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# AN INVESTIMENT IN CAPABILITY: THE CANADIAN FORCES PHYSICAL FITNESS PROGRAM NEEDS REPAIR

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# ABSTRACT

Physical fitness in the Canadian Forces (CF) has been the subject of many studies over the past thirty years. There have been numerous reviews in a sincere attempt to resolve the complex issue of establishing a fitness regime that meets the "one size fits all" solution. Regrettable, the efforts to date have not been successful in establishing a program that is in concert with the operational tempo that the CF has found itself over the past decade. This has caused continued pressure to the men and women of the CF. This research paper examines the historical importance of fitness within the military and how the overall fitness level within the CF has slowly degraded which has impacted it ability to perform both in Canada and abroad. Generally fitness levels continue to gradually diminish which has, and will continue to, strain the CF's ability to effectively conduct its daily business unless corrective action is taken. Though there has been a solid proposal to implement a more robust fitness program, it has yet to be put into practice. Additionally, there is a lack of linkages between current policies relating to imposing the current fitness regime and the consequences of not meeting these standards. To aggravate this situation, the existing physical fitness program and its related criterion are not vigorous enough causing overall fitness within the CF to decline. From a medical perspective, there are ample indicators that could be implemented to prevent a decline in general health of the CF and consequently improve overall productively in an already over extended military. The author argues that a move to a more hearty physical fitness program for the CF with preventative measures must occur in the near future. A greater connection of the CF fitness program to existing procedures associated with career prospects in conjunction with a positive based incentive program must take place. This new proposed solution would assist in identifying potential medical problems at the onset, and it would commence to reverse the current trend of an unfit military force. Key for this proposal to be successful is the leadership within the military must embrace this change in order to reverse the direction that the CF is presently moving towards. Anything short of a thorough commitment to a more vigorous military fitness program will degrade the Canada's military's capability to delivery its mandate to the people of Canada.

# CHAPTER 1

## INTRODUCTION

*"In operational theatres, people who are physically unable to do their jobs are a hazard not only to themselves but others…."*[1]

Physical fitness, an essential component to operational effectiveness in the Canadian Forces (CF), has been the subject of many studies during the past thirty years. While most members of the military agree on the basic tenant to be physically fit in the performance of their duties, there are many ways that this goal can be achieved. History has shown that physical fitness has played a part in the outcome of some very famous historical battles.

Perhaps one of the more famous historical occurrences took place at the end of the battle of Marathon on 9 September 490 BC. The ancient Greeks had just defeated a much larger army of the Persian Empire. According to the Greek historian Herodotus, a messenger named Phidippides, who fought on that day, carried news of the victory to Athens across the plains of Marathon, a distance of about twenty-six miles and then collapsed and died of exhaustion after delivering his message. His message warned the Athenian soldiers that the Persian fleet had set sail to attack Athens. Upon arrival, the Persians saw the Athenian soldiers ready to defend their city. The Persians turned and sailed home to Persia in defeat. Thus, the Battle of Marathon marked the end of a ten-year conflict between Greece and Persia. It distinguished the first time the Greeks had beaten the Persians on their own element, the land. The distance of the modern marathon

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[1] R. Kennedy, "Physical Fitness Training", *Dispatches,* Vol 6 (1 May 1999): 3.

foot race is based on this legend.[2] In a more modern Canadian context, in a recent telephone conversation with Lieutenant-Colonel D. McLeod (retired), a World War II veteran cited many examples of how fitness played an important role in his wartime service from 1941- 45. During this time frame, he served as the commanding officer for the armored training squadron in the UK and later commanded an armoured regiment in Europe. His instruction was demanding and challenging and it required physical toughness to successfully complete the training as the Canadian Armoured Corps prepared for war. While on the battlefield he was able to determine which soldier would be successful and which would not based on their fitness level, their ability to deal with stressful situations, and ability to take charge. He was later seconded to the Royal Military College of Canada (RMC) to establish a comprehensive and successful athletics department.[3]

In modern warfare mechanized transport is often utilized to get soldiers to the area of operation. However, the British experience in the Falklands supports the view that soldiers cannot depend on the availability or worthiness of transport equipment in operational theatres. In extremely inclement weather and over very difficult terrain, British soldiers were required to march as far as 60 km on foot carrying full combat loads

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[2] E.D. Hirsch, *The New Dictionary of Cultural Literacy*, (Boston: Houghton Mifflin Company, 2002), 647.

