



The Independent Medical Expert Group (IMEG) 5th Report

Report and recommendations on medical and scientific
aspects of the Armed Forces Compensation Scheme

February 2020

Topic 1 - The Hazards, Risks and Adverse Health Effects of Remotely Piloted Aircraft Systems

Key Points

1. Since 9/11, weaponised unmanned aerial vehicles have become key in combat operations. Current RAF squadrons provide 24-hour, 365 days a year, intelligence, surveillance and reconnaissance, close air support and targeted weapon strikes.
2. Combat involving remotely piloted aircraft systems (RPAS) offers precision targeting, avoids the need to fly long distances or refuel aircraft, provides no traumatic physical risk to operators, no need to deploy or be separated from family.
3. Increase in operational tempo has led to concern that crews may be stressed. The Chief of the Air Staff asked Professor Sir Anthony Newman Taylor, Chair of IMEG, to carry out an investigation and provide a report on the hazards, risks and adverse health effects of RPAS service. Sir Anthony visited a UK RPAS station where he was briefed on the work and had opportunity to speak informally with RPAS crews.
4. One UK questionnaire-based survey of 40 male RPAS operators considered functional impairment, alcohol use and used psychometric tests to determine “probable” mental health disorders. The results suggest high perceived functional impairment, but unremarkable rates of “probable” mental health disorders compared with the wider armed forces and general community and suggesting that functional impairment was not due to poor mental health.
5. Published peer-reviewed studies of RPAS service are few and evidence does not show any increased incidence of clinically diagnosed mental health disorders. IMEG found no studies concerned with physical health e.g. neck, back pain and headache due to ergonomics of work stations or organisational issues, such as shift work and long hours.
6. To date, from a medical and scientific perspective, we have found no strong evidence of the development of higher levels of discrete diagnosed psychiatric disorders in RPAS operators compared with other RAF personnel. However mental health disorders may present after some delay.

Recommendation 1

Defence should consider a follow-up surveillance study of RPAS operators looking at physical and mental health, including suicide, as compared with a suitable control population.

7. A distinct feature of RPAS service is “moral injury”. RPAS crews are not alone in being required to kill but they do so without risk to themselves and while viewing detailed events, often of

family life, with which many identify, over a long period. There is risk of killing non-combatants, women and children, and friendly forces as well as direct visual exposure to human remains and atrocities. These features may breach normal ethical standards and lead to moral ambiguity and “moral injury”.

8. US research from the Vietnam and Iraq generations shows high levels of killing and severe post traumatic symptoms in those who killed or observed killing. Symptoms often respond poorly to conventional best practice interventions with risk of persistent disabling effects, characterised by peri-traumatic dissociation, functional impairment and violent behaviour.
9. These aspects of PTSD phenomenology, described in the new ICD 11 classification as “complex PTSD”, may be particularly resistant to treatment with poor response to conventional best practice interventions, risk of chronic medium and long-term symptoms and disabling effects on normal functioning.

Recommendation 2

We recommend research on the impact on mental health of killing humans within a longitudinal study of RPAS teams.

Introduction and Background

1. Although remotely piloted aircraft systems (RPAS), began to be developed in the US in the 1960s, it is only since 9/11, in both the US and UK, that weaponised unmanned aerial vehicles (predominantly General Atomics MQ-9 Reapers) have played a significant and increasing part in combat operations. Presently the RAF has two RPAS squadrons, 13 Squadron based at RAF Waddington and 39 Squadron at Creech United States Air Force (USAF) base, Nevada. Together they provide 24 hour, 365 days a year, intelligence, surveillance and reconnaissance, close air support and targeted weapons strikes. From 2003 in the USAF, as demand increased, unmanned aerial vehicle pilots were recognised as being uniquely trained and qualified personnel and were given a specific military occupational code.
2. Combat involving weaponised RPAS offers the obvious advantages of precision targeting, avoids the need to fly long distances or refuel aircraft, presents no traumatic physical risk to the operators, and no need to deploy or be separated from family. Strike decisions are taken by a team, not necessarily a single person, and the role of RPAS operators has come to be viewed as more akin to routine non-deployed work than manned combat. Aircrew roles and duties were initially not subject to the measures usually associated with deployed combat service, harmony guidelines, set tour durations, mandatory enhanced psychological support such as decompression etc.
3. Since 2014 UK RPAS crews have been engaged in combat in Iraq and Syria. With significant increase in operational tempo, UK demand for RPAS aircrew as a sustainable core occupation, increased and under-manning, associated extra duties and longer working hours for those in post became an issue. Concerns that crews were stressed and reporting ill-health, followed. A similar pattern was seen in the US.
4. Against this background and, following concerns raised by the chain of command and RPAS medical staffs about the mental well-being of UK RPAS operators, the Chief of the Air Staff asked

