideal Pilot personality?

Many academics involved in military and commercial aviation have attempted to identify and quantify the ideal pilot profile, Goeters, (2004) Fitzgibbons et al, (2004); Hormann and Maschke's (1996); Chidester et al (1991) Picano's (1991). Their descriptions portray some common attributes of a pilot's profile consistent with Fitzgibbons profile (2004): 'tends to be very conscientious, high in deliberation, achievement-striving, competence and dutifulness, trusting, straightforward, active...and assertive' (p.5) According to Fitzgibbons et al (2004) this profile provides a general measure of pilot personality and they confirm that a 'pilot personality' exists. Pilot hiring managers would argue with this theory and suggest the argument should be more about employee 'fit'. They believe there are numerous different personalities employed as pilots and no airline would want or like to recruit one singular personality type 'it's the mix that makes it possible'. Research suggests particular airlines recruit different personalities but they do recruit a certain type of individual who will fit with their values. This is a very important aspect to their selection process. The majority of hiring managers suggested that if the individual didn't fit with their values and culture they would find it difficult to settle in and usually 'it was an aspect of their personality as opposed to their raw ability' that affected their transition. Engaging the pilot with their particular airline and 'not just their profession' appeared to be a key priority for many of the hiring managers, they felt very responsible for ensuring that the recruitment and selection process delivered highly capable, motivated and engaged

employees. They understood the financial implications of training failure and didn't want to make an expensive mistake (individual failure costs during ab-initio training is estimated at '50,000 euro', Goeters and Maschke, 2004, cited in Mesarosova, 2013, p.3) on a candidate who may have no loyal commitment to the airline employing them.

5.24 Culture

Most airlines are diverse, companies such as Emirates employs over 160 nationalities from diverse, cultural, ethnic and religious backgrounds (Emirates, 2014). To put this into context, the aviation industry is global and pilots are a movable resource. Airlines are finding it increasingly difficult to hold onto the talent they already have and develop it more, because of the 'pilot shortage' and the lure of airlines in China, Asia and the Middle East. Substantial packages are being offered to attract overseas pilots to fill shortages they are experiencing. This is becoming a supply and demand situation. According to Wang and Baribeau (2012) some airlines are paying 30% more than domestic pilots to multi-national pilots. Strategic airlines must be in a position to identify talent and future proof it, for their operational requirements, in terms of expansion, career progression and most importantly safety.

Some respondents hiring abroad especially in countries such as the Middle East and Asia had concerns about the personality assessments being used and suggested the industry may be basing their selection decisions on personality tools that did not cater for differences in language or culture. Mesarosova, (2013) confirms this issue and stated that 'European designed selection processes' with limited 'scientific validation' that did not cater for different cultures or English as a second language (p.1). Mesarosova (2013) confirms that a selection system that is fair and equitable must be considerate and sensitive to both cultural and language differentiations. Research suggested there were also differences in a candidate's motivation and value system to become a pilot in the Middle East and Asia in comparison to the western world. It was suggested that some nationalities don't place much value on or have any aspirations for this role. These countries are finding it increasingly difficult to successfully recruit pilots and are depending on the western world to supply them. This brings with it, its

own challenges in terms of mixing cultures on the flight deck. This is consistent with the findings of (Metscher,Smith and Alghamdi, 2009).

5.25 Challenges of Measuring Personality Traits For Pilot Selection

Personality assessment is growing rapidly, on average 10% annually and is worth \$400 million in revenue just in the United States alone (Hsu, 2004). Research confirmed the variety of tests used in selection differs from airline to airline however some of them appeared to be based on the FFM of personality or at least some elements of it. Those who did use this model of personality testing appeared to be satisfied with it for pilot selection but were open to investigate the advantages of a better product, provided it was validated and reliable.

The findings suggested the hiring managers experience a number of challenges when using personality testing for pilot selection. The main challenges they experience focus on issues surrounding the choice of tools available on the market and the validity and reliability of the tools they use. This finding is supported by Rothstein and Goffin (2006) who cite the apparent lack of evidence on the validity of personality testing for ‘predicting job performance’ as a ‘complexity of choosing the right test’ (p.156). However the FFM has provided industry with a taxonomy whereby they can classify personality traits related to performance and research has confirmed the benefits of this in pilot selection (Fitzgibbons, 2004).

