IS MILITARY FLYING A RISKY BUSINESS?

by Wing Commander R.W. Grey, HQADF

During the decade 30 June 1982 – 1 July 1992, the RAAF lost 23 of its pilots. A total of 30 personnel were killed including two non-aircrew and one civilian passenger. In the same period, 39 aircraft were written off while another 25 were severely damaged. These losses have been well spaced in time and location and, by themselves, may not seem remarkable, but analysis will put them into perspective and this may help to determine their relevance. Thus, future decisions governing RAAF flying operations may be facilitated. In particular, some analysis of these statistics is necessary to assess whether people in the RAAF, and the Australian public at large, should be concerned by them.

This article does not address the human cost or the financial implications of these losses even though these are not insignificant; rather, it attempts only to identify the degree of occupational risk for RAAF pilots and to recommend a course of action to reduce that risk.

The Australian Government has iterated its requirements of employers to minimise the occupational hazard to their employees in the Occupational Health and Safety (Commonwealth Employment) Act 1991. The RAAF must abide by this Act except when preparing for war or when acting in the defence of the nation. The Act requires that the RAAF ensure its employees receive adequate training so that they may safely perform their duties, and monitor their environment for safe working conditions. Implementation of the requirements of this Act are detailed in Defence Instruction (General) Personnel 19-2.

Risk analysts have estimated bench marks against which occupational hazard statistics may be compared. Their research has revealed levels of tolerance of occupational hazard within societies similar in nature to Australian society. Broadly, once the risk of a fatality exceeds one death per 1 000 people exposed per annum to a particular activity, then changes to reduce the risk are called for by concerned groups in the community. The Australian occupational fatality rate overall is believed to be approximately one death due to workplace accidents per 10,000 people exposed per annum. What then is the degree of occupational hazard facing RAAF aircrew while performing their flying duties?

The period 30 June 1982 – 1 July 1992 was selected for analysis to strike a compromise between the historical relevance of the statistics and rate distortions that can occur if too short a period is used. It also is the most recent decade to begin with a fatality-free year. Pilot fatalities were then categorised according to the prime role assigned to their aircraft at the time of each accident. For example, the Winjeel was categorised as a trainer even though it is used operationally as a forward air control aircraft. All roles are represented in the statistics but the following analysis refers only to graduates of No 2 Flying Training School. Even though other people died in RAAF accidents during the period, only pilots were chosen for analysis as they form a well defined and prime group fundamental to RAAF operations.

The statistics illustrated in Table 1 are for all RAAF pilots who died while on duty as a direct result of being involved in a military aircraft accident. They include RAAF pilots who were serving with other services and air forces, and those who were not in charge of the aircraft's controls at the time of the accident; eg, the maritime patrol fatality was a copilot who was seated in a crash station in the aircraft. Pilots who died from other causes, such as motor vehicle accidents, are not included.

From observation of the data in the above tables it can be seen that fatalities have occurred in all RAAF roles and that the mean occupational fatality rate for RAAF pilots during the period was 2.3 deaths per year. Applying the data to the size of the

