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**The relationship between risk-seeking behaviours
and risk-taking in-flight.**

**A thesis presented in partial fulfilment of the requirements for the
degree of**

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Stephen Ross Alexander Carey

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ABSTRACT

Aviation safety statistics show that accident levels are increasing, especially in the area of General Aviation. Ever since aviation became a viable option for travel, research has sought to explain the potential causes for accidents and has found that the most common cause is Human Error. This can be defined as any action or in-action that results in an accident that is a direct result of piloting behaviours, such as risk-taking in-flight. Models to guide training organisations in how to best compensate for the affects of Human Error have been developed, however, even with the development of these models, the number of fatalities caused by aviation accidents continues to rise. The current research was developed to investigate the possible relationship between everyday risk-seeking behaviours and risk-taking in-flight. Using a three study format, it first sought to investigate whether there were areas of aviation flight safety which were believed to be of concern by a New Zealand flight instructor focus group. A pilot group study was then used to investigate face, content and construct validities of the Cognitive Appraisal of Risky Events scale (CARE) and Domain-Specific Risk-Taking (Adult) Scale (DOSPERT) on a New Zealand population, for use in study three. Using an online survey presentation the relationship between everyday risk-seeking behaviours and risk-taking in-flight was examined. The survey consisted of presenting participants with the two psychometric measures designed to assess everyday risk-seeking behaviours and sixteen risky in-flight vignettes to measure confidence in taking risks in-flight. Results from the focus group found that the flight instructors believed the areas of alcohol, caffeine, breaches in class two medicals and pilot fatigue levels were all of concern to aviation flight safety. It was found that there were statistically significant relationships between everyday risk-seeking behaviours against the levels of confidence in risk-taking in-flight. Implications of the findings were discussed and finally proposals for further lines of research.

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DEFINITIONS

Definitions that relate back to a 'Part' are taken from the *Civil Aviation Rules 2010* (Civil Aviation Act, 1990). Where the entire definition was not relevant to the current research, it was shortened to contain only the information that related directly. All other definitions are derived from personal communications with J. Lanham (General Manager, General Aviation, Civil Aviation Authority of New Zealand, 15 June, 2011).

Accident means an occurrence that is associated with the operation of an aircraft and takes place between the time any person boards the aircraft with the intention of flight and such time as all such persons have disembarked and the engine or any propellers or rotors come to rest, being an occurrence in which—

(1) a person is fatally or seriously injured as a result of—

(i) being in the aircraft; or

(ii) direct contact with any part of the aircraft, including any part that has become detached from the aircraft; or

(iii) direct exposure to jet blast—

except when the injuries are self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to passengers and crew; or

(2) the aircraft sustains damage or structural failure that—

(i) adversely affects the structural strength, performance, or flight

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characteristics of the aircraft; and

(ii) would normally require major repair or replacement of the affected component—

except engine failure or damage that is limited to the engine, its cowlings, or accessories, or damage limited to propellers, wing tips, antennas, tyres, brakes, fairings, small dents, or puncture holes in the aircraft skin; or

- the aircraft is missing or is completely inaccessible.

Aeroplane means a power-driven heavier-than-air aircraft deriving its lift in-flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Air operation means an air transport operation or a commercial transport operation.

Air operator means the holder of—

- (1) an air operator certificate granted under section 9 of the Act and in accordance with Part 119; or
 - (2) a foreign air operator certificate granted under section 9 of the Act and in accordance with Part 129; or
- an Australian air operator certificate with ANZA privileges.

Air transport operation means an operation for the carriage of passengers or goods

DEFINITIONS

by air for hire or reward except—

- (1) a commercial transport operation.

Airline transport pilot licence means a licence type held under the requirements set out in Part 61, Subpart F. Minimum age of 21 and minimum of 1500 flight hours.

B-category flight instructor means an instructor with a minimum of 500 flight experience hours, and all other requirements under Part 61, Subpart G.

C-category flight instructor means an instructor with a minimum of 200 flight experience hours, and all other requirements under Part 61, Subpart G.

Civil Aviation Authority of New Zealand means the New Zealand Aviation regulatory body. It monitors rule and safety compliance within the civil aviation industry (non-military operations) as well as conduct investigations into aviation accidents and incidents in conjunction with the Transport Accident Investigation Commission.

Commercial pilot's licence means a licence type held under the requirements set out in Part 61, Subpart E. Minimum age of 18 and minimum of 150 flight hours in an approved training facility or 200 if not in an approved training facility.

Commercial transport operation means an operation for the carriage of passengers or goods by air for hire or reward—

- (1) where—

DEFINITIONS

- (i) each passenger is performing, or undergoing training to perform, a task or duty on the operation, or
- (ii) the passengers or goods are carried to or from a remote aerodrome

Evening civil twilight means when the centre of the setting sun's disc is 6 degrees below the horizon. After such time, night flying rules apply.

General Aviation means all the small airlines and charter operators of 9 seats or less, all helicopter operations, all agricultural operations, and all sport and recreational operations.

Incident means any occurrence, other than an accident, that is associated with the operation of an aircraft and affects or could affect the safety of operation. Incident sub-types include: Aerodrome Incidents, Aircraft Incidents, Airspace Incidents, Bird Incidents, Cargo Security Incidents, Dangerous Goods Incidents, Defect Incidents, Facility Malfunction Incidents, Promulgated Information Incidents and Security Incidents.

Instrument flight rules means the operating of an aeroplane in accordance to Part 91.401-.431, whereby the aeroplane is flown by sole reference to its instruments.

Large aeroplane means an aeroplane having a seating configuration of more than 30 seats, excluding any required crew member seat, or a payload capacity of more than 3410 kg. Must comply with all rules and the rules set forth in Part 119 and 121 if operating as an Air Transport Operation or Commercial Operation.

DEFINITIONS

Maximum all up weight means the maximum amount that an aeroplane can weigh.

This is to allow more fuel to be carried for larger aircraft prior to take-off to be used during taxiing and may be more than MCTOW.

Maximum certificated take-off weight, in relation to an aircraft, means the weight specified as the maximum take-off weight of the aircraft in a flight manual or airworthiness certificate relating to the aircraft at the beginning of the take off roll.

Medium aeroplane means an aeroplane having a seating configuration of 10 to 30 seats, or a payload capacity of 3410kg or less and a MCTOW greater than 5700kg, or to perform a SEIFR passenger operation. Must comply with all rules and the rules set forth in Part 119 and 125 if operating as an Air Transport Operation or Commercial Operation.

Near-miss (also known as a near collision) means an avoidance manoeuvre to avoid a collision or an unsafe situation or when an avoidance action would have been appropriate.

Pilot-in-command, in relation to any aircraft, means the pilot responsible for the operation and safety of the aircraft.

Private pilot's licence means a licence type held under the requirements set out in Part 61, Subpart D. Minimum age of 17 and minimum of 50 flight hours.

Recreational pilots licence means a licence type held under the requirements set out

DEFINITIONS

in Part 61, Subpart H. Minimum age of 17 and minimum flight hours 50.

SEIFR passenger operation means an air transport operation carrying passengers in a single-engine aeroplane under Instrument Flight Rules.

Small aeroplane means aeroplanes having a seating configuration of 9 seats or less, excluding any required crew member seat, and a MCTOW of 5700 kg or less, except when they are used for SEIFR passenger operations. Must comply with all rules and the rules set forth in Part 119 and 135 if operating as an Air Transport Operation or Commercial Operation.

Training organisation means a primary flight training school or aero-club. It allows pilots to be trained in single and multi engine aeroplanes. They must operate under Part 141.

Trainee Pilot means a pilot who is undergoing pilot training at a CAANZ approved training organisation. For the purpose of the current research a pilot who has under 250 hours 'Pilot-in-command' is also considered to be a trainee because of the hours of training it takes to become proficient in aeronautical manoeuvres.

Type rating means except as provided in rule 61.57, a pilot of a New Zealand registered aircraft, or a foreign aircraft operating in New Zealand, must hold a current aircraft type rating for that aircraft.

DEFINITIONS

Visual flight rules means the operating of an aeroplane in accordance to Part 91.301-.315, whereby the aeroplane is flown solely by visual reference.

ABBREVIATIONS

ABBREVIATIONS

ATPL means Airline Transport Pilots Licence.

CAANZ means Civil Aviation Authority of New Zealand.

CAAUK means Civil Aviation Authority of the United Kingdom.

CASA means the Civil Aviation Safety Authority (Australia).

CB means Cumulonimbus.

CPL means Commercial Pilot's Licence.

ECT means Evening Civil Twilight.

FAA means Federal Aviation Authority.

GA means General Aviation.

IFR means Instrument Flight Rules.

MAUW means Maximum All Up Weight.

MCTOW means Maximum Certified Take Off Weight.

PPL means a Private Pilots Licence.

PIC means Pilot-In-Command.

SEIFR means Single Engine Instrument Flight Rules passenger operation.

TCU means Towering Cumulus.

VFR means Visual Flight Rules.

CHAPTER ONE

INTRODUCTION

1.1 Aviation Safety

The Civil Aviation Authority of New Zealand's (CAANZ) vision is to have "Safe and secure civil aviation" in New Zealand. Its mission further outlines that it operates "To manage safety and security risks in New Zealand civil aviation through the implementation of efficient oversight, regulatory, and promotional action" (CAANZ, 2011a). What is clear in these two statements is the importance of safety in aviation. This significance is evidenced elsewhere around the world. For example, the vision of the Civil Aviation Safety Authority of Australia (CASA) is "Safe skies for all" (CASA, 2011a), and the Federal Aviation Authority's (FAA) "continuing mission is to provide the safest, most efficient aerospace system in the world" (FAA, 2011a). This emphasis on safety has been expressed among airline manufacturers (Airbus, 2011; Boeing, 2011a) and has brought about the 'safety culture' within the aviation research community (Wiegmann, Zhang, von Thaden, Sharma & Gibbons, 2004).

Barnett (2004)¹ stated that "a child who boards a U.S. domestic jet today is far more likely to win a future Presidential primary than to fail to reach her destination" (quoted in Sabatini, 2004, p.1). It is this type of assertion that airline transportation

¹ The original speech from which this quote was taken was unable to be located. An attempt was made to gain access via Sabatini and no response was received.

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companies continue to cite when they claim that air transport is still the safest form of transport per billion people, per kilometre travelled (“Flying still the safest”, 2000). Despite these claims of flight safety, when comparing the number of journeys made with the number of fatalities, air transport is the highest with 55 deaths per 100 million journeys, compared to 2.7 in train travel and 4.5 in car travel (Wier, 1999). This suggests that if the airline industry continues to grow at 5% (FAA, 2011b) then the level of safety would need to increase three fold in order to maintain the current number of passenger fatalities. Further research on aviation safety is therefore imperative as, although the safety claims of the industry are divided, it is in the very nature of aviation that when it goes wrong, it has a high probability of being fatal.

1.2 Accident Numbers within Aviation

On the basis of peer-reviewed publications, other than O’Hare and Tani, it appears that very little research has been conducted on aviation safety in New Zealand. This may be because as O’Hare, Batt, Wiggins and Morrison (1994) and O’Hare and Owen (2001) stated, the statistics made available on the CAA and Transport Accident Investigation Commission websites have substantial portions of information missing. The nature of reporting and the set up of the available databases means that the CAANZ does not have a broad base of information available on General Aviation (GA) operations as distinct from commercial operations (J. Lanham, General Manager, General Aviation, CAANZ, personal communication, 15 June, 2011; P. Cooper, Safety Data Analyst for the CAANZ, personal communication, 15 June, 2011). If the information is missing or not available for assessment, then it is important for researchers to establish exactly

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what is being examined as it may require further studies to be conducted in order to first gather the information for examination. It is also important to determine what is considered an accident when investigating the available data. Part One of the *Civil Aviation Rules 2010* states, in summary, that an accident is an occurrence that is associated with the operation of the aircraft resulting in a person being fatally or seriously injured, in which the aircraft sustains severe structural damage, or as a result of which the aircraft is missing or inaccessible (see Definitions, p. xi).

Although preventing accidents is a key role for the Civil Aviation Authority of New Zealand, aviation accident statistics reported on its website show that the number of accidents are, unfortunately, on the rise (CAANZ, 2011b). The number of aircraft having accidents has increased substantially for the years 2005-2010, from two reported in 2005 to 24 in 2010 (CAANZ, 2011b). Of more concern, as reported by the New Zealand Press Association (cited in Tani, 2010)², is that the official statistics are largely underestimated (by as much as 10 times). The quarterly accident briefings, the interim reports on the CAANZ and Transport Accident Investigation Commission websites, and statistics on the websites of the FAA (2011c), CAAUK (2011) and CASA (2011b) show that New Zealand has continued to have some of the highest aviation crash numbers in the developed world. However, if the only source of information were the popular media, it could be concluded that the accident levels were much lower. That is, without investigating each individual aviation authority's website, it maybe assumed that the majority of accidents occur with large passenger aircraft. It is important to investigate whether this representation in public media is correctly portraying the nature of aviation accidents within the industry.

² The original article, from which Tani (2010) cited, is now unavailable due to the New Zealand Press Association going into liquidation.

1.3 Media Misrepresentation

The media play a large part in reporting large aeroplane crashes from around the world (Alter, Oppenheimer, Epley & Eyre, 2007; Cobb & Primo, 2003). Although the facts of the case are often not reported, headlines such as “No survivors in Airblue plane crash” (No survivors in Airblue plane crash, 2010), “Indonesia moves to address airline crash problem” (Learmount, 2011), and “DR Congo plane crashes in rainstorm, 127 dead” (Bakumanya, 2011) all increase the impression that airliners are a high risk travel option and are a possible cause of flying phobias (Banos *et al.*, 2002). Media representations, such as these headlines would suggest that airliners are the greatest cause of aviation crash statistics (Brandt, 1998). However, even though the media has begun to report the GA accidents, the level of coverage and number of headlines generated about a single accident is greater when the accident involves an airliner (Alter *et al.*, 2007; Cobb & Primo, 2003). This may be because of the high number of deaths that occur in a single accident in comparison to GA accidents (Cobb & Primo, 2003). However, according to CAANZ (2011b), in New Zealand between the years 2005 and 2010, large and medium aeroplanes combined reported only 9 accidents whereas small aeroplanes (operated under a GA framework) reported 112 accidents. This confirms O'Hare's (1990) assessment, that GA piloting is 40 to 50 times more risky than airline operations. Although the media may provide coverage of aircraft accidents, it would appear, if this is the only source of information, that airliners incur more accidents than their GA counterparts. Literature published about aviation accidents however, such as O'Hare (1990), does not provide support to the observation that airliners have a greater number of accidents in comparison to its GA counterpart.

1.4 Airline Safety vs. GA Safety

There is a large difference between the numbers of accidents reported in airline operations and those reported within GA. The reasons for the difference are subject to research within the aviation safety community. Causes that have been investigated include, but are not limited to: types of flying, number of aircraft being operated, what should be reported, affects of flight experience and hours flown, and the affects of training.

1.4.1 Types of flying

A possible explanation for the differences between the accident numbers between GA and airliners is provided by the type of flying that is conducted by airliners in comparison to GA. Airliners take off, climb up to their cruising altitude and cruise at that altitude for a prolonged period with little traffic to compete with, and milder weather conditions, before descending to land (Boeing, 2011b). As shown in Figure 1 (Boeing, 2011b) accidents appear to occur more during taking off and landing phases of flight than during the cruising phase which constitutes most of the flight travel time. GA pilots, however, due not only to the nature of the aircraft they fly (small fuel loads), but also because of licence restrictions, tend to fly short distances and therefore are exposed to the most accident prone phases more often. When trainee pilots who operate under a GA framework in New Zealand undertake circuit training, the average time to complete a circuit is six minutes (this depends on aircraft type and weather conditions). This suggests that these trainee pilots have the potential to take-off and land every six minutes and, consequently, hugely increase

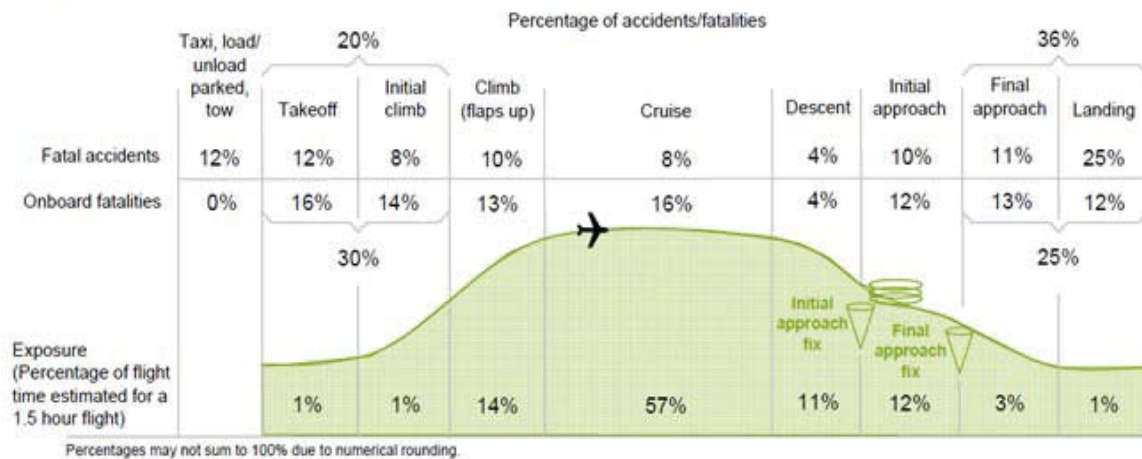


Figure 1. Phases of flight and the accident percentages. (Source: Reproduced with permission from Boeing, 2011b).

their likelihood of being involved in an accident or incident. This is supported by Dambier and Hinkelbein (2006) who found that 85% of GA accidents occurred during the take-off and landing phases of flight. Furthermore, Reveley, Briggs, Evans, Sandifer and Jones (2010) found that most loss of control problems by pilots also happened during the take-off and landing phases, potentially creating an increase in GA accident numbers.

1.4.2 Number of aircraft operating

The reason for difference between GA and airline crash statistics could also be due to the greater number of GA aeroplanes being operated compared to airliners. In the definitions (p. xiv), GA aircraft are operated as 'small aeroplanes' (aircraft with less than 9 seats). According to statistics provided by Paul Cooper, Safety Data Analyst for the CAANZ (personal communication, 15 June, 2011), large and medium aircraft number 189 and small aircraft number 853 in New Zealand. This has a twofold effect. First, the higher number of GA aeroplanes being operated suggests that they

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may be more likely to have accidents. This is due to the number of times that these aircraft would be in the take-off and landing phases of flight; thus being more exposed to the likelihood of an accident occurring. It is important to note however, that the 853 aircraft may only be operated twice a year and the 189 every day. Unfortunately the statistics provided on the CAANZ website do not provide a distinction between aircraft sizes when the 'hours flown' are reported in its Quarterly Report, so the question of whether the 853 GA aircraft fly more often than the medium and large aircraft cannot be tested. Second, a greater number of GA aeroplanes in the air at any one time increase the chances of being involved in an accident (Shorrocks & Kirwan, 2002). In the same way as greater numbers of driving accidents occur in built up metropolitan areas with high levels of traffic, as opposed to rural New Zealand (LTSA, 2011). Therefore if there are more aircraft in the air, they may be more susceptible to accidents, such as mid-air collisions (Shorrocks & Kirwan, 2002; Transport Accident Investigation Commission, 2010). This is especially true in un-controlled airspace such as Feilding Aerodrome (Transport Accident Investigation Commission, 2010).

1.4.3 What should be reported?

Another potential explanation for the differences between reported accident numbers between Airliners and GA could be, as Tani (2010) reported, the problems with understanding about what should be reported, and the effects on those who do report other pilots who break the rules. These problems with reporting could potentially lead to pilots not reporting accidents and incidents if they fear such actions will affect their careers within an airline organisation (Brandt, 1998). This is supported

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by traditional types of accident investigation where the key aim was to assign blame, although many investigators view it as a way to prevent a similar type of accident occurring in the future (Shappell, Detwiler, Holcomb, Hackworth, Boquet & Weigmann, 2007). By contrast, a personal communication with Alan Bradbury (19 May, 2011), Manager of Operational Integrity and Investigations at Air New Zealand, indicates that the organisation requires greater reporting standards than are expected by the CAANZ. Bradbury also stated that most of the reporting is done electronically, by directly downloading the information of in flight risky activities off the aircraft (such as steep turns and breaking no-fly times as are stipulated at the Queenstown Airport), therefore, essentially nullifying any human non-disclosures of accidents. Consequently, if under-reporting is happening as is speculated, then the airline accident numbers would be closer to the official numbers than those represented in GA.

1.4.4 Affects of flight experience

Another potential reason for the difference between the accident numbers reported for airliners and those reported in GA could be the greater number of hours flown by airline pilots as opposed to their GA counterparts. This would render the airline pilots as more experienced and as Hunter (2001) reported, high levels of flight experience are a protective factor against the potential for being involved in an aviation accident. O'Hare (1990), further supported by Goh and Wiegmann (2001; 2002) and Wiegmann, Goh and O'Hare (2002), found that pilots who were more experienced turned back sooner in poor weather conditions in comparison with those with less flight experience. As a high number of GA accidents are recorded as being

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Visual Flight Rules into Instrument Meteorological Conditions (VFR into IMC), the experienced pilots who turned back sooner would be less likely to be involved in VFR into IMC type aviation accidents (Goh, O'Hare & Wiegmann, 2007; Hunter, Martinussen, Wiggins, & O'Hare, 2011; O'Hare & Owen, 1999; 2001; O'Hare & Smitheram, 1995; Wiggins, Connan & Morris, 1996). This is consistent with Salvatore, Steams, Huntley and Mengert's (1986) finding that those pilots, who held an Air-transport Pilots Licence (ATPL) and were therefore more experienced in flight, were involved in fewer GA accidents than those who held a Private Pilots Licence (PPL).

1.4.5 Affects of training accidents

Lastly, the difference between airline accident numbers and those reported in GA may be attributed in part to training accidents. Recorded pilot training has nearly doubled in the past 15 years in New Zealand to nearly 300,000 hours per year (Transport Accident Investigation Commission, 2010). This may be in part to the "mass-market pilot training schools in New Zealand" which Eden (2010) reported had created a "monster". This "monster" was characterized as the old basic skills not being emphasised which has led to an increase in mid-air collisions and accident numbers, where almost half have involved trainee pilots. The Transport Accident Investigation Commission reported that this level of accident increase in trainee pilots was concerning (Transport Accident Investigation Commission, 2010). Dambier and Hinkelbein (2006) supported this concern when earlier they found that training accidents accounted for nearly 17% of all GA accidents during 2004 in Germany. Dambier and Hinkelbein (2006) did not report whether this 17%

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accounted for only a small amount of the total GA flight time or a large amount, so although this provided support to the Transport Accident Investigation Commission's recent 2010 statement, it is not known to what extent.

Recently, a small plane crash near Fielding Aerodrome occurred and the Interim Factual Report provided a summary which outlined that mid-air collisions had increased from 17 in the decade 1990 to 1999 to 131 in the decade 2000 to 2010. It further outlined that of those mid-air collisions, trainee pilots accounted for three of the collisions in the decade 1990 to 1999 and then 60 in the decade 2000 to 2010 (Transport Accident Investigation Commission, 2010). It was in the decade of 2000 to 2010 that seven fatalities occurred during mid-air collisions, all of which occurred during training.

All initial flight training organisations around New Zealand use small aircraft as their primary trainers. This means that the organisations come under the umbrella of GA (aeroplanes with fewer than 9 seats). For example, based on the websites from the individual training organisations, the Canterbury Aero Club (CAC) use a variety of aircraft from the piper range (i.e. PA 28, PA 38), Nelson Aviation College uses the Cessna 152 and 172, and Massey University Milson Flight Centre uses the Diamond Star. If training problems are a 'monster' as Eden (2010) reported, or of concern as the Transport Accident Investigation Commission (2010) stated, then the reason for the differences between GA accident numbers and Airliner accident numbers may be more to do with the fact that all initial flight training schools are within the bounds of GA.

1.5 Screening of Pilots

Air New Zealand has adopted a rigorous selection programme to help it 'screen' its potential pilots. Potential pilots undertake a two-day selection programme which includes a large number of psychological tests, allowing Air New Zealand to select only those pilots it considers suitable (personal communication, Keith Muirhead, Manager of Talent Sourcing, Air New Zealand, 15 July, 2011). As the airlines choose to 'screen' their potential pilots, this could create a potential expulsion of the risk-seeking pilots from the airlines, possibly causing these pilots to maintain only a GA flight rating. The methodology of screening is further used in the military services (Carretta, 2000). Carretta and Ree (2000) and Carretta (2000) reported that screening is an important and effective means of pilot selection within the military. The use of this screening methodology could suggest that those pilots who are more susceptible to taking risks in-flight (and thereby increasing their likelihood of causing an accident) are screened out of military and commercial operations and would therefore stay within the GA framework (Damitz, Manzey, Kleinmann, & Severin, 2003; Kororian, Valsler, & Burke, 2004).