5.26 Social Desirable Responding

Another concern they discussed was the phenomenon surrounding applicants faking personality tests. While they fully understood why some applicants engaged in SRD they had to be fair to the applicants who choose not to. They had to ensure the personality assessments used had the capability to measure what they required it to measure because pilot selection is a high-stakes high-risk selection ‘your life in their

hands'. This would be consistent with the findings of Konig et al (2012) who confirm the fact that applicants demonstrate a 'complexity' of 'cognitions' relating to the 'individual, situational or test characteristics' when taking the tests (p.450). In their study the test takers were given the opportunity to express their own concerns, when taking a personality test. They confirmed the fact that as test takers it would be easier for them if the test providers provided background for the test being used so they could better understand what it was measuring. They would prefer if the test provided an option for an 'ambiguous option' in the answers because they change their behaviors depending on the situation they find themselves in (Konig et al, 2012, p.450). This 'poorly understood phenomena' calls for more research in the area to address the questions of both the practitioners and the test takers (Konig et al, 2012, p.450). The sample are in agreement with research and confirm that response distortion (RD) is problematic 'in real-world selection' (Landers, Sackett and Tuzinski, 2010, p.202). This gives credence to a credible argument regarding Galic et al, (2012) research, where he concluded that we 'don't know how often response distortion occurs' (p.229) but we know it does.

Research confirmed the aim of personality assessment is to provide key personality trait information to assist the selection system in selecting the best applicant from the applicant pool and ensuring they have the key personality characteristics to fit into their airline. To capture the fit capability the personality assessment was usually used along side the interview in most airlines. Some hiring managers also used the results to investigate the applicant's training potential and this was then linked to performance in some airlines. Hiring managers referred to this process as still being in the 'infancy' stage in terms of quantitative hard data, but qualitatively most of them could confirm the link between personality and performance. The FFM appeared to be a good taxonomy of personality to describe individual differences in applicants and it also appeared to be 'fit for the purpose of pilot selection in commercial airlines'. Airlines aim to recruit a wide range of pilots with different personalities, because they recognise that diversity brings opportunities for success. The human resources management team have an important role to play in the development of a selection system fit for purpose. 'Selecting people that are likely to perform effectively is a key responsibility of the

human resource function, which by implication includes developing and validating effective selection procedures' De Kock and Schlechter (2009, p.1).

Conclusion

6.1 Introduction

A summary of the key personality traits and values were identified by the respondents along with a synopsis of the hiring manager's perception of the personality tools currently in use in a number of airlines. These findings were discussed in the essential personality traits model (Table 4.21) and along with the hiring manager's perception on the validity and reliability of the tools used (Table 4.22). The aim of this research was to identify certain personality traits in pilots that are predictive of good performance and ascertain if there is an alignment between academic research regarding personality assessment and industry practice when selecting pilots. Tews et al (2011) presented a similar question in their hospitality study and found that while general mental ability predicted performance better than any other measure managers placed more value on 'agreeableness, conscientiousness and emotional stability' (p.99) . So in fact some managers were not combining research with practice. Key findings from this study has established that a pilot's personality and cognitive ability were weighted as equal importance by hiring managers even though ability has more predictive validity than personality as stated in literature. The information resulting from personality assessment alongside ability assessments (psychometric testing) assists the hiring manager with their selection decision. If SRD-faking occurs, it will not invalidate the personality assessment because of a number of other measures incorporated into the selection system. Research has confirmed personality as a very important factor in determining the level of communication, interpersonal, CRM and emotional maturity skills a pilot displays, research has also confirmed that 'employee fit' is central to successful performance in commercial aviation.

6.2 Audience

Literature has focused on traditional models of selection and assessment, mainly in the military, but there was some evidence in commercial airlines, encompassing psychometric testing to measure cognitive and non-cognitive abilities. Rothstein and Goffin (2006) and Hormann and Maschke (1996) believe testing has ‘demonstrated to have a level of validity and predictability for personnel selection’ (Rothstein and Goffin, 2006, p.1). This view is supported by research in the form of meta-analytic evidence conducted by (Schmitt et al, 1998; Barrick and Mount, 1991; Tett et al, 1991; Ghieselli and Barthol, 1953). Personality assessments used to measure traits such as conscientiousness and openness are also frequently used in the selection of pilots (Carretta, 2011; Rothstein and Goffin, 2006; Fitzgibbons, Schutte and Davis, 2004; Hormann and Maschke, 1996). These findings align well with previous research conducted by Barrick and Mount (1991) who confirms conscientiousness and openness to experience correlated positively with performance. The findings from this study suggest that pilot hiring managers are in agreement with this theory and confirm an open communication style and a conscientious approach to work are key attributes of successful pilots.

