Healthcare Avoidance and Stress Risks in the New Zealand Population of Pilots and Air Traffic Controllers

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Table of Contents:

List of Tables:

List of Figures:

Appendices:

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1. Introduction

Pilots and Air Traffic Controllers (ATCO) are a unique subset of aviation related workers exposed to distinct stressors with the constant potential for consequential catastrophic outcomes of any errors which might occur. As holders of an aviation licence, they are continually required to maintain and be tested for an expert level of proficiency and suitability for their role.

Just one of the expected role requirements is to prove and maintain a specifically defined, high degree of medical fitness in order to remain qualified. Without proof of their current medical certificate status, pilots and ATCOs cannot exercise the rights of their licensed qualifications to be able to partake in the operational duties relating to their qualified roles.

Each time their Civil Aviation Authority New Zealand (CAA NZ) medical certificate is renewed, a license holder must make a legal declaration as to their state of health. As part of the declaration the question is asked ‘Have you ever experienced any of the following’ with yes/no responses required for 68 health conditions. There are a further 11 questions concerning medical care, alcohol and drugs, family history etc. Specific to mental health are the questions pertaining to occurrences of:

- Depression
- Anxiety disorder/panic disorder
- Specific learning difficulty
- Attention deficit or hyperactivity disorder
- Post traumatic stress disorder
- Suicide attempt
- Any other mental Illness
- Drugs and alcohol use

Because of the financial and time commitment required to gain the requisite qualifications to pursue an aviation career, before a student begins formal training or studies, they are typically required to first pass a Class 1 (for pilots) or Class 3 (for ATCOs) medical certificate (College). Anecdotally, by way of professional comparison, a medical doctor can go an entire career and never be required to undergo a personal medical examination to satisfy a training or pre-employment imperative.

With the process of submitting to and passing an aviation medical, whilst not explicitly stated, the implication is that to tick ‘YES’ to any of the above conditions can lead to complications or refusal in the issuance an aviation medical certificate.

Before the first hour of flight time in the pursuit of an aviation licence, a behavioural influence is typically imprinted on the psyche of the aviation professional. This influence skews decisions by

the pilot or ATCO regarding health, with a bias towards avoidance of disclosure. The implication is that to admit to a condition of impaired wellbeing may result in temporary or permanent career exclusion (Bayern, 2021).

Once qualified, there are strict obligations upon the holder of an aviation medical certificate to report any change in their medical condition to the Regulator (Government, 2017). The same Act of Law obligates any licensed medical practitioner or employer to inform CAA NZ if they suspect a change of medical condition which may interfere with the safe exercise of licence privileges (Government, 2018b).

> *if a licence holder is aware of, or has reasonable grounds to suspect, any change in his or her medical condition [ ] that may interfere with the safe exercise of the privileges to which his or her medical certificate relates, the licence holder—*
>
> *(a) must advise the Director of the change as soon as practicable; and*
>
> *(b) may not exercise the privileges to which the licence holder's medical certificate relates.*

This change of medical condition will necessarily require a closer inspection by an aviation medical examiner to ascertain whether the condition is of aeromedical significance.

In the context of mental health, to make an aeromedical assessment for fitness to fly, licence holders who meet a clinical diagnostic criteria for anxiety or depressive disorders are thought to be a hazard to flight safety (Government, 2018a). This is taken from the assumption that by meeting a clinical diagnostic criteria for this disorder, licence holders exhibit recurrent mental states that pose an undue hazard. As such, the seeking of certain mental healthcare services act as a surrogate indicator of hazardous mental states (Miranda et al., 2024).

Recent research of the way the aviation industry impact by the COVID-19 pandemic affected the mental health of pilots, showed that over one third of the study respondents met the diagnostic criteria of a mental health disorder. Most common was Anxiety disorder, followed by Attention Deficit Hyperactivity Disorder (ADHD), Adjustment Disorder, and Depressive Disorders (Ackland, Molesworth, & Grisham, 2023).

Studies suggest that the net effect of the medical condition reporting obligations, layered on top of the learnt bias against disclosure and in conjunction with the acute fear of losing control over negative outcomes perceived to be the inevitable result of open disclosure, is non-disclosure and healthcare seeking anxiety in aviators (Cahill, Cullen, & Gaynor, 2020). In their study, Cahill et al. conducted interviews to establish the impact of work related stress on pilot well-being and flight safety. They found the net result expressed itself as a reluctance to disclose mental health problems due to concerns over how this will effect their jobs .

In a recent survey of American pilots, Hoffman et al. (Hoffman et al., 2022) asked a series of four questions to determine if the respondents exhibited behaviours which indicated they had avoided

healthcare due to fears of the implications upon their medical status. This study found that because of concerns regarding aeromedical loss, 56.1% of the respondents disclosed healthcare avoidant behaviour having answered yes to at least one question. The study authors define pilot healthcare avoidance as a phenomena where pilots avoid seeking medical care or disclosing health information due to the perceived risk of aeromedical certificate loss.

When replicated by similar methodologies in the Canadian pilot cohort, the rates of healthcare avoidance demonstrated similar comparative results. It found that there was a very close mirroring of results and when analysed for demographic factors, the odds of healthcare avoidance were not significantly different (Hoffman et al., 2023). Looking into the demographics of the North American studies, there did appear to be a weighting towards the non-airline sector of the aviation industry, with 21% of respondents representing airline roles.

More recently, high profile events such as Alaska flight 2059 in October 2023, where an off-duty airline pilot of 23 years experience (positioning as a passenger seated in the jump-seat of the cockpit) had a significant psychotic episode and attempted to shut down the plane's engines. Preceding this event, the offender had been suffering depression for six years, recently had experienced the death of a close friend, not slept for 40 hours and self-medicated with "magic mushrooms" two days prior to the flight (Costello, Blackman, Ortiz, & Blankstein, 2023). Notably, fear of career exclusion due his understanding of a perceived likely treatment outcome and Regulator medical issuance rules and process, influenced his decision against seeking healthcare (Rose, 2023).

Stemming from this event, in November 2023 the United Sates Federal Aviation Administration (FAA) formed an Aviation Rulemaking Committee (ARC) on mental health & aviation medical clearances. Its charter was to discuss the barriers preventing pilots and air traffic controllers (ATCOs) from reporting and seeking care for mental health issues. They identified seven factors which present as barriers to seeking care which they summarised as:

- Culture, Trust, Fear, Stigma, Financial, Process, Knowledge & Information gap.

In their report they highlight that a culture of fear and distrust for the medical process can often result in a lack of reporting, fire-walling information and healthcare avoidance (FAA, 2024).

Given this apparent prevalence of healthcare avoidance, it is of vital importance to understand if there exists any defined and measurable criteria in the aviation industry to describe and quantify its interrelationship with flight safety. However, to date there exists a lack of conformity to describe the whole of industry impact upon flight safety that healthcare avoidance presents.
Asides from total incapacitation risks and fatigue impairment factors, there is a paucity of research data in aviation which determines to what degree impaired performance due to matters of diminished wellness is impactful upon the industry's established measures of safety.

For example, regarding mental health, except in extremely rare but highly visible events of pilot murder suicide as witnessed with Germanwings flight 9525 (GW9525), the impact upon flight safety by aviation personnel being present in the workplace whilst impacted by degrees of impaired mental wellness is unknown.

Some regulators state that the role which their medical certification policies and procedures have upon flight safety parameters is not evident. In the FAA ARC on mental health & aviation medical clearances report the assertion is made that there does not appear to be an obvious relevant connection between the FAA's processes and flight safety (FAA, 2024).

Some Regulators along with the US Air Force acknowledge that a state of healthcare avoidance in part exists due to policy and process for medical certification. This state has consequential operational fight safety effects, although the magnitude and complexity of that interrelationship is ill-defined. This paradigm is often classified as the the known-unknowns (Sprott, Preitner, & Dara, 2024).

The Civil Aviation Authority of New Zealand (CAA NZ) and Civil Aviation Safety Authority of Australia (CASA) are developing an alternate means of disclosure called Safe Haven for certificate holders. This has been formulated to provide a pathway through the mistrust of the regulatory medical processes. In this way a pilot or ATCO can maintain their medical status by disclosing to a Medical Examiner Safe Haven (MESH) who can make a determination for ongoing certification. Providing certain criteria are met, then direct disclosure to the Regulator is not required (Powell, 2025).

The US Air Force has developed a 60 day window where a pilot who is in treatment-care and fully duty capable, to remain in flight status without a lengthy waiver process. This change was incorporated in recognition of the direct impact that the previous Medical Standards Directory policy had on generating healthcare avoidance behaviours. By adopting a change within the Air Mobility Command *"to eliminate stigma, lower barriers and increase access and options to support Airmen mind, body and craft"* the USAF recognised the safety benefits of this policy change (Salzman, 2024).

Specifically, regarding the risks to aviation of healthcare avoidance, the European Aviation Safety Agency (EASA) highlights a lack of definitive data as it applies to assessment of mental health. The MEntal health for aviation SAFEty (MESAFE) report states that there are no specific, standard, validated mental health assessment methods which incorporate specific aeromedical operational needs, that address incapacitation risk due to mental disorders within the framework of the fitness for duty certification (Tomasello, Brambati, Rooy, Wagstaff, & Simons, 2022).

The industry assumption that simulator checks, line checks, and peer review, for detecting below standard performance consequential of cognitive decline is not support by published research. This was highlighted in an EASA report which addresses flight risk associated with impairment derived from cognitive decline (Simons et al., 2018).

As identified in these EASA reports, fitness-for-duty parameters that are specific to the operational role requirements of pilots and ATCOs for mental health flight safety measures, presently have no applicable standardised, validated assessment tests.

As such, there currently exists a lack of researched evidence to quantify links between differing states of impaired wellness and established Safety Management System (SMS) measures of flight safety. SMS is a proactive and systemised approach to the management of safety risks. It involves the use of defined tools of categorisation to identify and order safety issues in a manner that allows risk mitigation strategies to be prioritised and applied (Authority, 2015). Regarding mental health and risk in aviation, which degrees of progressively decreasing states of wellness, equate to increasing occurrences of flight safety error, incident or accident events?

There are studies which do show the connection between psychological distress and workplace incidents and accidents in other industries. An Australian workplace study with over 60,500 respondents, demonstrated that those present in the workplace with moderate psychological distress increased the odds for a workplace accident by 40%. Of all the predictable variables, psychological distress had the greatest effect on workplace failures, increasing the odds by 230%. This associative effect is greater than having 6 or more physical health conditions (Hilton & Whiteford, 2010).

Other safety sensitive occupational groups have also found this correlation. In medicine for example, a meta analysis of studies involving 21,517 physicians published in JAMA undertook to investigate whether physician wellbeing was associated with medical errors. It demonstrated a strong association between depressive symptoms in physicians and medical errors. The study concludes that:

> '*the bidirectional associations between physician depressive symptoms and perceived medical errors verified by this meta-analysis suggest that physician well-being is critical to patient safety'* (Pereira-Lima et al., 2019).

But for aviation, there is a high degree of focus on rare yet critical events which have a mental health cause such as the GW9525 tragedy (RAeS, 2024). Events of this category impact the aviation industry on less than 1:153,000,000 flights. A rate determined given 8 (2 unconfirmed) homicide-suicide events by pilots of commercial airliners recorded over 1.23 billion airliner departures since 1960 until 2024 (A4A, 2023; Kenedi, Friedman, Watson, & Preitner, 2016).

Contrast this statistic with consequence to the airline industry of collision or crash costs over the four year period of 2016 - 2020, the claims on aviation insurance was $4.5 billion USD (Statista, 2024). And in part, the global direct and indirect cost to the airlines for ground accidents and damage alone was estimated by the Flight Safety Foundation in 2007 at $10 billion USD per year (Lacagnina, 2007).

In the aviation industry the accepted risk mitigation approach to address the consequences of incidents and accidents is a methodology called Threat and Error Management (TEM). The objective of TEM is to establish an understanding of the conditions which underly why an error occurred. By determining commonalities amongst the manifestations of these underlying conditions, threat states can be identified. These threat states, once codified, can be predicted for and accordingly managed in order to reduce the chances of error occurrence. This management of threat states can be at a systems level, or tactically in the operational environment (Merritt & Klinect, 2006).

The research suggests that for aviation mental health, it has been left to proxy measures, intuited assumptions, inferential deductions and systemic failures to define mental heath policy . Because of the heterogeneity of the collected data, the summations of such policies can suffer from a lack of quantitative analysis. Without this analysis, correlations between healthcare avoidance, impaired wellness and the established SMS and TEM measures of aviation safety have not been rigorously explored.

It appears in regards to mental health, the aviation industry is distracted in efforts to prevent the next murder-suicide event with an occurrence probability of 6.5×10^{-9}, when the costs from errors due to impaired performance states caused by impacted mental health, goes unquantified.

