Statement of Objectives

The Australian Military Medicine Association is an independent, professional scientific organisation of health professionals with the objectives of:

- promoting the study of military medicine
- bringing together those with an interest in military medicine
- disseminating knowledge of military medicine
- publishing and distributing a journal in military medicine
- promoting research in military medicine

Membership of the Association is open to doctors, dentists, nurses, pharmacists, paramedics and anyone with a professional interest in any of the disciplines of military medicine.

The Association is totally independent of the Australian Defence Force.
Waxing lyrical as always, your Editor feels a need to touch on a number of diverse topics in his Editorial.

A Varied Lot

This edition of the Journal offers, once again, a good mix of copy. We start with Ben Fitzgerald’s very good study on fungal infections at sea, which has shown, with statistical credibility, what most Naval medical officers (and probably those from the other Services as well), have long suspected - that, in the operational environment, constraints on regular showering and changing of clothing inevitably lead to an increased incidence of fungal skin infections. As an example of the direct benefit that this can have on the military this study is it, since its results were used as the basis for advice to ships’ Commanding Officers to arrange their routines, even in combat, to facilitate these basic activities of hygiene.

The second article is Tracy Smart’s excellent ‘Weary’ Dunlop Award-winning (yes, your Editor did watch the Oscars) paper on the problems, challenges and solutions surrounding the movement of women into the fast-jet cockpit. It is of interest to note that many of the same issues, and quite a number of others, have been met and largely resolved in the navy with the integration of women into the Fleet - and shortly into submarines. That is not to say that there have not been problems - there have, and they were regrettable - but Navy has learnt from them and moved forward.

Next comes another article based on a Conference Paper, this time from the Naval Health Service’s Conference of 1997. Ian Jones discusses many of the issues related to readiness of operational health services, and in particular the Reserve component of them. There is no doubt that, as the ADF Health Service becomes more and more dependent upon the Reserves (and with increasing civilianisation and commercialisation this will creep in to the more traditional non-Specialist areas previously the preserve of the Permanent Forces), the ability to meet the Friday afternoon (it is ever thus) operational challenge will become more and more critical.

In a somewhat lighter vein, but perhaps more thought provoking, Anna Leeve provides us a view of the social, personal and psychological themes entwined in the hit television series MASH. Noting that the series lasted three times longer than the war it depicted, she concludes that the series depicted important lessons to be learnt by all health care professionals.

Finally, your Editor thought that all of those who have been involved in major corporate restructuring/downsizing/rightsizing (etc) would enjoy the Memo from Santa.

The Defence Health Service Branch

As our President notes in his Message, the Defence Health Service Branch (DHSB) is now up and running. The impact of this is being felt most noticeably in the Bases, with new national and Regional/Area Resource management structures on the verge of being established.

The Office of the Surgeon General, now under the full time leadership of the Director General, Defence Health Service, Brigadier Paul Buckley, is, apart from some significant downsizing and rank reductions, largely unchanged from its previous role.

Operationally, the three single Service Headquarters - Maritime, Land and Air - continue to do business as usual, with Headquarters, Australian Theatre coordinating.

Nationally, the Joint Health Support Agency is rapidly replacing the health management organisations previously represented by the single Service Support/Logistic/Training Commands.

Locally, the country has been divided into Regions/Areas, largely along State lines, except in New South Wales where there will be three Areas centred on the three major service providers in Sydney - Balmoral Naval Hospital, 1 Field Hospital and 3 RAAF Hospital. The key to efficiencies will be in seeking to rationalise and coordinate service provision in the regions, and, where practicable, across the Nation.

Farewells

Your Editor knows that the Navy is not unique in this matter, but it was a sad and sober occasion recently when about 60 members of the Naval Health Branch farewelled its three senior officers. The wider Navy was represented by the Deputy Chief of Navy, Rear Admiral Chris Oenbould, AO, RAN, who spoke eloquently of Commodore Mike Flynn, the last Director General Naval Health Services. Captains Bob Green and Bill Fussell also took their leave, these three officers representing 68 years of corporate knowledge in Naval health.

Finally

Having broken his rule to keep his Editorial to one page, your Editor turns now to an apology. The Assistant Editor, being overseas at present, has been unavailable to do this Journal’s update. The inadequate version herein is the re-
President’s Message

Nader Abou-Seif

Military medicine in Australia continues to be a very dynamic entity. While the skills and enthusiasm of its practitioners and students continue to be sharpened and prepared for response as needed – and response is part of the very nature of the art – the organisation surrounding the highest profile of military medicine has suddenly changed. Although the new structure of medicine in the military – and here I must remember the difference between military medicine in its broadest sense and its uniformed sense – was nominally in place in mid-1997, the announced structure has now actually come into physical being.

This year, we now have the ‘Defence Health Services Branch’, which has been formed as the central coordinating structure for medicine in the military. This organisation, headed by Brigadier Paul Buckley, is to bring about closer and more effective joint planning and response by the military Health Services as we approach the new millennium. The promised increased use of Reservists brings the chance of greater involvement for those with an interest - or should I say passion? - for military medicine.

Passion is perhaps an odd word to use. However, throughout my involvement in military medicine, and in particular with my involvement in AMMA, I think passion is the right word. In Australia, and throughout the world, military medicine is a field that engenders more than mere enthusiasm. Perhaps because in order to carry out one’s ‘duties’, one has to potentially endanger one’s own life for those in one’s care, a special type of person is attracted to military medicine. It is because of this passion, and to correct the unfortunate fact that for many years the special nature of the science and art of military medicine has been ignored by a large part of both the health and the military communities, that AMMA has been founded.

We aim to be a forum for all aspects of military medicine. We aim to bring together, in a professional but relaxed way, those who have devoted part or all of their time to the many disciplines that combine to make up military medicine. As AMMA grows and develops, it is hoped that it will continue to meet the growing needs of its membership. Our horizons must expand and we must maintain dynamism to meet the challenges of the future. AMMA must do this in the face of growing technology and increasing expectations that must be addressed and utilised, or we will be left behind. This year will see a growing presence of AMMA electronically, a further expansion of our journal and a new format to our conference. I hope that as many of you as possible may involve yourselves in AMMA’s activities and help in the development of our future.
A study of fungal presentations at sea

B.T. Fitzgerald, R.B. Schedlich

Abstract

A study was conducted into the incidence of fungal presentations in an Australian warship at sea under hot and humid conditions. It had been hypothesised that there was medical value in changing clothing of an evening. It was suggested that this change could contribute to an increase in hygiene and a decrease in the risk of fungal skin infections. Personnel with presumed fungal presentations to the Sick Bay in HMAS Melbourne (an Australian frigate) were registered in two surveys during Cruising Watches (when night clothing was worn from 18:00). This was compared with two surveys when the ship’s company were in Defence Watches, wearing combat coveralls (Proban® overalls) and safety boots throughout the day. Data were also collected during Cruising Watches when night clothing was not permitted and all had to remain in combat coveralls and protective footwear. It was found that presentation rates were statistically significantly lower during periods when a change of clothing was required.

Introduction

A preliminary study previously published assessed the value of changing to night clothing in an Australian warship under hot and humid conditions. It had been argued that changing into night clothing was beneficial from a medical perspective due to a perceived increase in hygiene and the anecdotal evidence that most personnel would shower before changing. It was hypothesised that this would result in a lower risk of fungal skin infections. The initial study showed that there was a statistically significant difference between the presentations of the two groups (p<0.01), supporting the hypothesis that changing uniforms was beneficial.

There were flaws in the initial study. The risk of infection increases the longer that personnel are exposed to adverse conditions. The Defence Watches component of the survey was conducted after Cruising Watches. The higher number seen during Defence Watches may have reflected this increased risk. The numbers seen were small, as was the time frame of the study (constrained by the operational role of the ship). In Cruising Watches, some personnel wore shorts and sandals as part of daytime uniform, decreasing the risk of development further. None of these factors was accounted for in the first study.

This second study continued the comparison of presentation rates during Defence Watches followed by a period in Cruising Watches. The ship’s routine meant that a third arm was able to be evaluated: a period when the ship’s company were in Cruising Watches, but had to wear protective coveralls and safety boots throughout their day; no other uniforms were permitted to be worn (ie there was no change to night clothing). However, in Cruising Watches personnel generally work fewer hours than during Defence Watches, and their activity rates are consequently less arduous.

Subjects

Subjects were the members of HMAS Melbourne’s ship’s company. The complement for the deployment was 224, five of whom were female. Personnel were aged from 18 to 48.

Cases were those who presented to the Sick Bay with skin lesions which were clinically diagnosed by the author as having a fungal aetiology.

Methods

Five surveys were conducted over two study periods as shown in Table 1.

During Defence Watches, personnel are required to remain in protective overalls and
safety boots. In Cruising Watches, the ship’s company are required to change into night clothing at 18:00.

All surveys were conducted prospectively, and recorded presentations of clinically diagnosed fungal infections on all body locations.

In the first study, two prospective surveys were undertaken - during an 18 day period in Cruising Watches (1CW) and during another 18 day period in Defence Watches (1DW).

The second study involved three surveys. The first was during Defence Watches, for 15 days (2DW). The second was 65 days of Cruising Watches during which period, personnel were required to remain in protective clothing at all times (2CW-NNC). The last phase was 19 days during Cruising Watches (2CW). In this phase personnel were permitted to wear uniforms other than overalls and boots and were expected to change into night clothing after 18:00.

**Table 1. Study periods and surveys showing duration.**

<table>
<thead>
<tr>
<th>Code</th>
<th>Days</th>
<th>Night Clothing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Study</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1CW</td>
<td>18</td>
<td>Yes</td>
</tr>
<tr>
<td>1DW</td>
<td>18</td>
<td>No</td>
</tr>
<tr>
<td><strong>Second Study</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2DW</td>
<td>15</td>
<td>No</td>
</tr>
<tr>
<td>2CW-NNC</td>
<td>65</td>
<td>No</td>
</tr>
<tr>
<td>2CW</td>
<td>19</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Codes:
- CW - Cruising Watches
- DW - Defence Watches

The five periods under observation included the entire period the ship was in tropical regions. The irregular duration of each period was a result of the operational requirements of the deployment. The two “Night Clothing” surveys occurred at the commencement and completion of the deployment, with the three “Non-Night Clothing” surveys being contiguous periods in the middle of the deployment.

Since the hypothesis under investigation was that changing into night clothing reduced the incidence of fungal infections, it was considered appropriate to test the validity of combining the surveys into two broad groups - Night Clothing (NC) and Non-Night Clothing (NNC) and testing the comparison between them. Table 2 shows the proposed combination.

**Table 2. Proposed data combination.**

<table>
<thead>
<tr>
<th>Group</th>
<th>Survey</th>
<th>Period</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>1CW</td>
<td>1st</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>2CW</td>
<td>2nd</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>37</td>
</tr>
<tr>
<td>NNC</td>
<td>1DW</td>
<td>1st</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>2DW</td>
<td>2nd</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>2CW-NNC</td>
<td>2nd</td>
<td>65</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>98</td>
</tr>
</tbody>
</table>

Because of the low number of cases observed, data were analysed using the Poisson method. In each case, the variation for 95% Confidence Intervals (lower - λ1, and upper - λr) around the observed number of cases were taken from a Poisson table.

Incidence rates (IR) for each group were determined in the usual way and expressed as cases presenting per day (the population was fixed throughout the deployment). Poisson 95% Confidence Intervals around the IRs were calculated using λ1 and λr.

All comparisons between groups were undertaken using Standardised Rate Ratios (SRR) calculated as

\[
SRR = \frac{O}{E}
\]

where O is the number of cases observed, and E is the number of cases that would be expected if the observed group had the same IR as the total of the combined groups.

Poisson Confidence Intervals around the SRR were calculated using λ1 and λr for the observed cases divided by the expected number of cases to give the 95% Upper and Lower Confidence Limits (UCL and LCL) around the SRR.

