

## WOMEN IN GROUND CLOSE COMBAT (GCC) REVIEW PAPER – 01 DECEMBER 2014

### Issue

1. The findings of the tri-Service 2014 review of the exclusion of women from GCC roles.

### Recommendation

2. The findings suggest Defence should adopt a positive approach towards this question. In the meantime Defence should conduct a programme of physiological research to further assess the risks and mitigations to women in GCC roles. This will inform a decision in mid 2016. Options for implementation plans are to be driven forward concurrently to ensure momentum is maintained.

### Timing

3. **Priority.** To be considered by Secretary of State (SofS) in December 2014.

### What is the current situation?

4. **Women in the UK Armed Forces.** In the Royal Navy (RN) 10.1% of officers and 8.9% of other ranks are women; 11.7% of Army officers and 8.1% of other ranks are women; and in the RAF 16.6% of officers and 13.1% of other ranks are women. The majority of roles are open to women: RN 79%, Army 70% and RAF 94%. The units which are affected by the current exclusion are: the Royal Marines General Service (RMGS); Royal Armoured Corps (RAC); the Infantry; the RAF Regiment.
5. **Previous reviews.** Formal studies into the continued exclusion of women from GCC roles were conducted in 2002 and 2010. The key issue for these studies was the effect of the inclusion of women in mixed gender teams. In both cases, Ministers and Service Chiefs concluded that the risks to cohesion and therefore Combat Effectiveness (CE) on GCC operations justified the continued exclusion of women from GCC roles.
6. **Legal position.** It is generally unlawful to treat women less favourably than males on the basis of their sex, this includes excluding women from certain employment types. Under the Equality Act 2010, however, the Armed Forces are permitted to discriminate against women and transsexuals provided it can be shown to be a proportionate means of ensuring CE<sup>1</sup>. Under European law, the MoD is obliged to review the basis for this exclusion every eight years. The 2010 Act also provides<sup>2</sup> that an employer will not be acting unlawfully if, in relation to '*risks specifically affecting women*', the employer is required by Health and Safety legislation to operate in a certain way. Whilst this exemption probably allows for the preclusion of women from certain activities due to pregnancy, it is less clear whether this would apply to the exclusion of women from all GCC roles.

### What is the case for change?

7. **Maximising talent.** The future land operating environment presents sophisticated challenges in which a people-centric approach will be increasingly important, but in which the physical requirements will endure. There is increasing competition for those in the recruiting pool, which will continue to change in character; arguably potential recruits are becoming less physically robust, but are likely to be better educated<sup>3</sup> and more technically able. These challenges will require the Services to maximise the available talent. Much of this currently untapped talent pool is female.

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<sup>1</sup> Equality Act 2010, Schedule 9

<sup>2</sup> Equality Act 2010, Schedule 22

<sup>3</sup> DCDC. *Global Strategic Trends to 2045, Fifth Edition*. (DCDC, Shrivenham: 2014)

8. **External perceptions.** The Services view themselves as meritocratic, but whilst women remain excluded from some roles, this view is challenged by wider society. By removing the exclusion, the Services will be viewed as a genuine meritocracy, where all who are capable of attaining the employment standards have the opportunity to succeed in any career underpinning the principle of equality of opportunity. This would make the Services more attractive to talented women.

9. **Other nations' experiences.** Many nations have now opened all roles to women,<sup>4</sup> others retain an exclusion,<sup>5</sup> and the United States (US) and Australia have lifted the exclusion and are integrating women into combat roles over an extended period. A number of these nations have a broad definition of the term 'combat' that includes roles the UK would consider to be Combat Support (CS) and Combat Service Support (CSS). The UK is therefore ahead of many of these nations in terms of integration, but without a policy change is likely to be behind by 2016. Whilst the UK is different in military, societal and cultural terms, these international developments may increase the external pressure for change.

## The GCC context

10. **Definitions.** In the context of this review, CE has been defined as: '*The ability of a GCC team to carry out its assigned mission, role or function. The cohesion of a GCC team is a vital factor in its CE*'.<sup>6</sup> The GCC roles are considered to be '*those roles that are primarily intended and designed with the purpose of requiring individuals on the ground, to close with and kill the enemy*'.

11. **Combat: The primary purpose of military forces.**<sup>7</sup> Combat and the requirement to retain the ability to close with and kill the enemy, sets the context for this review. When dismounted, this includes the requirement to deploy on foot over difficult terrain, carrying substantial weight, to engage in close quarter fighting,<sup>8</sup> recuperate in the field and then do the same again repeatedly over an extended period.

12. **The nature and character of conflict.** The review recognises that the nature of conflict is immutable; GCC will remain an intense, visceral and unavoidably physical activity. Violent death, injury, all-pervading concussive noise, horror, fear, blood and high levels of emotion are common themes.<sup>9</sup> Combat exposes inadequacies and applies manifold stresses at individual, team and organizational levels. These stresses are likely to occur repeatedly throughout combat operations and require high levels of both mental and physical endurance. The character of conflict changes: future operations will not only be akin to those prosecuted in Afghanistan,<sup>10</sup> but will encompass the complete mosaic of operations including major combat operations. The imperative remains therefore to continue to excel at warfighting<sup>11</sup> and to maintain credibility in the eyes of both allies and our enemies. The enemy will seek to expose vulnerabilities to influence both those prosecuting the operations and wider audiences.

13. **GCC Roles.** There are a variety of GCC roles, with teams operating in a range of environments, combining to create close combat effect. The RMGS, Infantry and RAF Regiment generally operate dismounted and some elements of the RAC operate primarily mounted. All have the ability to deliver their respective GCC effects through a combination of Mounted Close Combat (MCC) and Dismounted Close Combat (DCC). The RAC are crew centric and enable individuals to undertake a predominantly mounted career, although there remains a requirement, both in and out of role, for a dismounted element. The RMGS, Armoured Infantry, Mechanized Infantry and the RAF Regiment contain personnel employed in similarly platform-related roles (driver, commander,

<sup>4</sup> Austria, Canada, Denmark, Finland, Germany, Netherlands, New Zealand, Norway, Poland, Spain, Romania, Sweden and Ukraine

<sup>5</sup> Israel, the Czech Republic, Turkey, Slovakia and Bulgaria continue to exclude women from GCC roles. The Dutch and French retain exclusions in some GCC roles.

<sup>6</sup> Refined version of the definition contained in JDP 0-01 dated Jun 06. Note that there is no definition available in current doctrine.

<sup>7</sup> DCDC. *Army Doctrine Publication Operations*. (DCDC, Shrivenham: 2010) p 82.

<sup>8</sup> Close quarter fighting is defined as: '*Closing with and destroying an enemy at ranges of under 30 metres, using direct fire weapons, grenades, bayonets or hand-to-hand fighting.*'

<sup>9</sup> See for example Hugh McManners *The Scars of War* (Harper Collins; GB: 1993)

<sup>10</sup> DCDC. *Future Character of Conflict*. (DCDC, Shrivenham: 2012) p 7.

<sup>11</sup> DCDC. *Joint Concept Note 2/12 Future Land Operating Concept*. (DCDC Shrivenham: May 2012). pVI.

gunner), but as a specialisation in a primarily dismounted career. Under Army 2020 reorganisation the Light Cavalry and Armoured Cavalry contain some roles that are predominantly dismounted; the full extent of these changes is subject to ongoing work.

## **How the review was conducted and what it found**

14. **2014 review.** The aim of the review was to assess the current exclusion of women from ground close combat roles, to identify the benefits and risks of changing this policy and to make recommendations. The review was to be open and evidence based, building on the considerable work undertaken in support of the 2002 and 2010 studies. The assessment of benefits was to include the impact of a change in policy on the recruitment of women into the wider Armed Forces. It was to cover all three Services, with the Army acting as the lead Service working in close cooperation with the Navy, the Air Force and the Chief of Defence Personnel. The review was based on the premise that all roles should be open to women unless this would undermine CE. SofS directed that Armed Forces' effectiveness was not to be prejudiced by lowering operationally necessary standards. The Terms of Reference for the review, approved by the SofS, are at Annex A.

15. **Conduct of the review.** The 2014 review built on the evidence of previous studies and include any new information, whilst specifically focusing on benefits and risks of a policy change. Nine workstrands were identified, ownership apportioned, and other Service contributions obtained where appropriate. The review considered whether it was appropriate to remove the current exclusions; initiatives to create new capabilities or organisations that seek to use female talent better were out of scope. This paper has been considered by Equality Analysis trained personnel to ensure that the outcome does not have a disproportionate impact on those in the Protected Characteristics groups. The Employment Branches of all three Services have been consulted in the preparation of this paper.

16. **Workstrand outcomes.** As directed by the SofS, CE was central to the review. Workstrands assessed as critical to the decision were; cohesion (the basis for maintaining the exclusion in previous studies), and physiology (the area providing the newest objective evidence). CE, physiology and cohesion are considered in detail below and at Annexes B to D. The other workstrands (recent combat operations, internal and external engagement, other nations and implementation) provided important context and an understanding of the possible ramifications of a decision. They concluded that: the performance of women on the frontline in recent operations was comparable to that of their male counterparts in CS and CSS roles. They have experienced the intensity of combat on the frontline but by virtue of their employment, women have not been in incidents where they have deliberately closed with and killed the enemy. The internal poll (10,943 replies to a non-targeted electronic poll of service personnel) on whether women should serve in GCC roles found 54% against, 34% for and 12% unsure; these findings were reflected in numerous focus groups and interviews.