Professor Sir Anthony Newman Taylor if IMEG would carry out an investigation and provide an evidence based report to include findings on the hazards, risks and adverse health effects associated with Reaper service. Minister (DPV) endorsed the task. Following submission to minister and the Air Chief Marshal, the report forms part of the 2020 Fifth IMEG Report.

5. On 27 February 2018, Sir Anthony accompanied by ACDS PersCap DSSec visited RAF Waddington, the UK base of RPAS operations. Briefings, covering the nature of RPAS work and working conditions, were provided by the station and squadron commanders and senior medical staffs, including the RAF Consultant Adviser in psychiatry. Sir Anthony was also able to speak informally with the RPAS crews.

RPAS Operations

6. There are three phases in an RPAS flight: take-off, mission phase and landing. The aircraft are located in the Middle East where a Launch and Recovery element carries out the take-off and landing. Once an aircraft is in flight its control is passed to the UK or US based crew. RPAS UK crew fly unmanned aircraft from a cockpit or Ground Control Station (GCS) at RAF Waddington or Creech Air Force Base, Nevada, USA. The RPA are the size of a small standing manned aircraft, 36 feet long and 66 feet wide and the cockpits replicate that of a manned bomber. RAF Reapers are manned on the ground by the pilot, sensor operator and mission intelligence co-ordinator. The crew is observed by an authorising officer and senior mission intelligence coordinator in the Operations Room of each squadron.
7. The operational roles of RPAS flights are reconnaissance, intelligence and strike. The pilot is responsible for flying the aircraft. Pilots may be directly recruited and trained but typically are drawn from other aircraft fleets. The sensor operator works the camera and laser which guides the weapon to its target. Like pilots they are aircrew and often come from other aircraft fleets and roles. The mission intelligence co-ordinator integrates all sources of information, communicating them to other crew members and the Operations Room. Mission Intelligence co-ordinators are not aircrew. They have an intelligence background and, in addition, specialist imaging training. The authorising officer and senior mission intelligence officer are senior and experienced pilots or sensor operators. They monitor the same audio-visual images as the crew and their role is to provide advice and support to the duty teams. At the aircraft location, a senior designated officer authorises weapon release. However, any member of the crew can call for a strike to be aborted at any time up to the final few seconds before impact.
8. From his discussions, Sir Anthony learnt about UK RPAS operators' working patterns. From the beginning of operations until September 2018, both RPAS squadrons used a 6-3 schedule with six days on and three off. For individual crew members this involved varying start times often changing significantly over a working week, with shift lengths of minimum 10 hours rising to 12 hours with the addition of briefing and debriefing times. In 2015 to alleviate fatigue, a method of switching control from one squadron to another with the aircraft in flight was devised. Shift lengths remained at 10 hours but using the time difference between UK and US, personnel could be protected from flying during, and switching in and out of, circadian lows. From September 2018 another system focusing on Monday–Friday working has been implemented for 13 squadron. The squadron has been divided into four “families” with the intention that each team member has three weekends off in a month. In reality operational demand has meant that many have to fly two weekends per month. 39 squadron remains on the 6-3 model with shift lengths of 10-12 hours as the norm. One of the contrasts with the manned combat role is potential over a day for rapid psychological switches. To distinguish the enemy from friendly forces with accuracy, demands

high and sustained concentration on large amounts of audio-visual data, requiring attention to multiple screens and high-tech equipment. There may be several days' surveillance of often very monotonous terrain (1), but operators may then suddenly observe very harrowing events without being able to intervene. The prolonged surveillance also means that operators may become very familiar with their targets and family before the strike and directly observe the reaction of the family to the loss of a family member. Operators experience a compression of time and space being inches away from the screen while thousands of miles from the actual operational theatre. Finally, at the end of the working day the combat role is abruptly replaced by the resumption of domesticity and family life.