The groupings at Table 2 were validated by determining whether the 95% Confidence Intervals of the SRR for each survey, standardised to the grouping, showed a statistically significant difference (i.e., the null hypothesis of SRR = 1 was not within the CLs).

Once the two combined study groups, NC and NNC, had been validated, comparison between them was undertaken to determine the presence of a statistically significant difference.

Analysis of rates in different accommodation areas, and by work Department was also undertaken.

**Results**

A total of 72 cases presented during the study period. Table 3 summarises the data by survey period, giving IRs and 95% UCLs and LCLs of the IRs.

**Table 3. Night Clothing Group and Surveys:**

<table>
<thead>
<tr>
<th>Cases</th>
<th>IR</th>
<th>LCL</th>
<th>UCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1CW</td>
<td>2</td>
<td>0.11</td>
<td>0.01</td>
</tr>
<tr>
<td>1DW</td>
<td>17</td>
<td>0.94</td>
<td>0.55</td>
</tr>
<tr>
<td>2DW</td>
<td>10</td>
<td>0.67</td>
<td>0.32</td>
</tr>
<tr>
<td>2CW-NNC</td>
<td>40</td>
<td>0.62</td>
<td>0.44</td>
</tr>
<tr>
<td>2CW</td>
<td>3</td>
<td>0.16</td>
<td>0.03</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td>0.53</td>
<td>0.42</td>
</tr>
</tbody>
</table>

The overall incidence rate for the whole period (135 days, 72 cases) was 0.53 cases per day. The IR per 1,000 population per day was 2.38.
**Analysis of Surveys**

Table 4 shows SRRs, standardised against the whole study group and period, and 95% Upper and Lower Confidence Limits for each of the surveys.

**Table 4. Standardised Rate Ratios and 95% Upper and Lower Confidence Limits for all study Surveys (standardised to the whole period).**

<table>
<thead>
<tr>
<th></th>
<th>SRR</th>
<th>LCL</th>
<th>UCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1CW</td>
<td>0.21*</td>
<td>0.03</td>
<td>0.75</td>
</tr>
<tr>
<td>1DW</td>
<td>1.77*</td>
<td>1.03</td>
<td>2.84</td>
</tr>
<tr>
<td>2DW</td>
<td>1.25</td>
<td>0.60</td>
<td>2.30</td>
</tr>
<tr>
<td>2CW-NNC</td>
<td>1.15</td>
<td>0.82</td>
<td>1.57</td>
</tr>
<tr>
<td>2CW</td>
<td>0.30*</td>
<td>0.06</td>
<td>0.87</td>
</tr>
</tbody>
</table>

*Indicates statistical significance at the 95% level.

Both the periods in Cruising Watches where night clothing could be worn (1CW and 2CW), have SRRs statistically significantly lower than unity. The other three surveys (where night clothing could not be worn), all have SRRs greater than one, and in the first of these periods, 1DW, the difference is statistically significant (SRR 1.77, 95% CLs 1.03-2.84).

**Validation of Groups**

Table 5 shows the SRRs, 95% UCLs and LCLs for the two night clothing surveys (1CW and 2CW), standardised to the IR for the combined periods (Night Clothing Group).

**Table 5. Night Clothing Surveys - Standardised Rate Ratios, Upper and Lower Confidence Limits (standardised to the combined Night Clothing Group).**

<table>
<thead>
<tr>
<th></th>
<th>SRR</th>
<th>LCL</th>
<th>UCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1CW</td>
<td>0.82</td>
<td>0.10</td>
<td>2.97</td>
</tr>
<tr>
<td>2CW</td>
<td>1.17</td>
<td>0.24</td>
<td>3.41</td>
</tr>
</tbody>
</table>

Table 6 shows the SRRs, 95% UCLs and LCLs for the three non-night clothing surveys (1DW, 2DW, and 2CW-NNC), standardised to the IR for the combined periods (Non-Night Clothing Group).

**Table 6. Non-Night Clothing Surveys - Standardised Rate Ratios, Upper and Lower Confidence Limits (standardised to the combined Non-Night Clothing Group).**

<table>
<thead>
<tr>
<th></th>
<th>SRR</th>
<th>LCL</th>
<th>UCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1DW</td>
<td>1.38</td>
<td>0.80</td>
<td>2.21</td>
</tr>
<tr>
<td>2DW</td>
<td>0.98</td>
<td>0.47</td>
<td>1.79</td>
</tr>
<tr>
<td>2CW-NNC</td>
<td>0.90</td>
<td>0.64</td>
<td>1.23</td>
</tr>
</tbody>
</table>

Tables 5 and 6 show that in each of the two groups, the upper and lower confidence intervals of the surveys span the null hypothesis of unity (SRR = 1). It can thus be concluded that there are no statistically significant differences between the surveys within the groups, and accordingly the groupings are valid.

**Night Clothing vs Non-Night Clothing**

The IR for the NC Group was 0.14 (0.04-0.22), and that for the NNC Group 0.68 (0.34-0.87). Table 7 shows the standardised rate ratio and upper and lower confidence limits for each of these groups, standardised against the whole period.

**Table 7. Night Clothing vs Non-Night Clothing Groups - Standardised Rate Ratios, 95% Upper and Lower Confidence Limits (standardised to the whole period).**

<table>
<thead>
<tr>
<th></th>
<th>SRR</th>
<th>LCL</th>
<th>UCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Night Clothing</td>
<td>0.25*</td>
<td>0.08</td>
<td>0.59</td>
</tr>
<tr>
<td>Non-Night Clothing</td>
<td>1.28</td>
<td>0.99</td>
<td>1.63</td>
</tr>
</tbody>
</table>

*Indicates statistical significance at the 95% level.

The results of indirect standardisation of the incidence rates show that the SRR for the Night Clothing Group is statistically significantly less than for the whole period (SRR 0.25, 95% CI 0.08 - 0.59). Conversely, there is no statistically significant difference between the Non Night Clothing Group and the whole.

**Proportions by Accommodation**

Table 8 presents the breakdown of presentations according to accommodation areas. These data were collected in the second study period (99 days). The Mess with the highest rate was the Petty Officers' Mess (IR = 3.79, SRR = 1.59), and that with the lowest 2 Mess (junior sailors) (IR = 1.68, SRR = 0.70)
**Table 8. Incidence Rates (per 1,000 per day). Standardised Rate Ratios, Upper and Lower Confidence Limits by accommodation area (mess).**

<table>
<thead>
<tr>
<th>Mess</th>
<th>Cases</th>
<th>IR</th>
<th>SRR</th>
<th>LCL</th>
<th>UCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Officers (82)</td>
<td>6</td>
<td>2.16</td>
<td>0.90</td>
<td>0.33</td>
<td>1.97</td>
</tr>
<tr>
<td>f’P’Ps (16)</td>
<td>3</td>
<td>1.80</td>
<td>0.78</td>
<td>0.73</td>
<td>3.70</td>
</tr>
<tr>
<td>POs (24)</td>
<td>9</td>
<td>3.79</td>
<td>1.59</td>
<td>0.73</td>
<td>3.71</td>
</tr>
<tr>
<td>2 Mess (JS – 30)</td>
<td>5</td>
<td>1.68</td>
<td>0.70</td>
<td>0.23</td>
<td>3.14</td>
</tr>
<tr>
<td>3F Mess (JS – 66)</td>
<td>13</td>
<td>1.99</td>
<td>0.83</td>
<td>0.44</td>
<td>1.42</td>
</tr>
<tr>
<td>3A Mess (JS – 60)</td>
<td>16</td>
<td>2.69</td>
<td>1.13</td>
<td>0.65</td>
<td>1.83</td>
</tr>
<tr>
<td>Not Recorded</td>
<td>1</td>
<td>2.39</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (224)</strong></td>
<td><strong>53</strong></td>
<td><strong>2.39</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Proportions by Department

Table 9 divides the presentations according to work groups. These data were also collected only during the second study period (99 days). The Department with the highest rate of infection were the aviators (IR = 3.19), SRR = 1.33), and that with the lowest Supply (IR = 1.80, SRR = 0.76) closely followed by the Marine Engineering Department (IR = 0.76, SRR = 0.76). None showed any statistically significant difference.

**Table 9. Incidence Rates (per 1,000 per day), Standardised Rate Ratios, Upper and Lower Confidence Limits by Department.**

<table>
<thead>
<tr>
<th>Department</th>
<th>Cases</th>
<th>IR</th>
<th>SRR</th>
<th>LCL</th>
<th>UCL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seaman (95)</td>
<td>24</td>
<td>2.55</td>
<td>1.07</td>
<td>0.69</td>
<td>1.59</td>
</tr>
<tr>
<td>Marine Engineering (39)</td>
<td>7</td>
<td>1.81</td>
<td>0.76</td>
<td>0.30</td>
<td>1.56</td>
</tr>
<tr>
<td>Electrical Engineering (36)</td>
<td>9</td>
<td>2.53</td>
<td>1.06</td>
<td>0.48</td>
<td>2.19</td>
</tr>
<tr>
<td>Supply (28)</td>
<td>5</td>
<td>1.80</td>
<td>0.75</td>
<td>0.24</td>
<td>1.76</td>
</tr>
<tr>
<td>Aviation (19)</td>
<td>6</td>
<td>3.19</td>
<td>1.33</td>
<td>0.49</td>
<td>2.91</td>
</tr>
<tr>
<td>Not Recorded (7)</td>
<td>2</td>
<td>2.39</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (224)</strong></td>
<td><strong>53</strong></td>
<td><strong>2.39</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion

Fungi are ubiquitous and are routinely found as part of the normal flora of human skin. Certain factors promote the overgrowth and subsequent clinical signs and symptoms. Warm, moist conditions are most favourable. Infections tend to be more common in summer. Clothing further enhances conditions especially when fitted tightly. The length of time that these conditions persist for is another significant factor. Trauma provides a portal of entry. Obesity and many medical diseases and treatments (especially antibiotics) also predispose to mycotic colonisation. Those last factors are less likely in sailors at sea, who are required to be fit for sea posting.

In Defence Watches, personnel were required to wear protective S18 uniforms (Proban® overalls and safety boots). The watch system for most was a rotating five hours on, seven hours off, then seven hours on and five hours off. Engineering personnel worked four hours on and eight hours off, whether in Defence Watches or not.

In Cruising Watches, personnel were permitted to wear overalls or shorts and short-sleeved shirts with shoes or sandals. Most personnel anecdotal had more spare time, and showering and changing was more commonplace. Duty engineering sailors do not change to night clothing due to the need to be able to respond to emergencies in the engine rooms and work spaces at all times. Most in that department were said to shower and change night attire for sleeping, or to a new set of overalls) at the end of a watch. This replicated the hygiene effect of a change to night clothing, but meant that they continued to wear more constraining and tight-fitting attire.

This study has shown that there was a statistically significant difference (at the 95% level) in presentation rates of presumed fungal infections between the periods where night attire was permitted to be worn and when it was not. When the change in outfit was required, the presentation rate was one quarter (SRR = 0.25, 0.08 to 0.59) that of the overall presentation rate, and less than one-fifth that when night clothing was not permitted.

There was no consistent effect of duration of the exposure to tropical conditions. Although the second survey where night clothing was permitted (2CW) had an IR less than the first survey (1CW), the three surveys in the middle of the deployment where night clothing was not permitted (1DW, 2DW and 2CW-NNC), showed a gradual reduction of IR. This latter trend, although not statistically significant, does suggest a protective acclimatisation. The IR in 2CW is likely to include a 'carry over' of infections from the immediately preceding survey (2CW-NNC), and this may explain the higher figure compared to 1CW.
There are no obvious epidemic-like trends within accommodation areas. On the other hand, both the Marine Engineering and Supply Departments had a lower IR, although these were not statistically significant. In the latter case, this may be due to the generally less physically demanding and more environmentally favourable work patterns for Supply personnel. Marine Engineering personnel, however, consistently work in hot, humid conditions, often at high levels of physical activity - a situation conducive to sweating and skin maceration. The lower numbers of presentations in this group could be associated with the common practice of showering and changing clothes after work periods, although in this Department the duration of each work period is generally less than for other Departments.