17. **Combat effectiveness.** The review studied 21 factors that contribute to CE, of which physiology and team cohesion are the most relevant; these were considered under separate workstrands. The review assessed that one of the factors will be improved by the inclusion of women, seven are neutral or multi directional, eleven are likely to have a negative impact on CE and in two the impact was unknown. In three of the 11 negative factors, mitigation would be a significant challenge; these are survivability, morbidity and deployability, much of which are predicated by physiology. Details of these assessments are at Annex C, page C-8.

18. **Physiological differences.** The review has achieved a considerably better understanding of the physiological differences between men and women in the military. This is due to significant improvements in the accuracy of data available and the fact that the female cohort is both larger and more representative than that available to previous studies. In general, women have smaller hearts, about 30% less muscle, slighter skeletal structure and wider pelvic bones, resulting in less explosive power and upper body strength. The review concluded that the position of transgender service personnel who are in transition will need to be considered on an individual basis in order to

meet both equality and duty of care requirements. The Review has been conducted in a short time frame and has therefore not been able to commission new research. As a result, the data used has been based on the current population of women in CS and CSS roles. This data includes a sample based on a cohort that is wider rather than the few women in the physical elite, who would be able to pass the ground close combat tests. Experts believe this approach to be valid, in that the trends will be similar; however, there will a requirement to commission physiological research to gain a data set that is truly representative. Key findings are below:

a. **Physical capability.** The physiological differences between the sexes disadvantage women in strength-based and aerobic fitness tests by 20 to 40%; so for the same output women have to work harder than men. Despite the differences, there will be some women, amongst the physical elite who will achieve the entry tests for GCC roles. But these women will be more susceptible to acute short term injury than men: in the Army's current predominantly single sex initial military training, women have a twofold higher risk of musculoskeletal (MSK) injury. The roles that require individuals to carry weight for prolonged periods are likely to be the most damaging. Screening and testing may identify those women who, with the right pre-conditioning and continuation training, would be less prone to this acute short term injury. The current physical training regime for ground close combat roles is optimised for a male cohort; the training has been proven to be effective in the most demanding of operational environments. Research will need to be conducted to identify the most effective methods of achieving the same output from a female cohort whilst continuing to foster team cohesion.

b. **Morbidity and deployability.** Morbidity is the incidence of disease or injury in a cohort of the population. Research indicates that the physical demands of GCC roles could result in chronic long term risks to the health of women employed in GCC roles. For instance; regular periods of energy deficit, which occurs during periods of high energy expenditure, such as robust training and operations, can affect both reproductive and skeletal health. Given that women have not yet had an opportunity to serve in GCC roles, Defence does not have a representative cohort on which to test this hypothesis. Furthermore, the demands of the GCC roles are unique; for instance the experience of elite endurance athletes are inherently different in that athletes are not required to meet the requirements of high readiness or to optimise their fitness levels to meet the requirement of unforeseeable contingent operations. Physiological research will therefore need to identify the physical elite within the serving cohort of women in order to isolate the representative cohort. Thereafter the research will need to predict, analyse and where possible, to reduce risks to 'as low as reasonably practicable' (ALARP) each of the individual factors that have the potential to impact on morbidity in a female GCC cohort, both in initial training and over the course of a full career. On recent operations women experienced a 15 to 20% higher rate of Disease Non Battle Injury (DNBI). Mitigations may include measures such as a different and more scientific approach to fitness regimes, nutritional advice and supplements.

c. **Survivability and lethality.** Survivability in combat is, in part, predicated by physiology. The Infantry Battle School and Defence Science & Technology Laboratory (DSTL) have conducted a number of qualitative studies into load carriage, examining impacts on lethality and survivability. These studies suggest that the relative strength of women, compared to men, when carrying the combat load are likely to result in the early onset of fatigue. This is likely to result in a distinct cohort with lower survivability in combat. Similar research points to a reduced lethality rate; in that combat marksmanship degrades as a result of fatigue when the combat load increases in proportion to body weight and strength. The risks regarding survivability are therefore relative; these are about biology rather than character. This area continues to pose risks to CE, but given that the number of those likely to achieve the physical requirement will be small, the risks are unlikely to be operationally significant. Moreover; if it is possible to design the correct selection and testing regime, only those who are physically capable, with low morbidity, will fill GCC roles.

d. **Medico legal implications.** The severity of the physiological impacts on women may be such that Defence is required to retain an exemption from women serving in some or all GCC roles, most notably those that are dismounted. To include women in GCC roles without further scientific review and the examination of whether any such risks to them could be reduced could expose Defence to significant legal risk of personal injury claims (either under the common law of negligence and/or breach of statutory duty). If this research demonstrates that the steps necessary to mitigate the risks are grossly disproportionate in terms of time, resources and cost, lawful exclusion may have to remain in place.

19. **Cohesion.** The judgement on whether cohesion is reduced in mixed-gender teams remains finely balanced. There is empirical data to suggest that competence, leadership and collective training are key determinants in effective integration. There is evidence to suggest that unbalanced teams find integration harder, unless carefully managed. Academic studies (as detailed at Annex D) and experience in CS units have found that the negative issues are likely to be fleeting and can be offset by collective experience and strong leadership. The review concludes that the issue of cohesion should not be considered in further research, except where physiological differences have ramifications for CE.

20. **GCC recruiting.** Analysis of recent female Army entrants<sup>12</sup> indicates that 4.5% passed to the physical standards required to start infantry training. Recruiting Group (RG) judge that approximately 10 entrants a year will join the Infantry and approximately 20 will join the RAC. Figures for the RAF Regiment are comparable with the Infantry and the RMGS estimate that up to six women could pass training annually. Based on the number of male candidates that fall out during training (which tend to be lower than female rates), this would result in about 60 women serving in the Infantry and 150 in the RAC after 24 years (the length of a full career). These numbers might increase if the correct conditioning and progressive training courses were implemented. This could result in a larger cohort entering training (both men and women), though whether these individuals would be denied a full career by the effects of chronic ill health is not known. RG suggest that there might be a slight increase in female recruiting, and there may be a wider 'halo' effect were the exclusion to be lifted, as the Services would be seen as a more inclusive organization.

21. **Practicalities of implementation.** Should policy change, a resourced implementation programme will be required. This should deliver cultural and practical change, on a set of tri-Service policy principles, to be delivered by the single Services. The programme must be deliberate and carefully managed. Guiding principles for implementation are at Annex E.

a. **Cultural change.** Implementation must include a cultural change programme to ensure there is no impact on CE and ensure women are not career limited. This should dovetail with current and future work to prevent sexual harassment and assault. Furthermore; the Defence Diversity and Inclusion Programme would need to incorporate a cultural change strategy. Cultural change needs to start in the training base to set the conditions for successful future service.

b. **Cost of implementation.** The Army Recruiting and Training Division (ARTD) and the Royal Marines (RM) have submitted potential costs, should implementation be required. Infrastructure costs could range anywhere from a few thousand pounds up to £20m over 10 years<sup>13</sup>. A tri-Service pre-conditioning course is likely to be required for all female GCC applicants and the less physically fit of the male GCC applicants, to reduce risk of training injury and protect CE. This might cost in the region of £1m per year. More work will be required to produce a more detailed costing and may wish to consider: physical pre-screening for the GCC cohort (both men and women) to reduce risk candidates; through life and post pregnancy physical screening; additional liability to provide enhanced medical care

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<sup>12</sup> Data outlined at 27/8/14.

<sup>13</sup> D Cbt and the Commando Training Centre RM (CTCRM) have independently advocated an 'all of one company' approach to training (i.e. full integration of accommodation), on the premise that cohesion is so central to the infantry role that no segregation between men and women can be tolerated. Infrastructure costs will vary significantly depending on which model of integration is adopted.

and rehabilitation instructors in units; the development of gender-specific equipment; additional physiological research to optimise training standards and minimise injury risk; the provision of enhanced nutritional expertise in training and in units.

22. **Areas of uncertainty.** There remain considerable uncertainties surrounding physiology and its effect on survivability, lethality, morbidity and deployability. The US is researching these areas as part of their change programme, the results of which will contribute to UK decision making and implementation.

a. **Combat effectiveness.** The US Marine Corps (USMC) is conducting a wide ranging experiment that will examine the hypothesis that a mixed gender infantry unit, operating under gender free standards, will perform equally as well as a single gender infantry unit. The USMC has formed a Ground Combat Element Integrated Task Force with which to test the hypothesis. This 651 strong battalion will exercise until Jun 15 and data will be available from 2016. The experiment will refine gender free occupational standards for individual and collective tasks and will seek to quantify tasks, conditions and standards that have previously been largely qualitative. The trial will offer a degree of certainty on the impact of the inclusion of women on CE and is likely to consider any impact of lower survivability on cohesion.

b. **Physiological evidence.** Physiological research will be needed in a number of areas. These include the requirement to generate a more representative data set; the requirement to consider how the current physical training regimes can be optimised for women, and whether factors which influence morbidity can be identified and mitigated to ALARP to ensure high availability of personnel on the most demanding operations.

23. **The criteria required to make a decision.** There a number of criteria that need to be better understood in order to make a decision on whether exclusions can be lifted on women in GCC roles. These are:

a. Analysis of the impact of the functional physical requirements of each of the four GCC roles (RMGS, RAC, Infantry and RAF Regiment) in respect of female physiology.

b. An assessment of the risks to women in meeting these requirements on a routine and enduring basis. This assessment will need to address whether these risks specifically affect women.

c. An assessment of whether mixed gender units, operating under gender free standards, will perform equally as well as a single gender units.