LCol D. McLeod (retired) elephone interview with author, 21 March 2005. LCol D McLeod commanded the Lord Strathcona Horse (Royal Canadians) on the battlefields of from 1943-45. He ran a very successful athletic campaign at RMC that consistently saw the top third of academic class consisting of members of the varsity athletics teams over his ten years at the college (1960-70). In a survey conducted during this time, 85 percent of the cadets stated that the athletics program at RMC best prepared them for their leadership roles in later military life. During this time he trained such individuals General de Chastelain, who later became the Chief of the Defence Staff, and Lieutenant General Sutherland, who commanded the Canadian Air Force. His philosophy was that you needed to be blooded on the sports field in order to survive on the battlefield. He was also the first Canadian to graduate from Sandhurst as first in his class.

of up to 60 kg and they were expected to arrive fit to fight on the same day. British commanders have described physical fitness and esprit de corps as their "secret weapon" in that conflict.[4] To refer to a more recent military operation, the CF has been involved in the war against terrorism in Afghanistan in OPERATION APOLLO in 2002, where patrols were conducted looking for Al Qaeda and Taliban forces. Soldiers were carrying seventy-pound rucksacks in addition to individual protective equipment which weighs in excess of forty-five pounds in rigorous mountainous terrain for up to a week at a time. A key part to the success of these operations required that the soldiers were fit.

In *Generalship: Its Diseases and Their Cures*, J.F.C. Fuller's book states that there are three pillars to generalship - courage, creative intelligence and physical fitness. He maintained that the commander must be fit and in good health. If the commander is not, his mental ability will slip and his courage and determination will drain away. He goes on to summarize that fitness is invaluable as it allows the mind to remain fresh and clear.[5] Fuller quotes Baron von der Goltz who links the importance of physical fitness and intellect: "Good health and a robust constitution are invaluable to a leader. In sick, the body and the mind cannot possibly remain fresh and clear. It is stunted by the selfish body from the great things to which it should be entirely devoted."[6] Fuller further argues

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George Russell, "Final Act of a Bitter Tragedy," *Time Magazine*, 14 June, 1982, 40.

.F.C. Fuller, *Generalship: Its Diseases and their Cure*, (Harrisburg, PA: Military Service Publishing Company, 1936), 35. Major General Fuller served in the British Army. He saw service during the Boar War in South Africa. During the First World War he was a staff officer in France and in 1916 he became chief staff of the British Tank Corps, and it was he who planned the Cambrai offensive, which took place in 1917 that involved 381 tanks. He became a prominent British theorist who emerged after the war and wrote extensively on the art of war.

[6] Ibid., 34-35. Baron von der Goltz reached the rank of Lt General in the German Army and was involved with the invasion of Belgium and became its governor in 1914. In March 1915, Goltz served as

that physical fitness, health, vigour, and energy are essential assets for a leader.[7] General George S. Patton, Jr. links physical fitness and courage when he states simply: "Fatigue makes cowards of us all."[8] Finally from a historical perspective, General Matthew B. Ridgeway makes a clear point about the importance of physical fitness:

> My own earlier physical training…paid off in battle- first as a division, then as a corps, and finally, as an army commander…And remember this, since no one can predict today when you may be thrown into combat, perhaps within hours of deplaning in an overseas theatre- as happened in Korea, and as I no doubt to many in Vietnam- you will have no time to get in shape. You must be in shape all the time.[9]

In a recent article in the *Ottawa Citizen*, General Henault, the recently former Chief of the Defence Staff (CDS) stated: "Physical fitness is absolutely crucial to our ability to do our job. And the kinds of things our people do are often very team-oriented. However, they all represent things that we find crucial, such as leadership, dedication, and the kind of motivation that comes with being physically fit."[10] He also provided guidance to Commanding Officers stating that low physical fitness in conjunction with a variety of other factors will increase the possibility of stress related issues.[11] As well,

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commander of the Bosporous Army in Turkey. In October 1915, Goltz was given the command of the Sixth Army on the Mesopotamian Front.

[7] Ibid., 70.

[8] FM 22-100, Chapter 2, available from www.adtdl.army.mil/cgi-bin/atdl.dll/fm/22-100/ch2.htm; Internet; accessed 14 December 2004.

[9] Matthew B.Ridgeway, "Leadership," in Taylors, Robert L. and Rosenback, Williams E., eds *Military Leadership in the Pursuit of Excellence*, 7-35. (Boulder, CO: Westview Press, 1984), 28.

[10] C. Kristal-Schroader, "Military Honours Unsung Heros," *The Ottawa Citizen,* 17 October 2004, B.4.

Department of National Defence, Backgrounder, *CDS Guidance to Commanding Officers* Chapter 14 - Stress Management, http://www.forces.gc.ca/health/information/health_promotion/Engraph/StressManagement_e.asp Internet

poor physical fitness can serve as an inhibitor to assist in the aspect of dealing with stress management. In James E. Loehr book, *The New Toughness Training for Sports*, his premise is that the fitter one becomes, the greater one's capacity for energy expenditure and for accepting and dealing with stress. As an athlete, the fitter one may be, the greater one's ability to deal with the situation when exposed to physical stress. Being fit allows an individual to have more energy to fight mental and emotional battles. Becoming physically stronger and more responsive to one's surroundings deepens one's belief in oneself. Individuals are able to go the distance and intolerance for surrender is high.[12] This is extremely helpful in mentally stressful conditions where individuals may believe that they can turn a bad situation around and handle anything an opponent is prepared to project in their direction. Therefore greater exposure to a robust fitness program will inhibit mental and physical stressful situations. This type of program has many practical applications within the CF as members are continuously exposed to greater stressful situations at an increasing rate as the operational tempo within the military increases. Physical activity is a means by which stress can be reduced. To further emphasize the issue, stress is playing an increasingly important role in workplace illness and sick days. In a publication by the Vanier Institute of the Family, *From the Kitchen Table to the Boardroom Table,* it estimates that employees' stress-related disorders cost Canadian