Conclusions

There are several conclusions that can be drawn from these results. Changing attire during the day appears to decrease the risk of attaining a fungal infection by reducing favourable conditions for their development. This assumption would favour the policy of changing outfits at the end of a working day.

Another possibility is that environmental conditions during the surveys were different. All data were collected during hot and humid conditions. Recording and analysis of daily temperatures and humidity would have permitted more scientific comparisons to be made and could have strengthened this study.

Similar presentation rates during both periods where night clothing was worn suggest that the conditions in each of those periods were similar. Presentation rates in each period where night clothing was not permitted were also comparable, again suggesting that each of those surveys were conducted under similar environmental conditions. This would strengthen the argument that the difference in presentation rates was due to the change in attire rather than due to different climates.

It is interesting to note that the Marine Engineering department had the second lowest IR of any group. This group did not change into night clothing. They did tend to change out of their overalls at the end of each watch, as the overalls would be saturated with sweat and/or filthy. This suggests that the act of changing was more important than the type of clothing personnel changed into. It also reinforces the concept that changing clothing during the day reduces the risk of presenting with a fungal infection.

This study would suggest that medical teams substantially increase stores of antifungal medications in preparation for situations where prolonged periods of hot and humid climates are likely to be experienced. For Navy medical teams this could also be advised when lengthy intervals of Defence Watches are programmed or possible. Preventative programs aimed at increasing awareness of fungal problems, improving personal hygiene and recommending a regular change of outfits would help to reduce this problem.

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‘Weary’ Dunlop Paper - 1997

Fast women: Or why women who fly high performance aircraft are fast but not loose

T.L. Smart

This paper won the ‘Weary’ Dunlop Award for the best Paper read by a member at the 1997 AMMA Annual Scientific Conference.

Introduction

Women entering a male dominated sphere for the first time will always encounter difficulties. Some of these problems relate to the physical or physiological attributes of the women themselves. Others relate to the attitudes of the men whose world they wish to enter. The Royal Australian Air Force currently has its first female attempting to break into one of the last bastions of male domination left in today's military - the fast jet world.

The concept of flying women is not new. A brief look back at the history books tells us that women played a large role in the early history of aviation. Early pioneers included the Wright Brothers sister Katherine, Harriet Quimby in her purple satin flying suit who was the first woman to fly the channel, and household names such as Amelia Earhart and Amy Johnson. Australia even had its own pioneer aviatrix, Nancy Bird, who learned to fly in 1933 at the age of 17 and flew for one of this country's earliest airborne ambulance services.

Women have also played a major part in the military in general, however the role of female aviators in Western militaries has been an area of politics and controversy, particularly when enough men were available to do the job. Despite this, thousands of female pilots were called upon in World War 2 to fill vacant cockpits and free men for fighting duties.

In the US, the Women Airforce Service Pilots (WASPs) based at Avenger Field, Sweetwater, Texas kept the home planes flying from 1943. Eventually over 2 000 women flew over 70 aircraft types in non-combat roles, mostly performing ferrying, training and transport duties. Seventy of these women were killed or injured whilst flying, but it was not until 1977 that the WASPs were granted Veterans status by Congress.

The British kept women aviators out of uniform but had them fulfilling similar functions to the WASPs as part of the civilian Air Transport Auxiliary. It wasn't until 1952 that the first female RAF pilot, Jean Bird, a reservist, was given her full set of wings. By this time she had been flying for 20 years, had over 3000 hours on 90 aircraft types and had a Senior Commercial Pilot's licence. In fact she had more experience than most of the instructors who trained her for her wings. Unfortunately the WAAFVR, the only arm of the military in which these women could serve, was disbanded in 1957 due to an early Defence reform plan.

The Russians were far more progressive in World War 2, allowing women to fly in a combat role and creating entire female bomber and fighter regiments.

After the war, the surplus of fully qualified male pilots meant that women, who were still unable to take on a combat role, were relegated back to their 'proper' positions as wives and mothers. The one exception to this was the USSR who continued to allow women to fly and in 1962 put the first woman in space, Valentina Tereshkova.

The role of females in society gradually changed over subsequent years and in the 1970s female aviators once again began training in Western Defence Forces. In the late seventies and early eighties the Canadians conducted the 'Servicewomen in Non-traditional Roles' (SWINTER) study, culminating in the first female CF-18 pilot undergoing training in 1987. The US soon followed and now most Western militaries allow women to fly all aircraft types.

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1 Smart TL. Fast women: Or why women who fly high performance aircraft are fast but not loose. Aust Mil Med 1998; 7(1):8-16

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Wing Commander Tracy Smart joined the RAAF as an undergraduate medical student in 1983, beginning full time service in 1989. She has had postings to Amberley, Pearce, 6 Hospital, and Williamstown, the latter three as Senior Medical Officer. She has completed the UK Diploma of Aviation Medicine and was an instructor at the RAAF Aviation Medicine Training Centre, RAAF North Luffenham. In 1995, she served in the Second Australian Services Contingent in Rwanda. In 1996 she was posted to the RAAF Institute of Aviation Medicine assuming the role of Commanding Officer in January 1997.
Australia lagged a little behind in this area. Some women apparently managed to slip the shackles and fly in the UK during the war with the ATA, but our first female military pilots did not graduate until 1988. Fast jets were opened to women in 1996, however the first candidate, unfortunately failed Introductory Fighter Course (IFC). In 1997 an ex transport pilot passed IFC and commenced F-111 conversion. As of August 1997, the RAAF had eight female pilots flying most aircraft types including two Qualified Flying Instructors and a test pilot. Five pilots are presently completing training at 2 Flying Training School. The RAAF also has three female navigators and several non-commissioned aircrew, including three airborne electronics analysts, a loadmaster and a flight engineer. As a result of these small numbers, the concept of female aircrew is still a relatively novel concept within the Australian military environment.

This paper examines some of the main issues relating to these fast women concentrating on those areas where we as military health professionals may be called upon to provide support. The particular areas of concern are the four traditional arguments as to why women shouldn’t be flying - their physiological differences, their perceived physical weakness, specific women’s health problems, and squadron cultural issues.

Physiological Issues
“Women can’t fly fast jets - their tits will sag and their womb will fall out”
Crusty Old Jet Jockey, RAAF Pearce, 1991

Hypoxia
As in many areas of female physiology, studies into the differences in response to hypoxia between the sexes have been conflicting but have overall shown little significant difference. Some differences do exist in terms of physiology. Females have smaller values across a wide range of lung parameters and generally have smaller lung capacities than males. Females also have several haematological differences including reduced haemoglobin, and therefore oxygen carrying capacity, compared with their male counterparts. However women exist at sea level under normal circumstances with these differences and presumably have similar coping mechanisms to men when exposed to hypoxia.

Most studies in this area have been performed in mountaineers and have therefore focussed on chronic hypoxia. These studies have demonstrated no real difference between the sexes in terms of overall acclimatization although some minor differences in response have been reported. In fact women appear to tolerate chronic hypoxia better and have also been shown to be less susceptible than males to the symptoms of Acute Mountain Sickness. The limited studies comparing the response of males and females to acute hypoxia have shown little difference in performance between the sexes at altitude relative to their differences at sea level.

Decompression Illness
Various studies have shown that women are more susceptible to Decompression Illness (DCI) compared with men, with reported increased incidences of both hemorrhage and decompression sickness. However, these studies have not been consistent and have shown a wide variation in results. Dixon et al conducted separate studies on males and females which involved exposure to a chamber altitude of 15,500 ft for 6 hours breathing a mixture of 50% N2 and 50% O2. These studies revealed that although more bubbles were detected in males compared with females (73% versus 43% of subjects), females experienced more symptoms (17% versus 3%). A relationship between DCI and stage of the menstrual cycle has also been reported with an apparent increased incidence early in the cycle. Yet another study suggested that females were more likely to present with complicated DCI.

Several reasons for this difference between the sexes have been postulated. The most popular theory is that, as females on average have increased body fat compared with males, they therefore have an increased nitrogen load. In addition, hormonal changes occurring with the normal menstrual cycle or due to the oral contraceptive pill may result in reduced venous tone and this may exacerbate the effects of nitrogen bubbles.

Despite these differences, DCI is still a relatively rare event in aviation, and therefore even with this increased risk, the overall risk of female aircrew developing DCI when flying is still acceptably low. The risks associated with chamber training are however of some concern.

Effects of G
Centrifuge studies by Gillingham et al exposed subjects to rapid onset runs up to +7 Gz and gradual onset runs up to +8 Gz. No significant differences in relaxed or straining G tolerance were noted between the sexes in this series, however there was some evidence that there was a significant difference between the sexes when matched for height. In addition, a later study examining retrospective data did report a significant difference at higher levels of G. Two reasons were postulated for this difference. The first is that females have reduced body strength compared with males and therefore will have difficulties in sustaining an anti-G straining manoeuvre, particularly at high G. Another possible explanation is inadequate G suit fit, particularly as these garments are designed for men.

In a recent study utilizing custom fit G-suits, eight females were tested and their results were compared with data on ten male subjects. No significant differences were demonstrated in time to fatigue between the sexes. This study also examined performance across
the menstrual cycle in women on the oral contraceptive pill. It had been postulated that the theoretically increased vasoconstriction seen as a result of an oestriol surge during the midfollicular phase may have resulted in a slightly reduced tolerance, however no significant difference was noted.

Specific female health issues in relation to high G have not been studied despite the uninformed claims of some. Many studies have shown the potentially damaging effects of oscillatory motion on breast tissue, however breast discomfort has not been reported in centrifuge studies and there is no evidence that unidirectional motion is likely to cause long term damage. The Sillingham study deliberately screened out women with pre-existing gynaecological conditions however two of the 24 women in the study reported urinary incontinence whilst undertaking an Anti-G Straining Manoeuvre. This symptom has not been reported in men. The effect of G on the uterus in older women, and in situ intrauterine devices has also not been adequately studied to date, nor have effects on menstruation.

Tolerance to Thermal Extremes

Men and women tend to respond differently to hot environments. Some studies have demonstrated that men have a greater work capacity in heat however women sweat less than men and therefore conserve their water stores more effectively. A negative side effect of this latter difference is that females have been shown to react more severely on exposure to hot environments however there seems to be little difference between the sexes once acclimatisation has occurred. It has also been suggested that many of the reported differences may not be significant if subjects are controlled for physical fitness.

Cold environments are also encountered in aviation, especially in the survival situation. Females tend to tolerate cold better than males, possibly due to their greater average fat stores. On average females contain 25% fat whilst men only contain 15% and these differences remain even with training. Thus females have greater buoyancy, insulation and energy stores compared with males and are therefore better prepared physiologically in a survival situation, particularly at sea. This theory was supported by Mannino and Kaufman who reported a significant decrease in core temperature drop in men compared with women when exposed to a reduction in torso temperature. However, if controlled for percentage fat (and especially fat distribution), there is probably little difference between the sexes.

Motion Sickness and Disorientation

Studies utilising questionnaires have reported that females are significantly more susceptible than males to the symptoms of motion sickness. A male to female ratio of 2:5 has been calculated, and this gender difference appears to be further exacerbated during menstruation. Differences have also been reported in rates of simulator sickness.

The reason for this difference is not entirely clear although hormonal factors have been proposed. Other factors may also be of significance including field dependence; that is, when in an unstable environment (for example when stationary in a moving environment), females are more likely to experience conflicting perceptual cues than males. Field dependency correlates with both nausea and disorientation. This area clearly requires more study, but is supported by the fact that males are more stable than females on tests for ataxia such as Sharpened Rombergs. Another possible explanation is that women are more likely than males to report the symptoms of motion sickness as has been reported to be the case with other medical conditions.