24. **Research to inform a decision.** A programme of research will be designed to deliver against the criteria required to make a decision. Were the exclusion to be lifted, the research programme would subsequently deliver an implementation plan. Post integration there will be a requirement to monitor health effects on women in GCC roles. This is a wide ranging programme that will generate a data set that will contribute to continued improvement in physical development regimes for both men and women pan-Defence, but tailored to deliver a decision on women in GCC in mid 2016, when the programme will have:

a. Assessed the impact of the physical functional requirements of each GCC role on female physiology.

b. Identified the factors associated with higher morbidity and whether these can be mitigated (and reduced to ALARP) to remove any potential impacts on combat effectiveness.

c. Assessed whether employing women in GCC roles presents physiological risks specifically affecting women.

- d. Analysed the results of the USMC Ground Combat Element Integrated Task Force experiment to identify whether mixed gender GCC teams perform as well as single gender GCC teams.

The programme will not have delivered all of the measures required to mitigate the issues identified, or dispel all uncertainty by mid 2016, so the requirement for a risk judgment will endure.

25. **Further research required to integrate women into GCC roles.** Once a decision has been reached, the physiological research programme will continue to ensure that the essential prerequisites to the integration of women are delivered. This research will use the data generated in the analysis of the functional physical requirements of each of the four GCC roles. This will validate and potentially improve current training standards, and increase the scientific rigour of physical training regimes and ensure that the inclusion of women in GCC roles is legally defensible. As well as a cost benefit analysis, implementation planning will generate a comprehensive plan for the integration of women into GCC roles. This will examine all pan-DLOD areas, from policy through to Human Factors Integration. Implementation planning will be complete by mid 2016.

### Where does this analysis lead us?

26. **Recommended course of action.** This analysis led to three courses of action: to lift the exclusion now; to retain the exclusion; or to commit to further research and reduce physiological uncertainty. The review recommends that a programme of physiological research should be conducted to further assess the risks and mitigation to women in GCC roles, in order to inform a decision in mid 2016. Implementation plans are to be driven forward concurrently to ensure momentum is maintained.

- a. **Benefits.** This course of action takes Defence closer to integrating women, but balances the requirement to exercise due diligence and duty of care responsibility to service personnel with the requirement to protect combat effectiveness. Conducting further focused research will allow Defence to generate the conditions required for women to succeed, rather than integrating women in an ad hoc manner. Furthermore, this course of action will allow the UK to exploit the extensive US Army and USMC trials prior to making a final decision. Based on the considerable physiological uncertainties identified by the 2014 review, a decision to lift the exclusion now could be perceived as reckless. Conducting concurrent implementation planning will allow a full cost benefit analysis to be produced before a final decision is made and would also fast-track integration if a decision to lift the exclusion is made in 2016.

- b. **Risks.** There could be a perception that this course of action is seen to be delaying the issue and therefore the Armed Forces do not realise the benefits sooner. A chance remains that there may be insufficient certainty by 2016 and research fails to deliver new definitive data.

### Annexes:

- A. Workstrands.
- B. Physiological and health implications.
- C. Assessment of combat effectiveness.
- D. Review of recent literature on cohesion.
- E. Implementation planning.

## WORKSTRANDS

1. **Terms of Reference.** The Terms of Reference (ToR) for the WGCCR Review were approved by the SofS on the 4 June 2014. These are outlined below:

*The aim of the review will be to assess the current exclusion of women from ground close combat roles, to identify the benefits and risks of changing this policy and to make recommendations. The review is to be open and evidence based, building on the considerable work undertaken in support of the 2002 and 2010 studies. The assessment of benefits is to include the impact of a change in policy on the recruitment of women into the wider Armed Forces. It is to cover all three Services, with the Army acting as the lead Service working in close cooperation with the Navy, the Air Force and the Chief of Defence Personnel.*

*It is to be based on the premise that all roles should be open to women unless this would undermine combat effectiveness. Armed Forces' effectiveness is not, however, to be prejudiced by lowering operationally necessary standards.*

*The review will undertake:*

- *An assessment of women's roles in recent operations. **Workstrand 1***
- *An internal survey to determine current attitudes within the Armed Forces towards the effectiveness of mixed gender teams in ground close combat environments. **Workstrand 2***
- *The engagement of external stakeholders and wider society to determine attitudes towards women in close quarter fighting. **Workstrand 3***
- *A review of recent research literature on the effectiveness of mixed-gender teams in a combat environment. **Workstrand 4***
- *Consideration of the experience of other nations in training women for and employing them in ground close combat roles. **Workstrand 5***
- *A review of scientific literature on gender related physiological issues relating to the performance of military tasks. **Workstrand 6***
- *A confirmation of the legal position and a review of relevant legal cases since 2010. **Workstrand 7***
- *An initial assessment of the practical issues and risks of implementing a change to the existing policy. **Workstrand 8.***
  - *A fundamental review of training standards.*
  - *Examine how to implement any practical and cultural changes.*
  - *Study the potential cost of implementation.*
- *Produce implementation timeline.*

*The review is to be led by CGS and is to report by the end of 2014.*

2. In addition to the agreed workstrands, an additional task was added to investigate the wider recruiting effects:



- A review of the wider recruiting benefits and/or impacts. **Workstrand 9**

## PHYSIOLOGICAL AND HEALTH IMPLICATIONS

### Background

1. **Overview.** This review focused on the physiological, physical and health implications for women in GCC roles. Army Medical Directorate (AMD), supported by ARTD, have produced the following evidence that will support the decision to either retain or remove the current exclusion policy.
2. **Evidence.** This review is based on primary data from ARTD databases, Defence Medical Information Capability Programme (DMICP), original research, secondary sources from over 100 academic papers, and Subject Matter Expertise.
3. **Physical and physiological characteristics of women.** Adult women are typically shorter (~17%), lighter (~16%), have less muscle (~30%), more fat (~28%) and smaller bones than men. These differences are underpinned by the actions of sex hormones released in puberty. Women also have smaller hearts, lower oxygen carrying capacity of the blood (haemoglobin concentrations) and different muscle composition. These anatomical and physiological characteristics disadvantage women in physical performance.
4. **Physical performance.** Female recruits perform at a significantly lower level than men on physical performance tests and military occupational tasks. On average, decrements are:
  - a. 19% vertical jump test; 25% explosive power<sup>14</sup>; and 41% maximal dynamic lift strength<sup>15</sup>;
  - b. 31% single lift; 13% jerry can carry.
5. **Physical comparison.** Women have disproportionately lower upper body strength than men (~40%) compared to the lower limbs (~20%) and perform to a significantly lower standard than men on loaded marching tasks. This is in the range of 11 to 38%; the heavier the load carried, the greater the decrement.
6. **Musculoskeletal injury (MSK).** The high and unaccustomed physical demands of initial training are associated with increased risk of MSK injury in recruits. The overall risk of MSK injury is higher for women, reaching seven fold in some studies of British Army training. Based on data from the current in-service female cohort, it is assessed that women with the same aerobic fitness and strength as men are still likely to have a greater risk of MSK injury due to the inherent differences in their physiology and anatomy. However, no female GCC cohort currently exists against which to test this hypothesis – further work is required.
7. **Aerobic fitness.** The greater risk of MSK injury in women is generally attributed to their lower aerobic fitness on entry to training. Anatomical features, including shorter stature and wider pelvis, may also predispose women to a greater risk of hip and pelvic injuries.
8. **Policies.** Current initial training policies to reduce the risk of MSK injury in women include: a shortened stride length of women, from 30" to 28", this intervention has proven to reduce the risk of pelvic stress fractures in the Australian Army. In addition, conducting training in single sex platoons to reduce cardiovascular strain. This has reduced medical discharges due to overuse injuries by 47%, whilst maintaining similar improvements in aerobic fitness (~10%) in both sexes.

<sup>14</sup> **Explosive Power.** Explosive Power is when the rate of force development is at the maximum for any type of muscle action. In activities requiring high acceleration and output, explosive power is necessary for maximum performance.

<sup>15</sup> **Maximal Dynamic Lift Strength.** Lifting requires two types of muscle contractions, static and dynamic. The initial part of the lift closely resembles isometric exercise, as the postural muscles and the muscles required to overcome the inertia of the load all apply force without changing length. When the force applied is greater than the load, the lift becomes dynamic as a result of change in the lengths of the muscles involved. 'Maximal' dynamic lift refers to the maximum dynamic lift an individual is capable of. *Dynamic Strength Test as a Predictor for Maximal and Acceptable Lifting*, Pytel and Kamon, Pennsylvania State University, 21 Jul 1981.