The collection of these data in order to quantify where and to what extent any such a correlation exists between impaired performance due to matters of diminished wellness (outside of fatigue) and SMS measures of safety is not routinely undertaken by the aviation industry, nor is it required to be by the Regulators. Thus the true economical impact upon flight safety of healthcare avoidance is unknown.

Research is needed to both further quantify the extent of HCA globally, and establish what, if any, links to flight safety exists. Once quantified, then Regulators can possibly take up initiatives aimed for the general population of pilots and ATCOs (like Safe Haven or the US Air Force). Subsequently the industry can directly associate those initiatives designed to improve healthcare seeking behaviours as they relate to operational cost savings obtained by a definable reduction in errors and incidents.

In studying the state of HCA, mental healthcare avoidance and stress risks in New Zealand pilots and ATCOs, it is worthwhile to mention the influence of recent events surrounding the COVID-19 pandemic and it's impact on the global aviation industry. The authors of the paper 'COVID-19 Pandemic and Prospects for Recovery of the Global Aviation Industry', highlighted how ill-prepared the aviation sector is to deal with disasters. The study looked at how the complex, fragile, globally inter-connected and supply chain reliant model can best rebound after major distortions. They conclude that considering that natural hazards and pandemics are expected to increase in the future, airlines need to enhance risk reduction and management preparedness to disasters (Dube, Nhamo, & Chikodzi, 2021).

Their article in the Journal of Transport Management references the United Nations International Strategy for Disaster Recovery priority 4, which states that to effectively Build-Back-Better in recovery, there is a need to enhance disaster preparedness (United-Nations, 2015).

This preparedness is especially relevant considering that one of the key retardants preventing a fast recovery for the aviation industry post Covid-19 has been access to technical personnel. Many airlines were unable to rapidly re-acquire their skilled staff and high levels of post Covid burnout caused mass service cancelations (Jeffrey & Sposato, 2023).

2. Research Objectives

This study was initiated to understand if the population of pilots and ATCOs in New Zealand engage in healthcare avoidance behaviours due to a fear of the impact upon their aviation medical certificate. For this question, this study has, in part, sought to make a comparison to the Healthcare Avoidance study (HCA) by Hoffman et al (2022).

However, since this study's overall objective is to discover to what degree the aviation system in New Zealand is exposed to this behaviour, it is the first study which includes ATCOs into the survey population. The reasoning is that because ATCOs are also required to hold an aviation medical certificate and are also integral to aviation system safety.

As an extension to the HCA study outcomes, a question to do with avoidance behaviours directly associated with mental health was included to gain insight specifically around this highly safety sensitive topic.

Since the avoidance of healthcare may be associated with concerns regarding a declining health issue, a study objective was to find if the population is exposed to cumulative stressors which may predict poor health outcomes.

3. Research Questions

This research attempts to address the following research questions:

i) For the population of pilot/ATCO aviation licence holders in New Zealand, does there exist a state of healthcare avoidance for fear of losing their aviation medical status?

ii) Does there exist any differences between the pilot populations already studied in North America and the population of New Zealand pilot licence holders for matters of healthcare avoidance?

iii) Is this an issue that also presents itself in regards to mental healthcare avoidance?

iv) Finally, do the pilots and ATCOs in this population have exposure risks in their lives, brought on by work and personal stressors which accumulate to a point likely to result in ill-health effects?

4. Methodology

- Sampling.

In regards to how large the study population in New Zealand is, it was intended to sample all licensed pilots and ATCOs who hold a medical certificate in New Zealand (current, suspended or disqualified). For pilots, the only definitive comprehensive list of all such respondents is held on the CAA NZ database in Wellington (CAANZ, 2024). As shown in Table 1 the number of both active and non-active licence holders amounts to over 29,000.

Table 1. *Pilot Licence Statistics 2024*

Licence type	Total licences	Current Class 1 medical	Current Class 2 medical	Current Medicals
ATPLA Part 61 PL (Aeroplane)	4,554	268	1,639	1,907
ATPLH Part 61 PL (Helicopter)	291	9	113	122
CPLA Part 61 PL (Aeroplane)	8,381	532	1,927	2,459
CPLB Part 61 PL (Balloon)	53	6	6	12
CPLG Part 61 PL (Glider)	12	2	4	6
CPLH Part 61 PL (Helicopter)	2,453	141	763	904
PPLA Part 61 PL (Aeroplane)	11,951	154	923	1,077
PPLH Part 61 PL (Helicopter)	1,461	15	172	187
Totals	29,156	1,127	5,547	6,674

Source CAA NZ

For the purposes of this research, the primary focus is on those pilots currently holding a Class 1 or Class 2 medical which constrains the population size to a far more manageable 6,674.

It was deemed important to include ATCOs into this study for two reasons. Firstly, ATCOs are also subject to a medical certification regime to validate their operational licence (albeit they are held to a Class 3 medical standard). Consequently in the realm of healthcare avoidance, it could also be material should this subgroup display similar traits as pilots. Secondly when thinking of aviation system safety as a whole, ATCOs that are active in their role whilst operating at degrees of impaired wellness due to healthcare avoidance may contribute to any overall safety degradation.

Similar tables are not published for ATCOs, so a search of the New Zealand (NZ) census data from 2018 tallies up to 468 (Figure.nz, 2018). However all active controllers are employed by the one employer, Airways New Zealand who are the sole provider of air navigation services in the region. An enquiry with Airways determined the most accurate number to be 407 (Airways, 2024).

This then defined the whole population number as 7,081.

Preliminary enquiries were made to CAA NZ as to the viability of gaining access to the contact details of pilot licence holders in order to distribute a research survey. However, the applicability of the Privacy Act NZ 2020 was raised and as such disallows access to this database for this purpose. Additionally, for the avoidance of any perception that the Regulator might gain access to survey answers, it was decided not to distribute the questionnaire through their mail list.

The option of utilising the CAA publication communication channels to distribute the survey was also discounted. It was felt any confusion as to where the repository for the study data responses were collected and whether the responses might be discoverable by the CAA should be avoided.

A simple random probability sample was impractical due to the prohibitive cost and time involved to contact and randomly sample all NZ licensed pilots and ATCOs holding a medical with no guarantees that the full population could be contacted. Casting a broad net across as many sectors of NZ aviation was considered a sufficient sampling method to give answers of reasonable validity.

This study enhanced the answers provided from non-probability sampling methodology by using a multi-channel social media and multi-sector approach to better approximate a representative sample. To be able to sample this way as fully as possible required the engagement of all aviation sectors including both commercial and private versions of fixed wing, helicopter, gliding and balloon.

The use of snowball sampling via multiple channels of social media was investigated in a study of nurses which found that it provided an effective and efficient way to gain access to a hard to reach sample sector. It did discuss however that on its own this study methodology made generalising any findings to the population troublesome because of the difficulty in determining sampling error (Leighton, Kardong-Edgren, Schneidereith, & Foisy-Doll, 2021).

When searching for literature along a similar theme, past studies have gained a degree of success by obtaining access to a large, more focussed sample group through professional and private association collectives. A 2019 study on mental disorders and wellbeing amongst pilots utilised pilot unions to email an online survey link which gained a relatively small self-reporting response rate (Venus, 2022).

Addressing similar demographic options around gender and age as the HCA study was targeted so to make valid data comparisons. For sampling of the roles within the aviation sector, descriptions were chosen which provided the respondents with sufficient options so that they could identify their personal role sector in aviation easily. Whilst these weren't identical to the HCA, the roles we choose could be aggregated to align with the HCA study role categorisations.

Where this study introduced additional demographics in addition to those collected by the HCA study was for ethnicity. In the New Zealand context, it was important to be able to account for the proportion of Asian, Maori and Pacific Islander population in the survey data and see if any trends emerged.

- Questionnaire.

The Aviation Healthcare Behaviours survey comprised of twelve primary questions grouped into five subsections. (The full list of the AHCB study questions is listed in Appendix 1):

- The first five questions dealt with demographics.
- These were followed by the four core multinational comparison questions.
- Question 10 was the novel mental healthcare avoidance question.
- The accumulated life stress assessment questions comprised the last questionnaire subsection, with an ability to opt-out and skip ahead.
- Finally, there was provided the option to opt-in for any longitudinal studies.

i) Demographics

The first three items addressed the demographics of age, sex and ethnicity. Two further items addressed the respondent's occupational factors of the aviation sector within which they were primarily involved in and in which Regulator's jurisdiction they were licensed. The resulting categories are presented in Table 2

Table 2. *Aviation Sector selectable options*

ATCO	1. Air Traffic Controller,	2. Air Traffic Controller Student,	
Airline	3. Airline Jet Long-haul,	4. Airline Jet Short-haul	5. Airline Turboprop
Commercial	6. Commercial Fixed wing	7. Commercial Rotary Wing	
General Aviation	8. GA Fixed Wing	9. GA Rotary wing	
Other	10. Military	11. Student Pilot	

ii) Healthcare Avoidance

Since primary study objectives included both measuring healthcare avoidance in New Zealand and to make a multinational comparison placed alongside the North American Healthcare Avoidance studies (HCA), it was imperative that the four core questions asked in those studies were replicated as closely as possible here.

The four core multinational HCA comparison questions were all answerable as binary yes/no, as they related to a fear of jeopardising aeromedical certification, if the respondent had ever:

- Sought informal medical healthcare from a provider not normally used.
- Worked despite experiencing a symptom (physical or psychological) worthy of evaluation.
- Taken a prescription medication before working for a symptom worthy of evaluation.
- Misrepresented/withheld information for fear of losing Medical Certification.

iii) Multinational study comparison

Aspects of the HCA question language terminologies needed to be adjusted due to this Aviation Healthcare Behaviour (AHCB) study being the first to include ATCOs at a national level, and also the differences in Regulator certification nomenclature between North America and the Antipodes. In doing so it was important to preserve the nature of inter-study comparison without impacting the quality of the question.

For example, the question from the North American HCA study that was worded;

> - Have you ever misrepresented or withheld information on a written healthcare questionnaire (i.e a symptom is more or less severe) for fear of losing your operational status and/or Medical Certificate?

The same question in this AHCB survey was written as;

> - Have you EVER misrepresented or withheld information on a written healthcare questionnaire (i.e a symptom is more or less severe) for fear of losing your flying status and/or Airman Medical Certificate?

Appendix 1 details any comparative differences between the AHCB and the HCA study questions.

iv) Mental Healthcare Avoidance

Since the focus of healthcare avoidance in aviation has recently taken on a degree of specificity more directly aligned with matters associated to mental health, this study has introduced an additional distinct question. It's purpose was to directly enquire about whether the fear of impact from disclosing any mental health concerns upon a pilots or ATCOs operational status has caused them to eschew professional mental health care.

v) Life stress scale

A further study objective was to determine if the study population exhibited a degree of life stress which predicted illness and health breakdown.

The Holmes and Rahe Stress Scale (Holmes & Rahe, 1967) characterises 43 significant life events and attributes a mean weighted stress score for the degree of stress that each event imparts upon that person who has experienced the event.

The stress scale is ranked in Life Event categories of highest to lowest "mean stress value" (MSV). The highest MSV score of 100 is attributed to the life event of a spousal death, with progressive decrements of MVS scores for life event descriptions categorised as inflicting lesser degrees of stress.

When multiple events have been experienced in the preceding two years, the aggregate of the MSV scores can provide a useful indication for when a person may experience coping difficulties. That the individual perceives their personal and social resources which they are able to mobilise are insufficient to meet the demands (Lazarus & Cohen, 1977).

Known as the The Social Readjustment Rating Scale (SRRS), high aggregate MSV scores have been shown to predict illness and health breakdown.
On the SRRS, a sum score of:

- Below 150 points equates to a low amount of life change, low susceptibility to stress-induced health breakdown.
- 150 to 300 points indicates approximately a 50% chance of major health breakdown in the next two years.
- 300 points or more, raises these odds of major health breakdown to about 80%.

A study of Australian pilot mental health during the COVID-19 pandemic published in 2023 surveyed 77 pilots during the height of the pandemic. The study included a SRRS MSV sum score for the pilots as one of the collected parameters. It identified that with 95% of the participants affected in the context of their aviation occupations by the pandemic, one third of the participants had symptoms of a diagnosable mental health disorder (Ackland et al., 2023).

It should be noted that the period of sampling for this survey was likely to still have captured life stress events which were directly related how the COVID-19 epidemic adversely impacted upon the global aviation industry. However, this limitation of sampling itself could perhaps be harnessed in order to better prepare for future response to major industry disruptions so as to design a faster recovery within the fragility of the aviation industry.

The full Holmes and Rahe-Stress Life stress inventory table is reproduced in Appendix 2 with each life event category described and it's weighted MSV score itemised.