9. Separation anxiety can be a major stressor for deployed combat personnel and being close to home, as for RPAS operators, may be judged helpful in accommodating their fighting role. On the other hand, the small teams and relatively isolated work model of RPAS operators provide limited opportunity for effective peer support and development of unit cohesion. RPAS operators can be considered as fighting a war in a foreign country without being deployed.
10. It is Defence and Head Quarters Surgeon General policy to implement evidence-based interventions and treatments to protect individuals from hazards at work and prevent injury and illness. There is good evidence from the scientific literature, both civilian and military, that following a traumatic incident, workplace peer support is effective in addressing minor common mental health symptoms, preventing their becoming functionally disabling or a discrete diagnosable disorder (2). Such support also helps normalise such reactions to trauma, reducing stigma and fear of negative career impact. For operations across the three services but, as yet, not for RPAS service, Trauma Risk Management is available. Here trained non-professional practitioners, trusted members of the group who have shared the traumatic experience, provide support and, as required, a gateway to expert help. In addition, during the recent conflicts, decompression was introduced and delivered at an intermediate location for personnel returning from the conflict zone to home base. This allowed personnel to adjust and process their experiences amongst colleagues who had shared the deployment. As yet, evidence of the effectiveness of these two interventions is not available, but personnel generally find them helpful (3). Other issues being explored in relation to RPAS service include training for RAF medical officers and appropriate support and awareness for RPAS families.

RPAS Operations The Evidence of Adverse Health Effects in RPAS Operators

A. Surveys and Unpublished Research

11. There is unpublished UK evidence, mainly survey based and without appropriate comparison groups, of stress amongst RPAS operators. During the past three years, there have been reports of recruits withdrawing from training as RPAS operators because they feel stressed. In the last two years, 10% of those joining the RPAS squadron had been previously downgraded for mental health problems. Of these, 10% developed recurrent psychological symptoms while with the squadron. Although few formal clinical diagnoses have been made, and there is no evidence of increased referral rates of RPAS Squadron members to specialist mental health services, a significant number of UK RPAS crew members, confirmed by their families, report tiredness, stress, increased alcohol use, lowered mood and emotional symptoms that are common features of autonomic arousal, immediately before and less commonly, after weapon strikes.

12. Sir Anthony was informed of a UK RAF questionnaire-based survey using psychometric screening tools undertaken by 40 male RPAS operators, but no controls. The results of this survey have been published since this report was written (4). The operators had been in the role for at least two years and the survey took place at an Away Day which included a stress briefing delivered by a military psychiatrist. The aim was to record alcohol use, detect probable mental health disorders, and functional impairment. The tools used were the Work and Social Adjustment Scale (WSAS), Alcohol Use Disorders Identification Tool (AUDIT), Primary Health Care Questionnaire 9 (PHQ-9), Generalised Anxiety Disorder 7 (GAD-7) and PTSD checklist civilian version (PCL-C).

(6) The WSAS (5) has five items measuring self-reported functional impairment in the context of work, home life, relationships, social and leisure activity. For each item the maximum score is 8 with a low score indicating better function. A score of 10 or more implies probable functional impairment. AUDIT has ten items with scores ranging from nil to 40. Again, a higher score, in this instance, more than 8, is taken as suggesting possible problem drinking. PHQ-9 (7) uses nine items to assess depression. Maximum score is 27 and anyone scoring 10 or more is held to have moderate depressive symptoms. Anxiety severity was estimated using the seven item, GAD-7 (8). Score range is nil to 21 with 10 or more suggesting moderate anxiety symptoms. Finally, for PTSD symptoms, PLC-C, i.e. the 17 item PTSD checklist–civilian version was used (9). Again, for each item possible score is 1-5 where 5 is the highest severity. As in other military studies, an overall score of 30 or more implied subclinical potentially occupationally impairing symptoms, while for “probable” PTSD the cut-off was 50.