9. **Trauma.** In spite of these interventions and with the majority (88%) of female recruits carrying 15 kg in training: the rate of trauma and overuse lower limb MSK remains two fold higher in women and the rate of hip and pelvic stress fractures is ten fold higher in women (2.8 per 1000 vs 28.1 per 1000 trainees).
10. **Stress fractures.** The rate of hip and pelvic stress fractures in men during the Combat Infantryman's Course (CIC) is 25.3 per 1000 trainees. The risk of hip and pelvic stress fractures to women should they undertake the CIC is estimated to be 250 per 1000 trainees (or 1 in 4 female Infantry trainees); this is an extrapolation and needs to be tested using modelling, based on a representative sample of the 4.5% of service women capable of passing GCC training.
11. **Load carriage.** US research in a deployed population showed that a women's risk of injury increases 5 fold if the heaviest weight carried is > 25% of body weight. The loads carried in some GCC units would significantly exceed this.
12. **Physical Employment Standards.** To ensure that Army personnel are suitably recruited for the job they perform, the British Army introduced physical pre-employment tests in 1998. The Physical Selection Standards for Recruits (PSS(R)) (single lift, jerry can carry and 1.5 mile run) have been validated against three Representative Military Tasks (lifting, carrying, marching) across all military occupations.
13. **PSS(R).** The Physical Entry Standards for Recruits are highest for the GCC:
- Single lift 40 kg;
  - Jerry can carry 150 m (20 kg each arm);
  - 1.5 mile run 12:45 min (10:00 min parachute regiment, 13:15 min RAC).
14. **Numbers.** 4.5% of women enlisting in the British Army are able to achieve all three standards, compared with 90% of all men qualifying for non-Infantry/RAC occupations. Figures for the Royal Marines will be substantially lower since the physical standards are more demanding.
15. **Upper body strength.** Women exhibit disproportionately lower strength on the single lift, with 5.4% achieving Infantry / RAC standards. Lifting involving upper body strength is a principal (88% of all tasks) manual handling task of the British Army.
17. **Fitness tests (FT).** Employment standards in the Field Army are assessed using the Annual FT, a single loaded march performed over 8 miles in 2 hours; the load varies by occupation. The Infantry carry the heaviest load of 25 kg. Operational FT are used to assess fitness to deploy. Six different standards of loaded marching have been developed from expert opinion.
18. **Gender free.** At present validated 'gender free' employment standards to monitor the suitability of women to perform GCC roles do not exist in the Field Army.
19. **Commando training.** Selection and training standards for the Royal Marines General Service (RMGS) have been regularly and rigorously reviewed over the years and are currently assessed to be clearly linked to the operational role (via the Operational Performance Statement) and thus fit for purpose. The Institute of Naval Medicine (INM) has collated a substantial store of data concerning the physiological impact of Commando Training on male recruits. INM has analysed this data, considered previous studies and provided advice on the likely physiological impact of Commando Training on females<sup>16</sup>. For a RMGS recruit to have at least a 50% chance of successfully completing RM Commando Training in its current form, they should possess at the start of training:
- An aerobic fitness (assessed from maximum oxygen uptake,  $VO_2\max$ ) of more than 51  $\text{ml.kg}^{-1}\text{min}^{-1}$
  - Body mass should be 70 kg or heavier

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<sup>16</sup> Women in Ground Close Combat; a Review of Gender Related Physiological Issues Relating to the Performance of Military Tasks, Institute of Naval Medicine, dated 1 Aug 14.

- c. Body Mass Index (BMI) should fall between 23 – 29 kg.m<sup>-2</sup>
- d. Percentage body fat should be between 7% – 15%
- e. Maximum calf girth greater than 36 cm
- f. Thigh girth greater than 48 cm.

20. Similarly, poor aerobic fitness, low body mass and low bone strength are risk factors for stress fracture injury, which would be more prevalent in female trainees compared to males. Taking the above threshold for aerobic fitness as a minimum requirement, it is estimated that approximately 5% of the UK female population would pass the required standard, or approximately 57 of the 1140 female intake of UK service personnel (in 2013/14). Consideration of factors (b) to (f) substantially diminishes the percentage of females that meet the criteria associated with a 50% probability of passing Commando training. Further, as yet unknown risks to females undertaking GCC roles are likely. However, a higher rate (more than 60%) of medical discharge for females compared with males would be anticipated.

21. **Training programmes.** Significant improvements in physical performance of women are achieved with specific, periodised physical training programmes. Upper body resistance training is the most effective single mode of training for enhancing military occupational task performance. A combination of aerobic and resistance training modalities will optimise improvements in all physically demanding tasks. This would need to be delivered through career if women were to maintain these standards in GCC roles.

22. **Progressive build-up.** More women will achieve the relevant standards for GCC roles if targeted interventions are conducted pre-enlistment. Improving the single lift performance of female candidates achieving 35 kg by 20% would increase the numbers eligible for Infantry / RAC from 4.5% to 20.7%.

23. **Downgrading and discharge.** Overall, female military personnel have a higher percentage of downgrading (excluding pregnancy) than men by about 10%. Medical discharge rates as an indicator of health are similar for male and female soldiers (11.7 per 1000; 13.3 per 1000 personnel), but the causes are different. Women are more frequently medically discharged for knee / back pain and mental health compared to men. Men are more likely to be discharged for ear, nose and throat conditions. As a sub-set of broader mental health issues, more men are discharged for Post Traumatic Stress Disorder (PTSD) than women. The highest incidence of PTSD is found in the combat arms. It is assessed that the prevalence of these injuries may increase with prolonged periods of GCC activity.

24. **Pregnancy.** British female soldiers have a greater risk of MSK injury during the first 12 months postpartum than before pregnancy. The reversible bone loss associated with pregnancy takes up to 24 months postpartum to fully recover. Undertaking strenuous training with heavy loads during this period will increase the risk of skeletal injury. The risks are not fully understood and further research will need to be carried out in this area.

25. **Morbidity on deployment.** On operations, British female military personnel have a higher rate of Disease Non-Battle Injury (DNBI) (tri-Service data: 72 per 1000 vs 52 per 1000), than men. US female soldiers present with more 'all cause injuries' on operations than men, in spite of performing less physical roles. Aerobic fitness decreases more rapidly on operations in US female soldiers than in men. Women also present post-operationally with more injuries. More women present to the medical services with mental health conditions, and British female military personnel are more likely to be admitted for in-patient psychiatric care than men, reflecting the severity of illness. The graph presents the rate of surviving UK Service Personnel DNBI casualties on Op HERRICK by gender between 15 April 2007 (the start of HERRICK 6) and 10 June 2014 (the end of HERRICK 19). The average rate of DNBI casualties on Op HERRICK was 72 per 1,000 females compared to 52 per 1,000 males. With the exception of HERRICK 10, the rate of DNBI casualties is higher in females than males for all other roulemonts.

26. **Health risks.** There is no direct evidence confirming the chronic risk to health of women engaged in GCC roles. Predicted risk is based on findings from laboratory studies, non-Infantry populations, and acute exposures of US soldiers to operations. Whilst women have not been employed in GCC roles, research may indicate that the more extreme of these roles could have an impact on reproductive function and bone health. The immediate risk is stress fracture injury with training, and potential chronic risks may include irreversible bone fragility and infertility. Further modelling based on a representative population will be required to test this hypothesis and develop mitigation.

27. **Diet.** Based on US data, women with combat exposures are more likely to develop new-onset disordered eating and extreme weight loss when exposed to combat compared with those without combat exposures. The same risk is not evident in men.

28. **Infertility.** It is hypothesised that menstrual changes commonly reported during US initial military training of longer duration ( $\geq 1$  year) may occur with periodic chronic exposures to austere Infantry operational and training conditions, with possible risk of infertility and impaired bone health. It is known that regular periods of energy deficit can affect both reproductive and skeletal health and further investigation is required to understand the full implications.

29. **Post Traumatic Stress Disorder.** British female soldiers present with mental health problems more frequently than male soldiers (15% among women compared with 6.8% among men), but fewer serving women report PTSD. Meanwhile, US female veterans have a higher incidence of PTSD than men. PTSD is associated with a greater risk of disordered eating in women. In general men are more likely to experience substance abuse. PTSD is a specific mental health diagnosis that is presented more frequently amongst combat troops. It is hypothesised that women exposed to direct combat may suffer a higher rate of PTSD than their male counterparts because current trends suggest that they may be more susceptible to mental health disorders.

## ASSESSMENT OF COMBAT EFFECTIVENESS (CE)

27. **General.** The basis for the exclusion of women from GCC roles is based upon military judgement that the employment of women in combat roles would undermine and degrade CE<sup>17</sup>. The review has therefore considered how best to assess the impact on CE of the inclusion of women in GCC teams in order to reaffirm, or challenge, the previous findings. Cohesion was considered such a vital factor in relation to CE that it has been considered, in its own right.

28. **Premise of the Review.** The Review is to be based on the premise that all roles should be open to women unless this would undermine CE. Armed Forces' effectiveness is not, however, to be prejudiced by lowering operationally necessary standards.

29. **Context.** Practitioners of GCC will be required to operate across the conflict environment, from MACA to major combat operations; but the primary purpose of military forces is combat<sup>18</sup>. In the case of GCC, there remains an absolute and enduring requirement to retain the ability to close with and destroy the enemy, this includes the requirement to defeat the enemy at close quarters. In the worst case, GCC may include the requirement to deploy on foot over difficult terrain, carrying substantial loads, engage in visceral close quarter fighting, recuperate in the field, and then do the same again repeatedly over an extended period. In the context of this review, CE is therefore assessed against this most demanding requirement.

30. **Future operations.** The campaign in Afghanistan has seeped into the public and military consciousness as being characteristic of future operations. The Future Character of Conflict (FCOC) makes it clear that future operations will not only be akin to those prosecuted in Afghanistan<sup>19</sup>, but will encompass the full mosaic of conflict. Although the possibility of inter-state conflict may have receded for the UK, it has not disappeared globally. State-on-state conflict will still be possible and UK forces must be prepared for this eventuality – 'We cannot rule out the re-emergence of a major state led threat.'<sup>20</sup> The imperative remains therefore to continue to excel at all levels of warfighting<sup>21</sup> and to maintain our credibility in the eyes of both our allies and our enemies.

31. **The nature of close combat.** GCC is an intense, visceral and unavoidably physical activity. Violent death, injury, all-pervading concussive noise, horror, fear, blood and high levels of emotion are common themes in warfighting<sup>22</sup>. GCC exposes inadequacies and applies manifold stresses at individual, group and organisational levels. These stresses are likely to occur repeatedly throughout combat operations and require high levels of both mental and physical endurance.

32. **Definitions.** The following definitions are used throughout this review.

a. **Combat contribution**<sup>23</sup>. *The sum total of an individual's performance in relation to the requirement of a particular combat task or mission.*

b. **Combat effectiveness.** CE in this context is defined as: *The ability of a ground close combat team to carry out its assigned mission, role or function. The cohesion of a ground close combat team is a vital factor in its combat effectiveness*<sup>24</sup>.

<sup>17</sup> MoD. Report on 'The Review of the exclusion of women from Ground Close-Combat Roles' dated Nov 2010.