- Data Analysis

Respondents were excluded from the analysis if they did not complete the demographic questions. Those who did not proceed to answer any of the substantive study healthcare questions were removed from the analysis of the primary study objectives. Provided the respondent answered yes to any one of the four core healthcare avoidance questions, the primary study outcome for the multinational comparison was achieved.

Any demographic too small to determine viable data or give cause to be able to reverse identify a candidate did not have their demographic responses analysed, however their responses remained included in the whole cohort analysis.

Categorical data were summarised using percentages and analysed using Chi-squared test.
Significance for results was established when P-values were less than 0.05. Odds ratios (ORs) and their corresponding 95% confidence interval (CI) and P-values were then reported.

Statistical analysis was performed using IBM SPSS statistics (Version 26) analytics software.
Apple Numbers spreadsheet was utilised to make descriptive data analysis.

- Procedure

With the study of Healthcare Avoidance by pilots, Hoffman et al. utilised social media platforms (Facebook.com and instagram.com) specifically searching for groups with aviation affiliations, together with airlines, aviation universities and military air surgeons to communicate the online questionnaire link (Hoffman et al., 2022).

This multi-channel/multi-sector approach gained a greater degree of success with more respondents representative of the population being sampled and at publication, suggested that the study was the largest of it's kind to date.

For this study use of P.Prune, LinkedIn, Facebook, Instagram together with airlines, aviation employers, professional unions, aero clubs, flying schools, professional associations and the aviation medical fraternity was employed to achieve the multi-channel/multi-sector sampling.

The promotional flyer for the questionnaire is attached at Appendix 3. It was a sent to all of the participating agencies to include in their updates, newsletters and publications. It was digitally included in social media posts and provided both a QR code and full URL link to the Qualtrics survey platform questionnaire.

- Ethics

The study was carried out under the auspices of a low risk human ethics research notification. A low risk research project is one in which the nature of the harm is minimal and no more than is normally encountered in daily life. For this study, discussion with the supervisor covered of matters concerning the Code of Ethical Conduct for Research, Teaching and Evaluations Involving Human Participants and the ethical analysis of the project.

Research which is considered low risk does not receive approval from a Human Ethics Committee. A Low Risk Notification is used to record the research on the Low Risk Database which is reported in the Massey University Human Ethics Committee Annual Report (Administrator, 2015, 2017).

Specifically in regards to the methodology of this research, the Massey University Code of Ethical Conduct for Research highlights primary focus for ethical considerations of this study to be on:

- Obtaining informed consent to ensure participant autonomy.
- Following the ethical and data handling protocols for avoidance of harm.
- Protection of privacy and confidentiality to ensure responses are de-identified
- Maintenance of trust to ensure the special collegial industry relationships are preserved.

The Aviation Healthcare Behaviour Questionnaire Introduction page and consent form are presented in Appendix 4.

The results are to be provided by open publication such that the benefit to the participants and justice of potential benefits gained from discovered results towards industry improvements in safety can be provisioned.

The study is a similar replication of the Healthcare Avoidance in Aircraft Pilots Due to Concern for Aeromedical Certificate Loss (Hoffman et al., 2022) where the study design was conducted in accordance with the Declaration of Helsinki. The Brooke Army Medical Center Institutional Review Board approved the study protocol (protocol no. C.2019.158e).

The ethical issues considered and how they were addressed regards to this study, primarily amounted to matters of confidentiality. The discussion centred on adopting a multilayered approach to prevent any occurrence of a respondent being able to be reverse identified.

- Firstly the data collection platform was chosen so that established best practice confidentiality protocols are protected (ISP masking ect). By ensuring the option to disable URL tracking within the settings of the survey aggregator Qualtrics platform, it was ensured that data collection, confidentiality and security protocols were maintained.
- No data was collected which would allow responses to be associated with a single identifying data point e.g. No name, employer or ID number.
- If any data grouping became too narrow, such that elimination of other parameters by default would potentially lead to an individual's identity coming discoverable, this information was permanently masked and not analysed in the study.
- The questions were worded to be sure the responses did not actually seek an admission to having carried out an illegal activity.
- Equally the CAA NZ medical unit were consulted over the study format which they supported and also identified the imperative that to prevent any bias of responses, they ought not be associated with the survey.

The risks for emotional/spiritual harm or embarrassment were considered to be mitigated in the design of the study. This was achieved by utilising a self selecting, non-probability sample where the respondents elect to engage (or not) via a web-portal from within their own safe space and provided a format where respondents were able to easily discontinue at anytime they chose to.
The questions were worded intentionally to allow for a degree of interpretational "wiggle room" so as to give the respondent comfort when providing the answer they felt to be most accurate and to avoid any post survey regret, guilt or trauma.

To study the research problem with the sensitivities of the topic and provided confidence for the study respondents required assuring a high degree of anonymity. However upon peer review of the study methodology, it was observed that there potentially could be a lot of value in the collected data set if there was a means to re-survey at a later date. Any longitudinal study could demonstrate the effectiveness of interventions should an ability be designed into this study to re-survey those we knew to have been part of the original study group at a later date.

This then created a matter of challenging technical difficulty to being able to achieve a longitudinal, repeat measures survey, and to simultaneously preserve the anonymity protocols. The solution was achieved by providing the respondent an option to agree to be directed onto another unrelated survey platform, after the completion of the ten survey questions, for the purposes of collecting respondent contact details. These two structurally separate databases would have no cross functional operability to be able to trace back identity to the original survey answers. The contact Information and personal data collection form is reproduced in Appendix 5.

5. Results

After utilising as many means by which to snowball prompt survey participation, the collection of responses was closed after four months. Over this period there were 440 participants who followed the QR or URL link in order to access the Qualtrics survey platform, however not all of them followed through to completion. Below is a breakdown of participants' decisions to either continue or to opt-out.

From the 440 of those who undertook to access the survey link:
- 39 (9%) proceeded no further.
- 12 (3%) elected to not give consent and exited the study.
- 389 (88%) proceeded further by providing their consent to participate .
- 377 (86%) completed the demographic questions but six elected to go no further.
- 371 (84%) answered at least one of the four primary healthcare avoidance questions.

Further to the four healthcare avoidance questions were the survey questions regarding mental healthcare avoidance, the Holmes/Rahe life stress scale and ongoing study participation. The response rate for this portion of the questionnaire was:
- 358 (81%) completed the mental health avoidance question.
- 277 (62%) completed the Holmes Rahe stress scale.
- 91 (21%) opted to provide details so they could partake in a further later study.

The decision to run the survey analysis on the sample of N = 371 who answered at least one of the four primary HCA questions ensures study conclusions most accurately reflect the participant response intention. Any respondent that only answered one HCA question as No (leaving the other questions unanswered), was tallied as if they had responded No to all four HCA questions.

i) Demographics

Of the 371 respondents who answered at least one study question, 315 were Male (85%) and 55 Female (15%) and one identified as Other. The minor sample size of Other gender prevented a unique survey analysis of this demographic.

The average age of the retained research sample (N = 371) was 43.5 years (SD= 13.2 years), with ages ranging from 18 years to 79 years. Figure 1 shows the age distribution of the respondents and given the superimposed normal distribution, suggests there are no apparent gaps or biases in the age of participants, with the exception of the age 32 band.

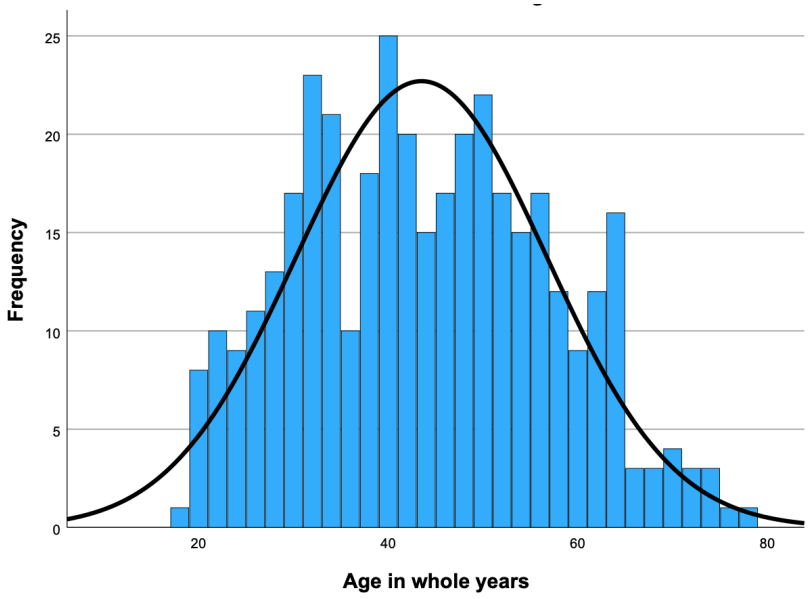

Figure **1. Respondent ages in whole years.**

Table 3 shows the ethnical breakdown of the research sample. Most respondents identified as European (87%). Pacific Islanders returned as a significant minority (6%), with Maori and Asians both represented as small minorities (1.6%). The NZ CAA does not publish statistics on the ethnicity breakdown of aviation licence holders in NZ in order to compare these proportions against.

The ethnicities which returned sufficient numbers to be analysed were European, Pacific Islander, Asian and Maori. These were the ethnicities used when it came to comparing survey responses between ethnicities. The other ethnicities remained in the overall analysis of study objectives.

Table 3. *Respondent Ethnicity.*

Ethnicity	***N***	**Percent**
Aboriginal	0	0.0%
African	2	0.5%
Asian	6	1.6%
European	324	87.3%
Latin American	1	0.3%
Maori	6	1.6%
Middle Eastern	0	0.0%
North American	2	0.5%
Pacific	22	5.9%
Other	8	2.2%
Total	**371**	**100%**

Table 4 shows the relative distribution of respondents by the sector of aviation category they are involved in. The survey respondents represented 4.7% of the study population for the whole of NZ aviation pilots and 7.4% of ATCOs with medicals. The aviation sector groups for which the respondent numbers was not representative of included student ATCOs, rotary wing and military.

Table 4. *Respondent Aviation Sector.*

Aviation Sector	*N*	Percent
Air Traffic Controller	30	8.0%
Air Traffic Controller (Student)	1	0.3%
Airline Jet Long-haul	83	22.2%
Airline Jet Short-haul	95	25.7%
Airline Turbo-prop	62	16.6%
Commercial Fixed wing	36	9.6%
Commercial Rotary wing	3	0.8%
GA Fixed wing	48	12.8%
GA Rotary wing	0	0.0%
Military	1	0.3%
Student Pilot	12	3.7%
Total	**371**	**100%**

ii) Healthcare Avoidance.

Table 5 shows the total responses from the respondents in this study who answered yes to any of the healthcare avoidance behaviours.

Table 5. *Respondent Rate to Primary Study Questions.*

	No	Yes	Did Not Answer
Sought informal healthcare from other than ME or GP.	192 (51.8%)	179 (48.2%)	0
Flying/Controlling despite symptoms worthy of evaluation.	181 (48.8%)	185 (49.9%)	5 (1.3%)
Flying/Controlling on medication not evaluated.	312 (84.1%)	46 (12.4%)	13 (3.5%)
Flying/Controlling without declaring health-state.	166 (44.7%)	192 (51.8%)	13 (3.5%)
Yes to at least one question		280 (75.5%)	

The highest reported avoidance behaviour of any category was for misrepresented or withheld information on a written healthcare questionnaire (i.e a symptom is more or less severe) for fear of losing their operational status and/or Medical Certificate, with 51.8% of the respondents disclosing this behaviour. In a breakdown of this behaviour, the ratio was 2:1 in favour of withholding information versus misrepresented information.

Of the study cohort, 75.5% survey respondents met the primary study endpoint of displaying healthcare avoidance behaviour by disclosing at least one of the four basic HCA behaviours for fear of losing their operational medical status.

The lowest response rate of the avoidance behaviours was that of taking a prescription medication not prescribed to them for a symptom they felt perhaps should've been evaluated by a physician before operating. 12.4% of respondents disclosed this as an avoidant behaviour they had displayed.

Table 6 shows the demographic breakdown of the data returns from the 371 who completed the demographic questions and answered at least one of the study questions.

The highest HCA return of any gender, age, or ethnicity demographic was for the Asian ethnicity of whom 83.3% disclosed HCA. However they only represented of 1.6% of the sample population. The second highest cohort was those aged between 25-40 who represented 36.9% of the survey population and returned a prevalence of 81.8% HCA.

Demographic returns between the genders showed Females, at 14.8% of the surveyed population, disclosing 78.2% HCA.

The ATCO population with an average age of 46 years returned the highest aviation sector HCA prevalence at 80.0%.

Student Pilots with an average age of 28 years responded with the lowest disclosure of HCA at 50.0%.

The Regulator under which respondents held certification for whom returned the highest HCA was the Australian jurisdiction at 79.6%.