Numerous studies have highlighted the effect of ineffective communication and interpersonal skills with regard crew performance and incidents and accidents. Pilot’s personality has been ‘predictive of occupation criteria’ in terms of situational ‘mishaps and accidents’ (Carretta, 2011, p.7). Monfries and Moore (1999) attribute a breakdown in crew coordination (teamwork) as a consistent trend in accidents in both commercial and military operations. Goeters (2004) identified the highly rated interactive social factors (Table 2.1) as being difficult to measure in pilot selection but highlights the fact that these skills can’t be stressed enough when selection pilots. The industry has highlighted that a deficiency in interpersonal skill is a consistent contributory factor in the cause of accidents and incidents and not the lack of technical knowledge or handling skills. Investigating airline pilots Hormann, Manzey, Maschke and Pescena (1997) have clearly correlated operational performance to interpersonal skills. Hiring managers concur with this finding and believe they can remedy the technical deficiency in most cases by training CRM behaviors but the interpersonal deficiencies are more difficult to manage and eradicate even with training. Reason (1990) confirmed that selecting sub-standard behaviors in the form of low conscientiousness or applicants demonstrating higher levels of emotional negativity and hoping that

training can change the behaviour in unlikely, commercial airlines must take these findings into consideration, especially as training will have its own limitations with regard to cost and CRM challenges. Helmreich (1999) has noted some of the limitations of CRM: suggesting that it does not allow for cultural difference in individuals, acknowledging there are a subgroup of pilots in every airline who appear to reject it's principals, there can also be a deterioration in 'CRM attitude' (p.5) over time from when they received initial CRM training and recurrent training. All of the above factors have implications for the airlines especially since 'remedial training' has not produced the required attitude or behavior (Helmreich, 1999, p.4).

Goeters (2004) believes an airline has two choices to make regarding improving interpersonal communication skills, 'select' in or 'train up' the required skills. Helmreich (1987) would regard this solution as inferior because he believes that personality is stable over time and change is unlikely. Goeters (2004) recommends that pilot selection should 'intensify' personality assessment in the future (p.106). Hormann and Maschke (1996) are in agreement with this because in their study of 274 qualified pilots they could predict performance correctly for 73.8% based on a simulator check and previous flying experience. Once they added the results of a personality questionnaire it increased to 79.3% it also demonstrated that successful pilots had higher interpersonal skills and were more emotionally stable than the unsuccessful candidates. Therefore research is aligned with practice because hiring managers are seeking emotionally mature candidates with high levels of interpersonal skills that can operate as part of a team.

Disparagement exists on the use of self-assessment personality questionnaires. The main argument highlights some discontents concerning the reported low predictive validity with performance or training outcomes and the extent of faking. However research from this study suggests that this has not appeared to affect the results of the selection process or decreased their use in selection (Murphy & Dzieweczynski, 2005; Hogan, Barrett, and Hogan, R. 2007). Even allowing for their low predictive validity with performance in academic research and the issues associated with SRD- faking, hiring managers still continue to use them for pilot selection and they appear to be experiencing considerable growth with hiring managers requesting research and development in the area and more sophisticated tools.

Fitzgibbons et al (2004) conclude that pilot personality could influence crew performance and this may have a major influence on safety, they have called for more research on the area. This fact was confirmed by the respondents who acknowledged that a lot of crew performance depended on the mix of personality in the team, CRM training was in place to encourage desired CRM behaviours consisting of communication, decision-making and team building. All of these essential skills were highly rated by the hiring managers and they also discussed the challenges associated with finding those skills in the first place then training them up to the required level of competence, this strategy has also been discussed by Goeters (2004).

6.3 Recommendations

This study has created a number of opportunities for future research in the area of pilot selection in commercial airlines. Barrick and Mount (1991) accept that the area of personality and performance must advance, it is only the industry that can make this happen by working together, de-sensitising findings and by ‘accumulating and categorising empirical findings’ (Barrick and Mount, 1991 p. 23). Grice and Katz (2007) have confirmed that no organisation has published research that compared personality profiles of qualified pilots with trainee or ab-initio pilots. This would be an interesting study to examine if the personality traits of ab-initio pilots were the same as experienced pilots. Another study opportunity does provide longitudinal analysis, to investigate if ab-initio pilot personality changes as a result of training and experience? The findings from this study confirm the fact that airlines are looking at the potential of this however acknowledge that more research is required in the area of personality assessment and its predictive validity on performance in commercial airlines.