<sup>18</sup> DCDC. *Army Doctrine Publication Operations*. (DCDC, Shrivenham: 2010) p 82.

<sup>19</sup> DCDC. *Future Character of Conflict*. (DCDC, Shrivenham: 2012) p 7.

<sup>20</sup> DCDC. *Future Character of Conflict*. (DCDC, Shrivenham: 2012) p 2.

<sup>21</sup> DCDC. *Joint Concept Note 2/12 Future Land Operating Concept*. (DCDC, Shrivenham: May 2012). pVI.

<sup>22</sup> See for example Hugh McManners *The Scars of War* (Harper Collins, GB: 1993) or Martin Lindsay *So Few Got Through* (Pen and Sword Military, Reprint edition May 2012).

<sup>23</sup> A categorization identified by DSTL Fort Halstead and defined by the WGCC Review Team.

<sup>24</sup> Refined version of the definition contained in JDP 0-01 dated Jun 06. Note that there is no definition available in current doctrine.

c. **Ground close combat roles.** Roles that are primarily intended and designed with the purpose of requiring individuals on the ground, to close with and kill the enemy.

d. **Close quarter fighting.** The process of closing with and destroying an enemy at ranges of under 30 metres, using direct fire weapons, grenades, bayonets or hand-to-hand fighting<sup>25</sup>.

e. **Ground close combat teams.** There are a variety of GCC teams included under the category the combat arms. These include: the amphibious infantry section; the tank crew; the crew of a light cavalry recce vehicle; the infantry section; the RAF Regt section. While these teams' environments may vary; their role and factors contributing to CE will be broadly similar.

33. **Assessing CE.** CE is a multi faceted concept and there is no general agreement on what it means. It is worth noting that there is no definition of CE in current UK military doctrine. Most commentators agree<sup>26</sup> that the CE of a given unit can only be measured in relation to the prevailing operational context and the enemy that the unit is set against. DSTL have conducted a number of studies on CE, but there are no studies that specifically consider gender differences in relation to CE. The definition used in this review is therefore bounded, and focuses on the impact of the inclusion of females in GCC teams.

34. **Measuring CE methodologies.** Methods to measure CE can be roughly separated into three approaches<sup>27</sup>:

a. **Intuitive approach.** Relies predominantly on the exercise of military judgement; it is the method of principle use and is characterised by a general lack of traceable connections between the facts, assumptions, and conclusions.

b. **War gaming.** The second approach is war gaming, in which the data on military capabilities, tactical situation etc. are more clearly taken into account, and military judgement is applied to a number of more clearly delineated and restricted problems. The distinguishing feature of war gaming is the simulation of important elements of the conflict, either by humans or by a computer.

c. **Mixture of empirical data, theoretical analysis, and, inescapably, military judgement.** Analysis clarifies the problem and reduces the range of possibilities. Military judgement is called upon to bridge the gap between the results of the analysis and the probability of success in combat.

35. It is necessary to emphasise that the validity of the results obtained through any one of these approaches can be checked in only one way – by actual combat. In the absence of such a check, the most that can be achieved is that any proposed measure of CE is logically consistent, and in general accord with the judgements of military, and scientific, experts.

a. **Review measurement of CE.** The 'Intuitive Approach' has been adopted to measure CE for the WGCC Review owing to the time and resource demands of conducting the other techniques. Factors that contribute to CE have been identified and the potential impact of the inclusion of women within the GCC team substantiated through evidence or judgement - conducted by a panel consisting of psychologists, physiologists, and military practitioners. All CE commentators agree that military judgment is central to assessing CE.

36. **Standardised parameters of judgement.** To avoid misinterpretation and misrepresentation of language there is a requirement to ensure the parameters of judgement are stated explicitly. So

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<sup>25</sup> As defined by the WGCC Review Team.

<sup>26</sup> See for example; Philip Hayward *The Measurement of Combat Effectiveness* (Operations Research, Maryland:1965).

<sup>27</sup> *The Measurement of Combat Effectiveness* (Philip Hayward, 1965).

called 'modal' language ('can', 'could', 'might', and 'may') – in the context of judgement – will be avoided where possible. Therefore, the following judgement parameters will apply:

- a. Will.
- b. Likely.
- c. Unlikely.

37. **Factors contributing to CE.**

a. **Method.** Factors contributing to CE have been compiled through a literature review (conducted by the review team), consultation with psychological and physiological experts, and military judgement. CE is relevant at GCC team and organisational (company, squadron, battalion or regimental) levels, both of which will be affected by a different combination of factors. The factors that contribute to CE are manifold and will often be specific to the context of a given operation or circumstance. Factors can be categorised as internal or external. It is assessed through military judgement that most external factors will not be affected by the inclusion of females in GCC teams. However, internal factors are generally those that impact on an individual's combat contribution and will, or are likely to, be affected by the inclusion of females; these are generally, but not exclusively, human factors.

b. **Influence Factors.** At the macro level these human factors can be categorised as physiology, group cohesion, training and leadership. It is assessed that physiology and cohesion are the most likely to be affected by the inclusion of females; with leadership and training potentially providing an opportunity to mitigate any negative effect. Internal and external factors are displayed in Figure 1 and internal human factors broken out in Figure 2. The factors identified are those that are assessed to be most relevant, for most GCC teams and units. The review has applied a methodology that captures objective assessment of quantifiable contributing factors to CE, with military judgement applied to those factors that are non quantifiable. Military and scientific judgement is further applied to synthesise the cumulative impact on CE.



38. **Internal human factors.** Internal human factors can be sub divided as:

Group	Organisation	Individual (Psychological/ Physiological)
Team Confidence		Aggression
Team Commitment	<b>Leadership</b>	Courage
Discipline	Prevailing culture	Health
Motivation	Credibility	Reaction to stress
Courage	Values	Reaction to fear
Credibility	Trust	Mental resilience
Peer pressure	Attitude	Fitness
Sexual relationships	Perceptions	Endurance
Collective experience		Morbidity
Trust	<b>Organisational</b>	Deployability
Morale	Deployability	Onset of fatigue
Values and standards	Critical mass	Reaction to fatigue
Concept of protection	Reputation	Dexterity
Perceptions		Self discipline
Hormonal and cultural influence		Intelligence
		Confidence
		Commitment

Figure 2: Internal human factors in CE

39. **Combat roles.** The combat role of the unit will dictate some of the factors inherent in CE. The GCC role is the most physically demanding and that which requires the individual to be prepared to fight at close quarters. The roles or purposes of the GCC arms are below.

a. **Royal Marines Commandos (RM Cdo).** The purpose of the RM Cdo is to conduct global operations under high threat conditions while facing the severest mental and physical challenges in arduous, uncertain and chaotic circumstances. Operating predominantly from the sea and across the littoral divide, this includes theatre entry operations to achieve decisive effects on the land, whether killing the enemy in close combat, enabling the introduction of other forces or contributing to a range of wider, supporting military activity, per mare per terram.

b. **Armour.** The Royal Armoured Corps (RAC) provides the mounted core of the Army's GCC capability. The RAC is primarily crew-centric; if you lose a crew member then you effectively lose that platform capability. It has 2 distinct main elements – armour and cavalry regiments. Armour crews' primary role is to deliver shock action – the sudden concentrated application of violence, close combat in intimate conjunction with Infantry and aggressive mobile action to destroy enemy armour. Armoured and light cavalry crews will fight for information mounted, or dismounted and, where appropriate, strike the enemy. Their operations are characterised by dispersal, long duration on task and the high risks and benefits of placing lightly armoured vehicles and their crews in critical positions, unsupported and isolated. All of this requires RAC personnel to operate on, from and away from their vehicles in all phases of war.

c. **Infantry.** The Infantry is the dismounted core of the Army's GCC capability. The Infantry's purpose is to outthink, outmanoeuvre, outwit, outfight and outlast determined and skilful adversaries (if necessary by aggressively closing with and destroying them in close combat) across the full spectrum of human, climatic and geographical environments, among populations and alongside allies.

d. **RAF Regiment.** The purpose of the RAF Regiment is to fight on the ground to enable control of the Air. The nature and character of the Complex Air Ground Environment and threat to Air Power requires the rapid and decisive elimination of the threat, often in fleeting engagements, where speed, surprise and violence are critical to success. The RAF

Regiment delivers capability through an air integrated light-force concept where agility, aggression, physical and mental robustness, and a warrior ethos are central to closing with and neutralising the threat. The Air Ground Environment is unique and complex; there is little opportunity to trade time and space, combat is invariably not at the time of the defenders choosing, and imminence of the threat may not allow for non-organic fires to be brought to bear - forcing a reliance on rapid organic direct action/violence.

40. **Explanation of individual factors in CE.** Some of the individual factors in Figure 2 may require further explanation.

- a. **Male-Female Interaction.** High male testosterone levels and the likelihood to produce sexualised behaviour.
- b. **Collective experience.** Shared experience or similar experience in recruit training; collective training with the GCC team in question, or a similar ground combat team. In the case of commanders, completion of the specific courses and qualifications required within that career employment group for promotion to the relevant rank.
- c. **Concept of Protection.** A feeling that some members of the group are more vulnerable than others resulting in detraction from task focus in order to protect them.
- d. **Survivability.** The combined effects of the impact of human and external factors on the likelihood of an individual becoming a casualty during combat.
- e. **Lethality.** In the context of the review, lethality is taken to be an individual's ability to deliver lethal effect.
- f. **Critical mass.** The point at which the inclusion of a minority within a group becomes a norm. When critical mass is achieved, an individual's primary identity is defined by their place in the team, rather than being defined by their attributes (such as gender, ethnicity or religion) that places them in that minority. Failure to achieve critical mass will result in tokenism<sup>28</sup>.