Table 6. *New Zealand survey returns by demographic factors and HCA objective.*

Category	Mean Age	Total N (%)	Healthcare Avoidance (HCA) N (%)
All	**44**	**371**	**280 (75.5%)**
Gender			
- Female	38	55 (14.8%)	43 (78.2%)
- Male	45	315 (84.9%)	236 (74.9%)
Age			
- Age <25	21	27 (7.3%)	21 (77.8%)
- Age 25-40	33	137 (36.9%)	112 (81.8%)
- Age 41-60	50	162 (43.7%)	119 (73.5%)
- Age >60	45	45 (12.1%)	28 (62.2%)
Flying Category			
- ATCO	46	30. (8.1%)	24 (80.0%)
- Airline Jet Long-haul	51	83 (22.4%)	61 (73.5%)
- Airline Jet Short-haul	45	95 (25.6%)	74 (77.9%)
- Airline Turbo-prop	37	62 (16.7%)	49 (79.0%)
- Commercial Fixed	38	36 (9.7%)	28 (77.8%)
- Commercial Rotary	52	3 (0.8%)	2 (66.7%)
- GA Fixed wing	41	48 (12.9%)	34 (70.8%)
- Student Pilot	28	12 (3.2%)	6 (50.0%)
Ethnicity			
- European	44	324 (87.3%)	243 (75.0%)
- Pacific Islander	40	22 (5.9%)	16 (72.7%)
- Asian	39	6 (1.6%)	5 (83.3%)
- Maori	34	6 (1.6%)	4 (66.7%)
Regulator Jurisdiction			
- New Zealand	43	357 (96.2%)	269 (75.4%)
- Australian	43	49 (13.2%)	39 (79.6%)
- Other	47	30 (8.1%)	21 (70.0)%
- Pacific Islands	43	5 (1.3%)	3 (60.0%)

iii) Multinational study comparison

This section describes the demographics of each nation's pilot population for the multinational comparison. Because the HCA study (Hoffman et al., 2022) did not include ATCOs, there is no opportunity to assess them as part of this comparison. As such, responses for ATCOs in this study were removed from the NZ sample for this portion of analysis.

The degree of non-probability sampling in each country is evident in the reporting of the percentage returns represented in each subset of the whole study population that the survey sample responses represent (Table 7).

In regards to demographic differences, whilst similar in the 18-40 age bracket, the NZ study is weighted more towards respondents in the age bracket of 41-60 years at 43% of the study group, whereas the North American studies, comprising both US and Canadian pilots, are less so, averaging closer to 25% in this age bracket.

The sample representation from different flying categories can be seen to show differences also. The NZ study is in the majority representative of Civilian Airline pilots with 53% of the respondents being employed in this category versus 10% (US) and 13% (Canada). The US and Canadian results are more generally representative of the General Aviation category as this is the category they have reported the most responses for (63% and 40% respectively).

Table 7. *Multinational pilot demographic factors.*

	All pilots		**NZ pilots**		**US pilots**		**Canadian pilots,**	
	N	**%**	***N***	**%**	***N***	**%**	***N***	**%**
Total Civilian pilot population	862,468		6,674		806,940		48,854	
Study pilots (% of Total)	5,505	0.6%	335	5.0%	3,765	0.4%	1,405	2.8%
Female (% of Study)	535	9.7%	44	13.1%	329	8.7%	162	11.5%
Age								
18–40	2,665	48.4%	151	45.1%	1,710	45.4%	804	57.2%
41–60	1,449	26.3%	145	43.3%	928	24.6%	376	26.8%
> 61	1,389	25.2%	39	11.6%	1,125	29.9%	225	16.0%
Flying Category								
General aviation	2,993	54.4%	48	14.3%	2,385	63.3%	560	39.9%
Civilian, mainline airline	715	13.0%	178	53.1%	360	9.6%	177	12.6%
Civilian, non-airline commercial	686	12.5%	36	10.7%	411	10.9%	239	17.0%
Civilian, regional airline	554	10.1%	62	18.5%	334	8.9%	158	11.2%
MIlitary	281	5.1%	1	0.3%	264	7.0%	16	1.1%
		95.0%		97.0%		99.7%		81.9%

Figure 2 shows the proportion of each nation's pilot population that met the study endpoint of reporting healthcare avoidance behaviour by answering yes to one or more of the four primary study questions.

Compared to the 56% (US) and 55% (Canadian) returns for the primary healthcare avoidance end point study result, the New Zealand experience of 74% for pilots disclosing HCA was 34% greater.

The New Zealand survey population returned proportionally higher disclosure percentage responses for all four HCA questions.

The single HCA response which contrasts the most between the national populations is for the question regarding those who carried out duties despite experiencing a symptom (physical or psychological) which they felt should have been evaluated by a physician before operating.

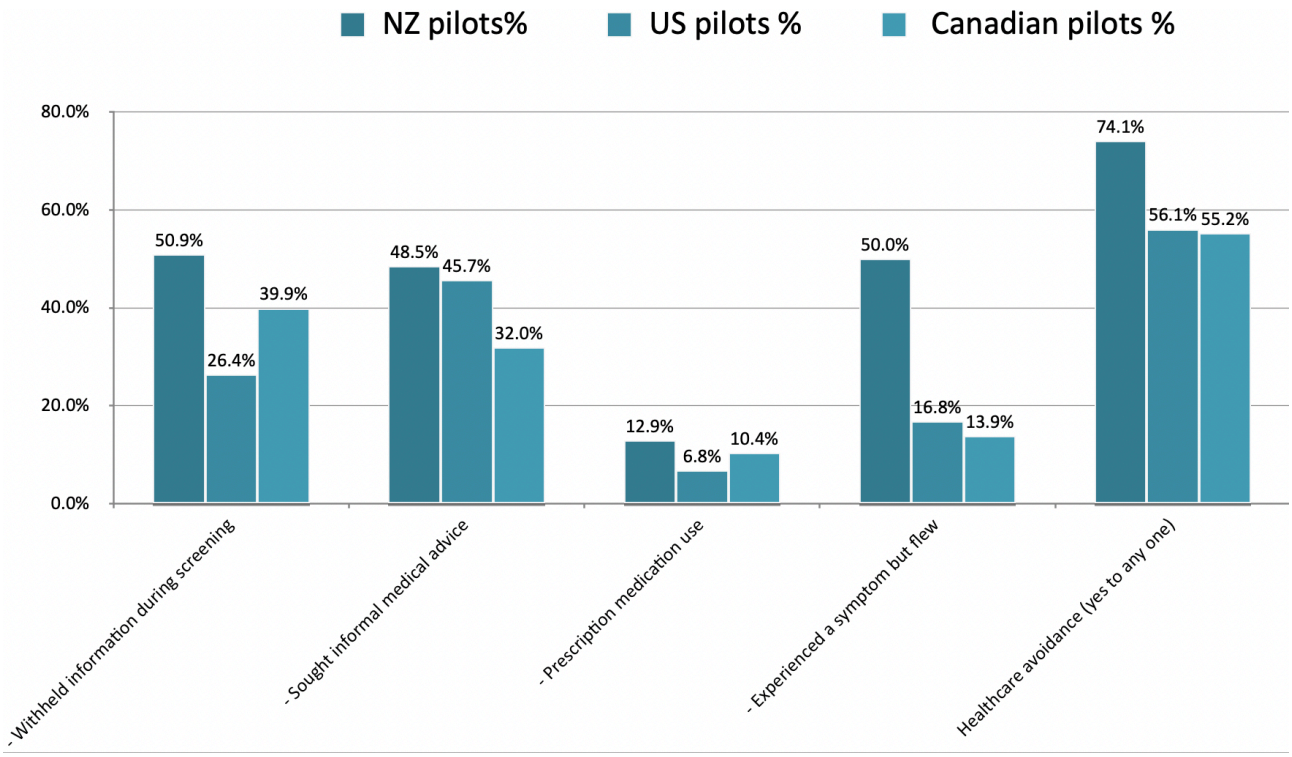

Figure 2. **Multinational Pilot Healthcare Avoidance Behaviours Comparison.**

Table 8 compares each of the individual primary study healthcare avoidant behaviours and the overall HCA return. It is shown as an odds ratio between the New Zealand pilot study population and the combined returns for the US and Canadian studies (North American study cohort).

The table compares the ratio between the odds that a New Zealand pilot study respondent would exhibit each of the healthcare avoidant behaviours versus the odds of that same behaviour being disclosed by a North American study respondent.

It shows that for all of the behaviours, the odds of the NZ study respondents conducting that behaviour significantly exceeds that of their North American colleagues.

Table 8. *New Zealand versus North American pilot odds of healthcare avoidant behaviours.*

	Odds Ratio	Lower 95% CI	Upper 95% CI	P
- Withheld information during screening	2.41	1.93	3.00	<0.01
- Sought informal medical advice	1.30	1.05	1.62	<0.01
- Prescription medication use	1.77	1.27	2.47	<0.01
- Experienced a symptom but flew	5.26	4.20	6.59	<0.01
Healthcare avoidance (yes to any one)	2.26	1.76	2.90	<0.01

Figure 3 graphs the ratio between the odds that a New Zealand pilot study respondent would exhibit each of the healthcare avoidant behaviours versus the odds of a North American study respondent (at the zero line).

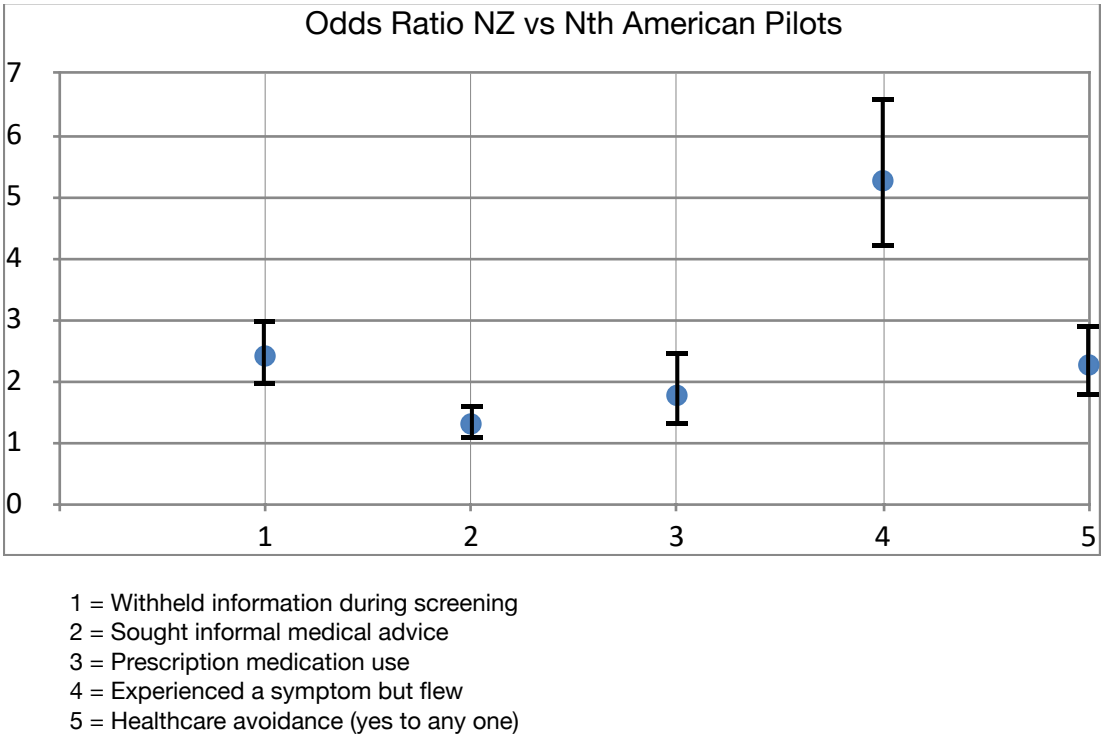

Figure 3. **New Zealand versus North American pilot odds of healthcare avoidant behaviours.**

The behaviour for which the odds ratio comparison has the most pronounced comparison is that of conducting duties despite experiencing a symptom (physical or psychological) for which the respondent felt should have been evaluated by a physician before operating i.e., item 4 'Experienced a symptom but flew' at 5.26 (95% CI, 4.20-6.59).

Overall, for the definition HCA (i.e., item 5, 'Healthcare avoidance (yes to any one)') the odds of the NZ study cohort to display HCA were 2.26 (95% CI, 1.76-2.90) more than the odds for the North American study cohort.

iv) Mental Healthcare Avoidance

In the study of healthcare avoidance behaviour, 36.4% of respondents answered yes to this novel question for not referring to a mental health professional (Counsellor, Psychologist etc.) when they considered to do so, but did not out of fear of losing their medical status.

Table 9 shows the demographic breakdown of the data returns from the 371 who completed the demographic questions and answered the mental health question.