14. Findings:

- WSAS score suggested that 70% of respondents believed their operational effectiveness was impaired because of how they felt emotionally.
 - AUDIT scores showed 40% reported drinking alcohol at possibly hazardous levels (as defined by AUDIT score of over 8). Because different AUDIT measures and normative data may be used in studies, valid comparison of findings with other contemporary populations and studies may not be possible. A cross-sectional postal study published in 2007 assessed alcohol consumption in 2003 (10). This found 67% men in the armed forces with an AUDIT score of over 8, compared with 38% men in the general population. The general population data were derived from the Office of National Statistics (ONS) National Psychiatric Morbidity Survey, conducted between March and September 2000 and weighted to be representative of the household population of GB. It is also of note that since these data were collected there have been campaigns both in the general community and armed forces re alcohol awareness.
 - PHQ-9 suggested that 20% had symptoms meeting criteria for moderate depression, although not requiring specialist referral. This is similar to the armed forces and the UK general community as a whole.
 - GAD-7 suggested 10% met criteria for moderate anxiety. Again, this is lower than in the wider armed forces and the general UK community.
 - No one reported symptoms of probable PTSD.
 - There was a widely held view that the RPAS role was undervalued and unrecognised by the armed forces and general public with consequent perceived impact on career progression and morale.
15. The published paper included the response to a free text question on work terms and conditions. The most frequent suggested change was that shift pattern and work time were problematic. The high level of WSAS based functional impairment is of interest as the other survey outputs and lack of

association suggest that this is not primarily explained by a diagnosable mental disorder. One might speculate that a possible explanation is “burnout”; i.e. emotional exhaustion, cynicism and functional impairment, a situation which is not a psychiatric diagnosis requiring medical support or treatment, but which is addressed by attention to work-related factors

B. Published Peer-Reviewed Evidence

16. To date, published peer-reviewed evidence on the health impact of RPAS operations is limited and mainly from the US. Although the US and UK work closely on RPAS, there are clear differences in UK and US weaponised RPAS policy as well as societal and cultural differences and approaches to management of mental health symptoms and illness. US results cannot be generalised beyond the particular group studied. Other published peer-reviewed data sources considered by IMEG in this investigation included studies, in the civilian context, of issues pertinent to RPAS operations such as shift work, long working hours and PTSD in civilian studies.
17. Limitations of the US RPAS studies often include sample bias, e.g. how representative of the overall group were volunteers, and the fact that perceived impact of stigma on career, which applies in both civilian and military contexts, may have led to delay in seeking help, failure to present or to report symptoms. The studies and surveys have other limitations including cross-sectional design, use of different assessment measures for psychological disorders (e.g. psychometric tests giving “probable” diagnoses or the gold standard clinical examination), the populations assessed; e.g. all RPAS team members or just aircrew or pilots, differing response rates (almost always less than 50% of those eligible), reliance on self-report, and in many studies, no or fewer than ideal controls.
18. Few of the published papers comment on the nature of stressors, particularly whether combat related, workplace or domestic stressors, and how they relate to RPAS service. Many UK RPAS operators have been in service for many years and have previously piloted manned aircraft in combat situations. For some the stressor might relate more to that earlier service or might have arisen in some different aspect of work, service or private life.
19. As in the UK, evidence to date, from the US RPAS studies, does not show any increase in incidence of clinically diagnosed mental health disorders, although almost all published reports do not have a contemporary matched control group. About 4-5% of US RPAS operators in one self-report online study, with a 49% response rate, met diagnostic criteria for PTSD as compared to less than 1% by clinical diagnosis in another contemporary study (11). This also contrasts with a 4-18% rate of PTSD amongst those returning from the battlefield (12) and is lower than the 2005 lifetime prevalence of PTSD in the US general population of 7% (13). One retrospective study calculated the incidence rates of 12 specific mental health outcomes in all active RPAS pilots between 2003 and 2011, comparing rates with USAF manned aircraft pilots deployed to Iraq and Afghanistan during the same period. During the period there were 709 RPAS pilots and 5,256 Manned Aircraft (MA) pilots. Of the 709 only 82 were solely RPAS pilots and had never been deployed. The majority had previously deployed as MA pilots. Compared to MA pilots, a greater percentage of RPAS pilots had deployed three or more times, had prior mental health diagnoses and six or more years’ service. Adjusted incidence rates of the 12 specific mental health outcomes (adjusted for time in service, age, number of deployments and history of mental health symptoms or discrete diagnoses) were the same for both groups and lower than in other USAF branches e.g. medical and administration, and USAF overall (14).
20. The retention and manning issues found in the UK RPAS squadron were replicated in the USAF, and US findings on self-reported tiredness and stress studies and are similar to the British experience. US studies have specifically considered burnout in RPAS operators (15) where burnout is defined as a state of functioning typified by high levels of exhaustion, a distant and negative attitude to work and low sense of professional efficacy. 14-26% of the 296 investigated reported exhaustion and 7-17%