Within a New Zealand context, it is important to note whether the numbers of GA accidents in New Zealand are similar to the numbers represented around the developed world (Australia, England and USA). In the United States it was found that overall GA crash rates had been decreasing for the decade to 1989 (National Transport Safety Board, 1989), but that this decrease was not recorded in the United Kingdom or New Zealand. Of greater concern is that accidents in New Zealand also appear to be more likely to end in a fatality, with 1 in every 5 accidents involving

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fatalities, compared to 1 in every 26 worldwide in 2009 (Learmount, 2010).

Combined with the incident statistics, the grave nature of New Zealand's aviation situation becomes further apparent. The *AC12-1 Advisory Circular 2010* reported that for every fatality there are “at least 600 incidents” (p.21). In 2010, New Zealand incurred 12 fatalities in GA, and it would follow that “at least” 7200 GA aviation incidents occurred. It is because of these high levels of accidents and incidents within the GA industry that the remainder of the current research will focus exclusively on GA.

The potential reasons for the differences between the reported airline operators, the military and those operating under GA are multi-faceted. Whether it is the types of flying the pilots are taking, the number of aircraft being operated, what pilots think should be reported as far as accidents are concerned, the affects of flight experience or the number of hours flown, and the affects of training or screening of pilots, the differences between airliners and GA are clear in the aviation crash statistics.

Explaining why there is a discrepancy in the statistics, however, does not explain how or why the reported accidents are occurring. It is important then to research the causes for aviation accidents.

1.6 What are the causes of aviation accidents?

The causes of aviation accidents have been extensively researched over the years since flying became a more readily accessible means of transportation. Mechanical failures, bird strikes, freak accidents, organisational errors or cost cutting have all been used to 'explain' the accidents. However, the greatest area of concern is pilot or

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human error which accounts for 70 to 90% of accidents (Dambier & Hinkelbein, 2006; Jensen, 1982; Li, Grabowski, Baker & Rebok, 2006; Shappell & Wiegmann, 2000; 2009; Wiegmann & Shappell, 2001). Furthermore, Driskill, Weismuller, Quebe, Hand and Hunter (1998) noted that 97% of GA accidents are created by errors from the flight crew. Human Error is the number-one theme among accidents and appears to exist in nearly all accidents at some level (FAA, 2011d). It involves people who make decisions, whether rightly or wrongly on the ground or in the air. The FAA (2011d) stated that Human Error represents a great opportunity for advancing safety by developing models to in order to reduce its affects. Investigation into the causes of Human Error is therefore important as it can lead to effective means of controlling it. Researchers appear to agree with this notion, with increasing perspectives on what the causes of human error include and how it can be combated being developed (Wiegmann & Shappell, 2001).

1.6.1 Traditional Perspectives

Traditional perspectives within the context of aviation human error can primarily be divided into five distinct areas: cognitive, ergonomics and system design, aeromedical, psychosocial, and organisational (Wiegmann & Shappell, 2001). It is important to note that although these are referred to as “traditional human error perspectives” by Wiegmann and Shappell (2001, p. 342), some of these perspectives, such as the psychosocial and organisational are still being utilised within the aviation safety field to this day.

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Cognitive Theory

The cognitive theory is based on the information processing theory (Wickens & Flach, 1988). The general outline is that the brain works similar to a computer operating system. Information comes in, it is processed and then a response or action to that information is executed (Noll & Krier, 1990). Newell and Simon (1972) reported a similar idea that they called the 'means end analysis', whereby the person actively and repeatedly compares their current state to their desired one with questions such as "Where am I now? Where do I want be? How can I reduce the difference between the two?" (Frederiksen, 1984). However, the 'means end analysis' and the cognitive model fail to take into account any exterior variables. For example, the fatigue levels of the pilot or other physiological/psychological information. This model attempts to lay sole blame with the operator, which could lead to other problems such as under-reporting of accidents and incidents, because of the nature of assigning blame to pilots (Shappell *et al.*, 2007).

Ergonomics and System Design Model

The Ergonomics and System Design Model (Edwards, 1988) however, counter-acts this problem of sole blame. It stipulates that errors occur when one of four possible areas falls short of optimal performance levels, or if one area fails to correctly interact with another. These four areas were outlined by Edwards (1988) SHEL model (Software, Hardware, Environmental and Liveware). More recently, Hawkins (1993) developed the model further and added an extra element, now called the **SHELL** model. This acronym represents **S**oftware (the rules, regulations that govern operations), **H**ardware (equipment, material and other physical resources), **E**nvironmental conditions, **L**iveware (the operator) and **L**iveware (other humans).

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The Liveware to Liveware interaction covers communications between peers, and supervision. Liveware to Hardware interaction refers to the interactions between the operator and technology, equipment and machinery that are used for the job. The Liveware to Environment interaction involves how the operator interacts with his outside environment as well as with his company environment. Lastly, the Liveware to Software interaction involves how the operator reacts to non-tangible issues such as rules and regulations as well as training of the operator (Cacciabue, 2005; Helmreich & Davies, 1996, Schmorow, 1998).

The major problem with this model is that it fails to fully take into consideration other factors of the operator, such as psychological or physiological conditions (Wiegmann & Shappell, 2001). Rather it treats these as secondary issues of the Liveware. Furthermore, it fails to assess those things outside of human control (i.e. Hardware to Environment) (International Civil Aviation Organisation, 2003). This consequently means that the model assumes that errors can be technologically advanced out of the aviation field. Considering the level of accidents created by 'human error' and the high levels of technology used in each aeroplane, it is clear that this model has a fundamental flaw (Chang & Wang, 2010; Wiegmann & Shappell, 2001).

Aeromedical Model

The Aeromedical model (Reinhart, 1996), is similar to the cognitive model, except that it places the blame on the physiological condition of the operator rather than the functions of the brain. It would appear to be common-sense that how the pilot is feeling physically would affect how they react to any given in-flight situation

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(Lauber, 1996; Reinhart, 1996). This notion of physiology affecting pilots during flight has not always been accepted (Wiegmann & Shappell, 2001). Physiological conditions that have the potential to affect pilots include hypoxia (Cable, 2003) and high levels of fatigue (Caldwell, 2005; Goode, 2003; Taneja, 2007). This cause and effect style model stipulates that the physiological condition of the operator can lead to errors occurring during flight. It is within this stipulation that the problem occurs in this model, as it attempts to provide a causal model of human error; however the Aeromedical Model appears to view these errors as more of a 'contribution' factor rather than causal (Wiegmann & Shappell, 2001).

Psychosocial Perspective

The psychosocial perspective suggests that aviation operations are a factor of social interactions between pilots, ATC's, ground crew, maintenance teams and organisational personal (Cooper, White & Lauber, 1980; Helmreich & Foushee, 1993). Errors occur when there is a breakdown in communication or there is a conflict within the group. It is through this perspective that the current Crew Resource Management (CRM) (Cooper, White & Lauber, 1980), model was developed. Initially, CRM was introduced to train pilot crews about communicating as a team (Salas, Burke, Bowers & Wilson, 2001). When training for pilots in the model was conducted however it came across some resistance from older pilots who viewed it as 'charm school' (Helmreich, Merritt & Wilhelm, 1999). Early psychosocial models stipulated that the concerns in human error surrounded things such as the psychological condition of the operator. These early definitions of human error have largely been rejected by modern theorists; with more 'all-encompassing' models being adopted (Helmreich *et al.*, 1999). However, the problem is that the

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developers of new theories under the psychosocial model have been accused of expanding the psychosocial model to a point that it has lost the focus of the original model (Helmreich *et al.*, 1999; Wiegmann & Shappell, 2001).

Organisational Perspective

The organisational perspective seeks to explain human error in terms of failures of the organisation rather than on the operator themselves. The first model under the organisational perspective was developed by Heinrich (1941) called the 'first accident causation model' (Domino Theory). It outlined that accidents occur in a one by one progression of events that lead to an accident (Katsakiori, Sakellaropoulos & Manatakis, 2009). Bird (1974) updated Heinrich's model, however recent criticisms report that these early models had a problem with being one-dimensional (Katsakiori *et al.*, 2009). That is that a single event will lead to another event and so on until an accident occurs. It takes away from the fact that there may be multiple causes for accidents. The lasting concepts from these first models are seen in the foundations of current models; that humans are the single greatest cause for accidents and that controlling these accidents needs to come from management (Fry, 2000). It was these foundations of human error and management that led to the beginning of multi-causality models (Fry, 2000; Katsakiori *et al.*, 2009; Reason, 1990) such as Reason's (1990) Swiss-cheese model. It outlines four areas in which human error can occur: organisational, unsafe supervision, preconditions for unsafe acts and unsafe acts. This type of 'domino effect' (that one event causes or creates an opportunity for another event/accident to occur) stipulates that it is top down failures created by poor management that lead to accidents. The major fall back of this perspective is that every error, even minor errors are blamed on the organisation, and

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is considered a reflection on the management themselves (Ferry, 1988).

Furthermore, O'Hare (2003) reported that even though Reason's (1990) model is good at showing accident conceptualisation, it is hard to apply it in a practical sense. This type of multi-causality model has led to the development of the currently most widely used model of human error in aviation; the Human Factors Analysis and Classification System (HFACS) (Shappell & Wiegmann, 2001). This model attempts to move away from the problems of Reason's (1990) model by making the HFACS more readily used in a practical sense through training programmes (Shappell & Wiegmann, 2001).

1.7 The Human Factors Analysis Classification System Model

The HFACS model (Wiegmann & Shappell, 2001) is based on Reason's (1990) model of latent and active failures (Swiss-cheese Model) and was initially developed for use with the U.S. Navy and Marine Corps as an accident investigation and data analysis tool. Since its initial development, it has been used extensively among other military groups (U.S. Army and Air-force and the Canadian Defence Force) and has recently been adopted for use in civilian aviation populations (Dambier & Hinkelbein, 2006; Shappell *et al.*, 2006; 2007; Wiegmann & Shappell, 2001). The model enables researchers to examine archival data provided on accident bases and further break it down into four failures within Human error; unsafe acts of the operators (hereafter called 'unsafe acts'), preconditions for unsafe acts, unsafe supervision and organisational influences. Figure 2 shows a complete overview of the HFACS model. Within GA, the problems with human error can be accounted for with the first two failures; unsafe acts and preconditions for unsafe acts. Although

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unsafe supervision and organisational influences may influence the accident numbers to a small degree, many GA pilots fly from local aero-clubs with no organisational accountability. That is, many pilots may hire aircraft from a local aero-club and fly to their destination and home again without as much as talking to someone on the phone. There is no-one to hold them accountable or check that they are adequately prepared for the flight (for example, weather, fuel, or passengers).

1.7.1 Unsafe Acts

Unsafe acts are divided into two sections, errors and violations. Errors are when an operator attempts to follow rules and regulations set forth by third party regulators (or the organisation itself if an airline operation) such as the CAANZ and fail to achieve the intended outcome. Violations are when the operator wilfully disregards the rules to achieve an intended outcome (Shappell & Wiegmann, 1997).

Errors

Within the 'errors' division, it is further divided into three distinct types; decision, skill-based and perceptual. Decision based errors are made when the operator assesses the information on hand and incorrectly makes a judgement (Shappell, Detwiler, Holcomb, Hackworth, Boquet & Wiegmann, 2006). An example of this is a pilot who does not correctly calculate the fuel load needed to get to a destination and runs out of fuel en-route. Skill-based errors occur with little or no thought from the operator. This usually occurs when the operator has practised a particular aviation manoeuvre and an error occurs because of the lack in concentration, or because of automatic behaviours (Shappell & Wiegmann, 2009). These types of

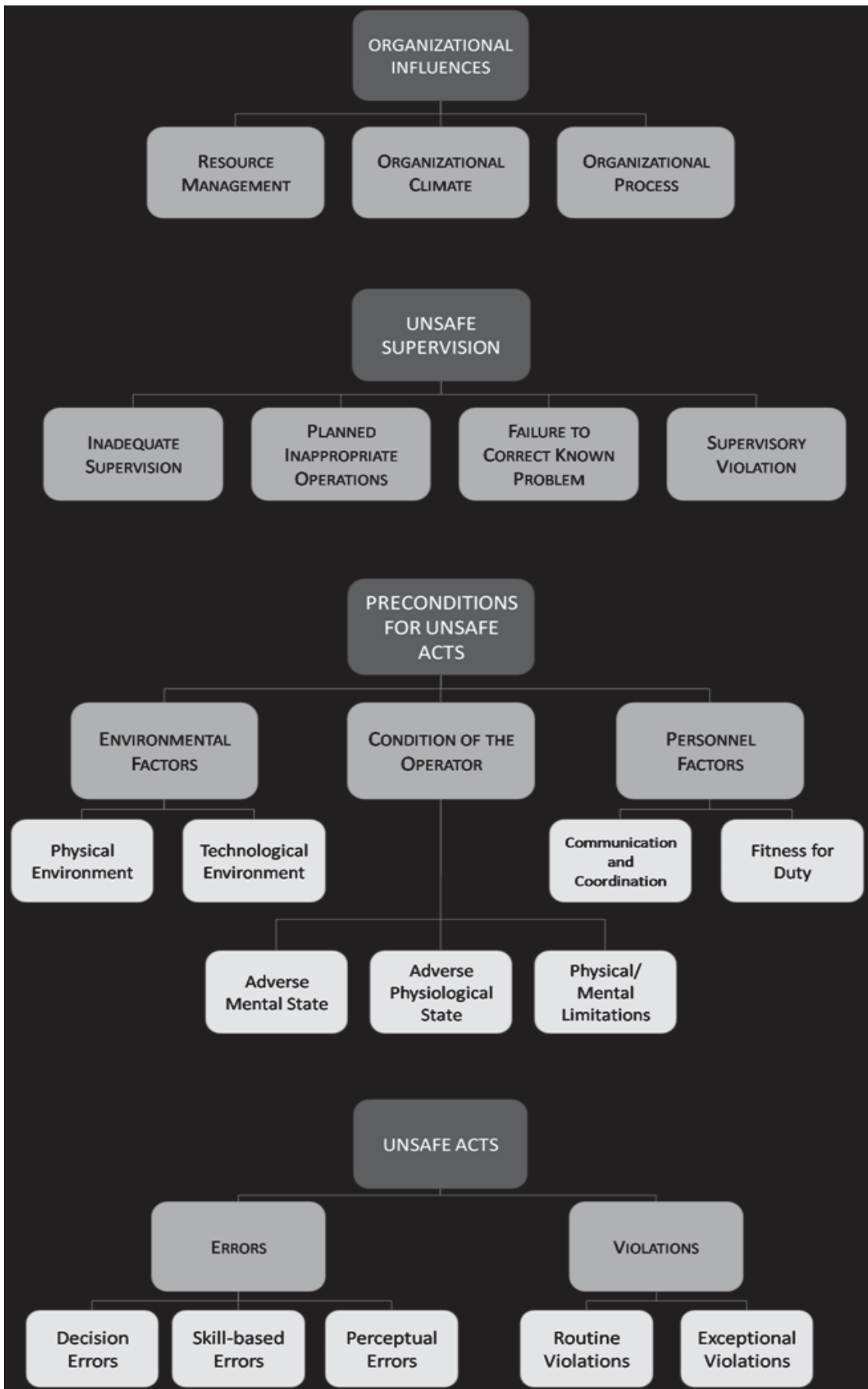


Figure 2. HFACS complete overview. (Source: Reproduced with permission of Wiegmann & Shappell, 2003.).

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errors are normally presented in areas such as not completing a check-list entirely or filling an agricultural plane's holding bays to capacity when using a different fertiliser than that which would normally be used. Finally, the last type of error is perceptual. This occurs when the operator misinterprets sensory information (Shappell, Detwiler, Holcomb, Hackworth, Boquet & Wiegmann, 2007; Wiegmann, Boquet, Detwiler, Holcomb, Faaborg & Shappell, 2005). The most common example of perceptual error is pilots who fly VFR into IMC.

Violations

Violations are when an operator is completely aware that what they are doing is against rules and/or regulations and continue to conduct the action regardless. Similar to errors, violations are also further broken down into two groups; routine violations and exceptional violations. Routine violations usually occur out of habit, normally because supervisors or upholders of the law allow it. For example (based on Shappell *et al.*, 2006; Wiegmann & Shappell, 2001), in New Zealand the urban speed limit is often set at 50kph. However, a 10kph margin is often in place that the police allow before taking action. Therefore, drivers may be found to be travelling at 55 to 60kph even though they know the speed limit is 50kph. In contrast, exceptional violations are when the operator deviates from the rules and regulations on a large scale. This is often out of character for the individual and is certainly not seen as acceptable by the authorities. To continue with the driving example, it would be similar to a driver travelling at 120kph in a 50kph zone.

1.7.2 Preconditions for Unsafe Acts

Preconditions for unsafe acts move away from the operator's actions directly and focus more on the external and internal factors that interact with the operator or their environment. This stage could be likened to a diagnosis ward at a hospital, where the doctors take a more holistic approach to assessing their patients and look at all the possible things that could be affecting them, rather than just the symptoms that they present with at the emergency department. The preconditions are segregated into three distinct divisions; Environmental factors, condition of the operator and personal factors (Shappell & Wiegmann, 2009; Wiegmann & Shappell, 2003). The current model includes the three divisions mentioned above as this allows for future researchers to further define human error related accidents (Wiegmann & Shappell, 2003). This is in contrast to the initial model proposed by Wiegmann and Shappell (2001) which had two divisions; substandard conditions of the operator and substandard practices of the operators.

Environmental Factors

Environmental factors are those that relate to the physical and technological environments presented to operators. Physical environmental factors relate to things such as temperature and noise in the work space (Shappell *et al.*, 2006). The physical surroundings that the pilots find themselves in are also included in this area. The technological environment refers solely to the equipment and technology that is used in operations. This may include technological malfunctions of the aircraft or as more recently identified ergonomic designs which have been recognized as a problematic (Wickens & Hollands, 2000).

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Conditions of the operator

Conditions of the operator is divided into three sections; adverse mental states, adverse physiological states and physical/mental limitations. Adverse mental states include conditions of the mind that could potentially affect the pilot's ability to think clearly in the act of duty. For example, overconfidence or fatigue levels of the pilot (Wiegmann & Shappell, 2003). Adverse physiological states include areas such as intoxication, spacial disorientation or pharmacologically induced physiological problems (i.e. use of antihistamines with amphetamines as a base ingredient). Physical/Mental limitations include factors when sensory information is available, yet the pilots do not understand it, or do not have time to react to the information. An example of this is mid air collisions when the pilot does not see the other aircraft due to its contrast in the visual field (Shappell *et al.*, 2007).

Personal Factors

Personal factors include all things that are related to the pilot or the organisation they are a part of. It is divided into two separate areas of communication and co-ordination and fitness for duty. Within communication and co-ordination, investigation into themes such training about organisational obligations (i.e. the need to report certain events that are required by the organisation and not at a CAANZ level) is covered. Fitness for duty is actions that may impede the pilot's performance such as not conforming to work load limitations, and can include actions conducted 'off-duty' that such as drinking heavily or irregular sleeping patterns (Shappell *et al.*, 2006; 2007, Wiegmann & Shappell, 2001; 2003).

The HFACS model provides support to research into the available accident data-

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bases and suggests that the databases can impart valuable information about aviation crashes (Wiegmann & Shappell, 2001). Each one of the divisions of the HFACS can be supported by clear examples of accidents which may occur under each. For example, the HFACS has the Unsafe Acts division which includes perceptual errors. Previous research has suggested that VFR into IMC is problematic in flight and is identified as a Human Error (Goh, O'Hare & Wiegmann, 2007; Hunter, Martinussen, Wiggins, & O'Hare, 2011; O'Hare & Owen, 1999; 2001; O'Hare & Smitheram, 1995; Wiggins, Connan & Morris, 1996). This provides support for the inclusion of perceptual errors in the HFACS model.

In the current study, three areas that have been extensively researched were included to assess risk-taking behaviours in-flight. These are: weather, 'get-there-itis', and social factors. When incorporated into the HFACS model, weather and 'get-there-itis' would be placed in the errors section of the model and social factors would be considered a violation. In order to better understand what this means to the aviation safety field, what risk is must first be examined.

1.8 What is Risk?

A standardised definition of Risk does not exist within the body of aviation safety literature. Undrill (2007) confirmed this segregation in the academic community when he presented five differing definitions of risk; risk as a chance, risk as a belief, risk as hazard or danger, risk as unacceptable hazard or danger, and risk as a combined measure of chance/belief and impact. Undrill (2007) defined risk as a chance as similar to buying a lotto ticket (risk without the chance of danger). This

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type of definition of risk is used more often by statisticians and could be referred to as 'odds' (Kaplan & Garrick, 1981). The second definition, risk as a belief, can be compared to the probability of something occurring. It allows the subject to change the amount of risk exposure based on new information. An example of this type of risk is trading on the stock market (Undrill, 2007). The third definition, risk as a hazard or danger, refers to a sense of warning. For example a high voltage sign next to a generator (Kaplan & Garrick, 1981). Risk as an unacceptable loss is to do with public concern. A hospital emergency department closing down would be considered a 'risk' under this definition (Undrill, 2007). Lastly, risk as a combined measure refers to the probability of an event occurring and then the impact that the occurrence of the event would create (Huang, 2008). For example, an early warning system for Tsunami's in the Pacific Ocean. In the current research, as an amalgamation of these definitions, risk will be defined as the potential that a chosen action or inaction has to lead to an undesirable outcome. As would be expected, the type of risks that people choose to under-take varies largely from individual to individual (Barnett & Breakwell, 2001).

1.8.1 Risk-seeking propensity

The cause for individual differences in a person's risk-seeking propensity has been extensively researched, and has lead to a number of approaches being developed (Wickham, 2008). These approaches attempt to explain how people make decisions, their attitudes towards risk or how they choose to frame their decisions when choices are presented in terms of risk (Wickham, 2008). These include the Naturalistic Decision Making, Normative and Descriptive approaches.

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Within the Naturalistic Decision Making model (NDM) (Klein, Orasanu, Calderwood & Tzsambok, 1993; Zsambok & Klein, 1997), decisions are made by people who act according to their understanding of the situation and take into consideration real world contexts. These contexts are things such as time constraints, variable conditions or low levels of information. It involves recognising that a problem exists and evaluating the situation to help define the 'nature of the problem'. The decision maker does not normally perform an exhaustive evaluation of all the possible options, and consequently usually selects an option that 'suffices' to meet their goal (Orasanu & Martin, 1998). Errors occur when people evaluate the situation incorrectly and make decisions based on this wrong evaluation or, they correctly evaluate the situation, but choose the wrong course of action (Zsambok & Klein, 1997). Consequently when a person evaluates risks, they may make their decisions based on incorrect information, therefore, exposing themselves to greater risks as the situation is incorrectly evaluated (Klein *et al.*, 1993).

The Normative approach outlines the end states which the decision maker believes will result from each course of action and the probabilities of those end states occurring (O'Hare & Owen, 1999). One of the most influential theories under the normative approach was developed over 300 years ago by Bernoulli in 1738 called the Expected Utility Theory (EUT) (Bernoulli, 1954). It proposed that people view decisions in the context of a hypothetical end state ("the end justifies the means"). It stipulated that decisions should not be based on things that have already been invested, but instead based upon the psychological appraisal of gains to be made, or *emolumentum* (translated as 'utility') (Munier, 2008). Risks are therefore taken when the psychological appraisal of the gains means that a risk must be taken in order to

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receive the gain (Munier, 2008). For example, if the gain is to see a concert, a pilot may choose to fly VFR into IMC if it means that they can get to the concert on time. The descriptive approach stipulates that people view decisions in terms of gains or losses from a reference point rather than the set end state described by Bernoulli (1954). Models under this approach are normally developed to compensate for the perceived failures of the normative approaches (Kahneman & Tversky, 1984). The prospect theory was developed by Kahneman and Tversky, (1979; 1984) to overcome the defects of the EUT (O'Hare & Smitheram, 1995). It stated that risky decisions are made in terms of being framed in prospective gains or losses from some reference point, also-known-as the 'sunk cost' effect. For example, if pilots normally frame their decisions to continue a flight in terms of potential losses (money spent, time already invested etc), the prospect theory outlines that they will be more inclined to be risk-taking in their choices. Those who frame it in terms of gains (safety conscious pilots) are more likely to be risk-adverse in their decisions making process (Goh *et al.*, 2007; O'Hare & Smitheram, 1995).

These models each seek to define how people make decisions and how they respond to risk. Within these models, everyday risks have been extensively researched in an attempt to identify how people make decisions in relation to particular risks, such as in financial situations where a choice between two equally risky ventures needs to be made. For example, in an investigation into business financial risks, Arkes and Blumer (1985) used the prospect theory to explain participant's decision making processes. In order to broadly define everyday risks, research has been conducted to place types of risks into distinct domains or areas. This type of research has been guided by the models of Naturalistic Decision Making, Normative and Descriptive

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(Dohmen, Falk, Huffman, Sunde, Schupp & Wagner, 2005; Schuckit & Smith, 2000).