Table 9. *New Zealand survey returns by demographic factors and Mental Healthcare objective.*

Category	Mental Healthcare Avoidance N (%)	Healthcare Avoidance (HCA) N (%)
All	**91 (36.4%)**	**280 (75.5%)**
Gender		
- Female	24 (43.6%)	43 (81.1%)
- Male	110 (34.9%)	236 (75.6%)
Age		
- Age <25	15 (55.6%)	21 (77.8%)
- Age 25-40	68 (49.6%)	112 (81.8%)
- Age 41-60	43 (26.5%)	119 (73.5%)
- Age >60	9 (20.0%)	28 (62.2%)
Flying Category		
- ATCO	9 (30.0%)	24 (80.0%)
- Airline Jet Long-haul	19 (22.9%)	61 (73.5%)
- Airline Jet Short-haul	25 (26.3%)	74 (77.9%)
- Airline Turbo-prop	34 (54.8%)	49 (79.0%)
- Commercial Fixed	15 (41.7%)	28 (77.8%)
- Commercial Rotary	*Insufficient Data*	*Insufficient Data*
- GA Fixed wing	23 (47.9%)	34 (70.8%)
- Student Pilot	8 (66.7%)	6 (50.0%)
Ethnicity		
- European	118 (36.4%)	243 (75.0%)
- Pacific Islander	7 (31.8%)	16 (72.7%)
- Asian	3 (50.0%)	5 (83.3%)
- Maori	2 (33.3%)	4 (66.7%)
Regulator Jurisdiction		
- New Zealand	128 (35.9%)	269 (75.4%)
- Australian	22 (44.9%)	39 (79.6%)
- Other	12 (40.0%)	21 (70.0)%
- Pacific Islands	2 (40.0%)	3 (60.0%)

Specific to the novel mental healthcare avoidance question, the female gender returned 43.6% Yes responses, which was 25% greater than the male survey respondents.

Student Pilots with an average age of 28 years responded with the highest mental healthcare avoidance of all aviation sector categories with 66.7% responding with Yes to this question. This stands in contrast to the same demographic being the lowest return for disclosing HCA.

30.0% of ATCOs answered yes to avoiding mental healthcare which sits alongside of their mean age of 46 years.

The lowest ethnicity demographic related return for mental healthcare avoidance was for the Maori and Pacific Islander who disclosed 33.3% and 31.8% respectively.

Notably in the Airline category, 54.8% of the Turboprop sub-set disclosed avoiding mental healthcare. The return rate of this group which is typically populated by pilots early in their career progress with lesser levels of experience, was over double that for the respondents from the jet pilot sub-set.

The Regulator under which respondents held certification for whom returned the highest Mental healthcare avoidance was the Australian jurisdiction, returning 44.9%, a rate 25% higher than the overall respondent rate.

v) Holmes Rahe Life Stress Survey

277 Participants (75% of those who completed the demographic section) elected to continue and take part in Q11 of the survey to complete their Holmes Rahe SRRS sum score rating. Figure 4 shows the occurrence returns of each Life Event Category in rank order of MSV score.

Each respondent aggregated their “achieved” Life Event MSV scores for a SRRS total score (sum score). The average SRRS sum score for the Q11 respondents was 182 (SD 116). The cohort distribution is shown in Figure 5. This score falls in the Holmes Rahe range of 150 to 300 significance.

When compared against the normal distribution, this result exhibits a positive skewness of 1.15 indicating the distribution was right skewed. The kurtosis of the SRSS sum scores was found to be 1.62, indicating that the distribution was more heavy tailed. These results show an apparent prevalence towards the higher aggregated life stress events.

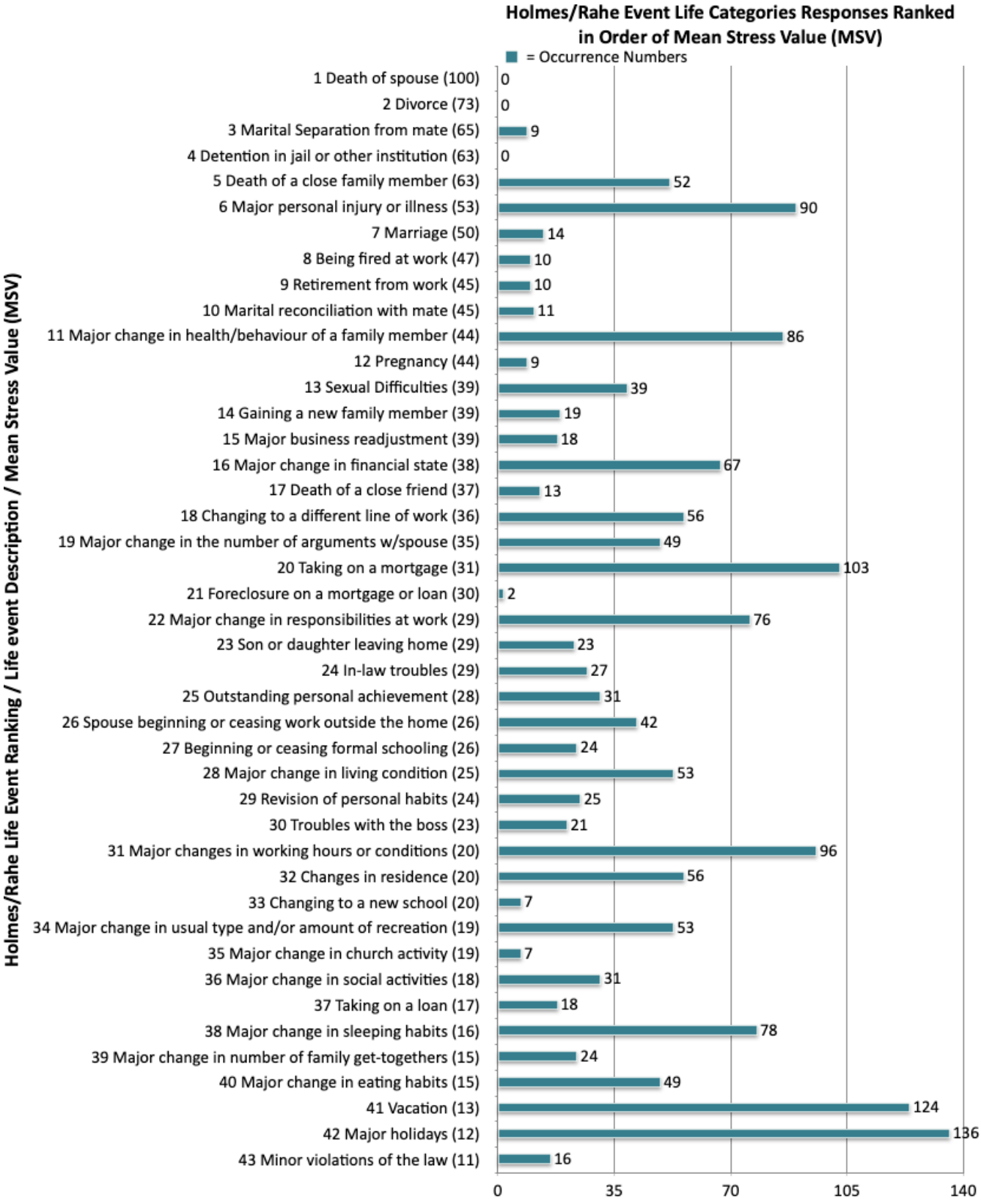

Figure 4. Holmes/Rahe Life Event Category, Occurrence Numbers, Ranked in Order of Life Event MSV.

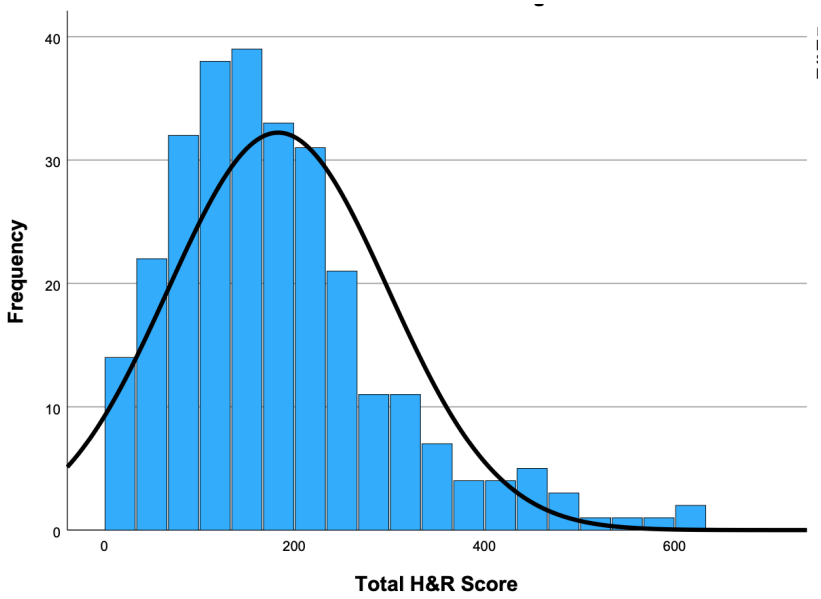

Figure 5. Graphs the distribution of SRRS

Table 10 shows the sum scores in the Holmes Rahe ranges of significance. Of note, 13.9% of the survey cohort returned a sum score of greater than 300 points. Five respondents returned a sum score greater than 500 points, with the maximum score of 628.

Table 10. *New Zealand survey returns by numbers in each H&R significance bands.*

Holmes & Rahe SRRS score	Mean Age	Total N (%)
- Score < 150	47	121 (43.2%)
- Score 150 < 300	44	120 (42.9%)
- Score > 300	38	39 (13.9%)

Table 11 breaks down the SRRS mean sum score for each demographic group of the data returns from those who completed the demographic questions and took the Social Readjustment Rating Scale questionnaire.

The SRRS mean sum score returns proved consistent as they applied across all demographics and roles, except for the age bracket of 25-40 years and those who are regulated under the Australian jurisdiction. The mean return for these cohorts was a sum score of 214 points and 211 points respectively. Both these demographics exhibited notably higher scores than the average. Alternatively, the Maori ethnicity stood apart with a HRSS mean sum score of 99 points, almost half the score for the full survey population.

The last two columns of Table 11. makes a comparison between the SRRS mean sum score of those in each demographic who disclosed HCA and those in the same demographic who did not.

Table 11. *New Zealand survey returns by demographic factors and Holmes & Rahe SRRS objective.*

Category	Average Holmes & Rahe (H&R) Stress Score	Average H&R Stress Score of HCA	Average H&R Stress Score of No HCA
All	**182**	**196**	**137**
Gender			
- Female	199	206	163
- Male	180	194	134
Age			
- Age <25	189	176	*Insuff' Data*
- Age 25-40	214	225	162
- Age 41-60	171	187	127
- Age >60	139	152	109
Flying Category			
- ATCO	171	167	184
- Airline Jet Long-haul	178	197	119
- Airline Jet Short-haul	181	197	133
- Airline Turbo-prop	196	212	118
- Commercial Fixed	183	204	112
- Commercial Rotary	163	163	*Insuff' Data*
- GA Fixed wing	190	197	166
- Student Pilot	171	139	236
Ethnicity			
- European	185	199	138
- Pacific Islander	192	207	152
- Asian	154	156	*Insuff' Data*
- Maori	99	113	*Insuff' Data*
Regulator Jurisdiction			
- New Zealand	185	198	138
- Australian	211	237	114
- Other	202	217	*Insuff' Data*
- Pacific Islands	*Insufficient Data*		*Insuff' Data*

For the whole study population this showed a 43% increase of SRRS mean sum score between those answering No to any HCA question and those disclosing HCA.

The group with both the highest SRRS mean sum score for their HCA cohort at 237 points, and the largest difference by comparison to their 'No to any HCA' peers, were those regulated under

the Australian jurisdiction who returned a SRRS mean sum score for those disclosing HCA of over double that of their 'No to any HCA' colleagues.

- Opportunity for Longitudinal study

91 respondents gave their permission to be contacted at a future time so that they may take part in another similar study. This represents 25% of the study cohort.

Demographically, Pacific Islanders scored highest at 41% providing further study permission, whilst the student pilots, and those aged between 41 and 60 years returned the lowest at 17% and 18% percentage of their demographic respectively.

6. Discussion

It was hypothesised that there exists in the population of pilots and ATCOs in New Zealand a degree of healthcare avoidance (HCA) related to a fear of losing their medical certificate. Such a study had been carried out for pilots in North America and Canada which demonstrated this type of behaviour was significant in that study population.

This study undertook to not only make a comparative examination of the issue against those findings, but went on to expand the subject by including the specific topic of mental healthcare avoidance.

As far as the author knows, it is the first study of it's kind which has included the cohort of ATCOs into the study population.