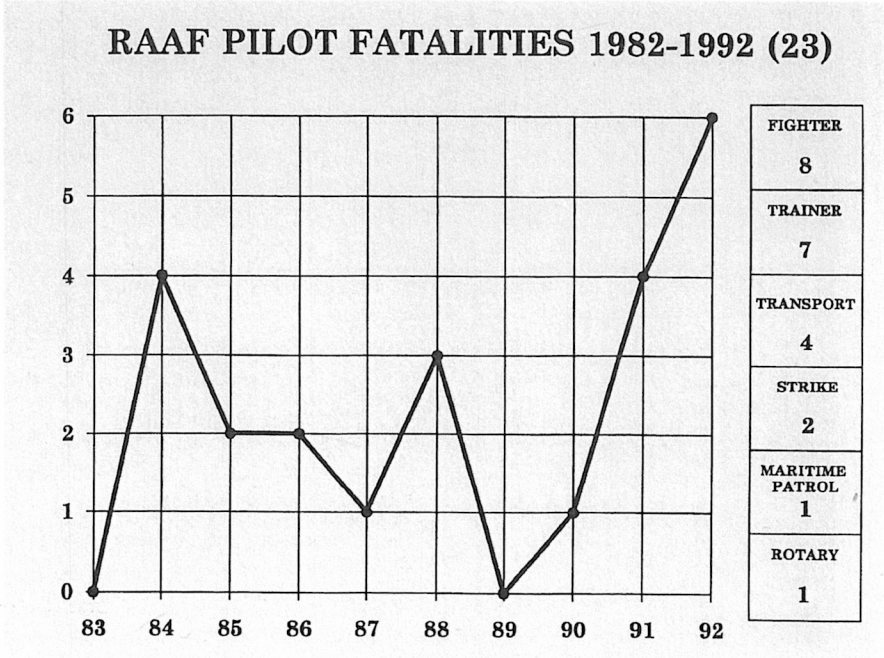


Table 1

group, ie, RAAF pilots exposed to this hazard, the pilot fatality rate, or the degree of occupational hazard may be calculated.

Due to resource constraints, the total number of pilots in flying positions during 1992-93 was taken to be representative of the 1982-92 period and was used for this analysis. During this period there were approximately 370 positions assigned to flying duties as the prime occupation of the incumbent.

The conclusion drawn from these statistics is that approximately one death occurs for every 160 pilots exposed to flying operations per year. Put another way, an RAAF pilot had a one in 16 chance of being killed if he had been assigned to flying duties for the whole of the decade. This is six times higher than the level of tolerance that is believed to exist in most western societies.

INDUSTRY	FATALITY RATE *(per people exposed per annum)*
Mining and quarrying	1 per 1 428
Transport and communications	1 per 2 631
Primary industry (farming, fishing, hunting, timber getting)	1 per 4 545

(If all RAAF pilots below the rank of Group Captain are said to be exposed, the degree of risk is further reduced to approximately 1:320.)

Table 2

In order to place this degree of occupational hazard into perspective, it must be compared with other occupations. Recent research into Australian occupational fatalities during the three calendar years 1982-84 revealed that the highest occupational fatality rates occurred in the industries listed in Table 2.

The fatality rate for RAAF pilots if they were engaged in their primary flying duty for the whole of the period examined was in the order of eight times higher than the next most hazardous occupation conducted in Australia.

While care must be taken when drawing conclusions from purely statistical analysis and even though some approximations have been made in this case, this analysis reveals that RAAF flying operations seem to incur an extremely high degree of risk. The statistics suggest that the degree of risk is, in fact, so high that investigation of the causes, with the aim of finding measures which may reduce the hazard, is warranted under the auspices of Part 4 of the Occupational Health and Safety (Commonwealth Employment) Act 1991.

The RAAF's accident rate may appear to approximate that of other equivalent air forces and this fact may be used to reduce the degree of concern. This argument may be countered by the fact that most equivalent air forces were involved in Cold War operations and were preparing for war at short notice during most of the period used for the analysis.

The difference in operational emphasis may be evident in the different nature of many of the fatal accidents in these other air forces compared with those of the RAAF. During this period, Australia faced no threat and a ten year warning period was nominally, but confidently, expected by the Government. In the context of the Commonwealth Employment Act of 1991, exemption from the requirements of the Act for the defence or security of the nation would be difficult to justify.

Finally, the RAAF operates most of the time in Australia where weather conditions are far better than in many countries with comparable air forces.

The question must be asked – was the RAAF required to expose its aircrew, or to accept for them, such high degrees of risk in those circumstances?

If the answer to this question is yes, then the degree of risk must be recognised in the management and practices of the RAAF. Rates of peacetime attrition have wider implications for predicting the cost of sustaining the RAAF so that it can perform the tasks expected of it. Are all assigned tasks really necessary? Lesser degrees of readiness may be acceptable for some roles in current circumstances. Alternatively, more resources and time may need to be devoted to the training of pilots and their supervisors. The numbers of aircraft and aircrew that will be required to sustain the force, while meeting its ongoing defence commitments, (and especially during any expansion for war) may need to be reassessed. These are issues which must be addressed at senior levels but advice from the operative level is a necessary ingredient to balanced judgments. We in the RAAF all have a part to play.

Cursory examination of RAAF accidents will reveal that a breakdown of supervision was a significant factor in most, if not all, RAAF accidents during the period examined. Supervision is the responsibility of everyone who is involved in, or who supports, flying operations. Executives must seek to ensure their subordinates receive adequate supervision, and subordinates must ensure that they embark upon only those activities that have the oversight of a superior. Most importantly, supervisors must be qualified through training and graduated experience to enable them to make sound judgments and manage risk sensibly.