This difference in susceptibility to motion sickness may be of significance in selecting potential aircrew, however apart from questioning for a history of significant motion sickness, screening for sensitivity is not routinely performed on aircrew applicants. If students do fail to adapt to the motion environment, they are able to undergo motion sickness desensitisation usually with good effect. Each individual is managed on a case by case basis and therefore a demonstrated increased incidence in females as a group is not viewed as a reason to bar all potential female aviators.

Physical Issues

"Men do not believe us capable"

Amelia Earhart, 1930s

Physical Strength

Women are, in terms of physical strength, the weaker sex. In fact, depending on the muscle group, they have only between 35 and 85 per cent of the strength of males. This can be improved somewhat by weight training, however the effects of weight training in female student pilots has not always produced benefits. When women first began flying training in the US Navy they were scheduled extra physical training sessions as part of their curriculum. This was in fact found to be detrimental to their training as it distracted them from studies and actually produced no real benefits in terms of strength.

Both manoeuvring an aircraft and performing an anti-G straining manoeuvre in a high G environment requires a high degree of muscular strength and endurance. Therefore it would appear that a greater percentage of women compared with men will experience difficulties in this area. However, it is also true that a percentage of men will also have difficulties, particularly when flying at the aircraft limits. Therefore in this area, as in many others, fitness to fly high performance aircraft...
should be judged on a case by case basis, with the acceptance that not all people are capable of flying all types of aircraft and all types of missions.

As well as assessing the ability to fly the aircraft, several occupational health and safety considerations may be of concern due to these strength differences. These include the potential for neck injury under high G loads and the ability to initiate the ejection sequence in an emergency.

Females have decreased neck strength compared with men (60%) but have a 12% greater range of movement and 11% faster neck muscle reaction time.36 As all three probably play a role in determining resistance to injury under G, the overall risk is believed to be similar for both sexes.

Ejection initiation requires a reasonable degree of physical strength however the general consensus of opinion is that most people will have the strength to initiate the ejection sequence in an emergency. Specific studies examining these issues do not appear to have been undertaken.

Anthropometry
As well as being physically weaker, females are also smaller on average than males across all parameters considered important in the cockpit. These include sitting height, buttock-heel, buttock-knee and functional reach. There is also an interaction between size and strength, as problems of reduced strength will be compounded when maximum force is required at maximum reach. In fact it is estimated that as many as 50% of women may be excluded from flying current US military aircraft on the basis of anthropology alone.37

Women are not only smaller than men but also have different dimensions in different places. For example, females have a greater hip breadth by 5 cm on average whilst males are wider across the shoulders by at least 2.5 cm.38 These size differences are not only important when considering fit in the cockpit and ability to control the aircraft but also with the fit of safety equipment. This includes firecrew helmets, oxygen masks, flying suits and Nuclear, Biological, Chemical Defence (NBC) ensembles, and necessitates either changes or modifications to this equipment to accommodate these size differences.

Ejection
Concerns have also been raised regarding safety in ejection. Females have a smaller cross-sectional area of vertebrae compared with males. In addition, seat charges are designed for the male weight range and therefore female vertebrae are exposed to a greater force per unit area than those of males. This suggests an increased risk of spinal column injury in females. Evidence to support these theories is however somewhat contradictory. One study using manikins demonstrated that the risk of vertebral fractures was significantly greater with smaller mass dummies,39 however a statistical analysis of real life ejection data revealed that the risks were increased in taller and heavier ejectees.40

With modern ejection seats being designed to reduce the overall force and particularly the onset of the force to which the aviator is exposed, the overall risk for females is probably not unacceptable. Despite this, several nations do not train females on an ejection seat rig during initial aviation medicine training although the RAAF has continued to do so.

Other differences in shape between females and males may result in an increased risk of other injuries, such as fracture of the femur, however this has not been thoroughly investigated at this stage.

Also to be examined further are the implications for the older female, particularly the post-menopausal effects on bones and the possibility of osteoporosis. Early indications are that hormone replacement therapy will be mandatory for post-menopausal women.

Solutions
Many of these physical problems can be overcome. Future aircraft are being designed to accommodate a greater percentage of the female population. An example of this is the design of the new Joint Primary Aircraft Training System (JPATS) aircraft and the F22 fighter for the US military. By order of the US Congress, the JPATS was to accommodate 95% of female pilots, however reality will see perhaps only 80% compatibility.41 Also, the fact that most modern aircraft these days utilize fly by wire control inputs means that the physical demands required to control aircraft are much reduced and therefore within the capabilities of a greater proportion of the population. However this may be countered by the fact that the new generation fighter aircraft will be capable of sustaining much higher levels of G and therefore will place greater demands on the aircrew in terms of sustaining an anti-G straining manoeuvre.

Safety equipment can also be modified, and in some cases in the past this has been attempted illegally. Legal modifications in the RAAF include applying darts in the waist, thighs and calves of G-suits, and removal of links from oxygen mask suspension chains thereby tightening the fit of the mask. Illegal modifications include the use of seat padding in the ejection seat and cutting holes in helmet liners to accommodate hair buns.

As mentioned above, ejection seats have already been designed to reduce the maximum force and rate of onset of force to which the aircrew are exposed. Some seats have also been designed to tailor the force to the individual by dialling in the recipient’s weight prior to take-off.
Ir. summary most of the problems resulting from the physical differences between males and females can be solved but generally at a considerable cost. Much effort and expense is being applied throughout the world at the present time in order to accommodate females in all types of aircraft. As far as the RAAF is concerned, the extent to which these modifications will be adopted will probably depend on both the need to adhere to the principles of equality and the overall cost of the measures.

**Medical Issues**

"Women are temperamentally unfit to fly and prone to panic in any calaemy"

Claude Graham-White, 1911

**General Health**

Some medical conditions are more common in women. These conditions include migraine, varicose veins, and urinary tract infections. There is also evidence to suggest that women report more symptoms and attend medical facilities more frequently than men. However women have a lesser incidence of serious and potentially permanently incapacitating disorders such as ischaemic heart disease.

**Women's Health**

Specific gynaecological problems may also compromise fitness to fly. These include menstrual abnormalities where the risk of sudden incapacitation may be of concern. Studies of female pilots before and after flight have demonstrated that flight has some influence upon the secretion of female hormones, however the significance of this is unknown. It has also been reported that menstrual cycles in female flight attendants may become disrupted during transmeridian flight and that a significant percentage of these individuals suffer from heavier menstrual loss whilst flying, however most report normalisation of their cycles with time. Effects on pilots of high performance aircraft have not been examined.

Pre-menstrual syndrome is another problem specific to women that may produce a variety of effects, some of which may be of significance in the aviation environment. Symptoms include pain and discomfort, oedema, abdominal bloating, nasal and sinus congestion, increased incidence of migraines, and psychological effects such as general irritability. The latter may not necessarily be a disadvantage, as few pilots would want to go into combat against an ace fighter pilot with PMT! However there is some evidence that increased rates of accident proneness occur during this stage of the menstrual cycle.

The most important aspect when considering these specific women's health problems is that they should be managed in a similar way to any other medical problems which may impact upon flying safety and operational effectiveness.

The conditions should be screened for at recruiting, and trained aircrew suffering from severe symptoms or incapacitating conditions should be grounded, investigated and treated.

**Oral Contraceptive Pill**

It is of course possible to successfully treat many of these menstrual disorders by use of the oral contraceptive pill. The pill is cleared for flight despite its potential side effects such as hypertension and deep venous thrombosis. In the ADF and many other air forces these risks are considered acceptable, however a ground trial of one month is required to eliminate the possibility of other systemic effects.

**Pregnancy**

Pregnancy is of course not an illness but a natural phenomenon. However, it does represent a change to the body's physiology and, as far as female aircrew are concerned, it should be considered as a medical condition with respect to fitness to fly. Areas of concern include flying safety (risks of sudden incapacitation, safety equipment and ergonomic issues), risks to operational effectiveness (psychological and physical distraction), and occupational health and safety issues (stresses on the foetus). The risks associated with these various considerations vary depending on the stage of the pregnancy and particularly trimester by trimester.

**First Trimester**

The risks of sudden incapacitation are especially high during the first trimester due to complications such as spontaneous abortion, ectopic pregnancy, and morning sickness. Also of concern are the potential effects on the embryo in its most delicate stage of development. Some of these aviation stressors are discussed below.

- **Hypoxia.** Severe hypoxia in certain periods of development has been shown to produce foetal malformations in animals. Most aircrew will only be exposed to mild hypoxia under normal flying circumstance and there appears to be no evidence to suggest concern at these levels of hypoxia.

- **Vibration.** Once again, animal studies have demonstrated the sensitivity of the embryo to this type of stress, with an increase mortality rate in chick embryos and intrauterine growth retardation in mouse embryos. These effects are more evident at certain frequencies.

- **Decompression Illness.** Bubbles formed in decompression illness have the potential to cause more effects in the foetus because of a patent foramen ovale. In addition there is a hypothetical increased risk in mothers due to increased fat stores and blood flow. Animal studies have also demonstrated that untreated DCI in the mother is likely to produce teratogenic effects in the foetus, but that the incidence of these problems was re-
duced with hyperbaric treatment. Studies in female divers have reported low birth weight babies and an increased incidence of birth defects. The significance of this for aviators is unknown however due to this theoretical increased risk pregnant females are not permitted to undertake hypobaric chamber training.

- "G" Effects. The effects of accelerative forces on the foetus have not been established despite theoretical concerns expressed of a bungy jumping foetus! Physiologically one would predict effects on placental blood flow and placental integrity may be of concern here.

- Other Aviation Toxins. The aviation environment contains many potential toxins some of which have the potential to cause effects on the foetus. The effects of exposure to cosmic radiation have been examined at some length in the literature. Concerns include the risk of foetal malformations and possible increased risk of neoplasms in childhood.

Most studies looking at overall risks to the foetus in this trimester have been performed in female flight attendants. There does not appear to be a significant risk to pregnancies in this group of individuals when all factors are controlled, however this type of flying environment is vastly different from that of high performance aircraft.

Of greatest concern for medical practitioners are the medicolegal aspects if complications occur during or after a flight. For all of these reasons, most military forces ground pregnant aviators during the first trimester.

Second Trimester
Maternal complications likely to cause incapacitation are less common in this trimester, however other effects of the pregnancy may become significant, including anaemia and fatigue. Ergonomic issues begin to become an issue during this period including fit of the G-suit and other safety equipment. However it is a relatively safe time for the foetus. Overall the risks are minimal and as such flying, at least in a multi-crew role, could be permitted on a case by case basis. Flying in high performance aircraft would still be of some concern.

Third Trimester
Risks to both mother and foetus increase again in this trimester. Specific risks include pre-eclampsia, premature labour and abruptio placentae, and ergonomic problems are exacerbated. In addition, psychological distraction is known to be a problem as the pregnancy progresses. It is therefore common practice to ground aircrew from the start of the third trimester until after the birth.

In summary ADF policy is that all female aircrew, including those flying fast jets, will be grounded as soon as the pregnancy is diagnosed until after the birth of the child. This in itself may be a problem for the military as considerable time and money has been invested to train such aircrew only to have them become unfit to fly for a prolonged period. However, all aircrew are required to perform ground jobs at some stage of their career and therefore female aircrew should be able to manage their family along with career demands.

Cultural Issues
"You would not want to fly a combat mission with a woman."
Ex USAF Chief of Staff, 1992

Squadron Bonding
The issue of squadron bonding appears to be the major concern touted by the leaders of the RAAF fast jet squadrons of today. Squadron morale, and therefore theoretically its fighting ability, is dependent upon the extremely strong bonding which occurs between squadron members. This is also the case for ground troops. Many men consider that the presence of women within this environment will upset this delicate balance by introducing the issue of sex, and that the essential bonding fabric will be rent asunder. However evidence from overseas does not appear to support this. A survey conducted amongst USAF pilots revealed that 97% of males and 98% of females felt comfortable flying in combat with both genders. In addition, 77% of males and 74% of females believed that squadron mission effectiveness had not been changed by mixed gender flights.