Additionally, this study included the collection of life stress data to explore if there exists any correlations between the work and lifestyle cumulative stressors experienced by pilots and ATCOs when seen alongside healthcare avoidance.

The study primary question response return of N = 371 constituted 95% of those who read and gave their consent to the study, which likely demonstrates a high degree of trust in the survey ethics statements.

Although the sampling methodology cannot show how wide the survey was distributed across the whole study population, as a proportion of the whole population, the respondent set of 4.7% of pilots and 7.4% of ATCOs indicates a good return rate.

As compared to the NZ national population demographics, the respondent set shows an overrepresentation of European (87.3% vs 59%) and underrepresentation of the Asian and Maori minorities (1.6% vs 15%). The Pacific Islander set was reasonably close to being representative

(6% vs 8%). However as ethnicity data is not collected by the NZ CAA, it may still stand that the survey ethnicity proportions returned are more representative of the study population than these comparisons suggest.

This gender breakdown of the study respondents at 85% Male and 15% Female is generally reflective of the aviation industry as a whole. But as the 2018 census data gives the NZ female participation rate in aviation as 7% of pilots and 22% of ATCOs, this suggests a small gender bias towards female pilots and against female ATCO's underlying the participation.

With 64.7% of the pilot respondents indicating that they are employed in an airline, it stands that for the sub group of pilots who are employed by airlines, the respondent population is representative.

i) Primary Study Endpoint Results for HCA and Mental Healthcare Avoidance

The result of 75.5% survey respondents displaying healthcare avoidance behaviour is notable for its higher return rate than both of the previous North American studies (56%). This is further discussed below under Multinational Study Comparison.

The result of 36.4% answering Yes to the separate single question of not referring to a mental health professional (Counsellor, Psychologist etc.), reveals novel relevant data on the aviation healthcare avoidance issue as it specifically applies to mental health. Whilst when compared to all of the four HCA questions individually, this issue ranks below the more common HCA behaviours, the consequences of poorly addressed mental health issues can have significant consequences in aviation where there is low tolerance for distraction and impaired or overwhelmed cognitive tasking.

Taking a closer look at the age and career stage of the demographic and aviation sector variables for HCA highlights some interesting observations.

The age band of 25-40 years which returned the highest HCA disclosure rate, when observed together with Airline Turbo-prop and Commercial Fixed wing (average ages of 37-38 years) show similar returns above the study average HCA rates. This perhaps indicates an early career role influence upon individuals by being presented with occasions where healthcare decisions ought to be made, and yet for which avoidance decisions occur. This can be corroborated with Student Pilots in training and over 60 year olds cohorts responding with the lowest HCA rates (50.0% and 62.2% respectively).

However the HCA highest returning aviation sector of ATCOs and third highest sector of Airline jet short-haul (with average ages of 46 & 45 years respectively) suggest that these career variables can be drawn pervasively along career paths. This raises a further study question as to whether or

not the stage-of-life age band, has a correlative factor determined by the stage-of-career or role within the industry which has an influence upon decisions around disclosure of medical concerns.

Regarding the novel mental healthcare avoidance question, an age trend can be observed, with over 60 years olds and Airline Long-haul (average age 51 years) responding at the lowest rates at one end of the scale. Disclosure rates increase up to it's highest values by the under 25 year olds, together with Student Pilots (average age 28 years). Viewed alongside the returns for the Airline turboprop role, it suggests that mental healthcare avoidance in the younger, earlier career stage cohort is almost three times of that which the more senior role, later career stage cohort exhibits.

When observing gender differences, reported behaviour shows that while females disclose marginally more overall HCA, they are significantly more reluctant to address matters of mental healthcare concerns than their male colleagues. This factor deserves further study to explore which variables have bearing on why females are influenced to a greater extent in this degree.

ii) Multinational Study Comparison

Exploring the survey data by expanding into the national data comparisons highlights both a number of noteworthy contrasts as well as similarities.

With the considerable variance between the North American HCA returns and the results of the same four primary comparison questions of this study, a closer look into the survey respondent demographic is required. The differences in aviation sector sampling between the studies shows that there is almost a four times greater proportional representation of Airline pilots in the NZ study than the percentage of Airline pilots represented in the North American study. This ratio is reversed for the General Aviation sector between the studies. It would suggest the North American studies are more representative of the healthcare avoidance issue across their General Aviation industry sector, as a whole, whilst this New Zealand study represents the issue more fully in the population of those respondents from the Airline sectors.

The question that showed the most homogeneous response across all studies was to do with the use of prescription medication when operating without a physician evaluation clearance to do so. All study groups responded within 6% of each other and at rates below 13% indicating a universal prevalence towards responsible medication usage. This implies that given a good understanding of medication protocols and consequences of misuse, aviation medical holders will in the main undertake to act responsibly.

The remaining top three healthcare avoidance question responses from this NZ study do contrast however from the North American studies. The NZ cohort displays a more homogeneous response rate with all three avoidance behaviour disclosure rates within 3% of each other, ranging from 48.5% to 50.9%. The North American returns for the same three questions varied from

13.9% up to 45.7%. It appears that the difference in career consequence for the NZ cohort with it's weighting towards a greater representation of airline employees may have influenced avoidance behaviours to cause these differences. Analysis of the odds ratio comparison adds some weight to this possibility since the behaviour of flying despite experiencing a symptom worthy of investigation was over 5 times more likely in the New Zealand pilot respondent cohort. This may be reflective of the barriers to disclosure associated with airline employed pilots where financial and career implications have an influence not present for GA pilots.

The odds ratio comparison shows that the avoidance behaviour most similarly expressed when compared with the North American studies, was seeking informal medical advice as the New Zealanders were only 30% more likely to disclose this.

There may exist cultural differences such as socialised healthcare and a lesser prevalence of insurance protocols which are confounding variables to give rise to these data differences. It is a recommendation that further surveys are carried out in other national aviation populations to understand how some of these cultural differences contribute to the heterogeneity between nationality samples of these data.

iii) Holmes/Rahe Life Stress Scale

The mean SRSS sum score of 182 points falls in the range of 150 to 300 points which Holmes Rahe indicates is able to predict an approximate 50% chance of major health breakdown in the next two years.

One out of every seven of the survey cohort returned a sum score of greater than 300 points which raises the odds of a major health breakdown to 80% in the next two years. Five respondents returned a sum score of greater than 500 points. This result was near identical to the Ackland et al. finding of average 189 points (SD = 130), and 12% in the range of 150 < 300 points (Ackland et al., 2023).

Given the strict medical criteria for duty fitness and the employer provided occupational sickness contract provisions, these results may indicate where a preventative focus might be applied best to pilot and ATCO wellness programmes.

Observing the demographics of ethnicity, Regulatory jurisdiction and age, there were notable outliers both above and below the whole population result. For example, on demographics which returned a higher mean sum score where those in the age band of 25-40 years and those regulated under the Australian jurisdiction. Alternatively for the low SRRS mean sum score, the Maori ethnicity provides points of interest. Normally in the realm of New Zealand Health statistics, the New Zealand indigenous Maori display universally poorer outcomes (Tobias & Yeh, 2007). The Maori in this study are an occupationally unique sub-set of population that sit

successfully in contrast to the wider aviator cohort, and in contrast to the national ethnicity cohort. This may suggest that given the controls of better education and higher socioeconomic standing, there could exist protective factors in the Maori cultural practices to better resist stress effects. These outlier cohorts warrant further study to validate the findings and explore both risk factors and protective factors.

When exploring the degree for which each life event category delivered an impact risk upon the survey population, the MSV ranking order of Figure 4 simply indicates the occurrence rates of the life stress event categories.

For analysis purposes however, to ascertain which life event category delivers the highest degree of stressful impact upon the overall study cohort, *n* occurrence values are of limited use on their own. They do not provide any real indication of events that have a greater degree of risk to health impact effect upon the survey population relative to the other life events. When extracting some meaning from the survey population perspective, it can be seen that when a life event category item of high MSV has no returns, then that category has no overall cohort impact. Similarly, if life event category has many yes returns, but a low MSV (such as the Major Holiday category which returned the highest *n* occurrence), then that life event category has little overall cohort stress impact. But if a moderate MSV life event returns a moderate number of occurrences then this event is of more significance.

The ranking order of Figure 6 takes the number of yes returns (*n*) for each life event category and multiples it by the MSV for that category to establish the stress impact upon the population of each event. Thus we can establish a ranking order between each of the life event categories which is based on how much stress impact upon the study population each event creates.

Re-ranking the life event categories this way shows that events of personal injury and family health, along with the death of a close family member feature as a group in the top three categories. The next group of five ranked life event categories have a financial and major employment change focus. Following thereafter is a grouping of four life event categories to do with interpersonal relationships and travel.

These results suggest there can be an evidence based targeted means for the aviation industry to provide resilience training and invest in preemptive protective measures against lost time and productivity. By proactive targeting of skills training to address the higher ranked event categories in their groupings of 1) health, 2) personal finance and 3) relationships, there is more likelihood for better end effect.

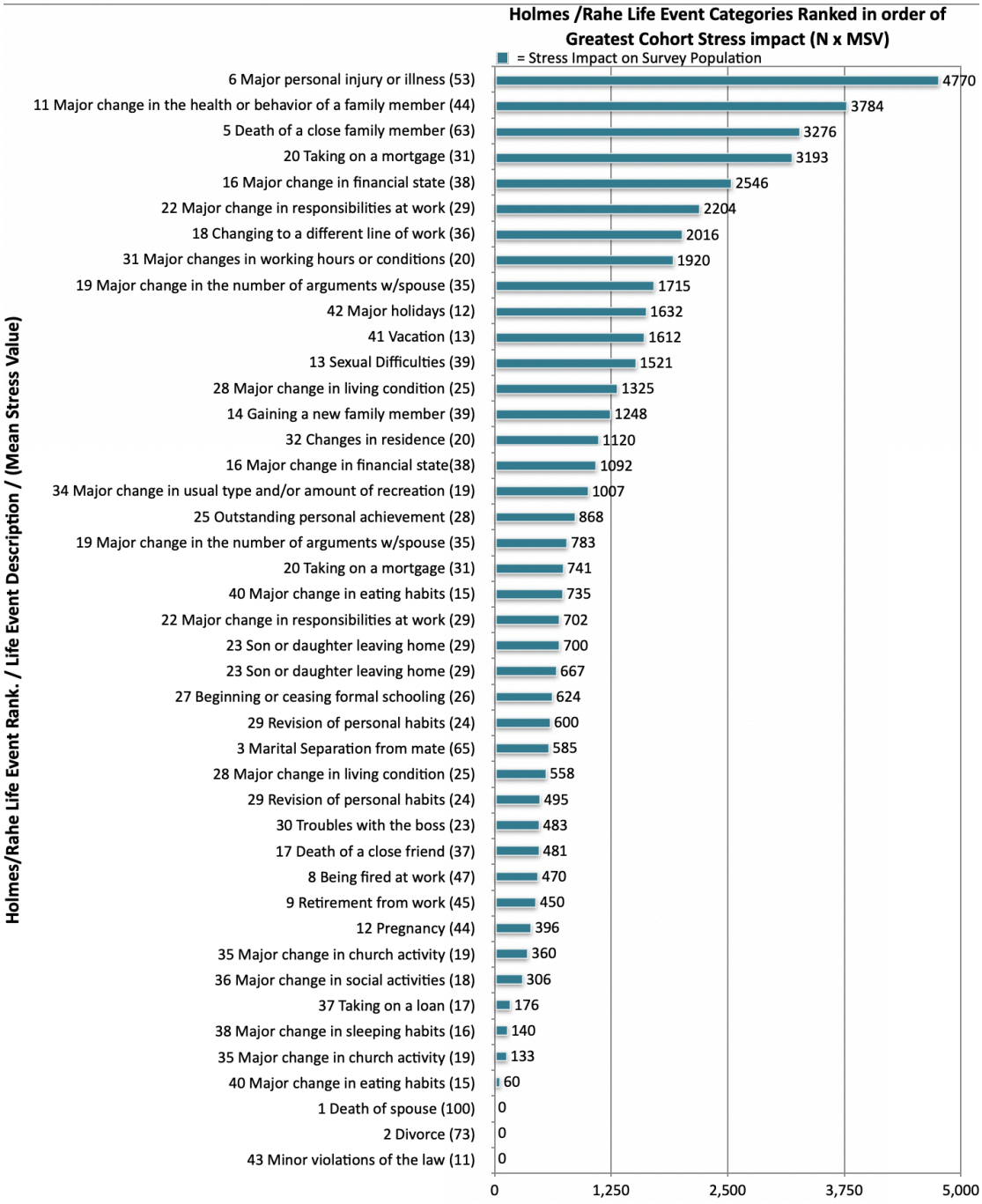

Figure 6. **Holmes /Rahe Life Event Categories Ranked in order of greatest cohort stress impact.**

It should be noted however that these data are likely to have captured the events and impact upon the aviation industry surrounding the Covid-19 pandemic. As such, there is possibly a bias towards those stress event categories most commonly associated with major aviation industry disruption.