Many accidents have been attributed to an unfortunate sequence of seemingly insignificant oversights. The margin between safety and danger is very small in military aviation. Inherent in these operations is the fact that the time available for making life or death decisions and reactions can be unexpectedly advanced and compressed into remarkably short time frames.

It behoves all RAAF personnel to recognise the high degree of hazard associated with military aviation. We must ensure that our preparation has been adequate for our assigned duties and that our actions do not exacerbate this hazard.

In conclusion, there is sufficient evidence to show that the occupational hazard associated with RAAF flying operations is extraordinarily high when judged by standards attributed to the Australian community. This fact does not appear to be well recognised within the RAAF and, at present, within the community. If 23 fatalities in one decade had occurred at one of the RAAF's medium sized bases, it would be reasonable to assume that wide and grave concern would be generated for the people on that base.

The first step toward improvement is to identify the problem. That has been the purpose of this analysis. Flying in preparation for the defence of our nation's sovereignty and accomplishing other national tasks for the community is too important to curtail in an attempt to reduce the accident rate. The evidence, however, strongly suggests that we in the RAAF should make an urgent effort to take 'time out' to critically review all aspects of our work. We all should make time to regularly and frequently review both our personal contribution and the collective contributions of the teams which constitute the RAAF.

Review of RAAF flying operations including the selection, training and practices of those who must conduct these operations, oversee them and support them, in particular, is warranted to seek out measures which, if implemented, may make RAAF flying a safer occupation.

Table 3 lists suggested options which may prove fruitful avenues of review and for students of air power to explore.

In the year that Defence is emphasising occupational health and safety, implementation of relevant studies and a high level review, in accordance with the Commonwealth Employment Act of 1991, would be a prudent demonstration of proper concern within the RAAF for the welfare of members and for preserving costly capabilities for the ultimate defence of Australia.

Finally, it behoves everyone who has involvement in RAAF operations to recognise the high degree of associated risk and to ensure they approach their duties appropriately.

DFS comment:

WGCDR Grey's article indeed invites us all to take a close look at all aspects of RAAF flying operations in an endeavour to reduce our accident

LIST OF SUGGESTED OPTIONS FOR REVIEW

- The tasks assigned to the RAAF and the expectations of Government with regard to the cost of preparing to meet those commitments and of accomplishing them.
- The training and selection of instructors (long term impact of fast-tracked QFIs, and QFI no longer being a qualification which pilots compete for).
- The employment of aircrew categorisation schemes – they seem to change with every change of squadron hierarchy.
- The ability of reporting systems to identify the best people for flying supervisors' posts, squadron executives and commanding officers – the PER/OER system is designed to identify those who are proficient at staff skills which are different from operative and command skills.
- The manning of flying supervisor posts and rotation periods.
- The opportunities for junior aircrew to gain operational training and experience are curtailed to give more time for preparing to become staff officers.
- The question of whether university training should be offered only to students in the 30-36 age group to permit earlier development of operative war fighting skills and to allow more time for those skills to be developed before entry into the executive arm of the service. (There are many other advantages to this proposal).
- The orders, instructions and manuals pertaining to aircraft operation and maintenance should be reviewed for their currency, relevance and 'user friendliness'.
- The separation and verticality of the operational Group structure which inhibits lateral communication at working levels. Are these structures appropriate for the management of military flying operations and aircrew training?
- The promotion of flight safety, including accident investigation and reporting, and the inculcation of a culture oriented towards safety and preservation of capabilities within the RAAF.
- The remuneration and working conditions for aircrew should properly recognise their demonstrated degree of occupational risk compared with other occupations.

The above aspects of RAAF management are just a few which could be reviewed. Detailed 'cause and effect' investigation and critical analysis of all aspects of RAAF management, including aspects which interrelate with training and operations, may reveal deficiencies which affect the safety of RAAF flying operations. Where alternative practices are not possible or wise, existing practices may prove to need adjustment to recognise the high level of occupational hazard associated with military flying.

Table 3

and fatality rate to zero. However, in practical terms, this has not been attained on any sustained basis by any military aviation organisation and for good, if arguable, reasons.