Protective Instincts
Another concern raised by male fast jet aircrew is that of the protective instincts of males in both combat and prisoner of war situations. This appears to be a problem even if females elect to take the risk to place themselves in such dangerous situations. In the above study 73% of males reported that they would be more protective of one gender in combat (compared with 6% of females).

Public Perceptions
One of the major concerns expressed by governments when deliberating on the women in combat issue was fear of the public’s reaction to women returning home from war in body bags. It would appear from recent experience such as during the Gulf War that this is no longer an issue.

Trail Blazers
At present only small numbers of female aircrew are being trained by the RAAF. This means that many of these women are still
“blazing the trail” for other females and this in turn often attracts media attention. This not only has the potential to cause jealousy amongst colleagues but also the belief that a double standard or quota may apply to those women. Many male instructors also believe that there is increased pressure to pass these women and that the women have to be treated differently from their male counterparts.

Solutions
There are no easy solutions to many of these issues, especially as most relate to the perceptions of male aircrew. However, many of these problems seemed to have been resolved in overseas militaries by such elements as good leadership, time and the emergence of increasing numbers of female aircrew. This has also become evident in RAAF experience as some flying instructors have noticed that concerns currently evident during introductory fighter training have ceased to be issues during initial flying training.

Perhaps these aspects are best summarised in a quote by Major Deanna Brasseur, one of the first female F-18 pilots in the Canadian Forces. Major Brasseur reports experiencing more difficulties as one of her country’s first female air weapons controllers than as a pioneer “fast woman”.

“As the first woman on my crew I experienced the stares, the snide comments, the questioning of my abilities and purpose for wanting to be a member of such a previously male environment. . . . Once I had established my credibility . . . and demonstrated that their crude language and bad jokes did not bother me, I was accepted”.47

Current Issues in the RAAF
Much research is ongoing in the area of female aircrew in general and in particular those flying high performance aircraft. The RAAF Institute of Aviation Medicine has so far been consulted on the following subjects.

F111 Relief Bags or “Piddle Packs”
In the F111, sorties lasting several hours are possible and a male relief bag with a condom-like attachment is in common use. Unfortunately this system is not suitable for female use and therefore a variety of other options have been suggested. These range from a simple nappy-like pad to a small collecting device that somehow must be manoeuvred into position in the close and less than private confines of the F111 cockpit.

Saline Breast Implants
A recent enquiry from an ADF Recruiting Centre requested information as to whether a young woman’s fitness to train as aircrew after having undergone a single saline breast implant. This condition is not covered in the ADFP 701 (Recruiting Standards), and little information is available on this subject in the aviation environment. The USAF does have a policy on this condition for currently serving aircrew, allowing them to return to flying nine months post surgery. This particular potential applicant elected not to apply.

Long Hair
This issue has become a case of Equal Employment Opportunity (EEO) meets flying safety. The problems of long hair are those of adequate helmet fit, risk of entanglement in the ejection seat, and fire risk. A draft Defence Instruction on aircrew dress and grooming implied that all aircrew should have short hair to prevent these problems. This caused some concern amongst our female aircrew and prompted one enterprising female pilot to develop an alternative, a hair bag. This consists of a Nomex cover that can be tucked down into the back of the flying suit thus solving the risks of fire and entanglement. It does not necessarily solve the fitment problems as long hair worn in any style at the back of the head may interfere with nape strap grip. It also poses other problems, particularly the concern that neck movements may be restricted during manoeuvring under high G. A project to assess the virtue of such a bag has been put on hold at present as a further draft instruction avoids comment on hair length, preferring to emphasise the necessity of an adequate fit.

Conclusions
There is no doubt that women are different in many ways to men. Many of the physiological differences probably require more research to determine their significance, particularly the problems facing older women. The problems relating to physical differences between the sexes can be solved by re-engineering both aircraft and safety equipment to accommodate a greater percentage of the population. Most of the specific women’s health issues really should be considered on a case by case basis and treated like any other fitness to fly issue.

This was confirmed by the findings of the United States Commission on the Assignment of Women in the Armed Forces (1992) which stated that there were no physical or physiological reasons why women could not fly combat aircraft. It has also been proved by the experience of many other nations.

The main reason why the issues surrounding female fast jet aircrew are still of concern in Australia is the novelty aspect - we are dealing with small numbers and the very male fast jet world doesn’t know quite what to do with these strange creatures. It is interesting to note that the first two women streamed to fast jets were heading for F111s and not FA-18s. Entry of women into the fighter world will be the final stumbling block, but provided she is good
enough and strong enough, our first female FA-18 pilot is probably not far away.

A final quote from an article entitled “Females, Girls, and Fighting Marines” from the US Marine Corps Gazette summarises the major problems confronting our prospective female fighter pilots. “It is not the psychological fortitude of women marines that concerns me but the men they might be serving with.”

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ADF health service readiness for combat 1997. A Reservist’s view

I.S.C. Jones

Based on a presentation to the 1997 Naval Health Services Conference held at HMAS Albatross in August 1997

Introduction
Preparation for war is an important function of the Australian Defence Force (ADF) and is especially so for our combat commanders. Their basic task is to seek out, engage and defeat the enemy. Their concern will be with the how, the when, the where and the with what. They will consider both their own and their enemies strengths, weaknesses, opportunities and threats. If we do not continue to provide guidance there is a risk that the first health service contact will be the requirement for health intelligence and this will probably be considered with the threats to the fighting force.

In the past combat commanders needed to think mainly of their core business at this time, that is fighting to win and they did not want to be distracted from this important function. However when battle and non-battle casualties started to deplete their fighting force and logistics become complicated by the movement of medical materiel forward and casualties backwards from the battle front, then the role of the health services certainly entered the commanders conscious thought patterns.

The need to consider these health issues well in advance of the above scenario is well recognised by our present day commanders. The combat commanders and members of the health services need to be constantly aware of what the health services can realistically provide under specific conditions. We must continue to present to our combat commanders an easily understood and accurate report of our current capability for inclusion in their overall battle plan.

Now this is where one of our real challenges begins. I ask you how many appropriately balanced surgical teams could the ADF muster and deploy overseas within the next seven days? What information do we need to compile such a report?

For current capability reporting we need to have up-to-date information about individuals, teams of individuals, team equipment status and knowledge about how we will move units from one place to where they are needed. Are we sure that we know where each team member is at present? Are they still fit for service and are they in-date medically? Are their billet prerequisites still current and especially for reservists are they available for the present task (see Table 1)?

Table 1. Current capability reporting

<p>| | |</p>
<table>
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<tbody>
<tr>
<td>1. Personnel</td>
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<tr>
<td></td>
<td>where are they at present?</td>
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<tr>
<td></td>
<td>are they medically in date?</td>
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<tr>
<td></td>
<td>are their vaccinations in date?</td>
</tr>
<tr>
<td></td>
<td>is their screening for infectious diseases in date?</td>
</tr>
<tr>
<td></td>
<td>are their billet prerequisites in date?</td>
</tr>
<tr>
<td></td>
<td>are members available?</td>
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<tr>
<td>2. Teams</td>
<td></td>
</tr>
<tr>
<td></td>
<td>are teams fully staffed?</td>
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<tr>
<td></td>
<td>has the whole team completed the training requirements?</td>
</tr>
<tr>
<td></td>
<td>has the team's performance level been tested recently?</td>
</tr>
<tr>
<td>3. Equipment</td>
<td></td>
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<tr>
<td></td>
<td>does the team have all of its equipment?</td>
</tr>
<tr>
<td></td>
<td>does all of the equipment work?</td>
</tr>
<tr>
<td></td>
<td>when was the equipment last tested?</td>
</tr>
<tr>
<td>4. Transportability</td>
<td>can the unit be moved from point A to point B in the required time?</td>
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</table>

If the individual is in-date and available what is the status of the team and its equipment and when was the last time that the team exercised together and did they reach the re-

---

2 Address for Correspondence: Dr I.S.C. Jones, North West Medical Centre, 125 Flockton Street, Everton Park, QLD, 4053
I.S.C. Jones MB ChB, Dip Obit, FRACOG, chM, MHA, FRACOG, FACS
Ian Jones is a Specialist Gynaecologist practicing in Brisbane. He is a Captain in the RAN Reserve, and holds the position of Director Reserve Health Services - Navy.
quired performance level? What other medical equipment will be available for them to use and under what physical conditions will they be able to use this equipment - assuming that this equipment can in fact be supplied to them? Remember Cyclone Justin and its effect on Exercise Tanjam Thrust.5

What is expected of us?
We as health service professionals need to have some idea of the ADF military strategies for various perceived contingencies. Has anyone here today received any recent specific advice about the way our strategists are thinking? Such information could have an important bearing on our provision of advice and services.

Do our combat commanders have any instructions for us when we develop policies? Such instructions need to be more than just generalisations and wish lists.

Do they have any standards for what they expect us as health service professionals to attain and maintain? If they do have requirements of us how do they want us to present regular STTREFs to them? We are not unique, the USN seems to have similar problems.6

In the past the way of doing business resulted in the health services considering each scenario on an as-needs-be basis. Fortunately this system has changed. Joint Project 2060 is a tri-Service project aimed at planning for the provision of health service support for low-intensity conflict.

Up until now unless a scenario had been experienced in the recent past there was a frantic rush to provide a service, always at short notice, often over a leave period, and somehow we manage to scrape through - a tribute to that small band of dedicated people who seem to be able to do the impossible.

This old way is not the way it should have been and would definitely not be successful now or in the future. I suspect that the initiators of JP2060 obviously recognise this as well.

The recent and continuing downsizing of the ADF in response to the Defence Efficiency Review (DER) and the subsequent Defence Reform Program (DRP) has meant that we cannot use the old ways to get out of trouble because we cannot guarantee that we will have the people with the previous experience to do the job.3,4 This loss of a significant amount of corporate knowledge means that we need to develop a system which seriously and regularly reviews our readiness for combat and also other aspects of our core business. Our senior combat and health service commanders have this heavy responsibility and they are actively addressing these issues in ADF centres like the Headquarters Australian Theatre (HQAST).

What might we be asked to do?
Let us consider the role of the ADF and its responsibilities in more depth.

The role of the ADF is to promote the security of Australia and to protect its people and its interests (Glenn Report).5 Other roles include assistance to the civilian community during natural disasters, our role in the SW Pacific and roles associated with our membership of the United Nations.

Predicting future scenarios
For planning purposes we and our advisers have to second guess the needs of future conflict or civil disasters. Such a guessing game runs the risk of us getting lost in the ifs-and-butts with the result that we will claim that it is all too hard and not do anything. An option is to develop two or three basic scenarios and a system for regularly assessing health service requirements and readiness for each of these scenarios. I suspect that this should be Service specific initially and then tri-Service with the results combined into a tri-Service data base.

This combined approach will maximise our resources. Obviously the data base would contain information on both full-time and part-time members. I suggest that the data base be held centrally, say with the Surgeon General's organisation, but the total document should be readily available for each of the services and their unit commanders. In this situation all information must flow upwards, downwards and across the various commands if it is to be of value to all those who need it.

Health Service Staffing
The level of staffing within health services teams depends on the services which these teams are expected to provide.

The requirements of combat and base support teams are obviously very different. During peacetime the tendency is to forget combat health service teams and convert base support to model civilian hospitals - even to the level of further reducing members required in uniform to minimal numbers. The longer the duration of peace the greater the civilianisation program. The application of civilian staffing methods to the staffing of combat health facilities is fraught with danger.