1.8.2 The areas of risk-seeking

The most influential model which currently measures risk is the ‘decision domains’ model (MacCrimmon & Wehrung, 1986; 1990; Weber, Blais & Betz, 2002). It seeks to counteract the problems of the EUT by framing risks in terms of the way people *perceive* levels of riskiness. It does so by presenting different content domains so that each area can be assessed using a Likert scale system in terms of perceived risks and the expected benefits of undertaking these risks as expressed in each domain (MacCrimmon & Wehrung, 1986; 1990). These content domains include (and are not limited to) gambling, financial investing, personal health decisions, social decisions, recreational decisions and ethical decisions (Weber *et al.*, 2002). These content domains are assessed by providing examples which would be found in these areas and are presented in a question format. This allows investigators to examine whether participants judge the activity researchers present to them as ‘risky’ and if the participants believe that they will benefit from undertaking the activity. For example, within the health and safety domain, topic areas in regards to smoking, exercise and diets could be asked. Within recreational, questions in relation to skydiving, car racing and rock climbing could further be asked. As such, many forms of risk can fit into one of the following five domains:

- Financial
- Social
- Health/Safety

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- Ethical
- Recreational

Proposed by Weber *et al.* (2002) as the ‘five domains of life’, the five content domains have high levels of face validity when one considers the types of risk that they are potentially exposed to in everyday life. For example, within the financial fields, participants perceived levels of risks in taking out stocks from the bank can be inquired about. Under social, aggressive behaviours towards others can be included. Furthermore, health/safety areas can involve asking questions about having sex with multiple partners, and within ethical areas, questions in relation to cheating on an exam. The recreational areas may include examples of high risk sports such as skydiving. The advantage of grouping activities into content domains is that researchers have been able to develop psychometric tests which assess participants for risk-seeking propensity (Fromme, Katz & Rivet, 1997; Weber *et al.*, 2002). Although many psychometric tests in the area of everyday risk may not use the five domains of life exclusively, or the tests may call the areas by a different name (such as ‘Aggressive and Illegal Behaviours’ Fromme, *et al.*, 1997), the questions that are asked of participants are able to be shown to fit into the ‘five domains of life’. For example, Aggressive and Illegal behaviours would fit into social content domain.

The five domains of life may experience problems with specificity. As they have been shown to be a way of separating risks into content domains (Weber *et al.* 2002), they have the potential to lose their specificity when investigating individual risk-seeking areas. For example, flying a plane is considered risky by Weber *et al.*

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(2002) in the recreational content domain. Participants are asked to express whether they believe piloting a small plane is risky and if they believe they will experience any form of benefit by undertaking this activity. The issue with this type of questioning is that it does not have the ability to ask deeper questions in relation to what types of risks a pilot would take in-flight (i.e. VFR into IMC).

Aviation specific risk-seeking behaviours have been identified in pilots in previous research. The five hazardous attitudes identified by Berlin *et al.* (1982) outlined that Antiauthority, Macho, Invulnerability, Impulsivity and Resignation were identified as risk-seeking behaviours in pilots (Binnema, 2005; Blais, 2010; Hunter, 2005; O'Hare, 1990). Ball (2008), Craig (2009a) and Wilson and Fallshore (2001) further showed the influence of overconfidence on pilots and how it is related to an increase in likelihood of being involved in an aviation accident. These risk-seeking behaviours appear to be implicit in the individual and not a way that pilots consciously choose to behave like. This would mean that because the pilots do not consciously choose to behave in a risky manner, it is an inherent risk-seeking behaviour, rather than a pilot undertaking risks in-flight. This distinction was identified by Molesworth and Chang (2009) and Pauley, O'Hare, Mullen and Wiggins (2008) who utilised an Implicit Association test methodology to assess pilots risk perceptions.

Drinkwater and Molesworth (2010) and Hunter (2006) both found statistically significant results between everyday risk seeking behaviours and risk-taking in-flight behaviour. However, both results were found by asking only four questions about everyday risk of the participants through the use of the Risk Perception – Self

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scale (Hunter, 2002). In the current study, the content domains of financial, social, health/safety, ethical and recreational, have been utilised to assess the participant's levels of everyday risk-seeking behaviour so that the findings of Drinkwater and Molesworth (2010) and Hunter (2006) could be replicated and further expanded. This will allow the nature of the relationship between everyday risk-seeking behaviours and risk-taking behaviours in-flight to be assessed.

1.8.3 Risk-taking in-flight

Orasanu and Martin (1998) made use of the Naturalistic Decision-making model (Klein *et al.*, 1993) when they investigated errors in aviation decision making. They showed that risks were taken when ambiguity of the risk, underestimation of the risk, goal conflicts and the consequences of undertaking the risk were misinterpreted. Furthermore, O'Hare and Smitheram (1995) conducted research under a descriptive approach (Prospect Theory; Kahneman & Tversky, 1979) when they examined the effects of framing (in terms of Losses and Gains) on pilots when presented with VFR into IMC situations and found that pilots behaved in a manner that supported the prospect theory. This type of research into aviation specific risks such as O'Hare and Smitheram (1995) supports that specific types of risk-taking behaviour in flight occur. However it fails to investigate the entire construct domain of the causes for 'human error'. As the greatest cause for aviation accidents has been identified as human error, the use of a model which explains the origins of this human error is therefore important. As the HFACS model (Wiegmann & Shappell, 2001) seeks to explain human error and allows for risk-taking in-flight behaviours to be identified based on retrospective data analysis of the accident databases, it is

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consequently the model that is used in the current research. The risk-taking in-flight behaviours that have been identified for use in the current study include weather related risk-taking, get-there-itis, and social pressures. These are based on the high volume of peer-reviewed publications in the aviation Human Factors field.

Weather

The influence of weather on aircraft is unmistakable. Research shows that the number one cause of weather related GA accidents is VFR into IMC (Goh, O'Hare & Wiegmann, 2007; Hunter, Martinussen, Wiggins, & O'Hare, 2011; O'Hare & Owen, 1999; 2001; O'Hare & Smitheram, 1995; Wiggins, Connan & Morris, 1996). O'Hare and Owen (2001) reported that VFR into IMC accounts for four times as many accidents than any other single form of human error. VFR into IMC errors occur when a pilot misinterprets sensory information, and/or information gained through other means (i.e. Metservice) and continues to fly VFR into a weather pattern that is considered IMC. Although demographics such as age and level of flight experience had no effect on the likelihood of accident exposure in this area (Goh *et al.*, 2007), trainee pilots were found to be poor interpreters of weather and that further training in weather interpretation had only weak evidential support of being effective (Hershey, Walsh, Read & Chulef, 1990; Jensen, 1995; Wiggins *et al.*, 1996; Wiggins & O'Hare, 1995). Under the HFACS model (Wiegmann & Shappell, 2001), VFR into IMC would be considered to be a perceptual error; however, when the choice of flying VFR into IMC is made consciously, and the sensory information is ignored rather than misinterpreted, then 'get-there-itis' (considered to be a 'violation') is more likely to be the cause of the error.

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Get-there-itis

Get-there-itis ('get-home-itis') or Plan Continuation Error (PCE) is another cause that has been extensively researched in the field of aviation accidents (Goh *et al.*, 2007; O'Hare & Owen, 1999). This seems to be a term which has caused a large amount of confusion among researchers (O'Hare & Owen, 1999; Vector, 2011). The CAANZ Vector Magazine defines get-there-itis as: "continuing with a failing plan despite evidence that it's not working" (2011, p.4). But this would be more coherent with 'pressing on' than 'get-there-itis'. O'Hare and Owen (1999) stipulated that it is most unhelpful to "replace one unknown ("pressing on") with another, such as "get-home-itis"" (p.2). However, "pressing on" VFR into IMC can be considered a perceptual error and therefore outlined by weather related errors. The clear distinction is that 'get-there-itis' is a conscious decision, and therefore a violation, rather than a perceptual error. Whether the influence lay with social pressures of passengers, or pressures to be home for an important event, the decision is made by the pilot to continue. This type of distinction is supported by Goh *et al.* (2007) who outlined that PCEs are directly related to Reasons (1990) notion of violations. 'Get-there-itis' is considered to be the cause for 75% of tactical decision errors (Bearman, Paletz, & Orasanu, 2009; Orasanu, Martin & Davison, 2001). The inclusion of the word 'tactical' and the nature of get-there-itis stipulating that the decision to fly VFR into IMC is deliberate, shows that the decision was conscious. Therefore 'get-there-itis' is a violation rather than an error under the HFACS model (Wiegmann & Shappell, 2001). As Mohler (1966) stated: "get-there-itis" [*often*] leads to early membership in the 'chapter eternal'" (p.3). In the current research, 'get-there-itis' is defined as the conscious and intentional decision of continuing on into deteriorating weather conditions.

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Social Factors

Social influences on pilots would appear to be 'common-sense', much the same as peer-pressure influences many individuals (Brechtwald & Prinstein, 2011). This may be a potential reason that research has done little in this field. Errors created in this area include influences 'in-flight' from conversations with passengers (Jensen, 1982) or pressures from management or passengers (Paltez, Bearman, Orasanu, & Holbrook, 2009). If the organisation places emphasis on a pilot maintaining a heavy flight schedule and the weather is marginal, the pilots may be more likely to 'press-on' to keep to the schedule. This is supported by Airbus (2006) who stated that 80% of crew errors are caused by high workloads. Similarly, if a pilot is mid-flight in a small aircraft with dignitaries, and they emphasise that they must make an important meeting, the pilot may be more likely to 'press-on' (Jensen, 1982). Lastly, if a pilot is flying with friends, and they make a request to do something that is a violation from the rules, the pilot may be influenced by the peer-pressure. According to Jensen (1982), some pilots are more susceptible to social pressures, and that these pilots are more likely to make poor judgements in-flight. Determining the level of influence of social factors in aviation accidents is hard to identify as many of the actual causes would be identified in accidents related to VFR into IMC or symptomatic of 'get-there-itis' violations (Paltez *et al.*, 2009).

The areas of risk-taking behaviours guided by the HFACS (Wiegmann & Shappell, 2001) of weather, get-there-itis, and social factors are all supported by research to influence human error levels. Unfortunately, even with research published in the Human Factors field and the development of training programmes to attempt to rectify the causes of human error, accident numbers in aviation continue to rise. This

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suggests the possibility of the following two problems:

1. The training programmes that have been proposed are inadequate to compensate for human error; or
2. There are other areas outside of the reasons for differences between GA accident numbers and Airliner accident numbers, aviation specific risk-seeking behaviours, and the risk-taking behaviours in-flight as guided by the HFACS that could be creating an increase in aviation accidents.

The first of these two problems should have little influence on accident numbers as most of the training programmes have been validated and have been shown to be effective (although limited). This places an emphasis on the second problem which indicates that there is a need to investigate the potential causes for human error in aviation accidents further. Research therefore needs to shift focus and investigate other fields where risk-taking behaviours is also a factor.

1.8.4 A good measure of future risk-taking?

From a psychological perspective, the single greatest measure of a person's future involvement in a given activity is their past involvement (Ouellette & Wood, 1998; Sheeran, 2002). Past behaviour is considered a standard indicator of habit strength, which in turn is the best predictor of future behaviour (Ouellette & Wood, 1998). This is further supported by Ajzen (1985) and Ajzen and Fishbein (2005) who presented the 'theory of planned behaviour' and Triandis's (1980) attitude-behaviour theory. More recently, Botch and Johnson (2009) found that pilots who had previous alcohol problems (abuse or dependence) were more likely to have alcohol problems

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at a later date. The past behaviour – future behaviour relationship would appear to support the CAANZ who wanted to have the ability to have access to pilot's criminal records (Radio New Zealand, 2011). As such, previous drink driving charges could be a reliable way of predicting future drinking in-flight problems. Unfortunately, this has not been approved by the New Zealand government (Radio New Zealand, 2011). It is therefore important to have knowledge as to whether a future pilot is currently undertaking risk-seeking behaviours, or by self admission will do so in the future.

Although the past behaviours are of importance in judging whether or not the pilot will engage in the behaviour in the future (Botch and Johnson, 2009), it is important to determine the relationship between what they say they will do and the behaviours that actually do occur. In previous research this has been referred to as the attitude-behaviour relationship (Ouellette & Wood, 1998; Triandis, 1980).

1.8.5 Attitude-behaviour relationship

The relationship between attitudes towards risk-seeking behaviours and actual risk-taking has been widely discussed with mixed results in the literature. Although most do not deny that there is a direct link between past behaviours and future behaviours, the correlations between how a person says they will behave and how they actually behave is an area of controversy (LaPiere, 1934). Ajzen (2001) and Sheeran and Orbell (1999) for example reported that there is a relationship between the past behaviours and future behaviours, although Ajzen (2001) also reported that the relationship was weak. Sheeran and Orbell (1999) reported that one factor that

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increases the level of prediction is whether the behaviour being predicted is a single action or a goal. The prediction of future behaviours is higher if it is towards a single action (such as passing the PPL exam) and not a goal (getting your CPL) (Sheeran, 2002). This is because a goal needs many single actions to be conducted in order to become a reality. Terry, Hogg and McKimmie (2000) provided support to the findings reported by Sheeran and Orbell (1999). Furthermore these results are supported in industries such as the prediction of future offending in criminals (Cunningham, Sorensen & Reidy, 2005; Williams & Houghton, 2004) where they have found such a relationship to be beneficial in predicting recidivism rates. These findings are also supported in the aviation industry which has found correlations between attitudes and behaviours (Hunter, 2005). Hunter (2005), however, reported that it is important not to take these findings in isolation, but more that the attitude-behaviour relationship needs to be taken in a multi-faceted context where all things including knowledge, skill, and personality are accounted for in the relationship.

A possible explanation for the discrepancies found between researchers could be because of the want by many to find a causal relationship, often called the causal assumption (Ling, 1982). However, it would be naïve to think that an attitude towards something *caused* the behaviour, but advantageous to think of the attitude as one attribute that led to increased *likelihood* of undertaking a behaviour. If there is a correlation between attitudes and behaviours, when combined with other proactive tools such as psychological screening, the predictive validity of past attitudes towards risk as a predictor of future risk-taking behaviours is increased (Glasman & Albarracin, 2006; Hunter, 2005).

1.9 Continuing Concerns

The traditional models of potential causes for aviation accidents, as individual models, fail to provide a complete outline of what the actual causes for accidents entail. As a consequence, the HFACS model (Wiegmann & Shappell, 2001) is clearly the next generation in thinking in regards to the causes of accidents in aviation. It provides the complete, over-all outlines that were deficient in traditional models (Wiegmann & Shappell, 2001). However, the HFACS model, along with the rest of the models related to aviation safety have three fundamental problems within them that need addressing if they are to help in the reducing aviation accident numbers, rather than only be used as data analysis/mining models. These are the issue of: 1) retrospective accident statistic data usage, 2) the limited nature of the samples being selected to study in the use of proactive tools and 3) the use of 'proactive' tools that only look at pilot attributes or behaviours, once the participants are already a pilot.

First, the problem with using retrospective accident statistics is that it employs a certain degree of 'hindsight' bias (Hunter, 2001). O'Hare (1999) investigated a number of causes of aviation accidents. Of the studies he investigated, all used a retrospective study methodology. The reason for this may be due to the accessibility of the data and to avoid the problems with prospective data collection such as participant reporting error (Wiegmann *et al.*, 2002). This is despite Hunter (2001) stating that prospective studies hold a stronger form of validity. Retrospective data analysis is an excellent way of attributing a cause to the accidents that have already occurred (Wiegmann & Shappell, 2001). This facilitates the researcher to propose

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training methods to counter-act the effects of the causes of accidents. However, as mentioned earlier, training only has limited effect of working (Hershey *et al.*, 1990). As such, simply because it can be speculated as to what the cause of an accident entails, it does not enable researchers to be any better prepared to stop it occurring in the future. A clear example of this is VFR into IMC (O'Hare, 1990).

Second, the samples that are being used for the development of 'proactive tools' (screening tools inclusive) are generally limited to commercial and military operations (Hunter & Burke, 1994). Hunter and Burke (1994) conducted a meta-analysis of the validities of aircraft pilot selection measures found in 68 published studies for the years 1940 to 1990. A cumulated sample of 437,258 cases was extracted and out of these only 3,625 cases were civilian, with the rest being based on military organisations. This seems to be an oversight by aviation safety researchers as the safety statistics clearly show that the majority of accidents occur within the GA framework, which is by definition, non-military (O'Hare, 1990). This finding supports the use of a screening process within a GA population. However, phone calls made to seven local aero-clubs in New Zealand (Auckland, Canterbury, Manawatu, Nelson, New Plymouth, Otago and Wanganui Aero-clubs) which offer pilot training, found that none conducted any form of pre-entry selection other than that which is required by the CAA in terms of the class two medical required for undertaking a Private Pilots Licence.

Within this small number of proactive measures in the civilian framework, even fewer are based on a trainee pilot population. If, as a large number of researchers have concluded (Goh *et al.*, 2007; Goh & Wiegmann, 2001; 2002; O'Hare, 1990)

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the way to reduce the levels of aviation accidents is through training, then surely the most logical way would be to train the pilots in these prior to them becoming pilots; not after-the-fact. Doctors are not initially informed of the importance of practising safety or the things that can potentially go wrong after they are qualified, they are told prior to having access to patients. To further expand this analogy, doctors are screened through the use of exams and interviews to make sure they are fit to become doctors in the first place. Utilising these types of pre-screening tools used in fields that involve high levels of potential human loss or harm (for example, Commercial Airliners, Military Operations, or Medical Examinations) are imperative to increasing the levels of safety within GA and consequently lowering aviation accident numbers.

Lastly, the prospective studies that do exist are linked mainly to piloting personalities, judgements and/or attitudes. As human error is the leading cause of aviation accidents, research into what types of personalities or attitudes of those pilots who are more inclined to under-take risky in-flight operations is coherent. Berlin *et al.* (1982), Blais (2010), Hunter (2005) and Hunter and Stewart (2011) illustrated how five hazardous attitudes are related to pilot involvement in accidents. These attitudes include Anti-authority, Macho, Invulnerability, Impulsivity and Resignation. Similarly, Jensen (1995) identified the importance of hazardous personalities and judgements in pilots and their consequential involvement in accidents. The issue that research into piloting behaviours in flight is that it is done after the pilot is already accepted into and has begun pilot training. Looking into how to modify these personalities or how to decrease the effects of hazardous attitudes is only of small value if the person is already a practising pilot. Their

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potential to cause accidents whilst they are being trained in human error reduction methods is still a very real possibility. It is therefore important to investigate whether there is a correlation between everyday risk-seeking propensity and risk-taking in-flight. If a correlation is found, then the development of proactive tools can be based around these, enabling training organisations to assess potential pilots before they become pilots, and consequently improving safety within the industry.

1.10 Summary

Aviation safety is a key concern of all civil aviation authorities around the world. Despite this emphasis on safety, the accident numbers continue to increase globally (CAANZ, 2011b; CAAUK, 2011; CASA, 2011b; FAA, 2011c; Transport Accident Investigation Commission, 2010). If one's only source of information were the popular media, one may conclude that the accident numbers were higher among airliners than its GA counterpart (Alter *et al.*, 2007; Cobb & Primo, 2003). This may be due to the substantial loss of life in a single occurrence (Cobb & Primo, 2003). Research conducted in this field however does not support this media misrepresentation and has found that accident numbers are much larger in GA, by as much as 40 to 50 times (O'Hare, 1990). Proposed explanations between the accident numbers reported in GA in comparison to Airliners include the types of flying, the number of aircraft being operated, what it is that should be reported, the affects of flight experience and hours flown, and the affects of training (Brandt, 1998; Dambier & Hinkelbein, 2006; Goh & Wiegmann, 2001; 2002; Shorrock & Kirwan, 2002; Transport Accident Investigation Commission, 2010). A further explanation for the differences between GA and Airliner accident numbers could be the use of

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screening tools on pilots who are inducted into commercial operations (Damitz *et al.*, 2003, Kokorian *et al.*, 2004). This finding was supported by military operations which utilise pilot screening tools for pilot selection (Carretta, 2000; Carretta & Ree, 2000). By the process of screening, the pilots who are not selected may continue to operate aircraft under GA.

Although the explanations of differences between reported accident numbers of Airliners in comparison to GA have been investigated, the number one cause of aviation accidents is consistent for both; that of human error (Dambier & Hinkelbein, 2006; Jensen, 1982; Li, Grabowski, Baker & Rebok, 2006; Shappell & Wiegmann, 2000; 2009; Wiegmann & Shappell, 2001). This has led to models being developed in order to help with the decision-making tasks required in-flight (Wiegmann & Shappell, 2001). Traditional models such as the cognitive model failed to encompass all of the variables presented to pilot's in-flight operations. In order to overcome this perceived failure of traditional models, recently the HFACS model has become the favoured model in investigating the influence of Human error on aviation accidents (Dambier & Hinkelbein, 2006; Shappell *et al.*, 2006; 2007; Wiegmann & Shappell, 2001). Looking at retrospective data on accidents, the HFACS model places the causes into four types of human error: unsafe acts, preconditions for unsafe acts, unsafe supervision and organisational influences (Wiegmann & Shappell, 2001). Within GA it is more likely that errors would occur under the areas of unsafe acts or preconditions for unsafe acts. The reason for this is because many GA pilots operate from aero-clubs where there may be little to no supervision or organisational structures which may influence risk-taking behaviours. The HFACS model can be used in an attempt to understand the causes of human

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error such as weather, get-there-itis, and social factors (Shappell *et al.*, 2006; 2007). However, accident numbers continue to increase which suggests that there may be other areas that have little empirical evidence, which may be influencing pilot risk-taking in-flight behaviours and consequently the aviation accident numbers. It is therefore important to investigate whether there are other areas outside of the reasons for differences between GA accident numbers and Airliner accident numbers, aviation specific risk-seeking behaviours, and the risk-taking behaviours in-flight as guided by the HFACS that have low levels of support that may be contributing to risk-taking behaviours.

In fields outside aviation safety, some have found relationships between risk-seeking behaviours and future risk-taking (Ajzen, 2001; Cunningham *et al.*, 2005; LaPiere, 1934; Sheeran & Orbell, 1999; Terry *et al.*, 2000; Williams & Houghton, 2004). These findings suggest that there may be a relationship between a pilot's level of risk-seeking behaviours and their levels of risk-taking in-flight. This relationship among pilots is supported by the findings of Drinkwater and Molesworth (2010) and Hunter (2006) who both found statistically significant results between the two variables. This type of investigation has received little focus from past researchers with many focusing on the relationships with hazardous attitudes or personality types of pilots and risk-taking in-flight (Berlin *et al.*, 1982; Blais, 2010; Hunter, 2005; Hunter & Stewart, 2011; Jensen, 1995). Although these findings are important to safety levels in aviation, the fundamental problem with existing literature is the emphasis on pilots after they have begun their training. It is important therefore to investigate whether there is a relationship between everyday risk-seeking behaviours and risk-taking in-flight. A relationship would allow for screening of potential pilots

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prior to them beginning training.

1.11 The Present Study

1.11.1 Aim

The present study aims to explore whether there is a relationship between everyday risk-seeking behaviours and risk-taking in-flight.

1.11.2 Research Questions

- Are there other areas outside of the reasons for differences between GA accident numbers and Airliner accident numbers, aviation specific risk-seeking behaviours (i.e. Hazardous Attitudes), and the risk-taking behaviours in-flight as guided by the HFACS that could be considered risk-taking behaviours in-flight by pilots?
- Is there a relationship between everyday risk-seeking behaviours and risk-taking in-flight?
- Do the risk-seeking domains correlate to the domains of risk-taking in-flight?

1.11.3 Format for the current research

In order to investigate this relationship, a three study format was utilised. The first study examined research question one through the use of a focus group. Study two used a pilot group to validate the two psychometric measures selected for study three. Study three will conduct an online survey of pilots to examine research questions two, and three.

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STUDY ONE: FOCUS GROUP

2.1 Overview

The purpose of the first study was to investigate factors, outside of the reasons for differences between GA accident numbers and Airliner accident numbers, aviation specific risk-seeking behaviours (i.e. Hazardous Attitudes), and the risk-taking behaviours in-flight as guided by the HFACS that could be considered risk-taking behaviours in-flight by pilots. These factors would therefore be considered an 'area of concern' by New Zealand flight instructors. The factors were identified by behaviours that New Zealand flight instructors either directly observed trainees conducting, or that had been brought to their attention (i.e. through popular media sites, such as Stuff.co.nz or NZHerald.co.nz). These 'areas of concern' factors and the factors of weather, get-there-itis and social were then developed into vignettes that were presented to participants in Study Three to test their risk-taking in-flight behaviours.

2.2 Participants

The focus group participants were six flight instructors, of whom four held current C-Category flight instructor ratings and two held current B-Category flight

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instructor ratings (for a definition of these instructor ratings see Definitions, p. xiii).

The group comprised of five males and one female, with the mean age of the instructors being 27 years ($SD= 4$). The moderator was a male of 24 years (thesis author).

2.3 Materials

A focus group was used in order to acquire further information required for the formulation of the vignettes to be used to assess pilot's levels of risk-taking behaviour in Study Three. Focus groups are a qualitative research design methodology in which participant's converse about opinions, perceptions, attitudes, and beliefs about a particular topic area, as guided by the moderator (Kress & Shoffner, 2007). It is a particularly appropriate form of methodology when the researcher wants to explore an open ended question (Kitzinger, 1995). Questions are first asked by the moderator to stimulate discussions among participants and the themes that emerge are investigated further by allowing participants to interact with one another. By allowing this type of interaction participants may draw on information that they may not have had prior 'access' to if it had not been encouraged by listening to other participants contributions (Kitzinger, 1995). It further allows for participants to be involved who would normally be reluctant to participate in a one-on-one interview format or those who feel they 'have nothing to say'.