Covid-19, the 2007 Global Financial Crisis and September 11 terrorist attack are global events which have shown that the aviation system is fragile in recovery from major industry disruptions. This is especially so within the context of the human stress condition upon the industry's personnel. The results of this study may well be informative in understanding and proactively designing strengths into an airline's strategy during the buoyant times preceding these calamities.

Given the annual $10 billion USD cost of ground damage and the post calamity drag on recovery of personnel factors, the data from this study could inform programs designed to deliver protective benefits to Airlines in regards to both:

- a swifter recovery post calamity in operational capability resilience, and
- fewer errors and incidents over the vulnerable stages during commercial recovery.

iv) Correlations Between Primary Research Objectives

When comparing Holmes/Rahe SRRS mean sum scores against the HCA study question, it becomes apparent that there is a visual correlation in the data.

This data shows that those who disclosed HCA behaviours, reported an average SRRS mean sum score of 196 points. This is of particular interest given the comparison against those who reported 'No to any HCA' behaviours. In their case, the average SRRS mean sum score was 137 points.

This showed that for respondents who disclosed HCA, on average their SRRS mean sum score was 43% higher than those with 'No to any HCA'. Expressed as an Odds Ratio, those who disclosed healthcare avoidance were 2.7 (95% CI, 1.61-4.57) times more likely to score greater than 150 on the Holmes/Rahe SRRS, and as such 50% more likely to encounter a major health breakdown in the next two years.

These results suggest that those industry personnel who are exposed to a greater number of collective life stress events are more routinely presented with healthcare issues. This subsequently is likely to lead to them being confronted with the cascading dilemmas of medical declaration versus avoidance decisions.

However the one demographic who showed a notable exception against the general data set were Student Pilots at an average age of 28 years. In their cohort the results were inverted when compared with the whole study population. Those who responded 'No to any HCA' had a SRRS mean sum score of 236 points, versus those who did disclose HCA who responded with 139 points. We would expect this behaviour as the normal uninhibited response to someone experiencing high cumulative life stress going on to find appropriate healthcare.

This trend was reflected in the under 25 years age cohort also. One young respondent, given a SRRS score of 375 points, had indeed indicated that they had sought healthcare. It is possible this may indicate improved healthcare seeking behaviours are developing in the younger cohort and at the flight training school level.

v) SMS Implications to Error Management

Given the lack of data to guide decision making, but the very real and pragmatic need to risk stratify pilots based on medical circumstances, a qualitative risk matrix can be utilised, where risk is categorised based on likelihood of occurrence and degree of negative outcome.

In the MeSafe, Review Report And Impact Assessment, the primary risk focus is of the impacts of Mental Incapacitation Events (MIE) and provides a Mental Incapacitation Risk Assessment Process (MIRAP) utilising a SMS type matrix to assess risk.
This goes some way towards acknowledging that a spectrum exists in which performance may become effected by degraded states of wellbeing to varying degrees. It arbitrarily pairs an incapacitation state with a likelihood of a flight safety event of increasing severity. The interrelatedness of consequence and likelihood is shown in Table 12 in the version of an SMS matrix.

Table 12. *Mental Incapacitation Risk Assessment Process (MIRAP), Mental health in aviation (MESAFE)*

MESAFE MATRIX Risk assessment of mental health			**Catastrophic - A**	**Hazardous - B**	**Major - C**	**Minor - D**	**Negligable - E**
			May cause catastrophic event	may cause flight safety critical event	May comprimise flight safety	Reduced effectiveness and capacity to adapt to operational requirements	Minimal impact on flight safety
	Frequency per year	Flight hours between each event (approx) *	Total incapacitation	Severe incapacitation	Major decrement on performance	Minor to moderate performance compromise, may continue duties	Minimal impact on performance
Frequent 5	> 1/month	100	5A	5B	5C	5D	5E
Occasional 4	1-10 times	1.000	4A	4B	4C	4D	4E
Remote 3	10-99%	10.000	3A	3B	3C	3D	3E
Improbable 2	1-10%	100.000	2A	2B	2C	2D	2E
Extremely improbable 1	<1%	>1.000.000	1A	1B	1C	1D	1E
*given random onset of event unconnected to flight. If event is connected to flying activity (e.g. Murder suicide or flight anxiety),use career frequency rather than yearly							
	Risk unacceptable					**Operational risk reduction could be co-pilot, backup crew, time window to land helicopter etc. Personal risk factors could be close follow-up by psychologist, peer-support etc. Formalised risk reduction is documented and required in the certificate.	
	Risk unacceptable, but may in some cases be acceptable after thorough review and specific mitigation. A medical board should in such cases be employed						
	Risk may be acceptable - may require operational and/or personal risk reduction						
	Risk acceptable						

But in only one out of the 44 recommendations of the report is there an acknowledgement that in any aeromedical assessment of mental health, the potential for incidents and accidents should be taken into account (Tomasello et al., 2024).

Rather, how “flight safety” is defined is left down to the probability of an MIE, where the conditions which are defined as an MIE are of an extreme nature and mainly include:

> *Suicide, Murder-suicide, Aggressive behaviour, Agitation, Intrusive thoughts/compulsions, Depersonalisation, Reduced alertness, Panic attack, Hallucinations, Delusions.*

Under a TEM construct, defining risk to aviation safety of impaired mental wellness would appear to be wholly incomplete without a clearer understanding of the error implications presented when professional, well intentioned personnel interact with the workplace at states of mental wellness impaired by normal life stressors.

Quantifying the degree to which threat states arise from personnel who are interacting within the aviation system at degrees of impaired mental wellness (even if below diagnostic thresholds) can provide vital TEM tools to ameliorate the probability of an aircraft undesirable state occurrence.

More targeted topic material improvements for educational aviation-related health promotion specific to the study population based off this study's data may provide a higher degree of relevance to that personnel.

The current, expert opinion based approach utilised as the primary SMS defensive barrier to prevent the consequence of a mental health related event in aviation has been shown by the healthcare avoidance results of this and other studies to have significant limitations. Using expert mental health diagnostic assessment as a proxy measure to gauge flight safety has possibly resulted in an unintended consequence of healthcare avoidance.

Within the already established framework of SMS and TEM in aviation, were the anonymised collection of contemporaneous SRRS scores together with operational occurrence reporting be carried out, then the ability to measure correlative associations between these measures would be unlocked.

The collection of these data to derive and test correlations is more likely to lead to a quantitative analysis in order to develop already established industry SMS system level hazard/controls.

Only then can the interrelatedness between the human performance detriments of mental health afflictions be correctly plotted against flight safety implications in a SMS risk matrix measure of consequence versus risk likelihood.

These human factor performance controls can then to be implemented/monitored/measured to ensure risk is modulated to a level acceptable and consistent with aviation rules and standards.

vi) Longitudinal Study

This ability to gather further study data for comparison over time utilising those known to have taken part in this survey group will provide a valuable study resource. By making contact in the future with those who provided their contact details to take part in a repeated measures study gives the opportunity to observe longitudinal changes and measure any differences concurrent with the administration of intervention variables such as The Safe Haven project.

7. Limitations

As a non-probabilistic sampling methodology, it remains important to highlight the limitations to self-reporting surveys include response bias (eg, pilots/ATCOs who are interested in this issue and/or who use social media may have been more likely to participate) and as a retrospective study, the risk for recall bias.

Additionally the limitations of convenience sampling means we do not know how many pilots/ ATCOs, nor thus what proportion of the whole intended study population received an invitation to participate, which prevents the calculation of an overall response rate.

As such, the caveat applies that care should be taken when generalising to the wider population of all licensed pilots and ATCOs holding medical certificates any observed results of this study.

8. Conclusion

The aviation system delivers an extremely safe transportation option to hundreds of millions of passengers every year. The accident rate continues to trend downwards with the 2022 showing 2.05 accidents per million departures (ICAO, 2023).

i) Healthcare Avoidance

This study shows 75.5% of the New Zealand pilot and ATCO respondents actively disclosed healthcare avoidance which reinforces the suggestion that pilots and ATCOs face barriers to seeking medical healthcare related to their role status.

For the novel single question of mental healthcare avoidance on its own, one in three respondents disclosed avoidance of the professional care they would normally wish to seek, but their concern for career implications stopped them from doing so.

The FAA ARC on mental health & aviation medical clearances highlighted the factors that present as barriers which obstruct healthcare seeking as; industry culture, lack of trust, fear, stigma, financial, process, knowledge & information gap.

In select circumstances consequences of this behaviour may have a permanent impact on the ATCO/pilot's mental and/or physical health, as the prognostic success for treatment options become more limited the longer many conditions go untreated. But there also sits within this behaviour the occupational health repercussions of extended medical certificate disqualification due to a more progressed/severe condition. In fact the higher SRRS mean sum scores returned in this study for those respondents who disclosed HCA behaviours suggests an increased likelihood of major health breakdown consequential to this behaviour.

The introduction of ATCOs into the survey population appears as a study first to explore how this role compares given the same regulatory medical paradigm. The similarity of disclosure results endorses this action with ATCOs displaying all the same avoidance traits but at higher rates of 80%. This result suggests a study specific to ATCOs should be undertaken to determine influencing factors unique to this role.

Given these results, and the possible outcomes of flight safety incident implications, the introduction by NZ CAA and CASA of the Safe Haven programme as an endeavour to bridge many of the factors identified as barrier issues in the FAA ARC ought to be commended. The impact of Safe Haven should be observed for results in medical licence holder engagement and attitudinal shift and is intended to form part of a future longitudinal study.

It could be suggested that the hypothesis of improved wellbeing and self awareness literacy in the younger cohort ought to be leveraged upon to develop good healthcare seeking adaptive behaviours. That aviation student specific programmes be uplifted to reduced barriers to healthcare seeking. This cohort's future employment and career benefits of improved wellness outcomes would endorse investment in this aviation sector by the airline sector.

ii) Multinational study comparison

The multinational HCA comparison reflected general equivalence in the overall study endpoint descriptions across the survey groups of the countries compared. All studies returned significant results demonstrating HCA behaviours. However, enough heterogeneity existed in the demographics and magnitude of each issue between the studies provide contrasting observations. This may have been brought about by the differences in sample populations. It is recommended that further replication studies of aviation healthcare avoidance be conducted in other countries. They would benefit from efforts to gain more probabilistic sample sets.

iii) Mental Healthcare Avoidance

The results to the additional question specific to mental healthcare avoidance are particularly noteworthy. Since the overall focus of mental health in aviation revolves around questions of the impact upon flight safety, the response rate to this novel study question gives rise to the need to explore further. The hypothesis on how the two factors of mental health and flight safety as measured by SMS protocols are related requires further study.

The studies in other industries which do show the connection between psychological distress and workplace incidents/accidents suggests that equivalent parallel risks are likely to be consequential in their impact upon flight safety.

The costs to aviation business-as-usual operations due to the lost productivity that occurs as a result from errors, incidents and accidents is well defined. But the sub-set of these errors,

incidents and accidents whose root cause has a component of performance degradation brought about when pilots and ATCOs are at work under a system that influences behaviours towards HCA may well be substantial.

The historical practice of expert diagnostic mental health appraisal as a proxy for the flight safety SMS barrier to aviation incident from mental health decline, is likely to be of limited success due to the high level of disclosed HCA shown in this study.

It is proposed that these data in this AHCB study warrants further investigation to discover to what extent any relationship exists between HCA, degrees of psychological and attention impairment and the odds ratio of error and workplace failure in aviation personnel.

Personnel engagement on topics of personal wellness may improve given data to show the degree which performance impairment due to matters of mental wellness degradation effects their susceptibility to make errors. The narrative of mental wellness can be refocused as an operational TEM mitigation proficiency.

This ought to be carried out with a focus on establishing the underlying costs of those errors and incidents which may be controlled for, but the cause of which is currently hidden as a sub-set inside the broader field of error, incident and accident analysis.

In this way a quantitative SMS risk matrix can be formulated, where the risk of negative outcomes consequential of professional well-intentioned personnel who interact in the workplace at states of impaired mental wellness is categorised based on the likelihood of occurrence, and the degree of consequence.

iv) Holmes/Rahe Life stress scale

The mean sum stress score across the respondent cohort was reasonably high at 182, well inside the score zone which is predictive of 50% chance for a major health breakdown in the next two years. The correlation between HCA behaviours and the Holmes/Rahe mean sum stress score draws attention towards the need for further study into exploring programs which teach skills focussing on the life event stress variables identified in Figure 6 to improve the resilience outcomes.