reported negative attitude. The outcomes on professional efficacy were varied and for the most part high levels of efficacy were maintained despite the exhaustion. The operators attributed these effects not to combat but to workplace/occupational stressors; primarily long work hours (51 or more hours a week), periods of boredom, family issues and shift work. Other US work has demonstrated safety risks associated with exhaustion, particularly secondary to long hours and shifts in RPAS operators, where mishaps are twice as common as in manned aircraft (16). Mishaps are defined by the total direct cost or severity of injury or occupational illness. For RPAS no personal injury was caused and so included in the total mishaps were those causing damage of \$20,000 or more as well as near misses deemed important to investigate for mishap prevention. Between 17-69% of these RPAS mishaps have been ascribed to human factors (17). To date there are no comparable UK studies.

- 21.** Since the Great War most research on military stress has focused on combat but a recent UK systematic review aimed to identify non-deployment factors, particularly work, social, interpersonal and family stressors, which might affect the mental well-being of military personnel (18). Non-deployment related stressors were as defined by HSE and applicable to all employments. These included work demands, work control, worker support, relationships, leadership, harassment and bullying, role clarity (i.e. do people understand their role and responsibilities) and, perhaps less relevant to the military context, how much involvement had they in organisational change. 2018 UK government statistics suggest that, while overall civilian sickness absence days, notably from musculoskeletal disorders, have been reducing, from 2009, sickness absence due to work-related stress, depression/anxiety symptoms and discrete mental health disorders has increased, currently accounting for 15 million days of sickness absence a year. Mental health problems are now the third most common cause of sickness absence after acute minor illness and musculoskeletal disorders (19). By contrast a degree of pressure or challenge is associated with most jobs and, although stressors are perceived differently and uniquely by individual people, in many cases the effect of stressors is positive, raising performance and providing job satisfaction. It is where pressure exceeds coping resources, especially for a prolonged period, that symptoms and ill-health can result (20).
- 22.** As well as similarities, differences between military and civilian employment include the 24 hour/365 days a year commitment of military employment and the fact that both employer and individual personnel have responsibilities beyond the workplace, to the living and recreational space. The Defence Health and Well-Being Strategy and Plan is designed to deliver the right mix of capable and motivated people through life and across the whole force of regulars, reservists, civil servants and contractors. The emphasis is on primary prevention, i.e. job modification with control of risks and hazards and individual personal protection, to prevent ill health. This is essentially a chain of command responsibility covering health education and promotion, healthy lifestyles, injury and illness prevention, good living and working conditions. Secondary prevention is appropriate when symptoms and illness have developed. It is concerned with early detection and referral to support, expert diagnosis and, as required, best practice evidence-based treatment. Here the main responsibility is medical care, through Headquarters Surgeon General and Defence Primary Health Care. Equally important is the need for the organisation and its senior leaders to endorse anti-stigma campaigns. Although not unique to the military, delay in seeking help is an issue, and the armed forces have embraced peer and line management support for those with mental health problems to access help early.
- 23.** International military studies show that under-manning, being posted or deployed, can all be associated with an increased risk of psychological symptoms, lead to poor work-life balance with excessive hours and limited opportunity for relaxation, sporting and social activity or interaction with family and peers. These are associated with a high turnover of military personnel and psychological symptoms (21). Opposite effects result from good peer and chain of command support, high quality leadership, shared ethos, teamwork, a quality work environment, and support from the chain of command for families; that leads to effective functioning, retention in service and high morale (22).

There is also a significant literature, well beyond the medical, that provides testimony that deployed service and combat can support organisational identity, unit cohesion and coping with stress.