In the current focus group the topic area was defined as: "areas of concern, which

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you as pilot trainers can identify, that are not in the following areas of weather, social factors, get-there-itis, the five hazardous attitudes of piloting behaviours (Anti-authority, Macho, Invulnerability, Impulsivity and Resignation), overconfidence, types of flying, the number of aircraft in the air, the problems with accident reporting, affects of flight experience, or affects of training accidents”. It allowed for all participants in the focus group to debate the themes that developed and gave an opportunity to provide examples based on their own individual experiences. As the topic areas were not self-incriminating, the participants were more likely to engage in the focus group and make valuable contributions (Kitzinger, 1995). By allowing this type of interaction, the moderator was able to focus the group on the themes that emerged and gain a greater understanding of how and why these were considered areas of concern within a New Zealand aviation context.

2.4 Procedure

Participants were invited to take part in two focus groups. The first aimed to investigate the factors outside of the reasons for differences between GA accident numbers and Airliner accident numbers, aviation specific risk-seeking behaviours (i.e. Hazardous Attitudes), and the risk-taking behaviours in-flight as guided by the HFACS that could be considered risk-taking behaviours in-flight by pilots, that may be leading to an inflated accident numbers and should therefore be considered an ‘area of concern’. Using the same participants, the second focus group was used to validate (in terms of construct, content and face validity) the vignettes developed

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from the themes generated in focus group one. For study one, construct validity refers to the way that the vignettes appear to support the previous research conducted in the areas of in-flight risk-taking (Cronbach & Meehl, 1955). Content validity refers to the way that the vignettes appear to measure the domains that they attempt to, as judged by the flight instructors (considered expert validation) (Cronbach & Meehl, 1955). Face validity refers to the way that the vignettes measure what they appear to be measuring (Cronbach & Meehl, 1955).

The invitation was made by a personal phone call to all participants and the thesis author's residence was used to undertake the focus group. Ethics approval was sought from the Massey University Human Ethics Committee for this study. It was peer reviewed to be low risk to participants (Appendix A, p. 151).

Focus Group One

In the first focus group, the discussion focused on the risks that current trainee pilots with less than 250 hours 'Pilot-in-command' would be exposed to in a New Zealand aviation environment. To stimulate the discussion between group participants, a number of previously identified factors were raised by the moderator. These included the Five Hazardous Attitudes of Pilots and overconfidence (Berlin *et al.*, 1982; Blais, 2010; Hunter, 2005; Hunter & Stewart, 2011; Jensen, 1995), the types of flying, the number of aircraft being operated, what it is that should be reported, the affects of flight experience and hours flown, and the affects of training (Brandt, 1998; Dambier & Hinkelbein, 2006; Goh & Wiegmann, 2001; 2002; Shorrocks & Kirwan, 2002; Transport Accident Investigation Commission, 2010), and lastly the

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areas of weather (Goh, O'Hare & Wiegmann, 2007; Hunter, Martinussen, Wiggins, & O'Hare, 2011; O'Hare & Owen, 1999; 2001; O'Hare & Smitheram, 1995; Wiggins, Connan & Morris, 1996), get-there-itis (Bearman *et al.*, 2009; Goh *et al.*, 2007; O'Hare & Owen, 1999; Orasanu *et al.*, 2001; Vector, 2011) and social influences (Jensen, 1982; Paltez *et al.*, 2009).

The participants were then asked if they knew of areas of concern that trainee pilots were being directly involved in, or that they had seen being reported in popular media sites. Following the conclusion of focus group one, the researcher identified the themes that emerged and developed these into draft vignettes. Upon completion of the vignettes they were grouped into the following in-flight risk-taking domains, as guided by both the HFACS model and the findings from focus group one:

1. Weather
2. Get-there-itis
3. Social
4. Areas of Concern

Focus Group Two

A second focus group was held one-week later with the same participants, where the draft vignettes were further developed, and the legitimacy and probability of each were discussed. Driskill *et al.* (1998) outlined scenario development in the aviation safety field and mentioned a number of considerations that should be contemplated prior to scenario development. On the basis of these considerations, the following

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criteria were formulated prior to vignette development:

- The content of each vignette had to be based on situations that the trainee pilots could have faced in the course of their training;
- Each vignette had to have all of the information required so that participants could make an informed decision as to their level confidence in continuing on with the flight;
- The plausibility and authenticity of each vignette must be assessed by flight instructors;
- The vignettes should be specific to New Zealand conditions so that local knowledge was available to the participants;
- The time to answer the two questions associated with each vignette should not take more than 2 minutes. This includes time to read the vignette and make a judgement on their confidence levels.

In-line with the above considerations, altitudes, direction of travel, cloud ceiling heights, time of travel and the likelihood that a trainee pilot would undertake such a flight were discussed. Craig (2009b) supported this high degree of pragmatism as he reported that the more realistic the scenarios are, the more likely that the pilots will engage in the scenario based process. Little, Lindenberger, and Nesselroade (1999) support Craig's (2009b) finding when they suggested that simulation rather than real world situations are more valid than previously reported. This finding suggests that through the use of scenarios researchers have the ability to test risk-taking in-flight behaviours without actually exposing the pilots to the actual risks. If the scenarios are as realistic as possible then the pilots are more likely to engage in the process

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and answer the scenario questions in a similar way as they would if they were actually conducting the flight (Craig, 2009b).

The primary flight information was discussed last and the results from this discussion developed the initial flight based information used in study three. This informed the participants of the nature of the flight that they were conducting within the bounds of the scenario.

2.5 Analysis and Discussion – Research Question One

2.5.1 Focus Group One

The themes that emerged from the first focus group were alcohol, caffeine, breaches in class two medicals and fatigue levels of pilots. These themes were extracted by analysing the transcripts where a consensus between all participants was made about an area of concern for flight safety in New Zealand aviation. These themes and the reasons that the participants believed they could be of concern are summarised in Table 1.

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Table 1

Themes that emerged from the first focus group

Theme	Area of Concern
Alcohol	The binge drinking culture in New Zealand and the consumption of alcohol prior to flight-time.
Caffeine	The effects of drinking high energy drinks and the taking of caffeine pills.
Fatigue	The levels of fatigue that may be induced by the workloads experienced by the pilots.
Breaches in Class Two medicals	The trainee pilot's non-compliance with what is stipulated in the class two medical requirements.

Alcohol

The focus group began with a discussion about alcohol and piloting. The participants noted that binge drinking was a major problem in New Zealand, especially among University students, and that this is a cause for concern for flight education and training facilities. This concern is supported by Kypri, Paschall, Langley, Baxter, Cashell-Smith and Bourdeau (2009) and Cousins, Connor and Kypri (2010) who found that University students regularly binge drink (defined as more than six beverages in a single sitting) and that the most common age within this group were the 15-29 year olds. McEwan (2009) and McEwan, Campbell and Swain (2010) support these findings with their research into New Zealand University binge drinking culture.

Ross and Mundt (1988) reported that the use of alcohol and then undertaking flight operations appeared to be a lack in common-sense and judgement. However, upon investigation of popular media sites, this problem is mentioned in a number of headlines (Kraus & Li, 2006; Li, Brady, DiMaggio, Baker & Rebok, 2010). For example, headlines such as “transatlantic pilot more than six times over alcohol

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flying limit” (London Evening Standard, 2007), “Airline Pilot Arrested On Alcohol Charge” (CBS, 2009), “Dutch police pull U.S. pilot after alcohol test” (CNN, 2010), “Pilots face random alcohol-drug tests” (Stuff, 2010) and “Indian pilots over alcohol limit” (The Guardian, 2011), all provide popular support that this is potentially a widespread issue within the industry. Investigations into the affects of alcohol on flying ability have also shown to seriously affect piloting judgement (Modell & Mountz, 1990; Yesavage & Leirer, 1986; Yesavage, Dolhurt & Taylor, 1994). Davenport and Harris (1992) found that even a very low level of alcohol led to a deterioration in the performance of pilots. In the United States of America, a pilot can fly with no more than an alcohol-blood concentration level of 0.04 litres of alcohol per litre of blood. Despite the findings of Davenport and Harris (1992), in New Zealand there is no alcohol-blood concentration level stipulation. It states in Part 19 of the CAANZ *Civil Aviation Act 1990* that:

No crew member while acting in his or her official capacity shall be in a state of intoxication or in a state of health in which his or her capacity so to act would be impaired by reason of his or her having consumed or used any intoxicant, sedative, narcotic, or stimulant drug or preparation.

Furthermore, in The New Zealand Flight Training Manual (NZFTM) (Wagtendonk & Boys, 2005), it recommends that a pilot does not fly for at least ten hours following 'small' quantities of alcohol and 30 hours following 'heavy drinking' (p.2a-3). What is considered small and what is considered heavy is not specified. The

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manual also stated that the absorption of alcohol in the blood stream is slowed as people sleep. For the presentation of the alcohol vignette in study three, because the NZFTM does not specify what ‘heavy’ and ‘small’ are, consumption of more than the recommended number of standard drinks by the Alcohol Advisory Council of New Zealand (ALAC) (2011) will be used to define ‘heavy’ drinking. For a male the limit is six standard drinks and for a female the limit reduces to four standard drinks.

Caffeine

The focus group discussed the increased dependence by students on energy drinks and the use of caffeine tablets (e.g. No-Doz[®]). The concerns raised were more to do with the *unknown side effects* of consuming caffeine tablets rather than the actual consumption itself. Depperschmidt, Bliss and Woolsey (2010) found that the consumption of energy drinks was associated with a decrease in the pilot’s ability to perform even routine ‘in-flight’ manoeuvres such as straight and level flight or simple turns. Furthermore, Miller (2008) found that consuming energy drinks was associated with increased levels of alcohol consumption, but also increased the consumer’s likelihood of engaging in other forms of risk-taking. Lohi, Huttunen, Lahtinen, Kilpeläinen, Muhli, and Leino (2007) do not recommend the use of caffeine pills by pilots who are sleep deprived as it can potentially lead to flight safety problems. However, Caska and Molesworth (2007) found that consumption of small (approximately 200mg) amounts of caffeine by non-regular users may increase awareness and therefore counteract the effects of pilot fatigue in a short term capacity. As the concern was raised in the focus group, and because research in the field is divided, study three included a vignette to investigate if confidence in using caffeine by New Zealand trainee pilots was common.

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Fatigue

The focus group also discussed their concerns surrounding pilot fatigue. A group member mentioned that “increased workloads and the potential for long hours at the flight training centres, due to lessons and flight time, lead to increased levels of fatigue”. Although this is anecdotal, the affects of fatigue on pilots is well documented, both in reported news articles and in the academic fields. Caldwell (2005), Goode (2003) and Taneja (2007) have all reported a positive relationship between pilot fatigue and the likelihood of being involved in an accident or incident. This is supported by NASA (1999), which showed that approximately 45 accidents per year in the United States were accounted for by pilot fatigue between the years 1994 to 1998. Moreover, a popular media article headline read: “Pilot fatigue raised in Canadian crashes” (CBC, 2010), this outlined at least a dozen reported accidents caused by pilot fatigue in Canada in the past decade. In New Zealand, according to the CAANZ Manager of Safety Analysis (Vector, 2000), the percentage of accidents accounted for by fatigue is around 25%. Furthermore, the CAANZ Manager of Safety Investigation, showed the importance of fatigue within the aviation industry when he stated that: “Almost everyone has felt fatigued at some stage in their lives, but not everyone then tries to fly 200 passengers into Wellington in a screaming southerly...” (Vector, Nov/Dec 2000, p.3). As can be seen by this quote, the importance of fatigue and its effects on the aviation industry are considerable, with public safety at the forefront. It is because of this, and the level of concern raised by the focus group, that a fatigue vignette was presented in the study three.

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Breaches in class two medicals

The focus group discussed the breaches in class two medicals based on the rules stipulated in Part 67 of the *Civil Aviation Act 1990*. Two areas were brought to the attention of the moderator; the non-compliance of wearing prescription glasses while flying, and the taking of prescription drugs not administered by a Grade One medical examiner (some antihistamines and cold and flu drugs). The monitoring of pilots taking drugs is difficult for flight training centres without random drug testing. As one group member stated “the problem is that often the trainees do not realise that they cannot go to their family doctor for cold medication. Most GP’s do not know the regulations put upon pilots.” It is because of these concerns surrounding prescription drugs and the difficult nature of testing pilots, that it was not included in study three in a vignette format. However, the fact that pilots do not often know whether the prescription medications they are taking is approved under Part 67 is a concern.

A focus group member stated that it “appeared that the number of pilots requiring prescription glasses had increased over the past few years”. This is supported at an international level for older adults with the number of people requiring corrective lenses on the increase (The Eye Diseases Prevalence Research Group, 2004). Furthermore, Rebok, Qiang, Baker and Li (2007) stated that the number of pilots with problems with vision was increasing. With this in mind, it becomes important for pilots to ensure that they are properly equipped to manage their vision impairments. A focus group member mentioned this as their primary area of concern regarding pilots and glasses. The NZFTM (Wagtendonk & Boys, 2005) stipulates that pilots must wear glasses if required under the class two medical, as well as carry

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a spare pair of glasses with them during flights. Nakagawara, Montgomery and Wood (2001) found that pilots not wearing their glasses accounted for 15 accidents in the 1980 to 1998 period in the United States of America. These concerns raised by the focus group were taken into consideration and a vignette was developed for study three.

The information that was collected during focus group one was then used to develop the vignettes for study three, and the draft versions of these vignettes were the focal point of focus group two.

2.5.2 Focus group two

A second focus group was conducted a week later and a dialogue about the initial flight information that would be presented to the participants prior to the vignettes was undertaken first. The aim was to outline the nature of the flight that the vignettes were based upon. The type of aircraft described had to be familiar to the trainee pilots, so a brief discussion about aircraft flight training organisations in New Zealand use was conducted. The pilots were then made aware that they needed to imagine that they were always flying under VFR and as the Pilot-in-command. The following is the final version of the initial flight information and was used in study three:

For the following section you will be presented with a series of scenarios where you will be asked to rate your level of confidence

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to continue with the flight or begin the flight initially. Please keep in mind that these scenarios relate to a small single piston engine aircraft, such as the Piper Warrior, Diamondstar, Cessna 182, 172, 152, Skyhawk or equivalent. In all scenarios you are flying under Visual Flight Rules and are flying as the Pilot in Command.

The focus group next discussed the draft versions of the vignettes formulated following the conclusion of focus group one and checked the plausibility and authenticity for each. Minor changes were made to presentation the vignettes, as well as the inclusion of further aeronautical language so that pilots could readily identify with the vignettes (Craig, 2009b). The weather, 'get-there-itis' and social pressure factors present the participants with four vignettes each (combined they will be referred to as a domain) and one vignette will be presented for each of the areas of concern (alcohol, get-there-itis, breaches in class two medicals and fatigue) in the study three. Presenting the pilots with four vignettes in each section will reduce the effects of potential random answering of the pilots, which may affect the entire domain.

Weather

Four weather related vignettes were developed to test the pilot's confidence in pressing on into poor weather. Hunter, Matrinussen, Wiggins and O'Hare (2011) and Knecht, Ball and Lenz (2010) reported that this is a common occurrence for accidents and incidents within the aviation industry. This is further supported by Goh *et al.* (2007), O'Hare and Owen (1999, 2001), O'Hare and Smitheram (1995),

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and Wiggins *et al.*, (1996). Study three investigates the confidence that a pilot has in continuing on with a flight into deteriorating weather conditions. The weather related vignettes are as follows:

1. You are flying above Foxpine, at an altitude of 2500 ft, on a southern heading towards Wellington International airport tracking along the coastal pathway. Your instructor gave you clearance to undertake the flight, but did mention the variable nature of the weather today. As you get to your current position, you notice TCUs/CB's developing in the distance just to the south of Mana Island in the Cook Strait, followed by an expanse of deteriorating weather which is due to hit Wellington in 45 minutes. Your flight south will take approximately 40 minutes.
2. When writing your flight plan you notice that the ceiling is reported to be at 500ft above the cook straight but only in a band of 10NM. Mid-flight you notice that the ceiling band has increased and extends as far north as Wellington. The height has also increased to a level of 1500ft.
3. On takeoff you checked the weather forecast which predicted that you would have clear skies throughout the course of your flight. Due to a joint military operation your minimum flight altitude above the Strait has been set at 3500Ft. The weather starts to deteriorate around you, and suddenly you find yourself in cloud.
4. It has been raining for most of the day, but the front has moved on

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now and the skies behind it have cleared up. However the forecast also reports that the front may bring thunderstorms behind it. VFR is not recommended. It is only a short flight to Whanganui where there is accommodation if needed.

Get-there-itis

Get-there-itis was the second domain that was developed and also included four separate vignettes. This type of risk occurs when pilots continue on with a plan despite having knowledge that potential continuation may be risky. Although moderating variables such as frequency bias and continuation bias have been reported, current literature indicates that 'Get-there-itis' is the common reason for continuation (Bearman *et al.*, 2009; Goh *et al.*, 2007; O'Hare & Owen, 1999; Orasanu *et al.*, 2001; Vector, 2011). The 'Get-there-itis' vignettes are as follows:

1. You take off from Hamilton International Airport for a flight bound for Napier Airport. Your flight plan was done as normal allowing for 30 minutes compulsory reserve fuel. The flight will mean that you arrive in Napier 45 minutes prior to ECT. This evening you have a wedding rehearsal dinner which starts one hour following your arrival in Napier. You are a member of the bridal party. Mid-flight you experience stronger than anticipated head winds which will extend your flight by 15 minutes. You can continue onto your destination and use 15 minutes of your 30 minute compulsory reserve fuel, or divert and refuel which puts

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you over ECT. As you have not been signed off to fly at night, this would mean you would have to stay at your refuelling destination till the following morning.

2. You are on late night cross country flight with one and a half hours left of your flight when you start to feel very tired and drowsy.
3. You are about to depart New Plymouth Airport, 3POB with their baggage. Prior to filling the plane with fuel you calculate the weight and with a full fuel load you will be 35kg over the Maximum (MAUW) limit for the aircraft. You are required in Gisborne for an important meeting and a refuel would mean that you would miss the meeting altogether. By not being able to take on a full fuel load, you would need to refuel en-route.
4. You are mid-flight on your way home from Kaitaia for the birth of your first child. Contrary to the weather report that you gained pre-flight, thunderstorm cells begin to form to the south surrounding you. The skies behind you are still clear.

Social Pressures

In Study three social pressures will be investigated by assessing pilots' levels of confidence to continue on with or begin a flight into poor weather when being asked to by passengers, pressure by friends, or pressure to undertake illegal manoeuvres by friends. Social pressures have been identified in past research as a causal factor for aviation accidents based on retrospective data (Jensen, 1982; Paltez *et al.*, 2009).

The social pressure vignettes are as follows:

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1. You have been asked to fly three business men from Nelson to Christchurch for a new business launch. It is very important that they make it there on time. The forecast reports that it will be marginal under VFR condition. Mid-flight you experience deteriorating visibility and plan on turning around. The business men urge you to continue as they must not miss the launch.
2. You have taken a close friend of yours up for a flight from Masterton to Napier. You tell him that you have recently been taking aerobatics lessons with your instructor in the plane that you are currently in. You have not passed your rating yet with a couple of hours left before its completion. Your friend begins to try and persuade you to do some with him in the plane.
3. It is a very still evening and you decide to take two friends for a night flight from Greymouth to Westport and home again. Mid-flight you discover that due to the conditions that a thick ground fog has begun to develop. It appears to be developing in a southward direction. You have been promising your friends this trip for a very long time.
4. You are planning on attending a concert for your favourite band in Hamilton that you have paid for and have been waiting all year to attend. You check the forecast and it is marginal at best. Your friends who are meeting you at the airport are telling you to hurry up otherwise you will miss the concert.

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Areas of concern: Alcohol

Support found in the literature, and headlines in the popular media support the concern being raised by the focus group about consumption of alcohol by pilots (Davenport & Harris, 1992; Modell & Mountz, 1990; Yesavage & Leirer, 1986; Yesavage, Dolhurt & Taylor, 1994). This led to the development of the following alcohol related vignette:

You have just received a phone call from your flight instructor telling you that you have a rescheduled flight that is due to take place at 0900hrs. Last night was a friend's birthday and you were not planning on flying till 1800hrs this evening. Consequently, last night you consumed 10 standard drinks over the course of the night, finishing at 0200hrs. This morning you are experiencing a small hangover. If you do not take the flight this morning you will be unable to fly for another month.

Caffeine

Reissig, Strain, and Griffiths (2009), reported that dependence upon energy drinks and caffeine is on the increase. Depperschmidt *et al.* (2010) and Lohi *et al.* (2007) both found that the use of caffeine by pilots can create in flight safety problems. However, Caska and Molesworth (2007) found that a small amount of caffeine (200mg) can increase the awareness levels of mildly fatigued pilots. As the effects of its use are divided among researchers it was decided to include the use of caffeine tablets in a vignette, as these are more easily consumed in-flight than an entire

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energy drink and also have a higher caffeine content (a normal 330ml energy drink can has 80mg of caffeine compared to a single caffeine tablet which has 100mg).

The vignette used in study three was:

You are on a long distance cross country flight, from Palmerston North to Great Barrier Island and home. On your way home you start to become tired and weary from the days flying. You decide to take 2 caffeine tablets (100mg each).

Fatigue

Caldwell (2005), Goode (2003), NASA (1999), and Taneja (2007) all reported a relationship between pilot fatigue and an increased likelihood of being involved in aviation accidents. As the problem with fatigue within the aviation industry is not only a concern for pilots being unable to pay full attention to the tasks required to operate an aircraft, but also the serious issue surrounding public safety, it was decided to include it in the vignettes. The case for fatigue was made expressly obvious in the vignette presentation and is as follows:

You are midflight on your way home from a long cross country flight when you start to feel fatigued from the lunch that you missed en route. This is causing you to become slightly dizzy. Your destination airport is one hour away.

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Breaches in class two medicals

The last vignette to be discussed concerned the wearing of prescription glasses in-flight. The focus group also discussed how the wearing of contact lenses could prove to be a problem if they failed in-flight. Although this type of failure is uncommon, accounting for only 9.1% of referrals to eye causality units, it is still a very real possibility (Melia, Islam, Madgula & Youngs, 2008). It was decided that due to the fact that the CAANZ rules did not stipulate any rules in regards to wearing of contacts that the vignette was better presented with the inclusion of prescription glasses as outlined in the NZFTM (Wagtendonk & Boys, 2005). The following breaches in class two medical (glasses) vignette is presented in study three:

You are planning on conducting a short cross country flight from Tauranga to Whakatane to complete the final hours that you require for your CPL cross country training. You realise that you have left your glasses at home that are required under your class 2 medical; however you are able to drive without glasses. The plane you are renting is not available for another 2 weeks if you do not make your flight at the scheduled time today.

In order to minimise the possibility that demand characteristics could affect participants' answering of the vignettes, they were presented to the participants in a sequential format. The order is Weather, Get-there-itis, Area of concern, and then social. The sequence is then repeated a further three times. This is because it is possible that completing the first sets of vignettes will influence their responding on

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subsequent vignettes. The order for the vignettes is presented in Appendix C (p. 155).

2.6 Conclusion

Study one provided valuable insights into the nature of risk-taking in-flight in a New Zealand context. The first focus group discussed areas of concern that the participants believed may be leading to increased accident numbers in aviation. These were based on risky actions that the focus group participants had directly witnessed or that they had heard of through popular media sites. This allowed the moderator to formulate these concerns into draft versions of vignettes to be presented to focus group two for validation. These vignettes were not modified any further following the conclusion of the second focus group and were presented to the participants in study three.

CHAPTER THREE

STUDY TWO: PILOT STUDY

3.1 Overview

The purpose of study two was to assess the validity of the psychometric scales selected for study three for use in a New Zealand context. It sought to assess the face, content and construct validities for both scales (Cronbach & Meehl, 1955). Face validity for study two refers to how well the scale measures what it appears to be measuring (risk-seeking behaviours). Content validity for the current psychometrics refers to how well they measure all the aspects of risk-seeking. Construct validity refers to how the scales measure ‘risk-seeking propensity’.

3.2 Participants

Participants were six males and four females with a mean age of 24 years ($SD= 2$), from the School of Psychology at Massey University, New Zealand.

3.3 Measures

Study two analysed two psychometric measures of risk-seeking propensity which will be used to assess the participant’s levels of everyday risk-seeking behaviours in study three. The decision to use two measures rather than one was made to increase

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the content and construct validity for study three. The selection of the measures was based on the following criteria:

- They must have good reported psychometric properties;
- Must show have statistical evidence of its previous use within the area of risk-seeking/risk propensity research;
- Must be written in English;
- Must be able to be developed into an online format (both in administration and scoring);
- Must be accessible for use on a civilian population (not be exclusive to and organisation or education provider); and
- Must be approved for use in the current research by the scale's authors.