41. **Measuring CE.** Measuring CE is extremely difficult and thus any decision predicated on an assessment of CE is likely to require a significant degree of judgement. In order to assess any impact on CE, the review has sought to identify the factors that contribute to CE; and thereafter to assess the potential impact on CE of the inclusion of women within the GCC team. Factors contributing to CE have been compiled through a literature review, consultation with DSTL and a number of Focus Groups. This was subsequently endorsed by an expert judgement panel consisting of SMEs representing: physiology, psychology, academia and the military.

- a. **Quantitative Factors contributing to combat effectiveness.** There are a myriad of factors that contribute to CE; the judgement panel selected and assessed the 21 factors deemed likely to change if females were incorporated into GCC roles. These factors were derived from academic and scientific literature including human factors. Two were unknown, one factor would be improved by the inclusion of females, seven were assessed to be neutral and eleven were likely to have a negative impact on combat effectiveness. Of these eleven factors, three cannot be mitigated by changes to structures or training: survivability;

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<sup>28</sup> Defined by Rosabeth Ross Canter *Men and Women of the Corporation* (New York: Perseus Books, 1977). Research suggests that minority groups will always be subject to discrimination – even though in many cases it will be subconscious – by the majority group (the research specifically concerns women in male dominated environments). This will result in isolation and in many cases will limit the career progression and probability of advancement of minority group members, and the majority group will subconsciously seek to retain its dominance by preventing the coagulation of the minority. For military specific implications, see Women's Research and Education Institute *The American Woman 1990-1991* (New York: W.W. Norton and Company, 1990), p.185. This research found that 'as long as women constitute small minorities in non-traditional employment contexts, substantial obstacles will remain. The presence of a few token females may do little to alter underlying stereotypes, and the pressure placed on such individuals makes successful performances less likely'. The report then goes on to suggest that the minority must probably hold about 30% of the jobs in such contexts before they can exert real influence and make changes.

morbidity; and deployability. The remaining factors were considered unlikely to have an effect.

b. **Negative effect on CE with mitigation measures.** Eight factors were assessed as having negative impact to CE but able to migrate to a 'neutral-impact' with appropriate mitigation measures. However, the length of time to mitigate these factors is not known and would require further consideration.

c. **Negative effect on CE without mitigation measures.**

(1) **Morbidity.** On recent operations, British female personnel have approximately a 15-20% higher rate of disease non battle injury (DNBI) than their male counterparts. These higher DNBI rates will be further exacerbated by findings from work on survivability, that women may sustain a higher combat casualty rate than males, due to a lower ratio of explosive power in relation to the combat load carried.

(2) **Deployability.** Current Defence statistics tell us that the physiological differences between men and women pre-dispose females to a higher incidence of injury and thus medical downgrading than males by about 10. Thus a female cohort is quantifiably less deployable than a male cohort.

(3) **Survivability & Lethality.** The combat role of the unit will dictate some of the factors inherent in CE. The GCC role is the most physically demanding and that which requires the individual to be prepared to fight at close quarters. Analysis of individual factors has identified that women who are performing to the same physical performance standards as a man, will be working closer to her maximum capacity when carrying the same absolute combat load, and will fatigue sooner than her male counterpart. The relative strength of females, compared to the combat load carried, is likely to result in a distinct cohort with lower survivability in combat. Similar research points to a reduced lethality rate; in that combat marksmanship degrades as a result of fatigue when the combat load increases in proportion to body weight and strength. However, this potential impact could be partially managed and mitigated through maintaining the current training and physical standards.

42. **Summary.** An assessment of the factors that may effect CE have been analysed by a panel of military, physiological, psychological experts. The panel concluded that three factors (morbidity, deployability, and survivability/lethality) are likely to have a negative effect on CE if women were to be allowed to conduct GCC roles. These factors are distinctly difficult to mitigate against and if measures were identified they may require a significant review or alteration of current policy or standards.

Ser	Factor	Effect			Direction of Effect			Objective (O) or Subjective (S)?	Comment/Mitigation
		Unlikely	Likely	Will	Pos	Neutral	Neg		
1.	Task Commitment	X						-Judgement Panel (S)	<u>Comment:</u> Variable and difficult to quantify.
2.	Discipline		X		X	X	X	-Judgement Panel (S)	<u>Comment:</u> Variable and difficult to quantify. A multi-directional effect depending on the strength or weakness of the mitigation methods. <u>Mitigation:</u> Armed Forces Code, Values and Standards, Leadership
3.	Motivation and Group Commitment	X						-Judgement Panel (S)	<u>Comment:</u> Variable and difficult to quantify.
4.	Courage	X						-Judgement Panel (S)	<u>Comment:</u> Variable and difficult to quantify, but anecdotal evidence from operations, including citations for gallantry, suggests that females will have a similar distribution curve to males.
5.	Skill Based Credibility		X					-Judgement Panel (S) -Focus Groups -Internet Poll	<u>Comment:</u> The expert panel considered trust as an important component of this factor. This question seeks to clarify whether an individual is valued for the skills they bring. If an individual is not valued then they will not be utilised to their full potential, and effectiveness degraded. Perception are likely to remain fragile. <u>Mitigation.</u> Cultural change programme, education, and the individual proving their ability in the task.
6.	Peer Support		X		X	X	X	Judgement Panel (S)	<u>Comment.</u> Focus groups produced some evidence that males in groups were more willing to share their feelings with female group members (which could induce emotional labour on the female), which can be good for individual morale and thus contribute to group morale.
7.	Collective Work Experience		X		X			-Literature -Judgement Panel (S)	<u>Comment:</u> Collective work experience will mitigate the effects of diversity in team cohesion.
8.	Collective Social Experience		X		X	X	X		<u>Comment:</u> Collective social experience will mitigate the effects of diversity in team cohesion. The effect will be dependent upon the group and individual to want to include and be included.
9.	Morale		X		X	X	X	-Judgement Panel (S) -Focus groups (S)	Morale will be maintained as long as trust remains (neutral). Should individuals lose trust in each other, morale will suffer (negative).
10.	Male/Female Interaction		X					-Literature -Evidence from Trg (O)	<u>Comment.</u> Individuals act differently when in the company of other individuals to whom they are attracted. Distraction, competition, jealousy were considered predominate factors, during focus groups, by a significant proportion – which detracts focus on the task and

Ser	Factor	Effect			Direction of Effect			Objective (O) or Subjective (S)?	Comment/Mitigation
		Unlikely	Likely	Will	Pos	Neutral	Neg		
									degrades cohesion. <u>Mitigation:</u> Collective training and experience will 'normalise' the presence of women on GCC operations. Whilst challenging, this combined with strong leadership and clear task focus could provide viable mitigation over time.
11.	Concept of Protection		X				ML	-Literature -Judgement Panel(S) -FLOC & FCOC	<u>Comment.</u> Males are biologically predisposed to protect females and it is likely that opponents will seek to target those members of the ground close combat team that they perceive as most vulnerable. Given that many conflicts will occur in regions that have a different concept of the role and position of females in society, it may be that some members of ground close combat teams are more vulnerable than others. <u>Mitigation.</u> Management through training and education.
12.	Survivability / Lethality			X			MU	-Judgement Panel (S) -Modelling (O) -Literature	<u>Comment.</u> Project PAYNE work has identified a correlation between load carriage and explosive power in relation to physiology. Those who are less strong with less explosive power will have a higher probability of becoming casualties. Similarly, an increased load in relation to physiology and fitness is will decrease effectiveness of combat marksmanship and thus lethality.
13.	Deployability			X			MU	-Judgement Panel (S) -Modelling (O) -Literature	<u>Comment.</u> The physiological differences between men and women pre-dispose females to a higher incidence of injury and thus medical downgrading than males. MLD/MND rates in females are 31.2%, excluding pregnancy, compared to 20.7% in males. Thus a female cohort is quantifiably less deployable than a male cohort.
14.	Sexual Relationships		X				ML	-Judgement Panel (S) -Literature	<u>Comment.</u> The potential for sexual relationships is likely to produce complication in relation to cohesion. <u>Mitigation.</u> Values and Standards, Management, Military Discipline.
15.	Controlled Aggression	NK	NK	NK	NK	NK	NK	-Judgement Panel (S) -Literature	<u>Comment.</u> Further evidence would be required to prove this categorically.
16.	Mental Health		X				ML	-Judgement Panel (S) -Literature	<u>Comment.</u> Military women have higher hospital mental health admittance then men. Men and Women cope differently to stressors. <u>Mitigation.</u> Training, support, shared experience and cohesion.
17.	Mental resilience	NK	NK	NK	NK	NK	NK	-Judgement Panel (S) -Literature	<u>Comment.</u> Further evidence would be required to prove this categorically.
18.	Physical			X			ML	-Judgement	<u>Comment.</u> This includes fitness, endurance, and onset of fatigue.

Ser	Factor	Effect			Direction of Effect			Objective (O) or Subjective (S)?	Comment/Mitigation
		Unlikely	Likely	Will	Pos	Neutral	Neg		
	Capability							Panel (S) -Literature	
19.	Morbidity			X				-Judgement Panel (S) -Literature  <b>MU</b>	<u>Comment</u> : British female personnel have about a 15% higher rate of disease non battle injury (DNBI). These higher DNBI rates will be further exacerbated by findings from work on survivability, that women will sustain a higher combat casualty rate than males. <u>Mitigation</u> . There are so many causes of morbidity it is difficult to achieve anything more than limited mitigation. Careful selection i.e. medical standards and screening could be a potential method to reduce morbidity rates to ALARP.
20.	Critical mass v tokenism			X				-Judgement Panel (S) -Literature -RG data and DM(A) projection  <b>ML</b>	<u>Comment</u> . Numbers will be such that critical mass is unlikely to be achieved, resulting in continual gender stereotyping. Women may act in an unnatural way to attempt to fit in – this can cause emotional labour. It is thought that this problem will endure. Assimilation versus integration. <u>Mitigation</u> . Well thought out implementation and Cultural Change programme, talent identification.
21.	Bullying, Harassment and Discrimination		X					-Judgement Panel (S) -Literature  <b>ML</b>	<u>Comment</u> . Linked closely to Critical Mass and considered a likely challenge. <u>Mitigation</u> . Ongoing armed forces bullying, harassment and discrimination directives, policy, and education. Cultural change programmes.