Parks and Guay (2012) demonstrated that values and personality are related to behaviors in an academic setting, but have different drivers. Personality (conscientiousness, emotional stability and extraversion) are driven by goal striving and values (achievement values) are driven by goal content and ‘are an important component of fit’ (Parks and Guay, 2012, p.150) and predict ‘job satisfaction’ according to Dawis (1991, cited in Parks and Guay, p.150).The respondents felt that

‘employee fit’ was a key component of job satisfaction and performance, so it is the hiring managers ultimate responsibility to ensure the pilots being selected fit with the airline selecting them. With current employment conditions being challenged with regard to ‘the war for talent’ where competition for exceptional employees who offer loyalty, commitment and tenure, employers are observing that ‘demand for highly experienced, skilled talent has never been fiercer’ (Steele, 2014, cited in Churchard, 2014, p.1).The researcher would have liked to investigate the area of job satisfaction and employee fit and would suggest further research in the area of employee engagement and motivation in aviation.

A review of general meta analytic studies (non-pilot specific) by Rothstein and Goffin (2006) have confirmed a number of advancements in the area of psychometric testing using personality assessments based on the FFM. It has been established that employers using assessments grounded in the FFM can predict the following: accident proneness, leadership potential, performance targets and job satisfaction. These personality traits are all critical for the success of the individual pilot but also for the success of the airline with regard to safety (Rothstein and Goffin, 2006, p. 161).

Hiring managers have confirmed having the ability to predict these traits helps them make a better informed selection decision. The personality assessment designers should consider these findings and incorporate them into the future assessments specifically for pilot selection or any other high-risk industry.

Following the study, it is hoped the findings will be used to enhance the assessment and selection methods used in the recruitment of commercial pilots in the future. This study should become part of future qualitative studies regarding the relationship of personality and performance in commercial pilot recruitment. It would be beneficial for commercial airlines to create a forum to discuss issues, challenges and advancements in the area of psychometric assessments, focusing on personality assessments and pilot selection. This would advance academic research in the area of pilot selection in commercial airlines.

6.4 Limitations

The study presented a number of limitations and shortcomings as there were only ten qualitative interviews with pilot hiring managers, this group are difficult to contact in most cases and the area being investigated is very sensitive for most airlines. Some invitations to participate were declined. There was evidence to suggest airlines don't appear to want to discuss the subject in any great detail. A similar situation was observed in an on-line survey by IATA (*Guidance Material and Best Practices for Pilot Aptitude Testing, 2012*). 110 institutions registered to answer the survey and only 12 completed it in full.

The tool (semi-structured interview) used to gather the data was a good choice, it offered the hiring managers an opportunity to express their inner most thoughts and discourses on the subject matter. In hindsight a better option may have been to distribute the questions in advance of the interview to allow the respondents an opportunity to critically assess their opinions before stating them. However the researcher did consider this option but felt a pre-rehearsed answer would not have gained the 'rich data' to answer the research question. There were a number of opportunities missed during the interviews to examine a number of other areas in pilot selection, but the researcher had to remain focused on the subject matter. There were a number of other areas not discussed during the interviews relating to 'pilot personality that is stable over time' or a 'pilot's value system' (intrinsic and extrinsic) that may have limited the overall results.

6.5 Conclusion

One must always remember the 'humans remain the last line of defence in the error chain' (IATA, p.6) especially when systems become redundant. As the industry enunciates training might be expensive, but having an accident is not worth thinking about (Daly, 2009). Spanair crashed in 2008 and it has been estimated to cost SAS who

owned it ‘\$50-60 million’ according to Daly (2009, p.1). The Human resources function have the ultimate responsibility to ensure the pilot selection system has the ability to identify the best performing candidates from the selection pool. ‘HRM information is viewed as the fuel that powers an organization's engines of competitiveness and it is the HRM practitioner's job to locate and obtain the highest octane fuel available’ (Terpstra and Limpaphayom, 2012, p.108). Chidester et al (1999) confirm the best way to advance personality research is to examine it in ‘the real world’ not the laboratory, focus on the operational environment where ‘behaviours are valid for the context in which behaviour takes place’ (p.42). The implications for pilot selection is evident, if practice is to be aligned with research, there must be more commitment to research to address the gap in literature regarding stable personality traits that can affect a pilots performance in commercial airlines.