A number of scales fulfilled some of the above criteria such as the Decision Making Questionnaire (O'Hare & Owen, 1999), Risk perceptions – Self (Hunter, 2002), Cognitive Appraisal of Risky Events (CARE) (Fromme *et al.*, 1997), Domain-Specific Risk-Taking (Adult) Scale (DOSPERT) (Blais & Weber, 2006) and Aeronautical Risk-Judgement Questionnaire (O'Hare, 1990). The Decision Making Questionnaire (O'Hare and Owen, 1999) and the Aeronautical Risk-Judgement Questionnaire (O'Hare, 1990) were not selected for use in study three as the main focus of the scales were on aviation specific risks rather than everyday risks. The Risk-perceptions – Self (Hunter, 2002) was not selected as although it had four questions on everyday risk, the scale did not provide enough questions to provide adequate coverage on the construct domain. The Cognitive Appraisal of Risky

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Events (Fromme *et al.*, 1997) and the Domain-Specific Risk-Taking (Adult) Scale (Blais & Weber, 2006) fulfilled all of the criteria and were therefore selected for use in study three.

A pilot study was used to assess the face, content and construct validities of both the CARE and the DOSPERT within a New Zealand population. Kraemer, Mintz, Noda, Tinklernberg, and Yesavage (2006) reported that pilot studies are important, allowing researchers to test the feasibility of the measurement tools they use for their studies, and help to set up processes for data collection and storage. The use of a pilot study further provides a way of sorting out potential problems with the above processes and the research design. These problems can then be corrected during the pilot testing phase and possibly lead to a better-designed study (Kraemer *et al.*, 2006).

3.3.1 Cognitive Appraisal of Risky Events (CARE)

The CARE questionnaire was developed by Fromme *et al.* (1997) to assess adults' outcome expectancies about the risks and benefits associated with undertaking risky activities. It consists of four standard scales (expected involvement in the next 6 months, past frequency in the last 6 months, expectation of benefits and expectation of risk scales) but it is recommended by the authors that only three of the four are used, at any one time. They stipulate that when administering the CARE scale, that either the 'past frequency in the last six months' scale or the 'expected involvement in the next 6 months' scale alongside the other two scales be used. The reasons for

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this are not explained by the authors³. The ‘expected involvement in the next 6 months’ scale was seen as more important for use in study three as all participants have been pilots for a period of greater than 6 months. Furthermore, it is was important to find out how people believe they will behave in the future as this has been found to be correlated to how they actually behave (Sheeran & Orbell, 1999). By using the ‘expected involvement in the next 6 months’ scale a greater understanding of whether the pilots’ still engage in the risky activities with no bearing on past risky behaviours can be assessed. By using these assessment scales from the CARE, it provides a means of assessment of concurrent validity when compared to the scales used in the DOSPERT. The scales that were chosen for this study include:

- Expected Involvement in the next 6 months;
- Expectation of Benefits;
- Expectation of Risk.

All scales utilised a 7-point Likert Scale format and these were anchored at: 1 (Not Likely at all), 4 (Moderately Likely) and 7 (Extremely Likely). These anchor points are replicated on those found in Fromme *et al.* (1997).

The 'expected involvement in the next 6 months' scale prompted participants to rate the likelihood that they would engage in each of the 30 risky activities within the next six months. In the 'expectation of benefits' scale, the participants were asked to

³ An attempt was made to contact the authors to investigate the reasons for outlining the use of only one of the two ‘past frequency in the last 6 months’ or ‘expected involvement in the next 6 months’ scales, however no response was received.

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anticipate the positive consequences (e.g. pleasure, win money, feel good about yourself, etc.) for participation in the same 30 risky activities. The 'expectation of risk' scale asked participants to anticipate the negative consequences (e.g. become sick, be injured, embarrassed, lose money, suffer legal consequences, fail a class, or feel bad about yourself) from participation in the 30 risky activities.

All three scales presented the same 30 risky activities. For example, “Drinking more than 5 alcoholic beverages”, “Leaving tasks or assignments for the last minute”, and “Sex with someone I have just met or don’t know well” (see Appendix C for the complete set of questions, p. 155). The authors then divided the questions and grouped them into the following six domains:

1. Illicit Drug Use;
2. Aggressive and Illegal Behaviours;
3. Risky Sexual Behaviour;
4. Heavy Drinking;
5. High Risk Sports;
6. Academic/Work Behaviours.

The CARE scale is scored by totalling the sum of the scores within a given domain and then dividing them by the total number of items in that domain. A high score in the 'expectation of involvement in the next 6 months' scale suggests a higher probability of undertaking the risky activities within the next six months. Higher scores in the 'expectation of risks' scale would indicate that participants expect to

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receive more negative consequences by being involved in the risky activities. Lastly, a high score on the 'expected benefits' scale would indicate that the participants expect to receive more benefits from undertaking risky activities or behaviours.

As a test of internal consistency, a series of Cronbach alpha coefficient scores were conducted. The Alpha scores indicated adequate internal reliability for both the expected risk scale (.83) and the expected benefit scale (.84) (Katz, Fromme, & D'Amico, 2000)⁴. The test-retest correlations range from $r = .51$ to $r = .79$ after 10 days (Fromme *et al.*, 1997).

3.3.2 Domain-Specific Risk-Taking (Adult) Scale (DOSPERT)

The DOSPERT scale (Blais & Weber, 2006) is a revised version of Weber, Blais and Betz's (2002) Domain-Specific Risk-attitude scale. The DOSPERT consists of 30 questions rather than the original 40 which were originally developed to measure the individual differences in people's attitudes towards risk. The same 30 questions were used in all of the DOSPERT's three scales of:

- Risk-taking;
- Risk Perceptions;
- Expected Benefits.

All three scales were answered using a Likert Scale format with the anchor points

⁴ The authors were emailed to see if the α score for the expectation of involvement psychometric properties were available. No response was received.

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being a direct replication of those found in Blais and Weber (2006). The 'risk-taking' scale was anchored from 1 to 7: 1 (extremely unlikely), 2 (moderately unlikely), 3 (somewhat unlikely), 4 (Not sure), 5 (somewhat likely), 6 (moderately likely) and 7 (extremely likely). For the 'risk perceptions' scale, anchor points also ranged from 1 to 7; 1 (not at all risky), 2 (slightly risky), 3 (somewhat risky), 4 (moderately risky), 5 (risky), 6 (very risky), and 7 (extremely risky). Lastly, in the expected benefits scale, anchor points were set at 1 (no benefits at all), 4 (moderate benefits) and 7 (great benefits).

In the 'risk-taking' scale, participants were asked to indicate the likelihood that they would engage in the described activity or behaviour if they were to find themselves in that situation. In the 'risk perceptions' scale, participants were asked to determine their gut (*sic*) level assessment of how risky each situation or behaviour was. Lastly, in the 'expected benefits' scale, participants were required to indicate the level of benefit they would obtain from each situation.

Each scale presented the same 30 risky activities/behaviours to the participants. For example; “Drinking heavily at a social function”, “Having an affair with a married man/woman” and “Piloting a small plane” (see Appendix C, for the full set of questions, p. 155). The 30 questions are then divided equally among the domains.

The domains investigated by the DOSPERT were as follows:

- Ethical;
- Financial;
- Health/Safety;

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- Social;
- Recreational.

Scoring of the DOSPERT is conducted by totalling the sum of the scores within a given domain and then dividing them by the total number of items in that domain. Higher scores in the 'risk-taking' scale indicate greater propensity toward risk-taking behaviours. A high score in the 'risk-perception' scale suggests a higher probability of partaking in risky activities or behaviours. Lastly, a high score on the 'expected benefits' scale indicates that the participants expect to receive more benefits than negative consequences from undertaking risky activities or behaviours.

Cronbach Alpha scores for 'risk-taking' are reported at .78 and then .77 for 'risk-perception' (Blais & Weber, 2006). Cronbach Alpha scores for 'expected benefits' were not specified by the authors⁵. Although statistics are not reported directly, Blais and Weber (2006) cite that the test-retest properties for this revised version of the DOSPERT are similar to the original Weber *et al.* (2002), version of .44 to .80 after a one month period. The reason for the wide range for the test-retest variables is not known as Weber *et al.* (2002) do not provide an explanation. External validity and generalisability are provided by the extensive use of the measure within multiple fields. For example, Hanoch, Johnson, and Wilke (2006), used the scales directly with groups who would 'fit' into the specific domains (i.e. a skydiving class for the Recreational Domain, and an investment class for the financial domain).

⁵Contact was made with the Authors to see if this statistic was available, no response was received.

3.4 Procedure

The participants were invited to take part in the pilot study upon entering the Massey University School of Psychology Computer room, which involved completing the online survey form before it was made available publicly online. Ethics approval for this pilot study was sought and approved within the bounds of the same Massey University Human Ethics form as study three (MUHEC/Southern A/10/59; Appendix A, p. 151).

The participants were asked to read both the CARE and DOSPERT and provide feedback as to whether they made sense within a New Zealand context. If a question was mentioned by a participant to be potentially problematic then this was recorded. If a consensus of more than six participants was made in relation to any one question, then it was reworded by the researcher to be more applicable for a New Zealand population. The reworded question was then answered a second time by the same participants to ascertain whether the reworded question made it easier to understand.

3.5 Analysis and Discussion

The group found that all of the questions presented in the CARE scale were relevant and made sense in a New Zealand context. The DOSPERT was reported to have one, question number 13, that participants found difficult to understand. In the original DOSPERT scale the risky activity was written as: “Going whitewater rafting at high

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water in the spring” and has been changed to: “Going whitewater rafting at high water”. The group was then asked to answer this question again so that the psychometric properties could be assessed for the change in wording. Although this was a small distinction, it was found by the pilot group to be 'less confusing' as high water is common year-round in New Zealand climate conditions. This may be because the entire population of New Zealand live within 100 kilometres of a beach which would mean that high water on rivers near their homes may be experienced regularly (tidal movement) (Coastal Statistics, 2000). It was found that the change led to the same results, current (Mean= 4, *SD*= 2), re-worded (Mean= 4, *SD*= 2). As the psychometric properties were therefore not compromised, the re-worded question was presented to the participants study three. The mean and standard deviations for the sub-scales and the domains from the CARE and DOSPERT scales are presented in Table 2.

Table 2.

Means and Standard Deviations of the Sub-scale scores and the domains for the CARE and DOSPERT scales.

Variable	Mean	<i>SD</i>
CARE ^a		
Expected Involvement in the next 6 months	2.56	1.03
Expectation of Benefits	2.33	0.99
Expectation of Risk	3.15	0.96
DOSPERT ^a		
Risk-taking	3.99	0.79
Expected Benefits	3.49	0.75
Risk Perceptions	4.02	0.73
CARE ^a		
Illicit Drug Use	1.51	0.90

Table 2 continued.		
Risky Sexual Behaviours	2.89	1.43
Aggressive and Illegal Behaviours	1.83	1.01
Heavy Drinking	3.70	1.95
High Risk Sport	4.59	1.33
Academic/ Work Behaviours	2.13	0.92
DOSPERT ^a		
Health and Safety	3.33	1.22
Social	5.14	0.65
Recreational	4.95	0.99
Ethical	3.16	0.82
Financial	2.59	0.96

^a Range 1-7

3.6 Conclusion

The use of the pilot study allowed the CARE and DOSPERT scales to be assessed by a sample of the New Zealand population and meant that they could be changed accordingly to be better understood in Study Three. The changes that were made to the DOSPERT did not cause any disruptions to the psychometric properties of the scale, and was judged by the participants to be 'less confusing' within a New Zealand context once reworded. The scales were found to have face, content and construct validities (Cronbach & Meehl, 1955) and are therefore appropriate to assess risk-seeking behaviours of participants in Study Three.

It is essential to be aware of the fact that study two had two potential limitations. First, the sampling method employed was not random and this may have reduced the possibility of the sample population being representative of a New Zealand cohort.

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Second, the sample size was very low and this may have once again reduced the generalisability of the study. It is important to note however that although there were limitations to study two, it was conducted in order to assess the validities in a New Zealand population for the purposes of assessing the usefulness of the scales for Study Three.

CHAPTER FOUR

STUDY THREE: ONLINE SURVEY [MAIN STUDY]

4.1 Overview

The participants were invited to take part in an online survey that consisted of the two validated psychometric measures and the presentation of 16 short flight vignette based questions. They were first asked to answer the CARE and DOSPERT scales as honestly as possible. The participants were then asked to rate their own level of confidence in undertaking each of the risk-taking in-flight vignettes. The aim of the study was to investigate research questions two and three:

- Is there a relationship between everyday risk-seeking behaviours and risk-taking in-flight?
- Do the risk-seeking domains correlate to the domains of risk-taking in-flight?

4.2 Participants

The participants were 2 female and 56 male pilots. Of these, 5 pilots held a recreational pilot's licence, 33 held a private pilot's licence, 20 held a commercial pilot's licence and no participants held an airline transport pilots licence. The mean age of participants was 23.75 years ($SD= 7.39$). Three participants were excluded because of incomplete data sets, and a further 6 participants were excluded because they reported having over 250 hours total flight time, reducing the working data set

to 49 participants.

4.3 Materials

The development of the online survey form (Appendix C, p. 155) first utilised appropriate demographic questions so that the representativeness of the participant group and compliance with the study involvement criteria could be assessed. This was followed by the presentation of the two risk-seeking psychometric tests, validated in study two. Lastly, participants were presented with the 16 short flight based vignettes which were developed in conjunction with the focus group in study one.

4.3.1 The relationship between risk-seeking behaviours and risk-taking in-flight survey

Demographics

Demographic information for age and gender were first collected. Age was requested to assess that the participants were over 18 years of age which is required for participation in the study. Gender information, although not directly used in this study, was collected so that future researchers could potentially use this information to assess gender participation in-flight safety research and gender trends in-flight operations. Further demographic information gathered included the highest aviation licence type held, total flight hours, and hours flown in the past 12 months. The type of licence that the pilot holds is indicative of the level of training that they have undertaken and the number of hours that they must have undertaken in order to gain

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the appropriate licence as stipulated by the *Civil Aviation Act 1990*, Part 61 (see definitions, pages xiii and xv). A stringent level of between 10 and 250 hours total flight time was set for three reasons. First, it allowed the researcher to assess pilots who were as close to a non-piloting population as possible, yet they have had enough flight time to have exposure to the types of risky situations presented to them in the in-flight vignettes. Although human error training has been found to have weak evidential support of being effective, the potential to change a pilot's way of viewing risks is still possible (Hershey *et al.*, 1990). Second, pilots with less than 250 hours only have small levels of flight experience. Hunter (2001) reported that high levels of flight experience are generally regarded as a protective factor against taking risks in-flight. Lastly, the collection of the above demographic information shows whether the pilot is currently active in maintaining flight hours within the past 12 month period.

Further pilot in command (PIC) questions were asked of the participants, including: how many total hours do they have as 'Pilot in Command', how many hours as 'Pilot in Command' have they had in the past 12 months, how many total hours of cross country VFR flight time do they have, and how many hours cross country VFR flight time do they have in the past 12 months. The total number of hours flown, when combined with the number of hours PIC, is indicative of the amount of training that they have undertaken. If the pilot is undertaking training, the PIC is the instructor, thus making the pilot under instruction (training) and not PIC. VFR flight time was also important as some of the in-flight vignettes are cross country based and the participant would therefore need to be exposed to undertaking cross-country flights in the past in order for the vignettes to be plausible.

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Lastly, participants were asked if they have ever been involved in an accident or incident that has been reported to the CAA or the Transport Accident Investigation Commission. These questions were included to assess whether the pilots are representative of the New Zealand aviation population. If the training programmes in New Zealand that are been utilised are effective then the accident numbers reported should be low. As we can see by the statistics provided on the CAANZ website, the training accidents have increased for the decade 2000-2010. The current participant group should therefore report that at least some have been involved in an accident in their aviation career.

In order to collect the demographic information (other than age and gender) participants could select a potential option from a list. First, for the question of ‘How many total flight hours do you currently have?’ the options were 10-50, 51-100, 101-150, 151-200, 201-250, and 250+. Second, for the questions of ‘How many hours have you flown in the past 12 months?’, ‘How many total hours of cross country VFR flight time do you have?’, and ‘How many hours cross country VFR time do you have in the past 12 months?’ the options were 10-30, 31-50, 51-70, 71-90, 91-110, and 111+. Third, for the questions of ‘How many total hours do you have as pilot in command?’ and ‘How many hours ‘Pilot in command’ have you had in the past 12 months?’ the options were 10-30, 31-50, 51-70, 71-90, 91-110, 111-130, 131-150, 151-170, 171-190, 191-210, 211-230, 231-250, and 250+. Four, for the question of ‘What is the highest aviation licence type that you hold?’ the participants could select recreational, PPL, CPL or ATPL. Lastly, for the question ‘Have you ever been involved in an accident or incident that has been reported to the CAA or the Transport Accident Investigation Commission? *Note: Accident as defined by the*

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CAA AC12.1 sub-part 12.51 (page 3) the pilots could select accident, incident, both or no. The order in which the demographic information questions were asked is presented in Appendix C, p. 151.

4.3.2 Psychometric Measures

The CARE questionnaire (Fromme *et al.*, 1997) and the DOSPERT (Adult) scale (Blais & Weber, 2006) were next presented to participants (the psychometric properties of these scales were assessed in Study Two).

4.3.3 Flight-based Vignettes

The 16 flight-based vignettes were designed for a New Zealand, trainee pilot population. The format for the in-flight vignettes within Study Three was based on the Federal Aviation Administration Pilot Survey (Driskill, Weissmuller, Quebe, Hand, & Hunter, 1998) and the Risk Assessment Task Battery (Kelley, Killgore, Athy, & Dretsch, 2010) which used a similar methodology by presenting scenarios to participants rather than using computer-based simulator programmes. The computer based simulators have been used widely in the research field (O'Hare & Owen, 1999; O'Hare & Smitheram, 1995; Wiegmann, Goh & O'Hare, 2002; Wiggins & O'Hare, 2003). However, according to Wiegmann *et al.* (2002) who reported that computer based simulator programmes can potentially have problems with response bias, where-by participants are more inclined to try to impress the researchers than actively participate in the simulation. To combat this problem, the

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current research used an anonymous online survey form in an attempt to allow the participants to answer honestly, without fear of potential repercussions (Krantz, & Dalal, 2000).

The vignettes were designed to test a pilot's level of confidence in continuing on with a given in-flight situation. The vignettes that were presented to participants were validated in terms of construct, content and face validities in Study One.

After the presentation of each vignette, the participants were then asked to rate their level of confidence to continue on, or begin, the flight described, on a 5-point Likert Scale. The Likert scales were anchored at 1 (Not Confident), 3 (Confident) and 5 (Very Confident). A score of 3 or more indicated that participants were confident to press on with the flight, despite the very nature of the vignettes being risky as judged by the New Zealand flight instructors in Study One.

4.4 Procedure

Contact was made with sixteen flight schools/education providers (e.g. Massey University School of Aviation), and three New Zealand Aviation Industry piloting associations (e.g. Flying New Zealand (RNZAC), Aviation Industry Association of New Zealand, and the Aircraft Owners and Pilots Association (NZ)). Initial contact was made by phone to enquire whether the organisations would be interested in being involved in the current study. Of those organisations who agreed to be involved, an introductory email was sent to them. The introductory email outlined

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the purpose of the study and asked the email recipient to forward the direct link to the online survey form onto its pilots. The direct link let the participants access the information sheet about the study (Appendix B, p. 153) and the online survey.

Participants could also email the researcher regarding any questions that they may have about the research. In-line with the Massey University Human Ethics Application consent process, consent was implied by the submission of the online survey form. In order to complete the survey the participants had to fulfil the following criteria:

- 1) Be aged 18 or older;
- 2) Be fluent in reading English;
- 3) Have greater than ten hours 'pilot in command' but less than 250hours.

These were assessed by the participant clicking on the link on the information page to participate in the research.

The survey was presented in an online format, which was created using a CGI and PERL scripted Form-Processor system. This was developed and shared by Selena Sol in the past from the extropia.com web resources. Coding was set up by the Programmer/Analyst of the School of Psychology at Massey University. The survey was then placed online at <http://psych-research.massey.ac.nz/carey/> and was activated for participant access on the 9th of March, 2011, closing on the 20th of August, 2011.

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4.4.1 Ethical considerations

A full Massey University Human Ethics Application (MUHEC/Southern A/10/59; Appendix A, p. 151) was submitted to the Human Ethics committee as the online research was deemed to have potential harm to participants. The potential harm as outlined by the ethic committee surrounded issues concerning informed consent and the anonymity of participants.

Informed Consent

Informed consent for each participant was implied if they entered the survey, following reading the information sheet and submitting their responses at the end of the survey. The information sheet detailed that each participant had the right to withdraw from the survey at any time and that they could decide to decline any question.

Anonymity

All participant responses were anonymous and involved no questions that could lead to the potential identification of any participants. As soon as the participants received the email directly from their respective organisations and clicked on the link provided to the research, the researcher had no way of identifying any participants. All responses made by participants were received and stored securely by the computer Programmer/Analyst of the School of Psychology at Massey University, without the researcher receiving the raw, un-coded data. The raw data will be stored for a period of five years in a secure location as required by the

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Massey University Human Ethics Committee. The only people who will have access to the information will be the researcher, the research supervisors and the Programmer/Analyst of the School of Psychology at Massey University.

4.5 Data Analysis

Using the Statistical Package for the Social Sciences (version 19, SPSS, 2011) a bivariate Pearson's correlation was conducted to test for a relationship between risk-seeking behaviours and risk-taking in-flight behaviours. In order to test for relationships between the risk-seeking domains and the risk-taking in-flight domains, multiple bivariate Pearson's correlations were conducted.

4.5.1 Missing Data

Three participant data sets were omitted from the current research because they failed to answer all of the questions of the CARE questionnaire and DOSPERT scales. As no instructions were provided by the authors about how to deal with missing data sets, and as these were fundamental in attempting to answer research questions two and three, the above sets of data were omitted. A further six sets of participant data were excluded because they failed to meet the less than 250 hour total flight hour criteria outlined for participant participation on the information sheet.

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RESULTS

The level of statistical significance, alpha, was set at $p = .05$ for all statistical tests, and all tests were conducted as two-tailed. The strength of each relationship is reported in terms of small ($r = .1$ to $r = .29$), medium ($r = .3$ to $r = .49$) or large ($r = .5$ to $r = 1$) (Cohen, 1988).

5.1 Demographic Variables

In order to assess whether the participants met the criteria for completing the current research (as outlined on the information sheet), demographic information were assessed first before addressing the research questions. Table 3 displays the frequencies for total flight hours, total flight hours in the past 12 months, total PIC hours, total PIC hours in past 12 months, total cross country hours, total cross country hours in past 12 months and accident and incident occurrences.

The means showed that the majority of pilots (65.31%) fell between 51 to 150 total flight hours. It further showed that most pilots (83.68%) had less than 90 hours PIC. This finding suggests that the majority of pilots who participated in the study were still in training. Only one pilot reported being involved in an accident and 13 reported being involved in an incident. Given the sample size this would appear to be representative of the New Zealand aviation population.

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Table 3
Pilot in command, total hours, past 12 months and Cross-country hours.

Variable	Included cases (n=49)	
	%	(n)
<i>How many total flight hours do you currently have?</i>		
10-50	8.16	(4)
51-100	26.53	(13)
101-150	38.78	(19)
151-200	8.16	(4)
<i>How many hours have you flown in the past 12 months?</i>		
10-30	8.16	(4)
31-50	10.20	(5)
51-70	16.33	(8)
71-90	22.45	(11)
91-110	16.33	(8)
111+	26.53	(13)
<i>How many total hours do you have as 'Pilot in command'?^a</i>		
10-30	16.33	(8)
31-50	22.45	(11)
51-70	24.49	(12)
71-90	20.41	(10)
91-110	6.12	(3)
111-130	4.08	(2)
131-150	0	(0)
151-170	2.04	(1)
171-190	4.08	(2)
<i>How many hours as 'Pilot in Command' have you had in the past 12 months?^a</i>		
10-30	20.41	(10)
31-50	34.69	(17)
51-70	22.45	(11)
71-90	10.20	(5)
91-110	4.08	(2)
111-130	0	(0)
131-150	2.04	(1)
151-170	0	(0)
171-190	4.08	(2)
<i>How many total hours of cross country VFR flight time do you have?</i>		
10-30	18.37	(9)
31-50	24.49	(12)
51-70	26.53	(13)
71-90	8.16	(4)
91-110	12.24	(6)
111+	10.20	(5)
<i>How many hours cross country VFR flight time do you have in the past 12 months?</i>		
10-30	30.61	(15)
31-50	28.57	(14)
51-70	12.24	(6)
71-90	10.20	(5)
91-110	12.24	(6)
111+	6.12	(3)
<i>Have you ever been involved in an accident or incident that has been reported to the CAA or the Transport Accident Investigation Commission? Note: Accident as defined by the CAA AC12.1 sub-part 12.51 (p.3).</i>		
Accident	2.04	(1)
Incident	26.53	(13)
Both	0	(0)
No	71.43	(35)

Note: ^a The participants were presented with 12 options, however, no participants selected an option above the 9 presented in this table.

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Table 4 displays the means and standard deviations for the CARE and DOSPERT scales (total), the sub-scales and the domains. It also shows the descriptive statistics for the In-flight vignettes (total) and for the In-flight domains (weather, get-there-itis, social and areas of concern). Cronbach Alpha scores for the CARE and DOSPERT sub-scales are also provided.