Obtaining the right balance between staff numbers for each facility, under differing operational situations, is difficult. The concept of providing supplementary staff, eg Mobile Surgical Teams, as add-ons to core surgical teams is a good one and allows for considerable flexibility. However the provision of the extra medical material to achieve the planned upgrade is a logistical nightmare/challenge depending on your proximity to the action.

Health Service facilities
I believe it is also our duty to regularly review our health service facilities to see if they meet our present needs and the predicted needs of the next 10 to 15 years.
The ADF has performed very well in this area. The civilisation program for base facilities will probably continue and as a result the management of these facilities may well be taken out of our hands. If this is the case it will allow us to concentrate further on the sharp end of our business.

Many of the systems we apply in the field today have their origins in wars past. Will these systems be adequate for the 21st century? What scientific and medical breakthroughs are about to radically change our ways of doing business? We must have a way of being able to assess these new technologies and seeing if they can be made robust and simple to fix if they break down when their users are on duty a long way from base support.

Navy

An area of concern that I have for the Navy is the possibility that we and our American colleagues outsmarted ourselves when we “tack on” a PCRF onto amphibious assault ships which are so valuable to their commanders that they will not be allowed to linger in dangerous areas to pick-up casualties because of the risks of being attacked and lost.

If such ships need to be held say five or even 50 miles off the beachhead how do we get the wounded out to them? Can helicopters be spared by the combat commander to undertake this role and will the weather allow flying? Are there any other methods of transport in the area to move casualties seaward, eg hovercraft, or should we be thinking of joint based facilities as my Army colleagues do?

The problem for all health services is the functioning of the evacuation chain and its use to free up health facilities nearer the fighting front. In my opinion a combined tri-Service approach is the answer here, but I wonder when this system was last tested with a large number of patients?

Health Service Readiness Training

I suggest that this topic needs to be considered firstly at an individual level, then at the Unit level and later we can address how we fit the various units together to get a cohesive whole - which is what JP 2060 will be doing.

The individual needs to be medically fit and in-date with general vaccinations and disease screening requirements for overseas postings as I have previously stated. Then there are the Service specific requirements, eg NBCD and fitness for sea duties, if I again may be allowed to use Navy requirements to illustrate my point. The other two Services will have their specific requirements as well and in combined operations these requirements will be summative.

Then we need a measure of what their task requirements are and a way of knowing if they can perform the tasks expected of them. For the individual, the EMST and the nursing and medic equivalent is a good starting point, but I suspect that we need to have regular and realistic training exercises to keep our members up to standard, ie perform a task in a set time and achieve set goals.

Some training can be undertaken at the Unit level but some will need to be at a grander level and involve joint operations between the three services. This will cost money and take up the time of a large number of people. Is the ADF serious about getting a standard of performance in its health service and maintaining it? The existence of JP 2060 suggests that they are.

Also think about health service standards of care in the civilian community, performance indicators and the linking of performance with funding. This system of performance could be a requirement of the ADF in the not too distant future.

The development of in house training and reporting protocols is a way of becoming more accountable. It will be a useful management tool to justify what we do and don’t do, together with what we are and are not capable of (see Table 2). Such a system will then be readily adaptable as a health service readiness reporting system for our combat commanders (see Table 3).

Table 2. Health services reporting system.

<table>
<thead>
<tr>
<th>Surgical Team 1, District 1</th>
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<tbody>
<tr>
<td>Details</td>
</tr>
<tr>
<td>Billet &amp; Personnel</td>
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<tr>
<td>OIC</td>
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<tr>
<td>MAO Support Services</td>
</tr>
<tr>
<td>MO Rescue</td>
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<tr>
<td>NO Rescue</td>
</tr>
<tr>
<td>Surgeon</td>
</tr>
<tr>
<td>Anæsthetist</td>
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<tr>
<td>etc</td>
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</tbody>
</table>

Scenario:
1. Defending N. Australia for 3 months
2. Contributing to UN force
3. Responding to a civilian emergency

Other benefits of this system include the alerting of health service unit commanders and individuals of when their currencies are about to lapse. The system will also be available to assist in the planning of update courses for our members by training command.
Table 3. Health services reporting system. Surgical teams

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tbody>
<tr>
<td>&quot;District&quot; 1</td>
<td>✔</td>
<td>✔</td>
<td>X</td>
</tr>
<tr>
<td>Team 1</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Team 2</td>
<td>X</td>
<td>X</td>
<td>✔</td>
</tr>
<tr>
<td>Team 3 (ame)</td>
<td>✔</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Team 4 (amphib)</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
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</table>

Further comments on training

The EMST course is an excellent one but the throughput for the ADF, including Reservists, is not quick enough for our needs. I know that the Surgeon General is well aware of this. I suspect that we will need to develop our own course and to ensure that it has suitable civilian recognition. I recommend a similar but professionally appropriate system be developed for our nursing and medical assistant colleagues. Our dental colleagues would probably undertake the military medical EMST unless they thought they would be better served in another way.

Conclusions

While I am considering the whole team I must point out that everyone in a health service team is a resource. When combat starts the numbers of patients may be great, for example during the Falkland's War the bombing of the Sir Galahad presented 179 casualties in a short time and during the Second World War two armoured piercing bombs hit the USS Franklin and caused 1 000 casualties out of a total compliment of 3 300. Tasks that we may consider in peace time as out of the range of our junior team members may under these extreme circumstances need to be performed by them if we are to do the most good for the greatest number. EMST training for all health service personnel is vital just as basic first aid is vital for all ADF personnel for this very reason.

References

3. Defence Efficiency Review:276-278
4. Defence Reform Program
6. Smith AM. Until the first bloodied body goes by. Proceedings 1993; Oct 65

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Shorts

Sometimes you hear the bullet

A. Leavy

The comedy/drama MASH, which concerned the lives of American army medical staff stationed just behind the front lines in the Korean War, was one of the most successful television programs of the 1970's. During its eleven year history it presented an enormous range of issues from the essentials of friendship and loyalty to the concerns of bigotry and the irony of war. In between, MASH provided a mirror for society's changing attitudes, particularly by revolutionising the public's perception of the medical fraternity.

MASH began as a novel by Richard Hooker and was produced as a cinematic feature in 1970 by Ingo Preminger. Between 1972 and 1983, 250 half hour episodes of the series were produced for television. During that period and under the direction of a variety of writers, directors and producers the program remained a consistent performer in the top twenty television programs of countries around the world.1, 2, 3

It collected 14 Emmys, and the final two and a half hour special was the highest rated program of its type in American history.

Although MASH was set during the Korean war (1950-1953), it had its roots in the late 1960's, a revolutionary period of history incorporating the 'flower-power', hippy era, rock and roll, student demonstrations and most notably, the Vietnam War. Traditional opinions on many subjects were being challenged during this time, notably public attitudes towards war and morality. These changes were reflected in MASH which, in many ways, was a pioneer in television production history.

Shortly after the end of the Korean War American television was making its first forays into the genre of medical drama. The initial result was a docudrama entitled 'Medic' which made a serious attempt to present medical issues to the public. It was killed by controversy in 1956.4 In 1961 Dr. Kildare' and 'Ben Casey' reached the screens and each lasted five years, to be followed in 1969 by 'Marcus Welby MD'. 'The Bold Ones' and 'Medical Centre'. All of these programs presented an idealised image of doctors. They were either young, alert and handsome or older, wise and definitely genteel, but as a fraternity they were, generally, infallible combatants of illness and disease, dispensers of wisdom and justice and guardians of moral order.4 MASH chose to present a far more realistic picture of the medical profession and was aided in this by the setting of the program.

Mobile Army Surgical Hospitals, the real MASH units, were a significant development of the Korean War. Combat experience established that the survival of trauma victims is inversely proportional to the time from injury to effective treatment.5 The introduction of helicopters reduced transport time which was further cut by moving fully equipped surgical hospitals to just behind the front lines.5, 7, 8 Time from injury to definitive care averaged two to four hours in the Korean War which dropped as low as 81 minutes during the Vietnam conflict.8 The cost of moving the hospitals forward was to increase the risk to the staffing personnel and hence the stressors imposed upon them. However, it was this pressurised setting that made it possible for the MASH writers to more fully explore the limits of human response to the variety of circumstances. Although a model of ensemble acting, the central characters in MASH were Benjamin Franklin "Hawkeye" Pierce and his companion in bedevilling "Trapper" John McIntyre (replaced in later series by B.J. Honnaicut). As protagonists their appearance and behaviour deviated markedly from that of previous television doctors. Unshaven and frequently stained with sweat and blood, they made a mockery of any dress code. Their living and working conditions were similarly in stark contrast to the accepted television standards of the time.

One of MASH's central themes was examining how the characters responding to being moved from their comfortable 'Stateside' lifestyles to be placed in the chaotic environment of a MASH unit. This was done essentially by contrasting the response of two characters, Majors Frank Burns and Margaret Hoolihan, to that typified by Hawkeye. Burns and Hoolihan maintained a strict adherence to military rules, regulations and, in anything that did not concern their relationship, codes of ethical and moral behaviour. Their dependence on the bureaucracy of the military to provide the ground rules for physical and mental survival was contrasted with Hawkeye's irreverent overall behaviour but reliance on the basic goodness in-
herent in humanitarian values to guide his actions and ethical commitments. The battle between bureaucracy and humanitarianism was among many of the issues covered by MASH, as was its corollary which accepts that there are limits to individualism when survival is dependent upon teamwork (for further discussion see Fass*).

Perhaps one of the best examples of a complex theme which is always relevant to members of the medical profession, and which was dealt with most completely in MASH, was carried by Hawkeye from the movie to the final episode. It examined Hawkeye's ability to cope with the insanity of being stretched to the limits of professional ability and personal responsibility. In general Hawkeye and his fellows maintained their links with sanity, in the conventional sense, by inoculation with small doses of insanity in the form of elaborate pranks and hijinks. However, this form of defence is not without its limitations.

In the movie Hawkeye is instrumental in helping the character of Painless (the dentist) to overcome his fears of sexual impotency. Throughout the television series it is Hawkeye who must deal with questions concerning his own worth and ability, hence his potency as a healer. An example of this occurred in the 1972-1973 season in an episode entitled 'Sometimes You Hear The Bullet' written by Carl Einstein. When Hawkeye was unable to save the life of an author friend and is discovered in tears by the commanding officer, Henry Blake, he is counselled with the advice that there are two rules: 1. Patients die and 2. Doctors can not change rule number one. Unfortunately Henry's advice is valueless in the final episode of the program (Goodbye, Farewell and Amen, 1983) when Hawkeye witnesses a mother suffocate her baby in an attempt to silence it and avoid detector when an enemy patrol approaches their stranded bus. The baby's death devastates Hawkeye and he retreats through a process of denial. His eventual recovery and acceptance of reality, tragic though it can be, is a slow process guided by a psychiatrist, Dr. Sidney Freidman.

In the final episode MASH comes full circle, recapturing the sentiment of the theme song for the movie, the lyrics of which did not follow the music in the transition to the small screen (see below). Essentially, life is often difficult and death and suffering raise awkward questions. In order to survive these questions doctors need to return to the roots of their profession and become, when healing fails, philosophers. It is not enough to turn away from the questions of "Why?", some attempt at an answer must be made for the sake of the patient's, the relatives' and the doctor's own mental wellbeing.

In the end, MASH lasted three times longer than the Korean War which it depicted. In doing so it provided a valuable medium which tempered drama with comedic relief and thus allowed the viewer to confront difficult and often dark issues without the risk of being engulfed by them. MASH also demonstrated the need for doctors to acknowledge not only their humanity and humility but also the vulnerability of that humanness.

SUICIDE IS PAINLESS
Through early morning fog I see
Visions of the things to be
The pains that are withheld for me
I realise and I can see

*That suicide is painless
It brings on many changes
And I can take or leave it
If I please

The game of life is hard to play
I'm gonna lose it anyway
The losing card of someday laid
So this is all I have to say

* chorus

The sword of time will pierce our skin
It doesn't hurt when it begins
But as it works its way on in
The pain grows stronger
Watch it brim

* chorus

The only way to win is cheat
And lay it down before I'm beat
And to another give my seat
For that's the only painless feat

*chorus

A brave man once requested me
To answer questions that are key
Is it to be or not to be
And I replied "Oh, why ask me?"