What are the alternatives? We can stop flying. This will have benefits of zeroing the accident rate as well as reducing the Defence financial outlay, and this might be fine if their was no threat, perceived or real, to our national security. If this was a practical alternative, then cash-strapped defence forces around the world would have moved this way.

We can stop practising for war. This would certainly reduce the risk element, but would leave us devastatingly naked *if* the balloon went up – tomorrow or at some unpredictable time in the future. As a defence force, we are in peacetime, paid-up insurance against the day we *might* be needed to act in anger. This insurance policy is a contingency plan paid up in full by the nation with the expectation that we are ready *now* and not at some time in the future. Regional conflicts in recent years have shown, if nothing else, that time is not on the side of the defender to prepare. If the expectation *is* that you will be ready, then you must train like you are going to fight!

Statistics can be made to represent or convey just about anything, depending on the desired viewpoint or impact. We do lose more people in road and other accidents in the RAAF than through flying; however, we doubt that anyone would seriously suggest that we simply stop functioning to eliminate these hazards. Certainly, we need to act responsibly to reduce unnecessary risks in *all* RAAF activities and, by and large, we believe the right policies are in place in this regard.

Statistics can also be grossly distorted by relatively small samples. While the RAAF compares reasonably favourably with most allied air forces, one bad accident, in terms of casualties, can distort the trend and totals. The Boeing 707 accident near East Sale, Victoria in October 1991 (five RAAF fatalities) and the Nomad accident near Tenterfield, NSW in September 1991 (one Australian Army and three PNGDF fatalities) are cases in point. Delving back into history a little, the Caribou accident in PNG in August 1972 (five RAAF, two Army and 20 PNGDF cadet fatalities), and the Lincoln accident at RAAF Base Amberley in February 1948 (16 RAAF fatalities) would have played havoc with flying safety statistics of the period, albeit they were not all RAAF pilots.

WGCDR Grey's analysis is food for thought for all of us associated with flying safety and his list of suggested options for review represents a wide range of safety-related activities. These sorts of in-depth considerations from time to time are essential to a comprehensive safety program. □

HIGH FLYING FITNESS

Q. While requirements for oxygen are specific about when aircrew and passengers are required to use or be provided with oxygen, are these standards appropriate for smokers, who would be expected to be more susceptible to hypoxia? Are there any guidelines for smokers, or is it not really a problem?

A. There are legal requirements for supplemental oxygen use and availability. Although these minimum standards are designed to be applicable to all pilots and passengers, the assumption regarding smokers is correct. Though there are no specific regulatory standards for them, those who smoke should consider that they start out with a significant handicap when it comes to flying in unpressurised aircraft.

The basis for this conclusion is that smokers are particularly susceptible to what is known as hypaemic (anaemic) hypoxia. This type of hypoxia is brought about because the blood is unable to carry enough oxygen even though there is plenty of oxygen available to breathe. This may be caused by numerous factors, including disease, blood loss, and blood cell abnormalities. In this particular case, the mechanism which interferes with the blood's normal oxygen-bearing capacity is the effects of carbon monoxide in cigarette smoke. Haemoglobin, a pigment in the red blood cells, is the primary means by which oxygen is transported through the body. It also helps transport waste carbon dioxide from the body. Haemoglobin is a large, complex molecule which, when combined with oxygen, gives oxygenated blood its characteristic bright red color.

Each red blood cell in a healthy human contains an average of 350 molecules of haemoglobin. Molecules of oxygen are attracted to the haemoglobin and attach themselves to it. Each haemoglobin molecule can carry four oxygen molecules. Unfortunately, carbon monoxide has a significantly greater affinity for haemoglobin than does oxygen. So, if there are significant amounts of carbon monoxide available, it is going to displace the oxygen that would normally attach itself to the haemoglobin. This is one reason carbon monoxide is so toxic to humans and animals. Cigarette smoke contains copious amounts of carbon monoxide. Studies have shown that up to 10 per cent of the blood haemoglobin in a very heavy smoker can be saturated with carbon monoxide. The 'average' smoker probably maintains a five per cent saturation. Depending upon which data you rely on, this can mean a penalty of from 3 000 ft to 7 000 ft in altitude tolerance. This is a serious handicap. A heavy smoker could be in serious danger of hypoxia while flying as low as 5 000 ft.