Table 4
Descriptive Statistics for the CARE, DOSPERT and In-flight vignettes.

Variable	Mean	SD	α
In-flight Vignette Total^a	2.29	.81	
CARE Total^b	2.64	.75	
DOSPERT Total^b	3.67	.46	
CARE Sub-scales			
Expected Involvement	2.52	.89	.932
Expected Benefits	2.44	.93	.930
Expected Risks	3.00	1.01	.944
DOSPERT Sub-scales			
Risk-taking	3.62	.58	.775
Risk Perceptions	3.80	.74	.890
Expected Benefits	3.55	.76	.889
CARE Domains			
Illicit Drug Use	1.55	.90	
Aggressive and Illegal Behaviours	1.83	.66	
Risky Sexual Behaviours	2.50	1.22	
Heavy Drinking	3.88	1.75	
High risk Sports	5.04	1.10	
Academic/Work Behaviours	2.45	1.02	
DOSPERT Domains			
Health and Safety	3.18	1.00	
Social	4.90	.57	
Recreational	4.74	.83	
Ethical	2.70	.65	
Financial	2.71	.80	
In-flight Vignette Domains			
Weather	2.40	.92	
Get-there-itis	2.26	.95	
Social	2.11	.79	
Areas of Concern	2.39	.90	

Note: ^a Participants were presented with a scale from 1-5. ^b Participants were presented with a scale from 1-7.

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Katz *et al.* (2000) reported Cronbach Alpha coefficient scores for the CARE sub-scales of .83 (Expected Risks) and .84 (Expected Benefit). Results reported for Study three were higher than those reported by Katz *et al.* (2000). Cronbach Alpha coefficient scores found in Study three were consistent with the reported score of .78 for the Risk-taking scale, but higher than the reported score of .77 for the Risk Perception scale for the DOSPERT in Blais and Weber (2006).

Internal consistency for the CARE expected involvement scale was reported at $\alpha = .932$ and could not be improved further by the removal of any item(s). The internal consistency for the CARE expected benefits scale was reported at $\alpha = .930$. This could be improved further to $\alpha = .931$ by the removal of questions 15 (rock or mountain climbing), 24 (snow or water skiing), 27 (involvement in sexual activities without my consent) and 30 (playing individual sports). The CARE expected risk scale internal consistency was reported at $\alpha = .944$. This could be improved to $\alpha = .945$ with the removal of question 24 (snow or water skiing), or $\alpha = .946$ with the removal of question 15 (rock or mountain climbing).

Internal consistency is reported at $\alpha = .775$ for the DOSPERT risk-taking scale. This scale could not be improved further by the removal of any item(s). The DOSPERT risk perception scale reported an internal consistency score of $\alpha = .890$. This could be improved to $\alpha = .891$ with the removal of question 1 (admitting that your tastes are different from those of a friend), or to $\alpha = .892$ with the removal of questions 6 (taking some questionable deductions on your income tax return), 27 (moving to a city far away

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from your extended family) and 30 (not returning a wallet you found that contains \$200). With the removal of question 25 (piloting a small plane) the alpha level improves to $\alpha = .893$. The internal consistency score for the DOSPERT expect benefits scale was reported at $\alpha = .889$. This could be improved to $\alpha = .890$ with the removal of questions 21 (choosing a career that you truly enjoy over a more prestigious one) and 27 (moving to a city far away from your extended family) and $\alpha = .893$ with the removal of question 6 (taking some questionable deductions on your income tax return).

These changes are important to note, however, it is commonly accepted in research⁶ that for a change to be significant it would be required to cause a change of greater than $\alpha = .05$ (personal communication, Andy Towers, Research Officer, Massey University, 15 August, 2011). Therefore, because only small increases in alpha would be achieved (below .05), it was decided that these did not justify adjusting the data.

5.2 Research Question Two

Research question two aimed to determine whether there was a relationship between everyday risk-seeking behaviours and risk-taking in-flight. This was assessed by conducting two bivariate Pearson's product-movement correlation (r) scores for the total CARE and DOSPERT scores against the total mean score of the individual's confidence ratings of the in-flight vignettes. These scores were calculated by dividing the sum of the vignette scores by the total number of vignettes (16). Prior to calculating

⁶ Upon investigation of the literature, there appears to be no explicit level of significance to change the scale based on Cronbach Alpha scores. A personal communication with Andy Towers reported that such a level is commonly accepted to be .05 although the reasons for this are unknown.

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r , a visual inspection of the normal Q-Q and detrended Q-Q plots for each variable confirmed that the data were normally distributed. Similarly, visual inspection of the scatterplots of the CARE and DOSPERT scores against the mean in-flight vignette score confirmed that the relationships between these variables were linear. Therefore, all four assumptions of independence, normality, linearity and homoscedasticity were met prior calculating the correlation. The correlation between the CARE scale score and the risk-taking in-flight vignette score was found to be a statistically significant, positive relationship of medium strength, $r(47) = .430, p = .003$. The correlation between the DOSPERT scale score and risk-taking in-flight vignette score was found to be a statistically significant, positive relationship of medium strength, $r(47) = .411, p = .004$.

The r^2 value indicated that the correlation between the DOSPERT Scale and the in-flight total domain score accounted for 16.9% of the variability in the relationship.

Between the CARE Scale and the in-flight total domain score the r^2 value indicated that the correlation accounted for 18.5% of the variability in the relationship. This finding supports Drinkwater and Molesworth (2010) and Hunter (2006) who found that everyday and driving risks were positively and significantly correlated to risk-perceptions of risky in-flight scenarios. This suggests that pilots who take risks in their everyday life are more likely to undertake risks in flight.

5.3 Research Question Three

Research question three aimed to determine which domains of the everyday risk-seeking behaviours correlated significantly with the domains of the risk-taking in-flight

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behaviours. The risk-seeking behaviour domains were specified in the DOSPERT as 1) Health and safety, 2) social, 3) recreational, 4) ethical and 5) financial domains and in the CARE domains of 1) Illicit Drug Use, 2) Aggressive and Illegal Behaviours, 3) Risky Sexual Behaviours, 4) Heavy Drinking, 5) High Risk Sports and 6) Academic/Work Behaviours. The risk-taking behaviours were outlined in the four in-flight vignette domains: 1) weather, 2) get-there-itis, 3) social and 4) areas of concern. The relationships between the variables were assessed using multiple bivariate Pearson's product moment correlations (r) between the scale domains and the vignette domains. Prior to calculating r , a visual inspection of the normal Q-Q and detrended Q-Q plots for the variables confirmed that the data was normally distributed. Furthermore, a visual inspection of the scatterplots between each of the variables confirmed that the relationships between each were linear. As such, all four assumptions of independence, normality, linearity and homoscedasticity were met for the variables prior to the correlations being calculated. A total of twenty-four significant relationships were found between the risk-seeking behaviours domains and the risk-taking in-flight domains. Of these, nine relationships were found between the DOSPERT domains against the in-flight vignette domains and fifteen were found between the CARE domains against the in-flight vignette domains. Table 5 displays the correlations between the CARE and DOSPERT domains and the in-flight vignette domains.

5.3.1 DOSPERT domains against the In-flight vignette domains

The DOSPERT domains were found to have nine statistically significant results out of

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Table 5

Correlations between the CARE and DOSPERT scale domains and the in-flight vignette domains.

VARIABLE	In-Flight Vignettes			
	Weather	Get-there-itis	Social	Areas of Concern
DOSPERT				
Health and Safety	.334*	.541***	.398**	.472**
Social	.449**	.504***	.409**	.557***
Recreational	.127	.251	.255	.070
Ethical	-.191	.064	.029	.037
Financial	-.285*	-.141	-.153	-.035
CARE				
Illicit Drug Use	.356*	.461**	.265	.469**
Aggressive and Illegal Behaviours	.194	.287*	.214	.244
Risky Sexual Behaviours	.302*	.568***	.313*	.485***
Heavy Drinking	.174	.427**	.111	.303*
High Risk Sports	.129	.346*	.191	.103
Academic/Work Behaviours	.534***	.608***	.479***	.617***

Note: * $p < .05$. ** $p < .01$. *** $p < .001$

20 against the in-flight domain scores. This included all the health and safety and social domain areas, and the financial domain against the weather vignette domain. The health and safety domain was found to have three positive, medium relationships against the weather, $r(47) = .334, p = .019$; social, $r(47) = .398, p = .005$; and area of concern domains, $r(47) = .472, p = .001$. The relationship against the get-there-itis domain was found to be positive and large, $r(47) = .541, p < .001$. The social domain was found to have two positive, medium relationships against the weather, $r(47) = .449, p = .001$ and social domains, $r(47) = .409, p = .004$. Positive and large relationships were found against the get-there-itis domain, $r(47) = .504, p < .001$ and the areas of concern domain, $r(47) = .557, p < .001$. These findings suggest that as the participant's level of

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risk-seeking behaviour increased their levels of risk-taking behaviour in-flight increased. The financial domain was found to be a single small strength, statistically significant negative relationship against the weather domain, $r(47) = -.285, p = .047$. Although this domain did not find any further statistically significant results, all of the correlations were in a negative direction. This suggested that as the participant's increased their risk-seeking behaviours in the financial domain, their likelihood of being involved in risk-taking behaviours in-flight decreased.

Weather

The weather vignette domain correlated significantly with the health and safety, social and financial domains of the DOSPERT. For both the health and safety domain and the social domain the relationships were positive. This suggested that as the risk-seeking behaviours in these two domains increased, the likelihood of taking weather related risks in-flight also increased. The r^2 value found for the health and safety domain indicated that 11% of the variability was explained in the relationship by the correlation with the weather vignette domain. The r^2 value found for the social domain indicated that 20.1% of the variability is explained in the relationship by the correlation with the weather vignette domain. This supports research which has found that pilots take weather related risks in-flight (Goh, O'Hare & Wiegmann, 2007; Hunter, Martinussen, Wiggins, & O'Hare, 2011; O'Hare & Owen, 1999; 2001; O'Hare & Smitheram, 1995; Wiggins, Connan & Morris, 1996). The relationship between the finance domain and the risk-taking in-flight vignette domains were found to be in a negative direction. Of these relationships, only the relationship with the weather vignette domain was found to

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be statistically significant. This result suggested that as a participant's likelihood of risk-seeking behaviours in the financial domain increased, their probability of taking risks in-flight decreased. Although this finding may only be spurious, the results are trending in the opposite direction than what would normally be expected (Zaleskiewicz, 2001; Zuckerman & Kuhlman, 2000). A possible explanation for this could be due to the cost of pilot training; thus, pilots who take financial risks may not be able to afford the expense of training (Van Den Bergh, 2011).

Get-there-itis

The get-there-itis vignette domain was found to be significantly correlated with the health and safety and social domains of the DOSPERT. As participants increased their likelihood of risk-seeking behaviours in these two domains, their potential for taking get-there-itis type risks in-flight increased. For both of these domains the relationship was found to be strong. The r^2 values indicated that the correlations found against the domains account for 29.2% (health and safety) and 25.4% (social) of the variability in the relationship against the get-there-itis vignette domain. These findings support the research conducted by Goh *et al.* (2007) and Bearman *et al.* (2009) who found that pilots took get-there-itis type risks in-flight. A possible explanation for the relationship between the social domain and the get-there-itis vignette domain could be the social type elements that lead to pilots undertaking these types of risks. For example, a pilot who is in a hurry to make it home for a party, wedding, birth of a child etc is more likely to conduct a VFR into IMC operation than those who do not have a reason to hurry home (Burian, Orasanu, & Hitt, 2000; FAA, 2011e). The reason for the relationship

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between the health and safety domain and the get-there-it-is vignette domain is potentially related to the social aspect of the health and safety questions such as “Drinking heavily at a social function”. This would further confirm the relationship between get-there-it-is vignette domain and the social domain found above.

Social

The social vignette domain was found to be statistically significant with the health and safety domain and the social domain of the DOSPERT. This finding suggests that as the participant’s risk-seeking behaviours in the health and safety and social domains increased, their likelihood of taking social type risks in-flight increased. It is coherent that a person who takes risks socially in their everyday life would take social risks in-flight also (Goh & Weigmann, 2001; 2002). The r^2 value found suggested that correlation accounted for 15.8% (health and safety) and 16.7% (social) of the variability in the relationship against the social vignette domain. This finding supports research conducted by Jensen (1982) who found that social influences increase the probability of accidents occurring in-flight.

Areas of Concern

The area of concern vignette domain was found to have positive, statistically significant relationships with both the health and safety and the social domains of the DOSPERT. This finding suggested that as the participants reported risk-seeking behaviours in the health and safety and the social domains, their willingness to undertake risks within the areas of concern vignette domain increased. The r^2 values reported indicated that 22.3%

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(health and safety) and 31% (social) of the variability in the relationship was accounted for with the correlation against the areas of concern vignette domain.

Of further note, is that no statistically significant results against the DOSPERT recreational and ethical domains were observed. This suggests that pilots who undertake recreational or ethical type risks do not take risks in-flight. A possible explanation for this is that people who take these types of risk do so in other areas of their life. For example, people who seek out adrenaline may undertake skydiving (recreational risk) as opposed to doing so while flying.

5.3.2 CARE domains against the In-flight vignette domains

The CARE domains were found to have 15 statistically significant results out of 24 against the in-flight domains. Three positive, medium relationships were found between the Illicit Drug Use domain against the weather, $r(47) = .356, p = .014$, get-there-itis, $r(47) = .461, p = .001$; and areas of concern domains, $r(47) = .469, p = .001$. A positive, but weak relationship was found between Aggressive and Illegal behaviours and the get-there-itis domain, $r(47) = .287, p = .048$. Risky sexual behaviours was found to have three positive, medium relationships against the weather, $r(47) = .302, p = .037$; social, $r(47) = .313, p = .031$ and areas of concern domains, $r(47) = .485, p < .001$. A positive, large relationship was found against the get-there-itis domain, $r(47) = .568, p < .001$. The heavy drinking domain was found to have two positive, medium relationships between the get-there-itis, $r(47) = .427, p = .002$ and areas of concern domains, $r(47) = .303, p = .036$. The relationship between the high risk sports domain and the get-there-itis domain

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was found to be positive and medium strength, $r(47) = .346, p = .016$. The relationship between academic/work behaviours and the social domain was found to be positive and medium strength, $r(47) = .479, p < .001$. The academic/work behaviours domain was found to be positive and large against the weather, $r(47) = .534, p < .001$; get-there-itis, $r(47) = .608, p < .001$ and areas of concern domains, $r(47) = .617, p < .001$. These findings suggest that as a participant's level of risk-seeking behaviours (as measured by the CARE domains) increased, the participant's confidence levels for risk-taking behaviours in-flight also increased.

Weather

The CARE's illicit drug use, risky sexual behaviours and academic/work behaviours domains reported significant, positive correlations with the weather vignette domain. As the potential for risk-seeking behaviours in the domains increased, the likelihood to take weather related risks in-flight increased. Based on the r^2 values calculated, the correlations accounted for 12.7% (illicit drug use), 9.1% (risky sexual behaviours) and 28.5% (academic/work behaviours) of the variability in the relationship against the weather vignette domain. Consistent with the findings from the DOSPERT, these results further support the research conducted by Goh *et al.* (2007), Hunter *et al.* (2011), O'Hare and Owen (1999; 2001), O'Hare and Smitheram (1995), and Wiggins *et al.* (1996) who found a relationship between pilots and weather related risk-taking.

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Get-there-itis

The CARE domains were found to be statistically significant correlations against the get-there-itis vignette domain. This finding suggests that all areas of risk-seeking behaviours measured by the CARE scale have a relationship with the potential for a pilot to undertake risky, get-there-itis type behaviours. The correlation between the get-there-itis vignette domain and the CARE domains accounted for 21.3% (Illicit drug use), 8.2% (Aggressive and Illegal behaviours), 32.3% (Risky sexual behaviour), 18.2% (Heavy drinking), 12% (high risk sport) and 37% (Academic/work behaviours) of the variability in the relationship based on the r^2 values found. This supports research which reported that get-there-itis is a potential problem with pilots (Bearman, Paletz, & Orasanu, 2009; Orasanu, Martin & Davison, 2001).

Social

The CARE domains of Risky sexual behaviours and academic/work behaviours were found to be significantly correlated against the Social vignette domain. Participants who expressed that they were more likely to undertake sexual risks or risks with their academic or work behaviours were more inclined to undertake social type risks in-flight. The r^2 values indicated that 9.8% (social) and 22.9% (academic/work behaviours) of the variability in the relationship was accounted for by the correlation against the social in-flight risk-taking. This further supports research conducted by Jensen (1982) who found that social influences led to an increase in aviation accidents.

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Areas of Concern

The areas of concern vignette domain was further found to have positive, statistically significant relationships with the illicit drug use, risky sexual behaviours, heavy drinking and academic/work behaviour domains of the CARE. The r^2 values indicated that 22% (illicit drug use), 23.5% (risky sexual behaviours), 9.3% (heavy drinking), and 38.1% (academic/work behaviours) of the variability in the relationship was accounted for by the correlation against the areas of concern vignette domain. These findings supported the concerns mentioned by the flight instructors in Study One, and warrant further investigation in future research.

5.3.3 CARE and DOSPERT against Areas of Concern Vignettes

As the Areas of Concern domain had four distinct vignette areas (Alcohol, Caffeine, Fatigue and Breaches in Class Two Medicals), it was important to assess if these individually had a relationship with the CARE and DOSPERT domains. These were calculated by conducting multiple bivariate Pearson's (r) correlations. These results are presented in Table 6. Prior to calculating r ; a visual inspection of the normal Q-Q and detrended Q-Q plots for the variables confirmed that the data was normally distributed. Furthermore, a visual inspection of the scatterplots between each of the variables confirmed that the relationships between each were linear. Therefore, all four assumptions of independence, normality, linearity and homoscedasticity were met for the variables prior to the correlations being calculated.

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Table 6

Correlations between the CARE and DOSPERT Scale domains and the specific Areas of Concern vignettes.

VARIABLE	Areas of Concern vignettes			
	Alcohol	Caffeine	Breaches (Glasses)	Fatigue
DOSPERT				
Health and Safety	.399**	.266	.471**	.255
Social	.421**	.410**	.400**	.409**
Recreational	-.142	.279	.060	.038
Ethical	.058	-.132	.165	.008
Financial	.026	-.094	-.075	.031
CARE				
Illicit Drug Use	.252	.491***	.316*	.287
Aggressive and Illegal Behaviours	.104	.408**	.050	.176
Risky Sexual Behaviours	.313*	.368*	.471**	.278
Heavy Drinking	.198	.228	.353*	.113
High Risk Sports	-.013	.538***	-.003	-.003
Academic/Work Behaviours	.308*	.375**	.540***	.447**

Note: * $p < .05$. ** $p < .01$. *** $p < .001$

DOSPERT domains against the Areas of Concern Vignettes.

The DOPSERT domains were found to have six statistically significant relationships out of 20 against the individual Areas of Concern vignettes. The Health and safety domain against the Alcohol vignette was found to be positive, and of medium strength, $r(47) = .399$, $p = .005$. Against the breaches in class two medical (glasses) vignette, the relationship with the health and safety domain was found to be positive, and of medium strength, $r(47) = .471$, $p = .001$. The social domain was found to have positive, medium strength relationships with all of the vignette areas. Correlations against alcohol, $r(47) = .421$, $p = .003$; caffeine, $r(47) = .410$, $p = .004$; breaches in class two medicals (glasses),

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$r(47) = .400, p = .005$, and fatigue vignettes, $r(47) = .409, p = .004$, were found. These findings suggest that as a participant's level of social risk-seeking behaviours increase, their confidence levels for risk-taking behaviours within all of the 'areas of concern' increases.

CARE domains against the Areas of Concern Vignettes.

The CARE domains were found to have 12 statistically significant relationships out of 24 against the individual Areas of Concern vignettes. The illicit drug use domain was found to have two positive, medium strength relationships with the caffeine, $r(47) = .491, p < .001$, and breaches in class two medical (glasses) vignettes, $r(47) = .316, p = .031$. A positive, medium strength relationship was found between the aggressive and illegal behaviours domain and the caffeine vignette, $r(47) = .408, p = .004$. The risky sexual behaviours domain was found to have three positive, medium strength relationships with the alcohol, $r(47) = .313, p = .030$; caffeine, $r(47) = .368, p = .010$; and breaches in class two medical (glasses) vignettes, $r(47) = .471, p = .001$. The heavy drinking domain was found to be a positive, medium strength relationship against the breaches in class two medical (glasses) vignette, $r(47) = .353, p = .014$. A positive, large relationship of $r(47) = .538, p < .001$, was found between the sports domain and the caffeine vignette. The academic/work behaviours domain was found to have three positive, medium strength relationships against the alcohol, $r(47) = .464, p = .001$; caffeine, $r(47) = .375, p = .008$; and fatigue vignettes, $r(47) = .447, p = .001$. The relationship between the academic/work behaviours domain and the breaches in class two medical (glasses) vignette was found to be a positive and large, $r(47) = .540, p <$

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.001. These findings suggest that as a participant's level of risk-seeking behaviours increased, their confidence levels for risk-taking in-flight also increased.

Alcohol

The alcohol vignette was found to be significantly correlated against four risk-seeking domains. The r^2 values indicated that the correlations account for 15.9% (Health and Safety, DOSPERT), 17.7% (Social, DOSPERT), 9.8% (Risky Sexual, CARE), and 21.5% (Academic/work behaviours, CARE) of the variability in the relationship with the alcohol vignette. These relationships are consistent with the common view that alcohol can become a health and safety concern (Yen, Ragland, Greiner & Fisher, 1999), be linked with social problems (Edwards, 1997), lead to risky sexual behaviours (Testa & Collins, 1997) and create problematic academic and work behaviours (Yen *et al.*, 1999). The finding further supported Canfield, Hordinsky, Millett, Endecott, & Smith, (2000) who found that alcohol lead to an increased likelihood of being involved in an aviation accident.

Caffeine

The caffeine vignette was found to have significant correlations against six risk-seeking domains. The r^2 values reported indicated that the correlations account for 16.8% (Social, DOSPERT), 24.1% (Illicit Drug Use, CARE), 16.6% (Aggressive and Illegal Behaviours, CARE), 13.5% (Risky sexual behaviours, CARE), 28.9% (High risk sports, CARE) and 14% (Academic/work behaviours, CARE) of the variability in the relationship with the caffeine vignette. The relationship between caffeine and academic

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and work behaviours is consistent with the concerns expressed by the flight instructors in Study One, who noted that they believed that students may be taking caffeine to stay alert due to increasing workloads. This concern was supported by Muthard and Wickens (2003) who found that high workloads were leading to aviation accidents. These relationships also support research by Depperchmidit *et al.* (2010), and Lohi *et al.* (2007) who investigated caffeine use among pilots.

Breaches in class two medicals (glasses)

Statistically significant results were found between the breaches in class two medical (glasses) vignette and six of the risk-seeking domains. The values reported by r^2 indicated that 22.2% (health and safety, DOSPERT), 16% (Social, DOSPERT), 10% (illicit drug use, CARE), 22.2% (risky sexual behaviours, CARE), 12.5% (heavy drinking, CARE), and 29.2% (academic/work behaviours, CARE) of the variability in the relationship was accounted for by the correlation against the breaches in class two medical (glasses) vignette. This supports the concern expressed by the flight instructors in Study One about potential breaches in class two medicals and findings reported by Nakagawara *et al.* (2001) on accidents caused by corrective glasses and pilots. Further research is essential in this area to understand these relationships in greater depth.

Fatigue

The fatigue vignette was found to have two statistically significant results against the risk-seeking vignettes. The first r^2 value found indicated that the correlation accounted for 16.7% of the variability in the relationship between the DOSPERT social domain

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and the fatigue vignette. The second r^2 value indicated that 22.8% of the variability was accounted for by the correlation in the relationship between the CARE academic/work behaviours domain and the fatigue vignette. These findings are consistent with previous research which found that fatigue was a cause for accidents in the aviation field (Caldwell, 2005; Goode, 2003; NASA, 1999; Taneja, 2007).

CHAPTER SIX

GENERAL DISCUSSION

“Don’t be a show-off. Never be too proud to turn back. There are old pilots and bold pilots, but no old, bold pilots.” E. Hamilton Lee (1949).

6.1 Overview

This chapter discusses the implications and potential practical applications of the studies that were conducted within this thesis. The research questions are first addressed and then the implications for the aviation safety community are discussed. It is important to note that the explanations presented as possible causes for the relationships are speculative. This chapter concludes by presenting the limitations of the research and directions for future studies.

6.2 Summary of findings

A literature review revealed that little research has been conducted on the relationship between risk seeking behaviours and risk taking in-flight. The existing literature focuses on the pilot’s attitudes towards risk seeking in-flight rather than on everyday risk.

Drinkwater and Molesworth (2010) and Hunter (2006) briefly examined the relationship between everyday risks and risk taking in-flight, however since the publication of these articles, further research has not been conducted to examine this phenomenon further.

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This raised the question about what the nature of the relationship between risk-seeking behaviours and risk-taking in-flight was, and whether pilot's who took risks in their everyday lives were more likely to take risks in-flight. Four research questions were developed to test the research problem identified in this thesis, whether there is a relationship between risk-seeking behaviours and risk-taking in-flight.