* chorus

Lyrics: Mike Altman
Music: Johnny Mandel
©Chappell Music

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References:
Abstracts from the Literature

Submitted by Andy Robertson


The Ohmeda 885A field anaesthesia machine is equipped with a non-agent-specific, universal vaporiser that can be used with most volatile anaesthetic agents. On a recent humanitarian medical mission to Honduras, the 885A was used to administer general anaesthesia to 26 patients utilising sevoflurane, a new inhalational anaesthetic with a variety of clinical benefits, including less airway irritability, making it ideal for inhalation inductions. Flow rates for delivery of anaesthetic agent were calculated by using the enflurane portion of the Verni-Trol flow calculator wheel, because sevoflurane and enflurane have similar vapour pressures. Calculated anaesthetic concentrations were compared with measured concentrations using linear regression analysis and found to have a Pearson product moment of 0.998. We find that the use of sevoflurane in the 885A is an excellent alternative to other inhalational anaesthetic agents and may have applications for use during both military conflicts and peacekeeping missions in remote areas.

**Comment:** Sevoflurane is receiving increased use in Australia and, given the decreased airways irritability, may have a useful application in the field.

Zilinskas RA. Iraq's biological weapons: The past as future? *JAMA* 1997; 278:418-24

Between 1985 and April 1991, Iraq developed anthrax, botulinum toxin, and aflatoxin for biological warfare; 200 bombs and 25 ballistic missiles laden with biological agents were deployed by the time Operation Desert Storm occurred. Although cause for concern, if used during the Persian Gulf War, Iraq's biological warfare arsenal probably would have been militarily ineffective for 3 reasons: (1) it was small; (2) payload dispersal mechanisms were inefficient; and (3) coalition forces dominated the theatre of war (ie, they had overwhelming air superiority and had crippled Iraq's command and control capability). Despite the Gulf War defeat, the Iraqi biological warfare threat has not been extinguished. Saddam Hussein remains in power, and his desire to acquire weapons of mass destruction continues unabated. In this context, the international community must firm in its enforcement of United Nations resolutions designed to deter Iraq from reacquiring biological warfare capability and must take steps to develop a multidisciplinary approach to limiting future development of weapons of mass destruction.

Christopher GW, Cieslak TJ, Pavlin JA, Eltzen EM. Biological warfare: A historical perspective. *JAMA* 1997; 278:412-7

The deliberate use of microorganisms and toxins as weapons has been attempted throughout history. Biological warfare has evolved from the crude use of cadavers to contaminate water supplies to the development of specialised munitions for battlefield and covert use. The modern development of biological agents as weapons has paralleled advances in basic and applied microbiology. These include the identification of virulent pathogens suitable for aerosol delivery and industrial-scale fermentation processes to produce large quantities of pathogens and toxins. The history of biological warfare is difficult to assess because of a number of confounding factors. These include difficulties in verification of alleged or attempted biological attacks, the use of allegations of biological attacks for propaganda purposes, the paucity of pertinent microbiological or epidemiologic data, and the incidence of naturally occurring endemic or epidemic diseases during hostilities. Biological warfare has been renounced by 140 nations, primarily for strategic and other pragmatic reasons. International diplomatic efforts, including the 1972 Biological Weapons Convention, have not been entirely effective in preventing the enhancement and proliferation of offensive biological warfare programs. The threats posed by biological weapons are likely to continue into the future.

Franz DR, Jahrling PB, Friedlander AM, McClain DJ, Hoover DL, Bryne WR, Pavlin JA, Christopher GW, Eltzen EM. Clinical recognition and management of patients exposed to biological warfare agents. *JAMA* 1997; 278:399-411

Concern regarding the use of biological agents - bacteria, viruses, or toxins - as tools of warfare or terrorism has led to measures to deter their use or, failing that, to deal with the consequences. Unlike chemical agents, which typically lead to violent disease syndromes within minutes at the site of exposure, diseases resulting from biological agents have
incubation periods of days. Therefore, rather than a paramedic, it will likely be a physician who is first faced with evidence of the results of a biological attack. We provide here a primer on 10 classic biological warfare agents to increase the likelihood of their being considered in a differential diagnosis. Although the resultant diseases are rarely seen in many countries today, accepted diagnostic and epidemiologic principles apply; if the cause is identified quickly, appropriate therapy can be initiated and the impact of a terrorist attack greatly reduced.

**Comment:** These three articles provide a useful update on the history of biological warfare, Iraq's biological weapon's program, and the clinical recognition and management of biological weapon infection or intoxication. This should be required reading for all military health practitioners.

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### Book Reviews

#### Regional Health Support Agency South Queensland

Donations to AMMA Library

The Regional Health Support Agency South Queensland has, through the kind offices of the Director of Health Services, Colonel Vlas Efstatidis, OAM, RFDF, RAMC, donated three books to the Australian Military Medicine Association's Library:

- *Arms and Aesculapius*
- *Reflections of Rwanda*
- *Across the Bar*

The cover jacket summaries of these books follow. Each of them is available for loan from the Association's Librarian:

**Russ Schellich**

Tel: (02) 9563-4504

Fax: (02) 9563-4519

E-mail: tatseh@ozemail.com.au

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**Pearn JH. Arms and Aesculapius.**

Brisbane; A mphio n: 1996

Medical history teaches and re-teaches one consistent lesson - that campaigns are won or lost on the morale and health of the combatants. A history of the origins of military medicine in Australia thus gives a perspective to the formation of the health services of the Army, Navy, and Air Force which protect the nation today. History is a tool for all who would wish to make optimal decisions for the future: and in this context this book is an account of the earliest steps towards the maintenance of health of Australian servicemen and women who have served the nation on four continents.

This book documents the evolution of the emergent armed forces in pre-Federation northern Australia. It traces the tentative origins of the Volunteer Force, the Militia Movement and the development of the medical and health services which supported them. It describes the origins of naval medicine in northern Australia. The men who formed the military Ambulance Corps, the Regimental surgeons who led them and the first Australian naval surgeons all came from communities in northern Australia which felt themselves vulnerable to invasion by foreign powers. In 1903, two years after Federation, the Australian Army Medical Corps adopted as its motto, *Paulatim*, literally translated as "little by little". The gradual evolution of the medical and health services in the military context was truly encapsulated by that phrase. This book describes the saga and adventure of that development.

**Pearn JH. Reflections in Rwanda.**

Brisbane; A mphio n: 1995

*Reflections in Rwanda* is another chapter in the history of Australia's international contribution to humanitarian aid and world peace. This photo-archive records some of the day-to-day experiences of men and women serving in the Australian Medical Support Force in Rwanda in 1994 and 1995; and of the life and experiences of some of the Rwandese themselves. It portrays, in a series of photographic moments-in-time, a period of singular importance in African history; and of the world's response to a civil war of ferocity and genocide not seen for more than half a century.

On 6 April 1994, the Presidents of Rwanda and Burundi were assassinated; and the whole of central Africa was affected by the resulting Rwandan Civil War. The United
Nations urgently established a peacekeeping force in Rwanda, UNAMIR II, which had grown to 7,000 uniformed troops by May 1995. Australia responded also to the crisis, providing the crucial medical support for the UN Force; and in addition treated tens of thousands of sick and injured Rwandese. This account records some of the humanitarian and military aid given to Rwanda during the 1994-95 Australian deployment there. As the world becomes a smaller place so, more importantly, is the maintenance of its peace.

Curran T. Across the Bar: The Story of Simpson, the Man with the Donkey, Australia and Tyneside's Great Military Hero. Brisbane; Omnios; 1994

For 24 days, from the day after The Landing at Anzac, John Simpson Kirkpatrick toiled up and down the broken, overgrown track, carrying wounded soldiers from the head of Monash Valley to the beach hospital, on the back of a donkey. He worked all day and halfway into the night, totally exposed for most of the time to the rifle, machine-gun and shell fire which constantly swept the 'Valley of Death'. Several of his donkeys were killed, and some of his passengers were hit again, some fatally, right next to him. How he survived for so long is quite incredible. Making between 12 and 15 trips a day he rescued somewhere in the region of 300 wounded soldiers. Five statues or statuettes throughout Australia honour the deeds of 'the most legendary Anzac of them all'.

This is his story.

**Battle Station Sick Bay. Navy Medicine in World War II**

Reviewed by Fabian Purcell

Jan K Herman
*Naval Institute Press; 1997*

This recent offering from the Naval Institute Press is a highly readable collection of personal accounts from USN personnel serving in a variety of postings in many different theatres of war during WW2.

As the preface explains, this is the work of Jan Herman, historian to the Navy Medical Department since 1980. In 1985 he began to conduct interviews with a diverse group of WW2 veterans. This was the beginning the US Navy Medical Department's oral history project and this book is a selection from those interviews.

The reader is taken from Pearl Harbour, to the Pacific war and service ashore with the USMC, in submarines, with the surface fleet and on the 'Mercy ships'. Some accounts are by personnel from the then USS COMFORT (AH6) a name familiar to some in the RAN Health Services Branch from service on Operation Damask. The Pacific picture is completed by including accounts from the 'Rice Paddy Navy' serving on mainland China.

The European experience is less emphasised (being by the author's admission, a predominantly Army responsibility) but D-
Hostile Waters

Reviewed by Fabian Purcell

Peter Huchthausen, Igor Kurkin and R Alan White
Random House; 1997

‘Truth is often stranger than fiction’ so the old saying goes. It’s also more exciting as this publication clearly demonstrates.

The book concerns the last patrol of the K219, a Soviet ‘Yankee’ class ballistic missile submarine from its departure from Gadzhievo in Northern Russia to its demise in the 18 000 feet deep Hatteras Abyss off the coast of Nth America.

The authors are Igor Kurkin, a former Executive Officer of the K219, Captain Peter Huchthausen USN Rtd, and R. Alan White a professional writer. The story is a merger of two literary styles, a factual retelling of the patrol from the Soviet perspective based on interview and testimony with the actual personnel. The second is a fictitious account of what is likely to have happened on the American side, based on Soviet observations, interviews with USN officers and “the authors’ long experience in naval affairs”. The two are intermingled in a style very reminiscent of a Tom Clancy novel and indeed Clancy contributes the foreword to the book.

The result is a very entertaining and at times gripping read. The accounts from the Soviet side display a nice balance in the description of human factors and the technological aspects of running a Soviet nuclear submarine. The tempo increases rapidly as the accident occurs and the damage control fight begins. Health personnel especially the Work place/Occupational specialists will be both fascinated and appalled by the dangers accepted by the Soviets as routine and which often resulted in major morbidity and mortality. The book succeeds because all the elements of a great story are present: a malevolent enemy, extreme crisis, heroism and the spectre of Armageddon hovering. The fact that the incident involved great tragedy is given the deference afforded such accidents.

The American response is fictitious because of the secrecy surrounding USN submarine operations and their reluctance to speak on this incident. Here the book is less effective because it is clearly a novelist’s unsuccessful attempt to match the real life drama occurring on the Soviet boat.

The book is enhanced by its final chapter, which describes the outcome to the personnel involved. The story concludes 10 years later in February 1995 back at the now deteriorating submarine base at Gadzhievo with a poignant tribute to K219’s commander and those who lost their lives.

The Naval Institute has published its own review of this book in its October 1997 edition of Naval Proceedings and was quite scathing of the “wholly fictitious narrative… of what was supposedly happening on board the USS Augusta (SSN 710)”. They may be correct but we’ll never know!

A late Christmas offering

SUBJECT: MEMO from SANTA

TO: ALL Employees

The recent announcement that Donner and Blitzen have elected to take the early reindeer retirement package has triggered a good deal of concern about whether they will be replaced, and about other restructuring decisions at the North Pole.