List of Appendices

Appendix A: NEO-PI-R Sub Facets

Openness	Conscientiousness	Extraversion	Agreeableness	Negative Affect
Fantasy	Competence	Warmth	Trust	Anxiety
Aesthetics	Order	Gregariousness	Straightforwardness	Hostility
Feelings	Dutifulness	Assertiveness	Altruism	Depression
Actions	Achievement	Activity	Compliance	Self Consciousness

	Striving			
Ideas	Self Discipline	Excitement Seeking	Modesty	Impulsiveness
Values	Deliberation	Positive Emotions	Tender Mindedness	Vulnerability

Adapted From: The NEO Five Factor Personality Inventory (NEO-PI-R) Costa and McCrae, 1992)

Appendix B: Timetable

TIMELINE							
Activity	FE B	MA R	AP R	MA Y	JU N	JU L	AU G
Finalise Thesis Objective Following Feedback	X						
Agree Sample				X			
Literature Reviews	X	X	X	X	X	X	X
Compile Questionnaire				X			

Introduction to Sample		X					
Compile Agreement Documents			X				
Conduct Pilot Test and Interviews					X	X	
Code and Analyse Data					X	X	
Check and Validate Data for Human Error							X
Interpret data and Present Findings						X	X
Write Up Dissertation						X	X

Source: (Weissmuller and Damos, 2014, p.11)

Appendix C: Training Failure Rates by Type of Training Organisation

Reference	Failure Rate (%)
Airline ab-initio	
Bartman & Baxter (1996)	12.1 (1)
Military ab-initio	
Boer, Harsveld & Hermans (1997)	38.9
Carretta (2000)	19.9
Griffin & Koonce (1996)	10.0
King et al. (2013)	10.5
Martinussen & Tourjussen (1998)	49.0
Stauffer & Ree (1996)	13.7
Stricker (2005)	22.2
Walters, Miller & Ree (1993)	21.0
Woychesin (2002)	20.0
Airline Low Experience (C)	
Sommer, Olbrich & Arendasy (2004)	53.7
Airline: High Experience	
Hormann and Maschke (1996)	3.0
<p>Note. The sources listed here are the result of a limited search of the literature published between 1993 and 2013.</p> <p>(a)Percent failure based on N < 50 cases. (b) Percent failures include different stages of flight training in different studies. (c) Studies of airline recruitment in which applicants averaged less than 1,000 of total flight time.</p>	

Appendix D Interview Schedule Table 3.10 The Interview Schedule

	Opinions on the use of psychometric assessment for the selection of pilots.
1.	Investigate your views on the use of psychometric assessments in pilot selection?
2.	Do you believe personality assessment adds value in the selection of pilots?
3.	Is your personality assessment tool based on the FFM (openness, conscientiousness, extraversion, agreeableness and emotional stability)?
	Stable Personality traits associated with excellent performance
4.	What personality traits are associated with good performance, CRM and command potential?
	Social Response Distortion (SRD) or Faking
5.	Do you believe candidates engage in SRD or faking in personality assessments? If so, why?
6.	Does SRD interfere with the psychometric properties of the assessments?
	Future improvements for the selection of pilots in terms of personality assessment
7.	Do you believe that airlines are looking for the same personality traits or do different airlines recruit different personality traits?
8.	Have you found correlations between personality assessments and performance?
9.	Would you like to change anything about your selection system in terms of personality assessment?

Appendix E: Briefing and Ethics for Research Respondents

This research project forms part of my Masters in Human Resource Management. I am conducting research into the area of Psychometric Testing for Pilot Selection. The main focus will be on the use of personality assessment in the recruitment and selection of pilots and the value it can add to the overall selection process.

I am asking you to participate in my research project. If you agree you will be asked to partake in one semi-structured interview with Linda Byrne. It will last approximately 30-40 minutes and will be scheduled on a date and time convenient for you. You are under no obligation to participate.