6.2.1 Research Question One

Are there other areas outside of the reasons for differences between GA accident numbers and Airliner accident numbers, aviation specific risk-seeking behaviours (i.e. Hazardous Attitudes), and the risk-taking behaviours in-flight as guided by the HFACS that could be considered risk-taking behaviours in-flight by pilots?

Research question one was addressed in Study One: The Focus Group. The participants comprised of six New Zealand flight instructors who were asked if they knew of any factors, outside of the reasons for differences between GA accident numbers and Airliner accident numbers, aviation specific risk-seeking behaviours (i.e. Hazardous Attitudes), and the risk-taking behaviours in-flight as guided by the HFACS that could be considered risk-taking behaviours in-flight by pilots and therefore should be considered an 'area of concern' by the New Zealand aviation training community. The focus group moderator directed the participants to mention areas of concern that they had directly observed or had read about on popular media sites, without the pressures that come with one-on-one interviews. By using a focus group methodology, it allowed the participants to discuss the areas that they believed were concerning and let other

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group members contribute to discussion. These discussions led to themes developing which were then extracted for the In-flight vignettes. The vignettes were developed in the areas of: alcohol, caffeine, breaches in class two medicals (glasses) and fatigue. A literature search revealed that little research had been conducted in relation to the affects of alcohol, caffeine, breaches in class two medicals (glasses) and fatigue on the pilot's risk-taking behaviours in-flight. Of the existing literature, it focused on the affects of the concern areas in comparison to piloting skills. For example, Davenport and Harris (1992) found that small amounts of alcohol led to a decrease in simple piloting skills such as flying straight and level. Caldwell (2005), Goode (2003) and Taneja (2007) reported that a positive relationship between pilot fatigue and aviation accidents. Nakagawara, Montgomery and Wood (2001) found that pilot's failing to wear glasses was a cause of accidents in aviation. Although Caska and Molesworth (2007) reported that the use of caffeine (up to 200mg) can increase piloting skill on mildly fatigued pilots, Lohi *et al.* (2007) outlined that caffeine use should not be used by pilots as the effects are unknown. As the examples above suggest, the focus group had justification in believing that the areas of alcohol, caffeine, breaches in class two medicals (glasses) and fatigue may be influencing aviation accident numbers. The current research attempted to investigate whether there was a relationship between these 'areas of concern' and risk-seeking behaviours. Results reported that when the individual vignettes were formed into the 'Areas of Concern' domain, that there were 6 significant relationships out of 11 against risk-seeking behaviours. When the vignettes were calculated on their own against risk-seeking behaviours, results found that there were 18 significant relationships out of 44. These findings suggest that there is a relationship

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between alcohol, caffeine, breaches in class two medicals (glasses) and fatigue and risk-seeking behaviours, which provides support to the ‘areas of concern’ outlined by the focus group. This support is evidenced in the relationship between everyday risk-seeking behaviours and risk-taking behaviours in-flight.

6.2.2 Research Question Two

Is there a relationship between everyday risk-seeking behaviours and risk-taking in-flight?

Study Three was developed in order to investigate research question two. It used the methodology of an online survey format and presented both psychometric measures and vignette based questions to the participants. The psychometric measures were used to examine the risk-seeking behaviours of the participants. The use of the vignettes allowed for the investigation of the risk-taking behaviours of pilot’s during in-flight situations. Results suggested that there is a statistically significant relationship between risk-seeking behaviours and risk-taking behaviours in-flight. This finding was evidenced on the relationship between the CARE scale and the in-flight vignettes which found a statistically significant result, where the correlation between the variables accounted for 18.5% of the variability in the relationship. The second psychometric measure, the DOSPERT, was also found to have a statistically significant relationship with the in-flight vignettes, where the correlation between the variables accounted for 16.9% of the variability in the relationship. These findings are consistent with Drinkwater and Molesworth (2010) and Hunter (2006) who found statistically

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significant results between everyday risks and risk-taking in flight situations. The results found in the current study are important for future researchers to replicate to ensure the robustness of these findings, as they may be able to guide further policies in general aviation pilot selection.

6.2.3 Research Question Three

Do the risk-seeking domains correlate to the domains of risk-taking in-flight?

Study Three found that 24 out of 44 relationships were statistically significant between the risk-seeking domains as outlined by the DOSPERT and CARE scales and the risk-taking behaviours as investigated through the use of the in-flight vignette domains. Within the DOSPERT, the domains of Health and Safety and Social were reported to have statistically significant results with all of the in-flight vignette domains. The CARE domains of Risky Sexual Behaviours and Academic/Work Behaviours also found statistically significant relationships with all of the in-flight vignette domains. These findings suggest that participant's who reported risk-seeking behaviours in the domains of health and safety, social, risky sexual behaviours or academic/work behaviours were more likely to report that they were confident to continue on with the risk-taking vignettes. These results are consistent with Hunter (2006) and Drinkwater and Molesworth (2010) who found significant results between everyday risk-seeking behaviours and risk-taking in-flight. However, the causes for the specific domain relationships are unknown and should be investigated by future researchers in order to understand the nature of these relationships. The DOSPERT financial domain found

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negative relationships with all vignette areas. This finding suggested that as the participant's levels of engagement in financial risks increased, their participation in risky in-flight behaviours decreased. These results trend in the opposite direction to what would be expected (Zaleskiewicz, 2001; Zuckerman & Kuhlman, 2000) and the causes for these results are unknown. Overall, the results found for the positive, significant relationships between the risk-seeking domains and the risk-taking in-flight vignette domains support the findings found by Hunter (2006) and Drinkwater and Molesworth (2010). These results provide further support for the findings in research question two. It is important for further research to replicate the current study in order to test the robustness of these findings.

6.3 Implications for the aviation safety

A number of important implications have been identified through the process of completing this thesis. First, the number of accidents within the GA community is still increasing even with the current models of Human Error seeking to increase the overall levels of flight safety and reduce the total aviation accident numbers. This leads to a need for investigation into new avenues of Human Error/Human Factors in order to combat the increasing accident numbers. The current research identified four areas that New Zealand flight instructors believed might be leading to increases in accidents: alcohol, caffeine, fatigue and breaches in class two medicals. Future research in relation to these four areas would allow for the aviation safety community to better regulate them. In New Zealand, a requirement to follow regulations provided by the FAA in relation to alcohol limits needs to be implemented. The vagueness of current regulations

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in New Zealand could be a cause for confusion and consequently accident involvement. As research has shown, even small quantities of alcohol in the blood stream of pilots can cause a reduction in piloting skill (Davenport & Harris, 1992).

Further research in regards to the use of caffeine and piloting also needs to be conducted. Only small amounts of literature in this area were able to be located for the purpose of this thesis (Lohi *et al.*, 2007). Study Three showed that pilots were confident on continuing on with the flight after taking two caffeine tablets. As the effects of taking caffeine on piloting skill is relatively unknown, it is important to investigate this area further.

The affects of fatigue on pilots is well documented within peer reviewed publications (Caldwell, 2005; Goode, 2003; NASA, 1999; Taneja, 2007). Results found in the current study support these findings by reporting a correlation between fatigue and social and academic/work risk-seeking domains. Due to high work-loads for pilots in both trainee and commercial operations (Airbus, 2006; Muthard & Wickens, 2003), it is important that rules and guidelines are implemented so that pilots must have compulsory extended rest breaks in order to combat the effects of fatigue. This recommendation is supported by Caldwell (2005), Neri *et al.* (2002) and Petrilli, Roach, Dawson and Lamond (2006).

Research into breaches in class two medicals should be conducted by the CAANZ. The level of awareness of pilots needs to be investigated. Through Study One, the flight

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instructors mentioned how they believed many pilots do not know that they must go to aviation doctors for medications, or carry spare glasses etc. Although the CAANZ regulates when to see an aviation medical examiner, the finding suggests that the pilots either have not received this information (not-readily accessible) or they are wilfully ignoring the rules. This has an important implication for the industry. Either, the information that the CAANZ believes is getting out to its pilots through the rules and regulations, its website and Vector Magazine is not, or the pilots do not see the importance of following the rules.

There was a statistically significant correlation found between everyday risk-seeking behaviours and risk-taking in-flight. The finding supports Drinkwater and Molesworth (2010) and Hunter (2006) who found statistically significant results between everyday risks and risk-taking in flight situations. It suggests that pilots who are more inclined to taking risks in their everyday lives are more likely to do so while flying. This has an important implication for the aviation safety community as it shows that it is an area that needs to be investigated further. By combining this type of research with other areas under the HFACS model (Wiegmann & Shappell, 2001) and psychological screening tools, a vetting process for the GA population could potentially become a reality (Gonzalez, 2003; Hunter, 2002). It is important to develop such a screening tool for GA pilots in order to increase aviation safety. This is supported by the reduction in accidents in aviation fields that screen their pilots already; such as commercial operators and the military. As GA contributes the greatest number of accidents, it seems logical to assess the nature of potential pilots in areas of everyday risk-seeking (Drinkwater &

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Molesworth, 2010; Hunter, 2006), psychological fitness (Helmreich *et al.*, 1999; Wiegmann & Shappell, 2001), and medical fitness (Caldwell, 2005; Goode, 2003; Lauber, 1996; Reinhart, 1996; Taneja, 2007).

6.4 Limitations

It is important to note that there are a number of potential limitations in the three studies that comprise this thesis. First, the results found in Study Three are the first reported in the aviation safety field. Therefore, there may be discrepancies with these results in future research. A possible cause for these discrepancies (if they occur) may be due to Type I or Type II error. This suggests that at least some of the results may be due to false positives or false negatives (Cohen, 1988). In order to address this limitation, further replication of Study Three with a larger sample would need to be conducted to determine the extent to which these errors affected the results, and to identify which of the results are test-retest valid.

Second, a non-probability sampling method was adopted for all of the studies conducted in this thesis. The representativeness of the results to the entire New Zealand and Global pilot training field is unknown. This is due to the New Zealand specific nature of the In-flight vignettes and the variations in training among New Zealand flight training organisations. Although it is acknowledged that this method may reduce the generalisability of the results, the very specific nature of the required participant population made this unavoidable. This type of non-probability sampling is common

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within the aviation safety research field and appears not to affect the robustness of the research being conducted.

Third, for Study Three, an over the internet recruitment method was used. Binek, Mah and Kiesler (1999) report that using the internet to recruit participants, may lead to an unrepresentative sample of the general public. This is because online respondents are usually younger, of a higher education and socio-economic status and male (Binek *et al.*, 1999). Although this limitation is important to note, the purpose of this study was not to generalise to the general population, but to identify whether there was a relationship between everyday risk-seeking behaviours and risk-taking in-flight. Further research would need to be conducted in other countries to be able to draw more generalisable conclusions about the state of pilot training.

Fourth, the sample size for Study Two and Three were small. For Study Two, this had the potential limitation of not adequately changing the psychometric measures enough to allow for understanding within a New Zealand population. Question 13 of the DOSPERT scale was identified as problematic and was changed accordingly. However, further questions may have been identified if a larger, more representative sample of the population was used for Study Two. Unfortunately, due to time constraints for this thesis, gaining a sample size of this nature was not possible. The sample size for Study Three was also small. This may increase the risk of Type I and Type II error, creating the chance of drawing significant results from the data where they should not be drawn, and also the possibility of missing significant results. Although the sample size for

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Study Three is small, many results published in the aviation safety literature are based on small sample sizes (O'Hare & Smitheram, 1995; Wiegmann *et al.*, 2001; Wiggins *et al.*, 1996).

Fifth, the length of the survey may have led to random answering by the participants. If the participants lost focus whilst answering the questions or began answering randomly at any stage while completing the survey then the reported results may further be subject to Type I and Type II error. However, there is no way of verifying if random answering occurred during Study Three. Further replication of Study Three would need to be conducted in order to check the robustness of the study's results.

Sixth, because of the nature of this research, due to ethical and practical reasons, hypothetical In-flight vignettes were used to assess participants' levels of risk-taking in-flight behaviours. It is important to note that the participants may act differently if they faced the same situations presented to them in the in-flight vignettes in-vivo. The presentation of scenarios is more cost effective and provides a way of measuring risk-taking in-flight without putting any participants at risk. The use of scenarios is common within the aviation safety literature, mostly using computer simulators (O'Hare & Owen, 1999; O'Hare & Smitheram, 1995; Wiegmann, Goh & O'Hare, 2002; Wiggins & O'Hare, 2003). By making use of an anonymous online survey, the aim was to reduce the likelihood obtaining Type I and Type II errors through participant response bias (i.e. social desirability bias). The use of scenarios has proven to be more valid than previously thought (Little *et al.*, 1999).

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Seventh, the use of psychometrically validated measures of everyday risks in this thesis may lead to problems with responding. This is due to the measures being validated in the United States and some language differences may not be understood correctly within a New Zealand context. Study Two was conducted in an attempt to address this potential problem, however as mentioned previously the sample size for Study Two was small. Future research in order to validate the measures on a New Zealand population would decrease the probability of the measures incorrectly reflecting risk-seeking behaviours in New Zealand.

Lastly, in the data analysis stage of Study Three, multiple correlations were conducted using the same data set. Hunter (2001) reported problems with conducting multiple correlations, with an increased likelihood of Type I and Type II errors. An alpha level of .05 was set for the analysis to attempt to reduce the probability of these types of error occurring, however they cannot completely nullify the existence of such errors. Further replication of Study Three would allow researchers to determine whether these errors have occurred in the current results.

6.5 Future Research

The current research has proposed two of areas of future research that should be investigated in order to increase levels of safety within the aviation community, and also decrease the number of accidents currently being observed. These are based on the implications of research. First, replication of the current study is required in order to test

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the robustness of the findings. As the relationship between everyday risk and risk taking in-flight is an area of aviation safety that has received little attention in relation to published research, replicating these results is important to assess the validity of the findings.

Second, an investigation into the formulation of a screening process for GA pilots which include assessing everyday risk-seeking behaviours, psychological fitness (including examining the hazardous attitudes as outlined by Hunter, 2003) and medical fitness of potential pilots. This line of investigation is important as currently there is no such process in place. As an academic community it has become clear that training pilots in Human Factors only has limited evidence of working. This is based on the sole fact that aviation accident numbers are still increasing. Within the aviation field, commercial and military operations currently undertake a similar process of vetting their pilots and maybe a reason for the reduced accident numbers in comparison to the GA field.

CHAPTER SEVEN

CONCLUSION

Based on the findings of Drinkwater and Molesworth (2010) and Hunter (2006), this thesis began with the research question of whether there was a relationship between everyday risk-seeking behaviours and risk-taking in-flight. There is a considerable difference between the accident numbers for GA and Airliners, with reasons of the types of flying the pilots are taking, the number of aircraft being operated, what pilots think should be reported as far as accidents are concerned, the affects of flight experience or the number of hours flown, and the affects of training or screening of pilots all being investigated. However, the reasons for the differences are not clear in the literature (Brandt, 1998; Dambier & Hinkelbein, 2006; Goh & Wiegmann, 2001; 2002; Shorrock & Kirwan, 2002; Transport Accident Investigation Commission, 2010). What was clear was that the number one cause for the aviation accidents is Human Error (Dambier & Hinkelbein, 2006; Jensen, 1982; Li, Grabowski, Baker & Rebok, 2006; Shappell & Wiegmann, 2000; 2009; Wiegmann & Shappell, 2001).

A number of models have been presented in order to try and reduce the affects of human error through training, yet the accident numbers have continued to rise. This had an important implication for research – What areas of Human Error, outside of the reasons for differences between GA accident numbers and Airliner accident numbers, aviation specific risk-seeking behaviours (i.e. Hazardous Attitudes), and the risk-taking

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behaviours in-flight as guided by the HFACS that could be considered risk-taking behaviours in-flight by pilots that could be further contributing to aviation accident numbers? Study One was designed to answer this question through the use of a focus group comprising of New Zealand flight instructors. It was found that four areas were identified by the focus group as being an 'area of concern' for pilot risk-taking. These areas were: alcohol consumption, consumption of caffeine, problems with fatigue and breaches in class two medicals. 16 vignettes were then designed in order to test pilots risk-taking in-flight behaviours. All four areas were found to be supported in Study Three when they were reported as being significantly correlated to the risk-seeking behaviour domains.

Study Three utilised two psychometric scales which were validated in Study Two in order to test everyday risk-seeking behaviours. These were then tested for significant correlations against the 16 risk-taking in-flight behaviour vignettes to assess whether there was a relationship between everyday risk-seeking behaviours and risk-taking in-flight. Results found provided further evidence to Drinkwater and Molesworth (2010) and Hunter (2006) when statistically significant results were reported. This finding suggests that pilots who undertake risk seeking behaviours in their everyday lives are more likely to undertake risks while they are flying.

This finding has important implications for the industry and for future research. Future research is required to test the robustness of the current findings and also continue to investigate the relationship between everyday risk-seeking behaviours and risk-taking

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in-flight.

The industry needs to stop focusing on how expensive it would be to develop and implement an 'across the board' GA entrance screening tool and look toward how it would reduce accident numbers and increase the levels of aviation safety. This is clear in the areas of military and commercial aviation where screening tools are currently utilised and the accidents numbers are lower than those within GA. It would need to investigate everyday risk-seeking behaviours (Drinkwater & Molesworth, 2010; Hunter, 2006), psychological fitness (Helmreich *et al.*, 1999; Wiegmann & Shappell, 2001), and medical fitness (Caldwell, 2005; Goode, 2003; Lauber, 1996; Reinhart, 1996; Taneja, 2007). This will stop potential implications of discrimination based on past behaviours when a more holistic approach to assessing the suitability of potential pilots is conducted.

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APPENDIX A

ETHICS APPLICATIONS LOW RISK APPLICATION



MASSEY UNIVERSITY

FILE

10 May 2010

Stephen Carey
23 Nikau Street
PALMERSTON NORTH

Dear Stephen

Re: The Relationship between Risk-Seeking Behaviours and Risk-Taking in Trainee Pilots

Thank you for your Low Risk Notification which was received on 6 May 2010.

Your project has been recorded on the Low Risk Database which is reported in the Annual Report of the Massey University Human Ethics Committees.

The low risk notification for this project is valid for a maximum of three years.

Please notify me if situations subsequently occur which cause you to reconsider your initial ethical analysis that it is safe to proceed without approval by one of the University's Human Ethics Committees.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

A reminder to include the following statement on all public documents:

"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director (Research Ethics), telephone 06 350 5249, e-mail humanethics@massey.ac.nz".

Please note that if a sponsoring organisation, funding authority or a journal in which you wish to publish requires evidence of committee approval (with an approval number), you will have to provide a full application to one of the University's Human Ethics Committees. You should also note that such an approval can only be provided prior to the commencement of the research.

Yours sincerely

John G O'Neill (Professor)
**Chair, Human Ethics Chairs' Committee and
Director (Research Ethics)**

cc Dr Andrew Gilbey
School of Aviation
PN833

Capt Ashok Poduval, GM
School of Aviation
PN833

Dr Stephen Hill
School of Psychology
PN320

Assoc Prof Mandy Morgan, HoS
School of Psychology
PN320

Massey University Human Ethics Committee
Accredited by the Health Research Council

Tē Kunenga
ki Pūrehuroa

Research Ethics Office, Massey University, Private Bag 11222, Palmerston North 4442, New Zealand
T +64 6 350 5573 +64 6 350 5575 F +64 6 350 5622
E humanethics@massey.ac.nz animalethics@massey.ac.nz gtc@massey.ac.nz
www.massey.ac.nz

APPENDIX A – ETHICS APPLICATIONS

MUHEC/SOUTHERN A/10/59



MASSEY UNIVERSITY

23 September 2010

FILE

Mr Stephen Carey
23 Nikau Street
PALMERSTON NORTH

Dear Stephen

Re: HEC: Southern A Application – 10/59
The relationship between risk seeking behaviours and risk taking in trainee pilots

Thank you for your letter dated 22 September 2010.

On behalf of the Massey University Human Ethics Committee: Southern A, I am pleased to advise you that the ethics of your application are now approved. Approval is for three years. If this project has not been completed within three years from the date of this letter, reapproval must be requested.

If the nature, content, location, procedures or personnel of your approved application change, please advise the Secretary of the Committee.

Yours sincerely

Professor Julie Boddy, Chair
Massey University Human Ethics Committee: Southern A

cc Dr Andrew Gilbey
School of Aviation
PN833

Dr Stephen Hill
School of Psychology
PN320

Captain Ashok Poduval, CEO
School of Aviation
PN833


A/Prof Mandy Morgan, HoS
School of Psychology
PN320

Te Kūnenga
ki Pūrehuroa

Massey University Human Ethics Committee
Accredited by the Health Research Council
Research Ethics Office, Massey University, Private Bag 11222, Palmerston North 4442, New Zealand
T +64 6 350 5573 +64 6 350 5575 F +64 6 350 5022
E humanethics@massey.ac.nz anmalethics@massey.ac.nz gtc@massey.ac.nz
www.massey.ac.nz

APPENDIX B

INFORMATION SHEET

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MASSEY UNIVERSITY

The relationship between risk seeking behaviours and risk taking in trainee pilots

Information Sheet for Participants

My name is Stephen Carey and I am currently undertaking my Master of Arts; Majoring in Psychology at Massey University. The purpose of the current exploratory research is to investigate the relationship between Risk seeking behaviours and Risk taking in trainee Pilots.

This type of research appears to be necessary with an increase in media reports outlining risk taking behaviours by pilots whilst in control of large aircraft. Headlines such as "Queenstown Pacific Blue takeoff pilots stood down" (Stuff, 27/07/2010), "Colleagues mourn pilot" (Manawatu Standard, 27/07/2010) and "Pilots under official surveillance for drink, drug problems" (NZ Herald, 24/02/2010), provide support for the need to investigate the relationship between risk seeking behaviour and risk taking in pilots. Further support for the need for the current study can be found with the number of aircraft accidents caused by human error, accounting for 70-80% (Shappell & Wiegmann, 2009).

You will have received an email either from myself directly, or through your aviation training provider. The participant group that we are currently investigating is pilots who have flown more than 10 hours as pilot in command, but no more than 250, over the age of 18 years, and who are fluent readers of English. If this is you, please continue with the rest of this survey.

The survey consists of a presentation of a number of short written flight scenarios. You will be asked to rate your confidence in relation to each of these. Time to complete this research will be approximately 30 minutes.

Some of the questions are directly asking you about personal attitudes and behaviours towards flight safety. Please answer these honestly, as **your responses are completely anonymous**. As soon as you click on the link to the online questionnaire, we have no way of tracking who completed the response forms. Completion of the online questionnaire implies consent.

At the conclusion of the research, the data will be stored at Massey University School of Psychology in a secure location. All data collected will be held in the secure location for five years post research completion. The only person with access to this data will be the current research team.

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- *decline to answer any particular question,*
- *withdraw from the study prior to the submission of your online form,*
- *ask any questions about the study at any time during participation,*
- *provide information on the understanding that you are completely anonymous to the researcher,*
- *be given access to a summary of the project findings when it is concluded.*

When the results have been reported, you as the participants will have access to these findings through another website. The address for this website will be forwarded on to you through the same channels as this initial contact.

What do I do now?

If you are happy to continue, please read your rights below and Click through to the survey pages.

Your Rights

Completion and submission of the following questionnaire implies your consent to participating in the research. You have the right to decline to answer any particular question

Please **Click Here** if you would like to continue and participate in this research.

Project Contacts

Please feel free to contact one or all of the following people if you have questions in regards to the research being undertaken.

Researcher

Stephen Carey, School of Psychology, Massey University, Palmerston North
Telephone - (06) 356-9099, Ext 7058
Email - srcarey@live.com

Supervisors

Dr. Andrew Gilbey, School of Aviation, Massey University, Palmerston North
Telephone - (06) 356-9099, Ext 4767
Email - A.P.Gilbey@massey.ac.nz

Dr. Stephen Hill, School of Psychology, Massey University, Palmerston North
Telephone - (06) 356-9099, Ext 7566
Email - S.R.Hill@massey.ac.nz

**Te Kunenga
ki Pūrehuroa**

Massey University School of Psychology – Te Kura Hinengaro Tangata
Private Bag 11222, Palmerston North 4442
T +64 6 356 9099 extn 2040 F +64 6 350 5673 www.massey.ac.nz

*This project has been reviewed and approved by the
Massey University Human Ethics Committee: Southern A, Application 10/59.*

*If you have any concerns about the conduct of this research, please contact
Professor Julie Boddy, Chair, Massey University Human Ethics Committee:
Southern A, telephone 06 350 5799 x 2541,
email humanethicsoutha@massey.ac.nz*

APPENDIX C

COMPLETE ONLINE SURVEY



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The relationship between risk seeking behaviours and risk taking in trainee pilots

Instructions

Thank you for taking part in this study. The survey will take about thirty minutes of your time. Completing the survey implies consent. Your responses are anonymous and data will be held in a secure file with no links back to you. Please complete all sections of the survey. You have the right to decline to answer any particular question.

If you have any concerns or questions regarding the study please contact the researcher on: srcarey@live.com

Your contribution is much appreciated.