Specifically in the area of mental health, it follows that whilst presently the empirical causative link between aviation lapse, error and incident rates and reduced states of mental health in the aviation workforce has not been quantitatively established, their can still be advantages realised to Airlines by investing in programs now that enhance mental wellbeing, resilience skills and mental health literacy. These data would suggest that to have the best effect on HCA, programs should target better understanding by personnel of the consequences of HCA upon their

occupational performance and the life event categories in their highest impact groupings of 1) health, 2) personal finance and 3) relationships.

By capturing this data as experienced by the study population of pilots and ATCOs in the period after COVID, a lens on the impact which major aviator industry disruptions can have upon the wellbeing of safety personnel was able to be refined. Should efforts be taken to proactively address in a specific and targeted manner the life stress event groups identified in this study as a matter of airline strategy during the commercially prosperous times, a first mover, faster recovery advantage to that airline may well reward larger returns post the next aviation “black swan” event.

Further studies are recommended to ascertain if such a recovery advantage, would be more financially favourable than the cost of proactively implementing these initiatives during the commercially prosperous times that typically precede these events .

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11. Appendices

Appendix 1. Full Qualtrics question list.

With variable response options, and comparison to Hoffman et al. HCA study.

Qualtrics Question	Variable Value	Question Wording	Response Options	Variation from HCA study
Question 1	Age	How old are you?	Whole year number	Same Variable
Question 2	Gender	Which gender do you identify as?	1. Female 2. Male 3. Non Binary 4. Other	Addition of 'non-binary' selection
Question 3	Ethnicity	What ethnicity of descent do you primarily identify with. (Hint, not nationality. Example; Fijian/ Indian = Asian, Australian/English = European, New Zealand/Samoan = Pacific)	1. Aboriginal 2. African 3. Asian 4. European 5. Latin American 6. Māori 7. Middle Eastern 8. North American 9. Pacific 10. Other	No equivalent variable.
Question 4	Aviation Sector category.	What sector of aviation are you primarily involved in??	1. Air Traffic Controller 2. Air Traffic Controller Student 3. Airline Jet Long-haul 4. Airline Jet Short-haul 5. Airline Turbo Prop 6. Commercial Fixed wing 7. Commercial Rotary wing 8. GA Fixed wing 9. GA Rotary wing 10. Military 11. Student Pilot	Greater selection of categories..
Question 5	Regulatory jurisdiction licensed in.	Which countries do you hold an aviation medical for??	1. Australia 2. New Zealand 3. Pacific Islands 4. Other	No equivalent variable.
Question 6	Sought healthcare from other than ME or GP.	Have you ever sought informal medical advice from anyone other than your healthcare provider for fear of losing your Medical Certificate?	1. No 2. Yes	- Deletion of "Airman"
Question 7	Flying/ Controlling despite symptoms worthy of evaluation.	Have you ever carried out duties despite experiencing a symptom (physical or psychological) that you felt perhaps should have been evaluated by a physician before operating?	1. No 2. Yes	- 'piloted' changed to 'carried out duties'. - 'flying' changed to 'operating'

Qualtrics Question	Variable Value	Question Wording	Response Options	Variation from HCA study
Question 8	Flying/ Controlling on medication not evaluated.	Have you ever taken a prescription medication not prescribed to you for a symptom you feel/felt perhaps should've been evaluated by a physician before operating?	1. No 2. Yes	- flying' changed to 'operating'
Question 9	Flying/ Controlling without declaring health-state.	Have you ever misrepresented or withheld information on a written healthcare questionnaire (i.e a symptom is more or less severe) for fear of losing your operational status and/or Medical Certificate?	1. No (skip to Q10) 2. Yes	- 'flying' changed to 'operating'. - Deletion of "Airman"
Question 9B		If you answered Yes to the previous question, was it because you (select those which apply):	1. Misrepresented Information 2. Withheld Information	No equivalent variable.
Question 10	Avoided seeing Mental Health Professional.	Have you ever considered referring to a mental health professional (Counsellor, Psychologist etc.) but didn't for fear of losing your operational status and/or Medical Certificate?	1. No 2. Yes	No equivalent variable
Question 11	Social Readjustment Rating Scale (SRRS)	To gauge if the stress levels imparted on professionals in the industry varies significantly from other industries, there is an attached SRRS form. The total score for events which you may have experienced shows your level of life stress. - Would you like to take the stress scale test?	1. No (skip to Q12) 2. Yes	No equivalent variable.
Question 11B	The Holmes-Rahe Stress Inventory	- Note each item that applies to events you have experienced during the last year. - Type their LCU (Life Change Unit) numerical value in the box alongside. - Your score will be totalled, please fill this total score in where you are asked to.	Multiple response options. Refer	No equivalent variable.
Question 11C	Total SRRS Score	Enter your Total score from the Holmes-Rahe Stress Inventory question above. (The next panel provides guidance to the score meaning).	Scaled whole number Entry	No equivalent variable.
Question 11D	SRRS Total Score Interpretation Guide	[The full text of this panel is written directly below this table.]	Nil Response Field	No equivalent variable.
Question 12	Further study Opt-In option.	For the purposes of gauging whether the aviation industry and it's regulation is able to improve over time, are you willing to partake in a future study at a later date? If you chose Yes; - You will be taken to an external and separate form to ask for your email. Your answers in this or any future study cannot be aligned or traced to any identifying data.	1. Yes (external URL) 2. No (End Survey)	No equivalent variable.

Question 11D.

The questionnaire gave the following information after the respondent entered their score:

> *If you were to continue without any interventions to address the impacts of stress in your life, then:*
>
> *- **150pts or less** means a relatively low amount of life change and a low susceptibility to stress-induce health problems.*
>
> *- **150 to 300pts** implies about a 50% chance of a major stress-induced health problem in the next 2 years.*
> ** Talk with those close to you about your score. What changes could you make or interventions could you adopt to reduce the impacts of stress in your life?*
> *https://www.stress.org/stress-effects*
>
> *- **300pts or more** raises the odds to about 80%, according to the Holmes-Rahe prediction model.*
> ** seriously consider seeking mental health assistance. If you have access to a Peer Support Network, they can provide confidential assistance also.*

The Holmes-Rahe Life Stress Inventory

The Social Readjustment Rating Scale

INSTRUCTIONS: *Mark down the point value of each of these life events that has happened to your during the previous year. Total these associated points.*

LIFE EVENT	MEAN VALUE
1. Death of spouse	100
2. Divorce	73
3. Marital Separation from mate	65
4. Detention in jail or other institution	63
5. Death of a close family member	63
6. Major personal injury or illness	53
7. Marriage	50
8. Being fired at work	47
9. Marital reconciliation with mate	45
10. Retirement from work	45
11. Major change in the health or behavior of a family member	44
12. Pregnancy	40
13. Sexual Difficulties	39
14. Gaining a new family member (i.e. ... birth, adoption, older adult moving in, etc.)	39
15. Major business readjustment	39
16. Major change in financial state (i.e. ... a lot worse or better off than usual)	38
17. Death of a close friend	37
18. Changing to a different line of work	36
19. Major change in the number of arguments w/spouse (i.e. ... either a lot more or a lot less than usual regarding child rearing, personal habits, etc.)	35
20. Taking on a mortgage (for home, business, etc. ...)	31
21. Foreclosure on a mortgage or loan	30
22. Major change in responsibilities at work (i.e. promotion, demotion, etc.)	29
23. Son or daughter leaving home (marriage, attending college, joined mil.)	29
24. In-law troubles	29
25. Outstanding personal achievement	28
26. Spouse beginning or ceasing work outside the home	26
27. Beginning or ceasing formal schooling	26
28. Major change in living condition (new home, remodeling, deterioration of neighborhood or home etc.)	25
29. Revision of personal habits (dress manners, associations, quitting smoking)	24
30. Troubles with the boss	23
31. Major changes in working hours or conditions	20
32. Changes in residence	20
33. Changing to a new school	20
34. Major change in usual type and/or amount of recreation	19
35. Major change in church activity (i.e. ... a lot more or less than usual)	19
36. Major change in social activities (clubs, movies, visiting, etc.)	18
37. Taking on a loan (car, tv, freezer, etc.)	17
38. Major change in sleeping habits (a lot more or a lot less than usual)	16
39. Major change in number of family get-togethers ("")	15
40. Major change in eating habits (a lot more or less food intake, or very different meal hours or surroundings)	15
41. Vacation	13
42. Major holidays	12
43. Minor violations of the law (traffic tickets, jaywalking, disturbing the peace, etc.)	11

Now, add up all the points you have to find your score **TOTAL**

150pts or less means a relatively low amount of life change and a low susceptibility to stress-induced health breakdown.
150 to 300 pts implies about a 50% chance of a major health breakdown in the next 2 years.
300pts or more raises the odds to about 80%, according to the Holmes-Rahe statistical prediction model.

CALLING ALL ATCOs & PILOTS

Do you wish it was easier to do medicals?

Is it ever a worry to seek healthcare because of what that might mean for your licence?

Whether Yes or No…

Please take the short anonymous survey below to help see if there is an issue.

https://qualtricsxm9tqs9cdzv.qualtrics.com/jfe/form/SV_20hsCluTy4WS2bA

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Aviation Healthcare Behaviour Study.
If you have any questions, please contact Captain Herwin Bongers, Massey University Masters research student
+64 [redacted] ([redacted])

Appendix 4. Aviation Healthcare Behaviour Questionnaire.

- Introduction Page and Consent Form:

You are invited to take part in this anonymous study. The study aims to determine the prevalence of health care avoidance with both pilots and air traffic controllers concerning medical status. This research is being carried out by the researcher Captain Herwin Bongers (Massey University Masters Research Student).

The study involves a short survey of 12 multiple choice questions, which should take no longer than 6 minutes to complete. Your responses will remain anonymous.

We want to thank you for your time. By participating, your response will help to generate a body of data that seeks to inform improvements in policy and practice in our industry.

Important points for you.

- Your identity is confidential, and I will not provide your individual responses to anyone.
- The results and data collected through the questionnaire will be only used by the researcher. The information collected may be quoted in freeform textual responses in the research.
- Personal information will not be requested for the survey. The option exists at the completion of the survey to agree to partake in any future similar anonymous questionnaire. You can decline this option.
- All the data from the research will be used for academic use and for the duration of the dissertation / research project.
- This survey similarly follows North American research in order to determine any comparability with data collected from the Antipodes.
https://academic.oup.com/occmed/advance-article-abstract/doi/10.1093/occmed/kqad091/7258910?redirectedFrom=fulltext

Q. What if you change your mind about taking part?
A. Participation in this research is voluntary. You are not obliged to take part and are free to withdraw at any time before final submission. Should you choose to withdraw from the study, you may do so without disadvantage to yourself and without any obligation to give a reason.

Q. What will happen to the information that you give?

A. All data will be collected, analysed and stored by the Qualtrics Data Protection Policy according to data protection laws.

If you have any further questions about the research or your potential participation, feel free to contact either Herwin [redacted] *or Professor José Perezgonzalez (j.d.perezgonzalez@massey.ac.nz).*

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 researchers 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, please contact Patsy Broad Team Leader, humanethics@massey.ac.nz, Phone +64 6 356 9099 extension 83840.

Consent Form

Please select one box below. By consenting to the research you understand the following:
- I agree to voluntary participate in this research project provided on Qualtrics
- I have read and understood the Participant Information Sheet, detailing the purpose of the research;
- I will not directly benefit from participating in the research;
- the data collected from this questionnaire will be stored anonymously and securely, and results published from the findings will have no bearing to the participant;
- I can withdraw from the survey offering no explanation;
- I am free to contact the researcher at any time to seek information and/or clarification

Thank you for your participation.

- ○ *I have read the Participant Information Sheet and the Consent Form, I am over the age of 18 and I agree to continue with the survey.*
- ○ *I do not consent (Skip to Study end)*

Appendix 5. Contact Information, Personal Data Collection Form.

Survey to Improve Aviation Wellness

Thank you for your commitment to the improvement of the aviation industry's wellbeing and it's regulation.

You have left the previous anonymous questionnaire and are now in a separate, distinct and unlinked form where any information you provide is unable to be connected back to your previous answers.

Your answers in the earlier questionnaire or any future study cannot be aligned or traced to any identifying data.

Here we will ask you for a contact email and/or phone number simply for the statistical purposes of repeating the questionnaire over time. You do not need to answer all of the questions.

In the future, an email requesting you to participate anonymously in a similar questionnaire will be sent. If you wish to participate then, I will appreciate it. If you don't, there is no commitment for you to do so and you may ignore that future email. I will use a similar procedure as today, with no way of identifying respondent's answers by their email.

- *Name:*
- *Email [only compulsory field]*
- *Mobile*
- *Comments*

Appendix 6. MESAFE – Disclosure, Copyright Table 12.

Disclaimer

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