You are not obliged to answer any questions you feel uncomfortable about. The interview will be recorded and typed up following the meeting. The data collected will be analysed by Linda Byrne and compared to other interviews. The purpose of this is to look for common trends, themes and relationships in the area of psychometric testing for pilot selection.

The respondents identified for the study are regarded as specialists in the field of pilot recruitment and selection. Their experience and tacit knowledge will add great insight into the overall academic area and the debate.

The recordings and the data analysis will be stored by the researcher in a confidential place for a period of six months once the dissertation has been submitted on 1st September 2014 and then destroyed. Some excerpts may be directly quoted but will be presented anonymously. The purpose of this is to protect the identity of the participant and the organisations they are employed in.

You are not obliged to participate and you also have the option to withdraw from the study up until 5th August 2014 in which case all of your information will be destroyed by Linda Byrne.

DR. T.J. McCabe my supervisor will have access to the study to grade it, once graded; it will be reviewed by a second external examiner. It will also be made available in the National College of Ireland's library as reference material. I am available to discuss any questions or concerns you may have both prior and during the study, my contact details are as follows:Lindabyrne1@hotmail or on M: 086-6059087.

Participating in the study will require you to read the Briefing and Ethics form and sign a consent document.

I.....have been briefed on the study by Linda Byrne on Date..... and agree to participate in her research study.

Appendix F: Consent Form for Research Respondent

I am satisfied with the rationale for this study and any questions I had, have been answered by Linda Byrne.

I have been assured of anonymity at all times by the researcher and my identity will be protected. The views and opinions presented are my own personal views based on my experience to date and do not necessarily represent my airlines.

I am participating voluntarily and have been made aware it is possible to withdraw from the study once a request is made up until 25th August 2014. The information would then be destroyed by Linda Byrne. I am aware what I say may be directly quoted or grouped with other responses in a thematic format. If this happens it will be presented in an anonymous manner and I give my permission for this. This study may also form part of future research studies.

I freely agree to the participation conditions and I give permission for this interview to be recorded by Linda Byrne.

Signed.....

Date.....

Appendix G: British Psychological Society's Structure of code of Ethics and Conduct.

a) This code is based on four ethical principles, which constitute the main domains of responsibility within which ethical issues are considered. These are Respect; Competence; Responsibility; and Integrity.

Ethical principles

Respect: Statement of values – Psychologists value the dignity and worth of all persons, with sensitivity to the dynamics of perceived authority or influence over clients, and with particular regard to people's rights including those of privacy and self determination.

Competence: Statement of values – Psychologists value the continuing development and maintenance of high standards of competence in their professional work, and the importance of preserving their ability to function optimally within the recognised limits of their knowledge, skill, training, education, and experience.

Responsibility: Statement of Values – Psychologists value their responsibilities to clients, to the general public, and to the profession and science of Psychology, including the avoidance of harm and the prevention of misuse or abuse of their contributions to society.

Integrity: Statement of values – Psychologists value honesty, accuracy, clarity, and fairness in their interactions with all persons, and seek to promote integrity in all facets of their scientific and professional endeavours.

b) Each ethical principle is described in a statement of values, reflecting the fundamental beliefs that guide ethical reasoning, decision making, and behavior.

c) Each ethical principle described is further defined by a set of standards, setting out the ethical conduct that the Society expects of its members.

Source: BPS 2009 Code of Ethics and Conduct

Appendix:H Dimensions and Facets Pertaining to the Pilot Personality

Dimensions & Facets	Very Low/Low	High/Very High
Neuroticism	60%	13%
Anxiety	61%	15%
Angry hostility	62%	14%
Depression	61%	13%
Self-consciousness	47%	15%
Impulsiveness	57%	16%
Vulnerability	71%	2%
Extraversion	23%	42%
Gregarious	24%	44%
Assertiveness	4%	71%
Activity	9%	56%
Positive emotions	29%	54%
Openness	36.5%	29%
Agreeableness	32%	27%
Trust	19%	53%
Straightforwardness	23%	45%
Modesty	45%	27%
Tender mindedness	45%	25%
Conscientiousness	7.5%	58%
Competence	4%	65%
Order	12%	41%
Dutifulness	11%	55%
Achievement-drive	9%	65%
Self-discipline	11%	40%
Deliberation	14%	61%

Source: Fitzgibbons, A., Davis, D. and Schutte, P. (2004) 'NASA Pilot Personality Profile Using the NEO-PI-R'. (p.8)

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