Another penalty paid by smokers is, in comparison with non-smokers, their night vision will be degraded by approximately 20 per cent. Since night vision is already very susceptible to oxygen deprivation, you can see this can make a big difference. The bottom line is that smokers should probably use oxygen at lower altitudes than legally required and that, even more than non-smokers, they will benefit from breathing oxygen at night.

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RESPONSE TO LETTER TO THE EDITOR OF SPOTLIGHT

Firstly, let me say how pleased I am to learn of the interest in my article. I agree with SQNLDR Mike Smith that an extension of this analysis to assess the degree of occupational hazard for non-pilot aircrew would be of value. My initial interest, however, simply was to find out whether we (in the RAAF) should be concerned about our accident record. My article was based upon some research undertaken by SQNLDR Daryl Redding at APSC and our choice of criteria for assessing occupational hazard was based upon the simplest approach, ie. all RAAF aircraft incidents will involve at least one pilot. This analysis produced results so extreme that they seemed to indicate a flaw in the logic. The results, however, have stood up to scrutiny. My next concern was what to do with this knowledge, hence my article intended to highlight to **all concerned** that RAAF flying operations are high risk activities. The point I wished to stress was that everyone involved in generating, or participating in, these activities is affected by this fact.

The DFS comments on my article and SQNLDR Smith's letter, highlight that the selection of the base group can be used to affect statistical analyses such as mine. Time also is an important factor. My inclination to include all aircrew in the analysis proved too difficult. For the analysis to be consistent with, and credible relative to, statistical analyses of other occupational groups, a well defined group had to be obtained. Choosing the size of the pilot group even proved difficult. For example, including all flying appointments for pilots, the degree of risk was 1:160 but if all RAAF pilots are said to have been exposed, the degree of risk was aproximately 1:320 during the decade 1982-92. I contend that the pilot statistics I chose produced a credible analysis sufficient to compare the degree of hazard associated with RAAF flying operations with other occupations.

Interestingly, if trainee pilots and Army and Navy pilots are included in the analysis, a greater degree of occupational hazard will be shown to have existed for the decade 1982-92. On the other hand, I suspect the RAAF provides one of the safest flying environments for passengers after QANTAS. Regardless of the size of the group chosen, the conclusion will be drawn that the degree of occupational hazard faced by military aviators was significantly greater during that decade than for any civilian occupation for which statistics could be found. The extra premium RAAF aircrew are asked to pay for life assurance is a reflection of this fact.

I share SQNLDR Smith's concern about the practice of short posting cycles for flying supervisors. A similar high rotation of flying supervisors was experienced at my squadron during my last flying appointment. In less than three years, the squadron of just three flights experienced a turn over of 13 different SQNLDR flying supervisors, five of whom were pilot flight commanders and only one of whom had QFI/IRE qualifications. This situation was exacerbated by several unsatisfactory circumstances. The Squadron QFI post was never manned, the pilot flight commander post had to be manned by a junior officer from within squadron resources for quite long periods, there were no second tour on type junior RAAF pilots until the return of an exchange pilot from Canada at the end of my second year, several pilots were giving priority to preparing for future civilian employment, pilots were posted within three months of achieving a command, incoming pilots had been trained by dedicated but inexperienced "fast tracked" QFIs and, to top all this off, one flight commander post was arbitrarily downgraded to a FLTLT without a reduction in responsibilities (and allowable redress). Through-out, a high flying rate and a high rate of deployments was maintained. Perhaps it is not a completely fair comparison, but my father and uncles experienced much greater stability and lower flying rates in WWII bomber squadrons.

I found that involvement in intensive work environments tended to result in "target fixation" on getting the job done at the expence of such things as giving credit where it was due. People who are good at their job make things look deceptively easier and they do not reveal stress. In retrospect, I salute the extra care and dedication of those Squadron personnel with whom I served and of all those who contributed and supported the Squadron and me in the endeavour to maintain standards.

In boom/bust economic cycles which influence airline recruiting, the conditions I experienced are likely to recur. SQNLDR Smith's letter shows that my experience was not unique. People, however, do not change but they may be influenced by their leaders to scrutinise their work habits and to exercise extra care in the quest for safety. I am sure that SQNLDR Smith's Commanding Officer will receive the same quality of support I enjoyed.

Bob Grey
Wing Commander
15 December 1994