Stephen Carey

Section A Initial Information

1	What is your age?	<input type="text"/> years
2	What is your gender?	<input type="radio"/> Male <input type="radio"/> Female
3	What is the highest aviation licence type that you hold?	<input type="radio"/> Recreational <input type="radio"/> PPL <input type="radio"/> CPL <input type="radio"/> ATPL
4	How many total flight hours do you currently have?	Please select one <input type="text"/> hours
5	How many hours have you flown in the past 12 months?	Please select one <input type="text"/> hours
6	How many total hours do you have as 'Pilot in command'?	Please select one <input type="text"/> hours
7	How many hours as 'Pilot in Command' have you had in the past 12 months?	Please select one <input type="text"/> hours
8	How many total hours of cross country VFR flight time do you have?	Please select one <input type="text"/> hours
9	How many hours cross country VFR flight time do you have in the past 12 months?	Please select one <input type="text"/> hours

APPENDIX C – COMPLETE ONLINE SURVEY

10	Have you ever been involved in an accident or incident that has been reported to the CAA or the Transport Accident Investigation Commission? <i>Note: Accident as defined by the CAA AC12.1 sub-part 12.51 (page 3).</i>	<input type="radio"/> Accident <input type="radio"/> Incident <input type="radio"/> Both <input type="radio"/> No
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Section B Expected Involvement

On a scale of 1 (not at all likely) to 7 (extremely likely), HOW LIKELY IS IT THAT YOU WILL ENGAGE IN EACH OF THESE ACTIVITIES in the next 6 months?

Expected Involvement						
Not at all Likely		Moderately Likely			Extremely Likely	
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
1	Trying/using drugs other than alcohol or marijuana	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	Missing class or work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	Grabbing, pushing, or shoving someone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	Leaving a social event with someone I have just met	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	Driving after drinking alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	Making a scene in public	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	Drinking more than 5 alcoholic beverages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	Not studying for exam or quiz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	Drinking alcohol too quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	Disturbing the peace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Expected Involvement						
Not at all Likely		Moderately Likely			Extremely Likely	
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
11	Damaging/destroying public property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	Sex without protection against pregnancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	Leaving tasks or assignments for the last minute	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	Hitting someone with a weapon or object	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	Rock or mountain climbing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	Sex without protection against sexually transmitted diseases	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX C – COMPLETE ONLINE SURVEY

17	Playing non-contact team sports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	Failing to do assignments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19	Slapping someone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	Not studying or working hard enough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Expected Involvement						
Not at all Likely		Moderately Likely			Extremely Likely	
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
21	Punching or hitting someone with fist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	Smoking marijuana	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	Sex with multiple partners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	Snow or water skiing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	Mixing drugs and alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26	Getting into a fight or argument	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27	Involvement in sexual activities without my consent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28	Playing drinking games	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29	Sex with someone I have just met or don't know well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30	Playing individual sports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section C
Expected Benefits

On a scale of 1 (not at all likely) to 7 (extremely likely), HOW LIKELY IS IT THAT YOU WOULD EXPERIENCE SOME POSITIVE CONSEQUENCE (e.g., pleasure, win money, feel good about yourself, etc.) if you were to engage in these activities?

Expected Benefits						
Not at all Likely		Moderately Likely			Extremely Likely	
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
1	Trying/using drugs other than alcohol or marijuana	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	Missing class or work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	Grabbing, pushing, or shoving someone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	Leaving a social event with someone I have just met	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	Driving after drinking alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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6	Making a scene in public	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	Drinking more than 5 alcoholic beverages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	Not studying for exam or quiz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	Drinking alcohol too quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	Disturbing the peace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Expected Benefits						
Not at all Likely		Moderately Likely			Extremely Likely	
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
11	Damaging/destroying public property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	Sex without protection against pregnancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	Leaving tasks or assignments for the last minute	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	Hitting someone with a weapon or object	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	Rock or mountain climbing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	Sex without protection against sexually transmitted diseases	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	Playing non-contact team sports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	Failing to do assignments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19	Slapping someone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	Not studying or working hard enough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Expected Benefits						
Not at all Likely		Moderately Likely			Extremely Likely	
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
21	Punching or hitting someone with fist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	Smoking marijuana	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	Sex with multiple partners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	Snow or water skiing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	Mixing drugs and alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26	Getting into a fight or argument	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27	Involvement in sexual activities without my consent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28	Playing drinking games	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29	Sex with someone I have just met or don't know well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30	Playing individual sports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section D Expected Risks

On a scale of 1 (not at all likely) to 7 (extremely likely), HOW LIKELY IS IT THAT YOU WOULD EXPERIENCE SOME NEGATIVE CONSEQUENCE (e.g., become sick, be injured, embarrassed, lose money, suffer legal consequences, fail a class, or feel bad about yourself) if you were to engage in these activities?

Expected Risks						
Not at all Likely		Moderately Likely			Extremely Likely	
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
1	Trying/using drugs other than alcohol or marijuana	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	Missing class or work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	Grabbing, pushing, or shoving someone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	Leaving a social event with someone I have just met	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	Driving after drinking alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	Making a scene in public	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	Drinking more than 5 alcoholic beverages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	Not studying for exam or quiz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	Drinking alcohol too quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	Disturbing the peace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Expected Risks						
Not at all Likely		Moderately Likely			Extremely Likely	
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
11	Damaging/destroying public property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	Sex without protection against pregnancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	Leaving tasks or assignments for the last minute	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	Hitting someone with a weapon or object	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	Rock or mountain climbing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	Sex without protection against sexually transmitted diseases	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	Playing non-contact team sports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	Failing to do assignments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19	Slapping someone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	Not studying or working hard enough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Expected Risks						
Not at all Likely		Moderately Likely			Extremely Likely	
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
21	Punching or hitting someone with fist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	Smoking marijuana	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	Sex with multiple partners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	Snow or water skiing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	Mixing drugs and alcohol	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26	Getting into a fight or argument	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27	Involvement in sexual activities without my consent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28	Playing drinking games	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29	Sex with someone I have just met or don't know well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30	Playing individual sports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section E Risk Taking

For each of the following statements, please indicate the *likelihood* that you would engage in the described activity or behaviour if you were to find yourself in that situation. Provide a rating from *Extremely Unlikely* to *Extremely Likely*, using the following scale:

Extremely Unlikely	Moderately Unlikely	Somewhat Unlikely	Not Sure	Somewhat Likely	Moderately Likely	Extremely Likely
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
1	Admitting that your tastes are different from those of a friend.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	Going camping in the wilderness.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	Betting a day's income at the horse races.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	Investing 10% of your annual income in a moderate growth mutual fund.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	Drinking heavily at a social function.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	Taking some questionable deductions on your income tax return.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	Disagreeing with an authority figure on a major issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	Betting a day's income at a high-stake poker game.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	Having an affair with a married man/woman.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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10	Passing off somebody else's work as your own.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
----	---	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

Extremely Unlikely	Moderately Unlikely	Somewhat Unlikely	Not Sure	Somewhat Likely	Moderately Likely	Extremely Likely
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
11	Going down a ski run that is beyond your ability.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	Investing 5% of your annual income in a very speculative stock.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	Going whitewater rafting at high water.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	Betting a day's income on the outcome of a sporting event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	Engaging in unprotected sex.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	Revealing a friend's secret to someone else.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	Driving a car without wearing a seat belt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	Investing 10% of your annual income in a new business venture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19	Taking a skydiving class.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	Riding a motorcycle without a helmet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Extremely Unlikely	Moderately Unlikely	Somewhat Unlikely	Not Sure	Somewhat Likely	Moderately Likely	Extremely Likely
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
21	Choosing a career that you truly enjoy over a more prestigious one	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	Speaking your mind about an unpopular issue in a meeting at work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	Sunbathing without sunscreen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	Bungee jumping off a tall bridge.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	Piloting a small plane	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26	Walking home alone at night in an unsafe area of town.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27	Moving to a city far away from your extended family.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28	Starting a new career in your mid-thirties.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29	Leaving your young children alone at home while running an errand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30	Not returning a wallet you found that contains \$200	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section F Risk Perceptions

People often see some risk in situations that contain uncertainty about what the outcome or consequences will be and for which there is the possibility of negative consequences. However, riskiness is a very personal and intuitive notion, and we are interested in **your gut level assessment of how risky** each situation or behaviour is.

For each of the following statements, please indicate how risky you perceive each situation. Provide a rating from *Not at all Risky* to *Extremely Risky*, using the following scale:

Not at all Risky	Slightly Risky	Somewhat Risky	Moderately Risky	Risky	Very Risky	Extremely Risky
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
1	Admitting that your tastes are different from those of a friend.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	Going camping in the wilderness.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	Betting a day's income at the horse races.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	Investing 10% of your annual income in a moderate growth mutual fund.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	Drinking heavily at a social function.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	Taking some questionable deductions on your income tax return.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	Disagreeing with an authority figure on a major issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	Betting a day's income at a high-stake poker game.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	Having an affair with a married man/woman.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	Passing off somebody else's work as your own.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Not at all Risky	Slightly Risky	Somewhat Risky	Moderately Risky	Risky	Very Risky	Extremely Risky
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
11	Going down a ski run that is beyond your ability.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	Investing 5% of your annual income in a very speculative stock.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	Going whitewater rafting at high water.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	Betting a day's income on the outcome of a sporting event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	Engaging in unprotected sex.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	Revealing a friend's secret to someone else.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	Driving a car without wearing a seat belt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	Investing 10% of your annual income in a new business venture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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19	Taking a skydiving class.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	Riding a motorcycle without a helmet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Not at all Risky	Slightly Risky	Somewhat Risky	Moderately Risky	Risky	Very Risky	Extremely Risky
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
21	Choosing a career that you truly enjoy over a more prestigious one	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	Speaking your mind about an unpopular issue in a meeting at work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	Sunbathing without sunscreen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	Bungee jumping off a tall bridge.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	Piloting a small plane	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26	Walking home alone at night in an unsafe area of town.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27	Moving to a city far away from your extended family.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28	Starting a new career in your mid-thirties.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29	Leaving your young children alone at home while running an errand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30	Not returning a wallet you found that contains \$200	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section G Expected Benefits

For each of the following statements, please indicate **the benefits** you would obtain from each situation.

Provide a rating from 1 to 7, using the following scale:

No benefits at all	--	-	Moderate benefits	--	--	Great benefits
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
1	Admitting that your tastes are different from those of a friend.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	Going camping in the wilderness.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	Betting a day's income at the horse races.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	Investing 10% of your annual income in a moderate growth mutual fund.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	Drinking heavily at a social function.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	Taking some questionable deductions on your income tax return.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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7	Disagreeing with an authority figure on a major issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	Betting a day's income at a high-stake poker game.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	Having an affair with a married man/woman.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	Passing off somebody else's work as your own.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

No benefits at all	--	-	Moderate benefits	--	--	Great benefits
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
11	Going down a ski run that is beyond your ability.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	Investing 5% of your annual income in a very speculative stock.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	Going whitewater rafting at high water.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	Betting a day's income on the outcome of a sporting event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	Engaging in unprotected sex.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	Revealing a friend's secret to someone else.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	Driving a car without wearing a seat belt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	Investing 10% of your annual income in a new business venture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19	Taking a skydiving class.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	Riding a motorcycle without a helmet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

No benefits at all	--	-	Moderate benefits	--	--	Great benefits
1	2	3	4	5	6	7

		1	2	3	4	5	6	7
21	Choosing a career that you truly enjoy over a more prestigious one	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	Speaking your mind about an unpopular issue in a meeting at work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	Sunbathing without sunscreen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	Bungee jumping off a tall bridge.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	Piloting a small plane	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26	Walking home alone at night in an unsafe area of town.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27	Moving to a city far away from your extended family.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28	Starting a new career in your mid-thirties.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29	Leaving your young children alone at home while running an errand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

30	Not returning a wallet you found that contains \$200	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Section H Scenarios

For the following section you will be presented with a series of 16 very short scenarios where you will be asked to rate your level of confidence to continue with the flight or begin the flight initially. Please keep in mind that these scenarios relate to a small single piston engine aircraft, such as the Piper Warrior, Diamondstar, Cessna 182, 172, 152, Skyhawk or equivalent. In all scenarios you are flying under Visual Flight Rules and are flying as the Pilot in Command.

Scenario 1

DEPARTURE AIRPORT: Palmerston North Airport
 DESTINATION AIRPORT: Wellington International Airport
 CURRENT POSITION: Airspace above Foxpine
 AIRCRAFT ALTITUDE: 2500ft
 TIME OF DAY: 0400 PM
 GROUND TEMPERATURE: 15 degrees C
 WIND CONDITIONS: N 13 kts

You are flying above Foxpine, at an altitude of 2500 ft, on a southern heading towards Wellington International airport tracking along the coastal pathway. Your instructor gave you clearance to undertake the flight, but did mention the variable nature of the weather today. As you get to your current position, you notice TCUs/CB's developing in the distance just to the south of Mana Island in the Cook Strait, followed by an expanse of deteriorating weather which is due to hit Wellington in 45 minutes. Your flight south will take approximately 40 minutes.

H1	On the scale below, <i>rate your level of confidence</i> to continue on with the flight to Wellington:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

APPENDIX C – COMPLETE ONLINE SURVEY

Scenario 2

DEPARTURE AIRPORT: Hamilton International Airport
 DESTINATION AIRPORT: Napier Airport
 CURRENT POSITION: Airspace above Taupo
 AIRCRAFT ALTITUDE: 4000ft
 TIME OF DAY: 0630 PM
 GROUND TEMPERATURE: 22 degrees C
 WIND CONDITIONS: SW 10 kts

You take off from Hamilton International Airport for a flight bound for Napier Airport. Your flight plan was done as normal allowing for 30 minutes compulsory reserve fuel. The flight will mean that you arrive in Napier 45 minutes prior to ECT. This evening you have a wedding rehearsal dinner which starts one hour following your arrival in Napier. You are a member of the bridal party. Mid-flight you experience stronger than anticipated head winds which will extend your flight by 15 minutes. You can continue onto your destination and use 15 minutes of your 30 minute compulsory reserve fuel, or divert and refuel which puts you over ECT. As you have not been signed off to fly at night, this would mean you would have to stay at your refuelling destination till the following morning.

H2	On the scale below, <i>rate your level of confidence</i> to continue on with the flight to Napier directly:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

Scenario 3

DEPARTURE AIRPORT: Invercargill Airport
 DESTINATION AIRPORT: Oamaru Airport
 CURRENT POSITION: Invercargill Airport
 AIRCRAFT ALTITUDE: 0ft
 TIME OF DAY: 0800 AM
 GROUND TEMPERATURE: 9 degrees C
 WIND CONDITIONS: W 6 kts

You have just received a phone call from your flight instructor telling you that you have a rescheduled flight that is due to take place at 0900hrs. Last night was a friend's birthday and you were not planning on flying till 1800hrs this evening. Consequently, last night you consumed 10 standard drinks over the course of the night, finishing at 0200hrs. This morning you are experiencing a small hangover. If you do not take the flight this morning you will be unable to fly for another month.

H3	On the scale below, <i>rate your level of confidence</i> to begin the flight to Oamaru:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

APPENDIX C – COMPLETE ONLINE SURVEY

Scenario 4

DEPARTURE AIRPORT: Masterton Airport
 DESTINATION AIRPORT: Napier Airport
 CURRENT POSITION: Airspace above Danniverke
 AIRCRAFT ALTITUDE: 2500Ft
 TIME OF DAY: 0530 PM
 GROUND TEMPERATURE: 13 degrees C
 WIND CONDITIONS: SW 7 kts

You have taken a close friend of yours up for a flight from Masterton to Napier. You tell him that you have recently been taking aerobatics lessons with your instructor in the plane that you are currently in. You have not passed your rating yet with a couple of hours left before its completion. Your friend begins to try and persuade you to do some with him in the plane.

H4	On the scale below, <i>rate your level of confidence</i> to fly aerobatic manoeuvres while airborne in your current flight path:				
	○	○	○	○	○
	Not confident	--	Confident	--	Very Confident

Scenario 5

DEPARTURE AIRPORT: Nelson Airport
 DESTINATION AIRPORT: Paraparaumu Airport
 CURRENT POSITION: Airspace above Cook Strait
 AIRCRAFT ALTITUDE: 3000Ft
 TIME OF DAY: 1000 AM
 GROUND TEMPERATURE: 18 degrees C
 WIND CONDITIONS: N 10 kts

When writing your flight plan you notice that the ceiling is reported to be at 500ft above the cook straight but only in a band of 10NM. Mid-flight you notice that the ceiling band has increased and extends as far north as Wellington. The height has also increased to a level of 1500ft.

H5	On the scale below, <i>rate your level of confidence</i> to continue on with the flight to Paraparaumu:				
	○	○	○	○	○
	Not confident	--	Confident	--	Very Confident

APPENDIX C – COMPLETE ONLINE SURVEY

Scenario 6

DEPARTURE AIRPORT: Queenstown Airport
 DESTINATION AIRPORT: Woodbourne Aerodrome
 CURRENT POSITION: Airspace above Ashburton
 AIRCRAFT ALTITUDE: 3000Ft
 TIME OF DAY: 9300 PM
 GROUND TEMPERATURE: 22 degrees C
 WIND CONDITIONS: NE 12 kts

You are on late night cross country flight with one and a half hours left of your flight when you start to feel very tired and drowsy.

H6	On the scale below, <i>rate your level of confidence</i> to continue on with the flight directly to Woodbourne:				
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

Scenario 7

DEPARTURE AIRPORT: Palmerston North International Airport
 DESTINATION AIRPORT: Palmerston North International Airport
 CURRENT POSITION: Airspace Taranaki side of Mount Ruapehu
 AIRCRAFT ALTITUDE: 5500Ft
 TIME OF DAY: 0330 PM
 GROUND TEMPERATURE: 12 degrees C
 WIND CONDITIONS: N 10 kts

You are on a long distance cross country flight, from Palmerston North to Great Barrier Island and home. On your way home you start to become tired and weary from the days flying. You decide to take 2 caffeine tablets (100mg each).

H7	On the scale below, <i>rate your level of confidence</i> to continue on with the flight directly to Palmerston North:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

APPENDIX C – COMPLETE ONLINE SURVEY

Scenario 8

DEPARTURE AIRPORT: Nelson Airport
 DESTINATION AIRPORT: Christchurch International Airport
 CURRENT POSITION: Airspace above Hanmer Springs
 AIRCRAFT ALTITUDE: 4500Ft
 TIME OF DAY: 1145 AM
 GROUND TEMPERATURE: 27 degrees C
 WIND CONDITIONS: S 18 kts

You have been asked to fly three business men from Nelson to Christchurch for a new business launch. It is very important that they make it there on time. The forecast reports that it will be marginal under VFR conditions. Mid-flight you experience deteriorating visibility and plan on turning around. The business men urge you to continue as they must not miss the launch.

H8	On the scale below, <i>rate your level of confidence</i> to continue on directly to Christchurch:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

Scenario 9

DEPARTURE AIRPORT: Wellington International Airport
 DESTINATION AIRPORT: Nelson Airport
 CURRENT POSITION: Airspace above Cook Strait
 AIRCRAFT ALTITUDE: 5000Ft
 TIME OF DAY: 0600 PM
 GROUND TEMPERATURE: 17 degrees C
 WIND CONDITIONS: E 15 kts

On takeoff you checked the weather forecast which predicted that you would have clear skies throughout the course of your flight. Due to a joint military operation your minimum flight altitude above the Strait has been set at 3500Ft. The weather starts to deteriorate around you, and suddenly you find yourself in cloud.

H9	On the scale below, <i>rate your level of confidence</i> to continue on with the flight directly to Nelson:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

APPENDIX C – COMPLETE ONLINE SURVEY

Scenario 10

DEPARTURE AIRPORT: New Plymouth Airport
 DESTINATION AIRPORT: Gisborne Airport
 CURRENT POSITION: New Plymouth Airport
 AIRCRAFT ALTITUDE: 0ft
 TIME OF DAY: 1130 AM
 GROUND TEMPERATURE: 25 degrees C
 WIND CONDITIONS: W 6 kts

You are about to depart New Plymouth Airport, 3POB with their baggage. Prior to filling the plane with fuel you calculate the weight and with a full fuel load you will be 35kg over the Maximum (MAUW) limit for the aircraft. You are required in Gisborne for an important meeting and a refuel would mean that you would miss the meeting altogether. By not being able to take on a full fuel load, you would need to refuel en-route.

H10	On the scale below, <i>rate your level of confidence</i> to continue on with the flight directly to Gisbourne being over-weight:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

Scenario 11

DEPARTURE AIRPORT: Tauranga Airport
 DESTINATION AIRPORT: Whakatane Airport
 CURRENT POSITION: Tauranga Airport
 AIRCRAFT ALTITUDE: 0ft
 TIME OF DAY: 1045 AM
 GROUND TEMPERATURE: 15 degrees C
 WIND CONDITIONS: W 9 kts

You are planning on conducting a short cross country flight from Tauranga to Whakatane to complete the final hours that you require for your CPL cross country training. You realise that you have left your glasses at home that are required under your class 2 medical; however you are able to drive without glasses. The plane you are renting is not available for another 2 weeks if you do not make your flight at the scheduled time today.

H11	On the scale below, <i>rate your level of confidence</i> to begin your flight to Whakatane Airport:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

APPENDIX C – COMPLETE ONLINE SURVEY

Scenario 12

DEPARTURE AIRPORT: Greymouth Aerodrome
 DESTINATION AIRPORT: Westport Airport
 CURRENT POSITION: Airspace inland from Punakaiki
 AIRCRAFT ALTITUDE: 2000ft
 TIME OF DAY: 0530 PM
 GROUND TEMPERATURE: 4 degrees C
 WIND CONDITIONS: S 4 kts

It is a very still evening and you decide to take two friends for a night flight from Greymouth to Westport and home again. Mid-flight you discover that due to the conditions that a thick ground fog has begun to develop. It appears to be developing in a southward direction. You have been promising your friends this trip for a very long time.

H12	On the scale below, <i>rate your level of confidence</i> to continue on with your flight to Westport and THEN home again:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

Scenario 13

DEPARTURE AIRPORT: Foxpine Airport
 DESTINATION AIRPORT: Whanganui Airport
 CURRENT POSITION: Foxpine Airport
 AIRCRAFT ALTITUDE: 0ft
 TIME OF DAY: 0130 PM
 GROUND TEMPERATURE: 9 degrees C
 WIND CONDITIONS: N 15 kts

It has been raining for most of the day, but the front has moved on now and the skies behind it have cleared up. However the forecast also reports that the front may bring thunderstorms behind it. VFR is not recommended. It is only a short flight to Whanganui where there is accommodation if needed.

H13	On the scale below, <i>rate your level of confidence</i> to begin the flight to Whanganui:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

Scenario 14

DEPARTURE AIRPORT: Kaitaia Airport
 DESTINATION AIRPORT: Whangarei Airport
 CURRENT POSITION: Airspace above Kerikeri
 AIRCRAFT ALTITUDE: 2200ft
 TIME OF DAY: 0430 PM
 GROUND TEMPERATURE: 23 degrees C
 WIND CONDITIONS: NW 8 kts

You are mid-flight on your way home from Kaitaia for the birth of your first child. Contrary to the weather report that you gained pre-flight, thunderstorm cells begin to form to the south surrounding you. The skies behind you are still clear.

H14	On the scale below, <i>rate your level of confidence</i> to continue on with your flight to Whangarei Airport:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

Scenario 15

DEPARTURE AIRPORT: Invercargill Airport
 DESTINATION AIRPORT: Kaikoura Airport
 CURRENT POSITION: Airspace above Huranui
 AIRCRAFT ALTITUDE: 4500ft
 TIME OF DAY: 0500 PM
 GROUND TEMPERATURE: 17 degrees C
 WIND CONDITIONS: N 10 kts

You are midflight on your way home from a long cross country flight when you start to feel fatigued from the lunch that you missed en route. This is causing you to become slightly dizzy. Your destination airport is one hour away.

H15	On the scale below, <i>rate your level of confidence</i> to continue on with your flight to Kaikoura Airport:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

APPENDIX C – COMPLETE ONLINE SURVEY

Scenario 16

DEPARTURE AIRPORT: Taupo Airport
 DESTINATION AIRPORT: Hamilton International Airport
 CURRENT POSITION: Taupo Airport
 AIRCRAFT ALTITUDE: 0ft
 TIME OF DAY: 0630 PM
 GROUND TEMPERATURE: 21 degrees C
 WIND CONDITIONS: N 11 kts

You are planning on attending a concert for your favourite band in Hamilton that you have paid for and have been waiting all year to attend. You check the forecast and it is marginal at best. Your friends who are meeting you at the airport are telling you to hurry up otherwise you will miss the concert.

H16	On the scale below, <i>rate your level of confidence</i> to begin your flight to Hamilton International Airport:				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not confident	--	Confident	--	Very Confident

To submit your results, please click on the **Submit this information** button.
 With submission of your answers, you imply consent to participate in this study.

If you wish to wipe your answers, click on the **Clear your answers** button.

*This project has been reviewed and approved by the
 Massey University Human Ethics Committee: Southern A, Application 10/59.*

*If you have any concerns about the conduct of this research, please contact
 Professor Julie Boddy, Chair, Massey University Human Ethics Committee:
 Southern A, telephone 06 350 5799 x 2541,
 email humanethicsoutha@massey.ac.nz*