**ML** = Mitigation Likely  
**MU** = Mitigation Unlikely

## A REVIEW OF RECENT LITERATURE ON COHESION

### KEY FINDINGS

- An examination of the recent literature failed to yield any reliable empirical findings that demonstrate the effects of mixed-gender on unit cohesion.
- Newer evidence continues to support the assumption that cohesion is a key determinant of unit performance, though research tends to suggest that performance affects cohesion, rather than the reverse.
- While a shared commitment to a unit's task-related goals (i.e. task cohesion) is important for effective unit performance (i.e. combat effectiveness) interpersonal liking (i.e. social cohesion) is not essential.
- The empirical literature shows that the essential components, required to build cohesion and improve unit performance, are military leadership (i.e. vertical cohesion) and training.
- Literature on the effects of race and gender on unit cohesion provide inconclusive results. But the findings suggested that if there are effects of race or gender composition on unit cohesion, they are likely to be 'weak and fleeting'.

### Issue

1. Building on the findings of the 2010 report, which focused significantly on the effect of gender on small team cohesion, Workstrand 4 sought to review recent research literature on the subject in order to determine whether the findings of the 2010 study remained valid.

### Background

2. **Context.** The basis of the retention of the exclusion in both 2002 and 2010 was the potential impact of gender mixing in small teams in GCC environments. As part of the 2010 study, Cawkhill, Rogers, Knight and Spear (2009) reviewed the literature on the effectiveness of mixed gender teams in a combat environment. They did not identify "any empirical, scientific data that examined the effects of women in GCC teams" so they could not provide sufficient evidence to alter the previous exclusion decision. Despite the inconclusive nature of these findings, it was the view of military judgment that under conditions of high intensity close quarter battle, team cohesion is of such significance that the employment of women in this environment would represent a risk to CE with no gain in terms of CE to offset it. The purpose of this literature review is to update Cawkhill et al.'s (2009) findings.

3. **Overview.** It was found that since the last review on women in GCC, the amount of cohesion research has declined. The findings that have a bearing on women in mixed gender teams may be more likely to emerge from the literature on resilience and social identity. Thus no substantial evidence has been identified to challenge the findings of the 2002 or 2010 studies and their findings remain valid.

4. **Function of unit cohesion.** Cohesion is reliably associated with performance: including CE. It has an effect on group performance, rather than individual performance and also has a positive effect on job satisfaction, retention, well-being and discipline. Cohesion has an important buffering

effect on unit stress whereby the negative relationship between stressful conditions and performance will be less where there is high cohesion.

5. **Relationship between cohesion and CE.** Newer evidence continues to support the assumption that cohesion is a key determinant of unit performance, but the causation partly goes from performance to cohesion, rather than the reverse. There is strong evidence to support a distinction between task and social cohesion. While a shared commitment to the unit's task-related goals (i.e. task cohesion) is important for effective unit performance (i.e. CE), interpersonal liking (i.e. social cohesion) is not essential. The empirical literature shows that the essential components, required to build cohesion and improve unit performance, are military leadership (i.e. vertical cohesion) and training.
6. **Heterogeneity and unit cohesion.** Literature on the effects of gender on unit cohesion is inconclusive. If there are effects they are likely to be "weak and fleeting". There is some evidence that the gender has a more detrimental effect on performance when there is a more unbalanced team (i.e. a large majority and small minority), but it is unlikely to have a big practical significance.
7. **Sexual harassment.** Sexual harassment more commonly affects women in the military rather than men. Junior ranking soldiers are at most risk and women are more likely to be offended by sexualised behaviour than men. Targeted sexualised behaviour that service personnel found upsetting is likely to have a negative impact on team cohesion and operational effectiveness.
8. **Stress and social support.** Stressors may not be specific to women in GCC roles, but any additional stressors that place an extra burden on women may reduce CE. To mitigate the negative effects of stressors people need support, but both the ways that many stressors are perceived and support pathways differ for males and females.
9. **Social identity.** When group members share a mental image of group members who display attributes of the group prototype, group members have positive feelings towards them and are cohesive. Gender is an obvious self-identity attribute and if group members only perceive the group prototype of a combat unit as embodying "male", rather than "male or female", the introduction of females may reduce the level of cohesion.
10. **Gender and safety culture.** There is a clear link between gender and safety culture. When women work in male dominated jobs, where behaviours normally associated with toughness and strength are generally preferred, women may need to act like men to fit in, rather than having their different needs and capabilities recognised. The attitudes towards women at all levels within an organization will have an impact on safety.
11. **Women in the front line.** There are many examples of women integrating successfully into front line teams. They become part of a cohesive team because they are respected for their professional skills. But they do not have the same skill sets as men. There is undoubtedly a critical role in the front line for women, but there is no unique contribution that women bring to ground close combat: in this physical job, men are typically more capable.
12. **Summary.** Current literature does not tend to identify gender as a significant factor in team cohesion. Where there are effects, they are likely to be "weak and fleeting", and can be overcome through collective training, shared experience and strong leadership. Literature topics that warrant further examination include: trust, consensual romantic relationships at work, male reactions to injured women, aggression and fear, jealousy and favouritism, intimacy, and building mixed gender team cohesion.



## IMPLEMENTATION PLANNING PROPOSAL

1. **General.** The Service Boards recommendation was to conduct pre-emptive implementation planning, in order to maintain momentum in the instance that the exclusion might be rescinded following a decision in mid-2016.
2. **Tri-Service policy principles.** Based on the findings of the 2014 review and the experiences of other nations, the following principles should be applied to implementation:
  - a. CE must not be undermined or prejudiced by lowering operationally necessary standards.
  - b. Implementation is a command led activity and takes time to accomplish; short cuts are not beneficial.
  - c. A fundamental review of the physical requirements for each role, linked to the operational requirement, is essential. Physical employment standards must be gender free.
  - d. Cultural change is required; any programme should include measures to ensure that Armed Forces structures and procedures do not limit female opportunities and prevent sexual harassment and assault. The Defence Diversity and Inclusion Programme could include a cultural change strategy. Programmes need to start in training establishments to set the conditions for successful future service.
  - e. Phased implementation (internal transfer first then direct recruiting) enables a chain of command to be established early in process; this will assist integration.
  - f. Specific training, nutrition, equipment and healthcare will be required.
  - g. Training and accommodation should be integrated for greater cohesion, once associated risks are mitigated and managed, and implemented where appropriate in a carefully controlled de-risked manner.
  - h. A rigorous communication strategy, internal narratives and a marketing campaign is required.
  - i. Trailblazers must be managed carefully.
3. **Terms of Reference.** The tri-Service policy principles lead to cross Defence Line of Development (DLod) implementation requirements that will need to be addressed. Implementation planning will:
  - a. Review current employment policies and recommend areas for further development.
  - b. Monitor other nations' implementation, specifically the Australia implementation programme, the US Army Soldier 2020 project and US Marine Corps trials, to identify whether the inclusion of women in GCC teams impacts (positive and negative) on CE.
  - c. Quantify the physical employment standards required for GCC.
  - d. Validate training standards and modify training plans where necessary, in light of the work to generate physical employment standards.
  - e. Contribute to a cultural change programme in conjunction with extant tri-Service plans.

- f. Produce a plan to manage trailblazers.
- g. Make recommendations for equipment changes.
- h. Recommend infrastructure changes as required.
- i. Identify organisational changes required.
- j. Conduct Human Factors Integration analysis.
- k. Plan to monitor integration.
- l. Conduct a cross DLOD cost benefit analysis.

4. **Reporting.** The implementation planning team will report prior to the decision point in mid 2016. The current review team anticipates therefore, that – subject to the nature of the decision – the first women might start training for GCC roles in late 2018.

## Background

5. **Training.** As part of the 2014 review training standards were reviewed for all centralised and distributed training courses run for the combat elements of the Armed Forces<sup>29</sup>, including the Household Cavalry and Royal Armoured Corps (HCav & RAC) and Infantry and with direct input from the Royal Marines General Service (RMGS) and RAF Regiment. It was found that the vast majority of training standards comply with the Defence Systems Approach to Training (DSAT) and are deemed to be related to the combat roles outlined in Operational Performance Statements. In the timeframe available, a scientific validation of functional physical employment standards and their relation to female physiology was not conducted. This work will be conducted as part of a subsequent programme of physiological research to inform a decision in mid-2016. As a principle, physical standards must be gender free. The US Soldier 2020 programme is currently validating US Army occupational physical standards for each military occupational speciality. Whilst there is likely to be some read-across to UK military Career Employment Groups (CEGs), the UK will still need to validate its own physical standards against the serving population to ensure that they are relevant and legally defensible.

6. **Equipment.** A study of the experiences of other nations has suggested that ergonomically designed gender specific equipment has had a significant effect in reducing the physical impact of dismounted weight carriage on the female form. This has not hitherto been necessary for the UK Armed Forces because roles currently open to females have not exposed them to the level or intensity of dismounted movement and manoeuvre expected of the infantry. A pan-Defence Human Factors Integration (HFI) study with tri-Service input will be required to consider gender-specific alterations to PLCE and body armour.