- 24.** For RPAS operators other factors reported as contributing to stress include physical working conditions, the ergonomics of work stations and digital equipment, often with monitoring of multiple screens, leading to musculoskeletal symptoms, headache, eye strain and difficulty alternating their work with family responsibilities acutely and on a daily basis. Job satisfaction and morale in any context, including the military, is enhanced by recognition, a feeling of being valued and rewarded. A particular issue in UK RPAS operators, as noted in the Away Day survey and discussed with Sir Anthony, is feeling undervalued by public and peers alike, with limited career progression. Some of this relates to limited or misunderstanding of the role and its challenges and failure to appreciate the RAF Reaper Force and the personal ethos of team members. This goes well beyond adherence to the Geneva Convention which states that civilians may be killed in war provided numbers involved are not excessive in relation to the military advantage anticipated. UK policy is zero civilian casualties.
- 25.** Another issue is shift work. There is an extensive literature, predominantly civilian, on shift work, but study designs are variable, and many questions remain unanswered (23). Shift work means work time arrangements out with normal daytime hours of 0600-1800. This includes fixed early morning, evening and night work, roster work and rotating three shifts work, where there is regular rotation between day, evening and night shifts. Shift work disrupts the normal sleep-wake cycle causing shortened sleep and excess tiredness (24).
- 26.** Individual studies suggest that shift work may affect health and safety, lead to increased accidents and may even be associated with chronic disorders including coronary disease and some cancers. A recent review looked at 38 meta-analyses and 24 systematic reviews of shift work, and its relation to insufficient sleep, chronic diseases and accidents (25). A weak association was found between shift work and accidents, diabetes type 2, coronary heart disease, and some cancers. The evidence of individual studies is however inconsistent, and it is unclear as to whether shift work is a causal factor for these diseases. Good evidence does exist for a relationship between insufficient sleep and immunological and metabolic changes, increasing the risk for chronic physical disease. It seems plausible that the adverse effects of shift work are mediated via sleep and circadian rhythm disturbances. Other possible mechanisms, relevant to RPAS operators, include changed lifestyle behaviours, by their own admission: less attention to diet, reduced physical activity, increased consumption of caffeine and alcohol and poor work life balance with disrupted exercise, social and family commitments. Shift work affects some people more than others with the suggestion that the ability to compartmentalize (i.e. separating work, personal and home duties) is helpful in preventing adverse health effects. More research is required, especially longitudinal studies, to identify best practice on shift scheduling to support improved sleep, and also to investigate what happens when shift working ceases, including whether there is any difference if the shift pattern is long established or of recent and short duration.
- 27.** Previous research has linked long working hours with physical disease, e.g. coronary disease, reporting a relative risk of about 1.4, i.e. a 40% increase in risk, (26)(27). However, limitations to generalising from these studies include publication bias, i.e. the tendency to publish studies with a positive outcome, reverse causation (where employees with advanced disease may reduce their working hours in the years before the cardiovascular event); and possible confounding factors. For example, - cardiovascular disease is more common in people from lower socio-economic groups (SEG), while working longer hours is a feature of those from higher SEGs. A 2016 systematic review and meta- analysis of longitudinal published and unpublished studies included over 600,000 individuals; it looked at long working hours (45-55 hours weekly) and incident risk of both coronary disease and stroke in individuals free of symptoms at entry to the study (28). The results showed a 30% increased risk for stroke in those working 55 hours or more, while the risk for coronary heart disease was raised, but only weakly and, in most studies, the risk was not statistically significant.

Findings:

- 28.** The IMEG investigation has led to four main findings: -
- i. An adequate high-quality published peer-reviewed evidence base on hazards, risks and adverse health effects of RPAS service does not as yet exist. The emphasis of most research has been on possible mental health effects. We found no RPAS studies concerned with the physical health of personnel.
 - ii. Neither in US or UK studies was there an increased risk of discrete diagnosed mental health disorders or problems, leading to help seeking, at levels above that of manned combat pilots or other military personnel.
 - iii. There is some survey and questionnaire evidence from UK and US, confirmed by families, of reported stress and exhaustion in RPAS crew members. In discussion, some RPAS operators identified challenges related to shift work and long hours, particularly at times of increased operational tempo and manning shortage, leading to physical symptoms such as neck and back pain, related to the ergonomics of the ground control station, and daily psychological switches between the role of war fighter and family member.
 - iv. In addition RPAS operators reported low morale, feeling undervalued and unrecognised by peers and the general public. They also perceived restricted opportunity for career progression. They were clear that their roles as pilot, sensor operator and mission intelligence co-ordinator were not replicated in manned combat aircraft. Different training and competencies are required, such as rapid processing of audio-visual data, concentration and self-reliance. Coupled with the work pattern and content, the rapid alternation of war fighter and family roles and the limited time for off-duty support and team building, the roles were felt to be similarly demanding as in manned combat aircraft.
- 29.** It is established that, in general, the health and well-being of employed personnel and primary prevention of symptoms and illness is supported by high quality jobs and conditions, issues primarily for the chain of command. We recognise that care is needed to avoid implementation of changes in areas such as selection for RPAS duties, screening and ongoing routine extra medical examinations or surveillance where there is no clear evidence of such requirement nor of the effectiveness of the change. Inevitably such action can do harm and convey a message that the core duties of the occupation are thought to be risky or hazardous.
- 30.** The medical risks of screening are well known (29). There is a significant literature, US based, that “screening out” of military service of those judged to be at risk of mental health symptoms and illness is ineffective. In the early part of US involvement in the Second World War, personality testing was used to predict those likely to break down when faced with the stress of combat. By 1944 they were running out of personnel and General Marshall reversed the practice. Many of those previously turned down now enlisted and for the most part made adequate soldiers.
- 31.** One reason for the failure of screening in prevention of traumatic psychological injury is that not everyone alleged to have predisposing risk factors will in fact be exposed to a traumatic stressor, the best single predictor for development of PTSD or adjustment disorder (30). These disorders are not more likely where there is a family history of mental health disorder or dysfunction etc. While risk reduction is important for good mental health, so too is building enhanced resilience. Many studies confirm good mental and physical health at times of obvious public risk, e.g. during the Second World War and, more recently, in the aftermath of 9/11 and the London, Paris, Berlin and Madrid bombings. In these situations, people, especially professionals, police, fire and paramedics, were able to see and

accept that total prevention of such events is unlikely, but there is good reason for accepting the risk. Such a philosophy has long been the tradition of the UK armed forces and an aim is for it to remain so at this time of smaller volunteer forces, increasing change, new challenges, new technology and principal service occupations. Support of this tradition demands prevention and protection and where there are suggestions of stress or lowered morale, early detection, recognition and, proportionate response by the chain of command sponsored by senior leaders.

Recommendations:

32. Apart from the musculoskeletal and other physical sequelae related to the ergonomics of workstations and ground control stations, the reported health and well-being effects of RPAS service focus on nonspecific and psychological symptoms. The chain of command, senior personnel staffs and Headquarters Surgeon General are already engaged in addressing many of the issues raised in this paper.¹The IMEG role is to consider contemporary evidence on the issues from a scientific and medical perspective and, as relevant, make recommendations.
33. To date, from a medical and scientific perspective, we have found no strong evidence of the development of higher levels of discrete diagnosed psychiatric disorders in RPAS operators compared with other RAF personnel. However mental health disorders may present after some delay.

Recommendation 1

Defence should consider a follow-up surveillance study of RPAS operators looking at physical and mental health, including suicide, as compared with a suitable control population.

34. We identified one distinct feature of RPAS service. PTSD was first defined in DSM 111 in 1980 in the aftermath of the Vietnam War and a guilt symptom was included: “guilt about surviving while others have not, or about behaviours required for survival” which in later editions disappeared (31). RPAS crews are not alone in being required to kill, but unusually they do so without risk to themselves and while viewing detailed events often of family life, with which many identify, over a long period. There is also risk of killing non-combatants, women and children, and friendly forces and of direct visual exposure to human remains and atrocities. These features may breach normal ethical standards and lead to moral ambiguity and injury. Research from the Vietnam generation (32) and more recently in Iraq War veterans (33), has shown similar levels of killing in both conflicts and severe post- traumatic stress (PTS) symptoms in those who killed or observed killing, sometimes with delay of years to onset or presentation. This is often referred to as “moral injury”. After controlling for exposure to general combat, and viewing atrocities, body parts etc, killing predicts PTSD, characterised by peri-traumatic dissociation, functional impairment and violent behaviour. There is increasing evidence (34) that these aspects of PTSD phenomenology, described in the new ICD 11 classification as “complex PTSD”, may be particularly treatment resistant with poor response to conventional best practice interventions, risk of chronic medium and long-term symptoms and disabling functional effects.

Recommendation 2

We recommend research on the impact on mental health of killing humans within a longitudinal study of RPAS teams.

¹ The RPAS branch has now been restructured such that a cross-over to manned flying is now possible, with the blue laurels of the former RPAS flying badge changed to brown, the same as the badge for pilots of manned aircraft. RPAS crews are now also available for the Operational Service Medal (Iraq and Syria).

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