Streamlining was appropriate in view of the reality that the North Pole no longer dominates the season’s gift distribution business. Home shopping channels and mail order catalogues have diminished Santa’s market share and he could not sit idly by and permit further erosion of the profit picture.

The reindeer downsizing was made possible through the purchase of a late model Japanese sled for the CEO’s annual trip. Im-
proved productivity from Dasher and Dancer, who summered at the Harvard Business School, is anticipated and should take up the slack with no discernable loss of service. Reduction in reind-eeer will also lessen airborne environmental emissions for which the North Pole has been cited and received unfavoured press.

I am pleased to inform you and yours that Rudolph's role will not be disturbed. Tradition still counts for something at the North Pole. Management denies, in the strongest possible language, the earlier leak that Rudolph's nose got that way not from the cold, but from substance abuse. Calling Rudolph "a lush who was into the sauce and never did pull his share of the load" was an unfortunate comment, made by none of Santa's helpers and taken out of context at a time of year when he is known to be under executive stress. As a further restructuring, today's global challenges require the North Pole to continue to look for better, more competitive steps. Effective immediately, the following economy measures are to take place in the "Twelve Days of Christmas" subsidiary.

- The partridge will be retained, but the pear tree never turned out to be the cash crop forecasted. It will be replaced by a plastic hanging plant, providing considerable savings in maintenance.
- The two turtle doves represent a redundancy that is simply not cost effective. In addition, their romance during working hours could not be condoned. The positions are therefore eliminated.
- The three French hens will remain intact. After all, everyone loves the French.
- The four calling birds were replaced by an automated voice mail system, with a call waiting option. An analysis is underway to determine who the birds have been calling, how often, and how long they talked.
- The five golden rings have been put on hold by the Board of Directors. Maintaining a portfolio based on one commodity could have negative implications for institutional investors. Diversification into other precious metals as well as a mix of T-Bills and high technology stocks appear to be in order.
- The six geese-a-laying constitutes a luxury which can no longer be afforded. It has long been felt that the production rate of one egg per goose per day is an example of the decline in productivity. Three geese will be let go, and an upgrading in the selection procedure by personnel will assure management that from now on every goose it gets will be a good one.
- The seven swans-a-swimming is obviously a number chosen in better times. The function is primarily decorative. Mechanical swans are on order. The current swans will be retrained to learn some new strokes and thereby enhance their outplacement.
- As you know, the eight maids-a-milking concept has been under heavy scrutiny by the EEOC. A male/female balance in the workforce is being sought. The more militant maids consider this a dead-end job with no upward mobility. Automation of the process may permit the maids to try a-mending, a-mentoring or a-mulching.
- Nine ladies dancing has always been an odd number. This function will be phased out as these individuals grow older and can no longer do the steps.
- Ten Lords-a-leaping is overkill. The high cost of Lords plus the expense of international air travel prompted the Compensation Committee to suggest replacing this group with ten out-of-work congressmen. While leaping ability may be somewhat sacrificed, the savings are significant because we expect an oversupply of unemployed congressmen this year.
- Eleven pipers piping and twelve drummers drumming is a simple case of the band getting too big. A substitution with a string quartet, a cutback on new music and no uniforms will produce savings which will drop right down to the bottom line.

We can expect a substantial reduction in assorted people, fowl, animals and other expenses. Though incomplete, studies indicate that stretching deliveries over twelve days is inefficient. If we can drop ship in one day, service levels will be improved.

Regarding the lawsuit filed by the attorney's association seeking expansion to include the legal profession ("thirteen lawyers-a-suing") - action is pending.

Lastly, it is not beyond consideration that deeper cuts may be necessary in the future to stay competitive. Should that happen, the Board will request management to scrutinise the Snow White Division to see if seven dwarfs is the right number.

Questions should be directed to me.

(Signed) S. Claus
News of Members

Defence Force Retirements
The following AMMA members have recently left the Australian Defence Force (most as a result of the Defence Reform Program):

- Graeme Moller
- Mike Flynn
- Warren Harrexx
- Paul Alexander
- Graham Boothby
- Bob Green
- Andy MacNeil
- Viv Bird
- Coralie Gerrard
- John Greenham
- Bill Fussell

AMMA Conferences

1998 Conference
The 7th AMMA Scientific Conference will be held at the Swiss Grand Hotel, on the shores of Bondi Beach, Sydney from the 17th to the 18th of October 1998. With a slightly revised format of two full days for the Plenary Sessions, the Conference will commence on the night of Friday the 16th with the opening and a Cocktail Reception. The Keynote Address will be delivered by Captain Art Smith, USNR, on "Casualty Care on the High Seas". A Call for Papers for the Conference is included in this edition of the journal. Members are reminded that the 'Weary' Dunlop Award of $500 will be determined from the best Paper delivered at the Conference.

Future Conferences
In accordance with a decision previously taken by Council, it determined that, in principle, future Scientific Conferences will be held on the third full weekend in October.

The following dates and locations for the 1999 and 2000 Conferences are notified for planning purposes:
- Adelaide 15-17 October 1999
- Hobart 20-22 October 2000

Members residing in these cities might start thinking about volunteering for the Convening Committee.

AMMA Contacts
For all general AMMA enquiries contact the Secretariat:
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Tel: (03) 6247-1850
(0412) 87-5390
Fax: (03) 6247-1855
E-mail: paulaleishman@trump.net.com.au

Research Grants
Details of the AMMA Research Grant program are included in this journal. Members are reminded that applications for the 1998 Research Grant should be received by 30 June 1998. Further details on the Grant can be obtained from:
Janet Scott:
Tel: (08) 9272-7399
E-mail: JFS@obtero.com.au

Journal
Journals will be published as follows:
- Issue: August 1998
  - Copy Deadline: 30 June
- Issue: December 1998
  - Copy Deadline: 31 October
- Issue: April 1999
  - Copy Deadline: 28 February

All queries regarding the Journal should be directed to:
Russ Schedlich
Tel: (02) 9563-4504
(0412) 286-740
Fax: (02) 9563-4519
E-mail: tatsch@ozemail.com.au

Library
The Association’s Library is located at the Fleet Health Support Unit, Maritime Headquarters, Sydney. Any member who wishes to browse through the Library (and visit the Librarian for coffee) is welcome to call.

Books from the library are available for loan of up to 12 weeks. Contact:
Russ Schedlich
Tel: (02) 9563-4504
(0412) 286-740
Fax: (02) 9563-4519
E-mail: tatsch@ozemail.com.au
Conference and Meeting Calendar

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<th>Conference</th>
<th>Venue</th>
<th>Contact No.</th>
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<td>2-6 May 1998</td>
<td>ANZCA ASM</td>
<td>Newcastle, NSW</td>
<td>(03) 9510-6299</td>
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<tr>
<td>6-17 May 1998</td>
<td>GPUMG Annual Meeting</td>
<td>Palau</td>
<td>(03) 9885-8883</td>
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<tr>
<td>10-15 May 1998</td>
<td>RACS ASM</td>
<td>Sydney</td>
<td>(03) 9859-8899</td>
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<tr>
<td>11-15 May 1998</td>
<td>RACP Annual Scientific Meeting</td>
<td>Melbourne, VIC</td>
<td>(02) 9256-5422</td>
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<tr>
<td>10-13 June 1998</td>
<td>National Sexual Health Conference</td>
<td>Sydney, NSW</td>
<td>(02) 9418-9396</td>
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<tr>
<td>13-18 June 1998</td>
<td>World Organisation of Family Doctors</td>
<td>Dublin, Ireland</td>
<td>353 (1) 676-3705</td>
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<tr>
<td>17-20 June 1998</td>
<td>Clinical Dermatology 2000</td>
<td>Singapore</td>
<td>44 (171) 407-9131</td>
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<tr>
<td>29-30 August 1998</td>
<td>RACGP Practical Procedures Workshop</td>
<td>Sydney, NSW</td>
<td>(02) 9886-4714</td>
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<tr>
<td>5-10 September 1998</td>
<td>World Congress Orthopaedic Surgery and</td>
<td>Sydney, NSW</td>
<td>(02) 9884-6823</td>
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<td></td>
<td>Traumatology Conference</td>
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<tr>
<td>11-15 October 1998</td>
<td>RACGP Meeting</td>
<td>Melbourne, VIC</td>
<td>(03) 9826-8676</td>
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<tr>
<td>16-18 October 1998</td>
<td>7th AMMA Conference</td>
<td>Sydney, NSW</td>
<td>(03) 6247-1850</td>
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<tr>
<td>15-17 October 1999</td>
<td>8th AMMA Conference</td>
<td>Adelaide, SA</td>
<td>(03) 6247-1850</td>
</tr>
<tr>
<td>20-21 October 2000</td>
<td>9th AMMA Conference</td>
<td>Hobart, Tas</td>
<td>(03) 6247-1850</td>
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AMMA on the net

Visit the Association's home page at:


Other useful Internet addresses:

International Society of Infectious Diseases - http://www.isid.org

Do you know where these members are?

BERNARD  FLTLT Roger  LEE  LT Stirling  To ensure all members receive their journals and other AMMA information, please let us know if you know the location of these AMMA Members.
BURKE    LT (RAN) Edward  LEEKS  Dr Nichole
COLES    CMDR Elizabeth  MacCARRICK  SQNLSR Geraldine
CUSACK   SBLT Nicholas  MacLEOD  CAPT Lewis
DAVIES   Dr lan  McNEIL  CPL Elizabeth
ELRICK   SBLT Megan  MURPHY  CMDR Terence
FIELKE   Dr Kenneth  MURPHY  MAJOR Emmet
FULLER   FLTLT Karen  NICHOLSON  AWGCDR Geoffrey
GALLAGHER  LT Naomi  NICHOLSON  WGCMDR Hamish
GISLER    FLTLT Paul  PEARSONS  FLGOFF Louise
GRILLS   MIDN Nathan  PRENICE  Dr Desmond
HANDLEY  FLTLT Paul  RIDDLE  CAPT Peter
HARVEY   SBLT Anna  ROE  FLTLT Jennifer
HERRING  CAPT Maurice  ROYAL  LTMDNS Elizabeth
HIGGS    MAJ. Michael  SCALZO  CAPT Frank
JOHNSON  SQNLSR Andrew  SENIOR  GPCAPT David
JONES    LTCOL Robert  STEPHENSON  SBLT Elizabeth
KELLY    SQNLSR Philip  WATZL  Dr Roland
LANDY    MAJOR Rosemary  WITHERS  LT Kenneth

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or Fax 03 62471855
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for the August issue should be sent to:

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PO Box 730
PYMBLE NSW 2073

E-mail: tatsch@ozemail.com.au

Deadline is 30 June 1998

Instructions for Authors:
Articles submitted for publication in AMM should conform to the following guidelines:

- Two hard copies should be submitted, typed double-spaced on A4 paper (single-side).
- An electronic copy on an IBM formatted 3.5 inch floppy disc in a standard word processing program should be submitted.
- The text in both hard and electronic copies should be unformatted.
- References in the text should be numbered consecutively as they are cited and annotation of the references should accord with the style given in Index Medicus. Where there are seven or more authors, list only the first three then et al. For example:
  

- Figures and Tables should be submitted separately with an indication in the text as to where they should be located.
- The originals of all photographs, ECGs, EEGs etc should be submitted to allow high quality reproduction.

Articles submitted may be subject to peer review. Articles which have been published elsewhere will only be considered if they are of importance to the field of military medicine, and publication will only proceed with the prior approval of the original publisher.

Letters to the Editor:
Letters to the Editor are welcome on any subject. They may be mailed to the above address, or preferably,
E-mailed to: tatsch@ozemail.com.au
Australian Military Medicine
Volume 7 Number 1
April 1998

Journal Editor: Russell Schedlich
Assistant Editor: Andrew Robertson

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