7. **Personnel.** Further analysis will be required in a number of areas:

- a. **Career Progression.** Based on predicted female inflow and outflow<sup>30</sup>, generate an understanding of the projected career progression of a female cohort through the various currently excluded cap badges. This should include an assessment of female suitability for all areas of employment within each Service and cap badge, and the probability of female success at Section Commanders' Battle Course (SCBC), Platoon Sergeants' Battle Course (PSBC) and Platoon Commanders' Battle Course (PCBC) and the RM and RAF Regt equivalents. An understanding of the availability of viable alternative pathways will be critical to ensure females in GCC units are provided with the prospect of a full and rewarding

<sup>29</sup> Including Phase 1, 2 and 3 training across all establishments where individuals are trained for GCC roles and units.

<sup>30</sup> Based on statistical modelling, it is predicted that 24 years after lifting the exclusion there would be 156 females across the RAC and 64 in the Infantry. Whilst based on the Army model the issue is deemed comparable for the RAF Regiment and potentially smaller numbers for the RM based on the greater physical demands of the Corps.

career.<sup>31</sup> In the Army, there are other courses that allow promotion within the Infantry/RAC such as storeman, signaller and mortar operator. However in the RM and RAF Regiment there is only one pathway which is physically very demanding.

b. **Recruiting.** Initial surveys have suggested that the opening of GCC roles to women could positively impact female recruiting across the Armed Forces (+7%), though some parents may be less inclined to encourage their children to join (-11%). A more detailed study will be required to expose the net effect on recruiting of incorporating women into all roles. Recruiting strategy must be adapted to expose the greater employment opportunities within the organisation.

c. **Liability.** Given the projected higher injury and medical discharge rates for females, set against likely population numbers, further analysis will be required to consider the level of additional liability that may be required to mitigate reduced deployability and increased Premature Voluntary Release (PVR) figures.<sup>32</sup> Identify the extent to which negative trends may be mitigated as a result of the findings of the physiological research programme and revalidated physical employment standards.

8. **Information and Intelligence.** An essential part of mitigating risk will be to accurately track and record information about females serving in GCC roles during and after their careers. This research will require the necessary Ministry of Defence Research Ethics Committees (MODREC) permissions and appropriate resource and sponsorship. Information on the implementation experiences of other nations will assist with our own implementation studies. Some are summarised below.

9. **Implementation Headlines from Other Nations.** Phased implementation is deemed good practice, although timescales have varied; the start state is usually in-Service transfers. Selection and training standards are overwhelmingly gender-free with many countries validating physical standards to ensure they are based on the requirement of combat roles. Gender free standards maintain CE and reduce backlash from male soldiers.

10. **Doctrine and Concepts.** Based on an assessment of the future role of the Armed Forces in an FCOC/FLOC environment, consider the optimal means of employing females in GCC roles across the spectrum of conflict and develop doctrine to codify an optimal employment model. Assumptions should be tested against a Development, Concepts and Doctrine Centre (DCDC) model of future employment.

11. **Organisation.** As predominantly male organisations with small numbers of female attached ranks, the incorporation of females into most GCC units will require a substantial cultural shift. Phased implementation, education and strong leadership will be critical in mitigating the negative effects of potential change. Based on the work articulated in para 4, more work will be required to:

a. **Implementation.** Develop a viable, phased implementation timeline – linked to a cultural change programme (education and normalisation) and a practical change programme (infrastructure alterations, equipment programme and liability changes), to mitigate any negative impact on CE and maximise the employment opportunities for successful female applicants.

b. **Education.** Develop a communication strategy to inform and educate the GCC community throughout the implementation process in order to build consent and minimise the impact of change. A wider external marketing campaign will be necessary to dispel any myths and rumours and advertise the wider employment opportunities.

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<sup>31</sup> The physical demands of SCBC, PSBC and PCBC, for instance, substantially exceed those of basic Army Infantry training and thus may present a barrier to down-stream female career progression.

<sup>32</sup> Average Length of Service (LoS) amongst female Army Officers 2009 – 2013 was 11.1 years vice 18.2 years for males; and for female soldiers over the same period 9.9 years vice 11.3 years for males, (*Defence Statistics (Army)*).

c. **Governance.** Ensure that the assignment of females occurs incrementally. Where possible a female chain of command should be in place first to provide a support network for junior female soldiers and offer advice to the unit's male leadership. After a period of in service transfers; officers followed by Non Commissioned Officers, the implementation should then open to direct entry officers and eventually be followed by female recruits.

d. **Cohesion.** Understand the effect of physiology on cohesion. The impact on cohesion and the subsequent effect on CE have been central to the WGCC debate and were the basis upon which the exclusion was retained both in 2002 and 2010. Whilst CE is inherently difficult to define and there is a paucity of data to establish a clear link between cohesion and gender in the GCC environment, the 2014 review identified a potential risk against CE and cohesion generated by the physiological differences between men and women. This warrants further investigation.

12. **Infrastructure – ‘All of One Company’.** Initial assessment by both D Combat and Commando Training Centre Royal Marines (CTCRM) along with the experiences of several other nations suggests that – in the combat arms – small team cohesion is so vital to CE that no segregation of males from females can be tolerated. It will be necessary to study the practical implications of this approach in terms of accommodation and facilities in training establishments and GCC units, assess the associated risks versus the potential benefits and make recommendations.

13. **Estimation of costs.** It is inherently difficult to estimate the sunk and through-life costs of incorporating women into some or all of the combat arms when so many of the parameters are unknown. To accurately estimate cost and produce a viable business case for change, a subsequent implementation plan will be required to clarify some basic criteria:

a. Validate current estimates of the numbers of women likely to attempt, pass or injure during training for currently excluded roles.

b. Validate the model of male/female integration in training and at Regimental Duty (RD).

c. Validate current predictions of the career progression, deployability, Premature Voluntary Release (PVR) and medical discharge rates of a female GCC cohort.

d. Conduct cost profiling based on projected implementation timeline.

14. **Areas requiring cost analysis.** Based on current assumptions, it is assessed that costs fall broadly into the following areas:

a. **Manpower.** Some liability increases are likely; both in training establishments and at RD to ensure that female support or pastoral care is available to women that wish to join GCC units. Associated costs might be neutral as compensating reductions may be found elsewhere. Given the projected higher injury and medical discharge rate for females, additional liability may be required to compensate for reduced deployability and increased PVR statistics. Further work to quantify these figures and forecast the associated cost is required. Other liability costs may include additional medical staff at both training establishments and RD and the establishment of Rehabilitation Instructors (RIs) within each GCC unit.

b. **Equipment.** More detailed analysis is required to cost the HFI study described in para 6 as well as any subsequent gender-specific alterations to PLCE and body armour.

c. **Training.** To mitigate training injury risk, it may be reasonable and proportionate to provide all women, and some men, with a pre-conditioning course in order to reduce the risk of injury. The Army Recruiting and Training Division (ARTD) have costed an indicative 8-

week tri-Service pre-conditioning course to be run for 300 pax (250 male and 50 female) per annum at Infantry Training Centre (ITC) Catterick at circa **£1m**.<sup>33</sup>

d. **Infrastructure.** The Army Recruiting and Training Division have estimated infrastructure costs that may be attributed against ITC Catterick to facilitate the inclusion of women in infantry training at **up to £1.6m**, depending on numbers and the model of male/female integration adopted.<sup>34</sup> The Royal Marines (RM) have done similar work, but extended it to include infrastructure alterations that may be necessary across all RM establishments – this has produced a similarly broad cost range of **up to £17.79m over 10 years**.<sup>35</sup> More detailed analysis is required to define the parameters of integration more clearly and provide a more comprehensive costing.

e. **Medical pre-screening and through-life screening.** Physical pre-screening of all GCC candidates (male and female) to identify pre-disposition to musculoskeletal injury will reduce training wastage and reduce the likelihood of downstream personal injury and breach of statutory duty claims. Through-life and post-partum physiological testing will be necessary to monitor female bone and MSK health throughout the course of a DCC career. Costs have yet to be estimated.

f. **Other costs.** Additional likely costs will need to be more clearly defined and examined and may include:

- (1) Provision of enhanced nutritional support (one of the key determinants in bone health) to the DCC community, potentially via the establishment of Unit nutritionists.
- (2) Estimated cost of personal injury claims and breach of statutory duty claims from the female DCC cohort, and the extent to which this may be mitigated by the measures described above and the outcome of the physiological research programme.
- (3) Development of a recruiting strategy and associated marketing campaign to recruit women into currently excluded role.

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<sup>33</sup> Cost modelling conducted by ARTD Business Support Team. Key assumptions: Wastage rates will occur through the entire course of the training pipeline so have not been costed; clothing costs have not been included (it is assumed that uniforms would be taken into phase 1 trg); accom and catering will be provided through the existing Multi Activity Contract – it is not expected that the proposed increase to throughput will trigger a cost increase; existing accommodation will be sufficient.

<sup>34</sup> D Combat, ARTD and the Commando Training Centre Royal Marines (CTCRM) have independently advocated an 'all of one company' approach to training (i.e. full integration of accommodation and ablutions), on the premise that cohesion is so central to the infantry role that no segregation between males and females can be tolerated. Within those parameters, they then costed two distinct models – one that saw 2% of the Untrained Strength (UTS) being female, and the other 5%. The fully integrated 2% model attracted minimal infra costs of a few thousand pounds (modesty curtains in showers, additional doors in accom blocks, etc). The segregated 5% model required the construction of new accommodation attracted a cost of £1.6m.

<sup>35</sup> Broken down as £1.19m RDEL over 10 years and £16.7m CDEL over 10 years. As with the Army costing, the level of cost will depend on the degree of male/female integration adopted.