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accessed 12 December 2004. Individual stress resistance can be improved by minimising the pre-deposing vulnerabilities. Low physical fitness, smoking, excessive alcohol use, illness, personal family instability, inadequate training, insufficient unit support, lack of unit cohesion, unreliable or substandard equipment and poor leadership will increase the possibility of stress related problems. COs should also be aware that under sustained stress, regardless of the optimization of all disposing vulnerabilities, people would eventually show reduced adaptability.

[12] James. E. Loehr, *The New Toughness Training for Sports* (Middlesex, England: Penguin Books Ltd, 1995), 140.

businesses an estimated $12 billion per year.[13] This amount is slightly more than the defence budget for 2004/05.

According to the US National Library of Medicine, National Institute of Health, physical exercise in conjunction with proper eating habits will have a very positive impact for those that may be susceptible to any form of mental illness such as stress.[14] A lack of physical fitness could in turn have a negative impact on the ability to conduct simple day-to-day operations in the CF. Furthermore, this deficiency could affect the requirement for an already stretched system as CF personnel deploy within Canada and throughout the world. In light of the turmoil resulting from internal and regional conflicts, there is an ever-increasing likelihood of CF members to serve outside of Canada. Therefore, the requirement for each member of the CF to maintain a high degree of physical fitness is no longer a luxury but a must, if we wish to prepare our personnel to be capable to sustain operations either nationally or internationally.[15] Canada's recently approved National Security Policy (NSP) in April 2004, clearly focuses on three national security interests that relate directly to tasks assigned to the CF. These interests are: protecting Canada and Canadians at home and abroad, ensuring Canada is not a base for

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[13] Clarence Lochhead, *From the Kitchen Table to the Boardroom Table:* The Canadian Family and the Work Place (Ottawa**:** *The Vanier Institute of the Family,* 1998), 21.

[14] American Academy of Family Physicians. "Mental Health: Keeping Your Emotional Health." http://www.nlm.nih.gov/medlineplus/posttraumaticstressdisorder.html; Internet; accessed; 12 December 2004.

[15] More than 1,600 Canadian soldiers, sailors and Air Force personnel are deployed overseas on operational missions. On any given day, about 8,000 Canadian Forces members - one third of our deployable force - are preparing for, engaged in or returning from an overseas mission. Since 1947, the CF has completed 72 international operations. That figure does not include current operations, or the many CF operations carried out in Canada.

threats to our allies, and contributing to international security.[16] Each of these considerations could require CF personnel to deploy in domestic operations or overseas, and consequently, the requirement to be fit to deploy is a relevant factor.

Associated with the NSP, the 1994 White Paper directed that the CF must maintain combat capable forces that are able to meet its obligations.[17] Maintaining combat capable forces is essential in ensuring that Canada has a legitimate voice on the international stage, is able to make a respectable contribution to international security, can deploy fit Canadian service men and women, and has the respect and credibility to work with the opportunity to influence allies at crucial points.[18] This is consistent with the 1999 cornerstone document for the CF entitled *Strategy 2020*. This document incorporates lessons learnt from a wide range of initiatives and studies. Developing this strategic assessment is based on the embodied principles from the *White Paper* and therefore *Strategy 2020* states a directive that there should be a, " Focus on global deployability with allies and rapid response while accepting that sustainment for long deployments which will require support from the Reserves, host-nation support and contractors."[19] One of the key corporate priorities for Defence 2004-2005 in *Strategy*

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Canada, Privy Council Office, *Securing an Open Society: Canada's National Security Policy* (Ottawa: Privy Council Office, 2004), vii.

[17] Department of National Defence, *1994 Defence White Paper* (Ottawa: Canada Communications Group, 1994), 2. The White Paper of 1994 clearly sates that the CF must be able to provide for the defence of Canada and Canadian sovereignty, defence of North America, and contribute to international security.

[18] Ibid.,14.

[19] Canada, Department of National Defence, *Shaping the Future for Canadian Forces: A Strategy for 2020* (Ottawa: CDS Documents and Presentations, June 1999), 6. At its core, the strategy is to position the force structure of the CF to provide Canada with modern, task-tailored, and globally deployable combat-capable forces that can respond quickly to crises at home and abroad, in joint or combined operations. The force structure must be viable, achievable and affordable.

*2020* is to "develop and support a professional, effective and sustainable Defence Team."[20] This includes the promotion of "wellness and health."[21] Ultimately the CF must train for its most difficult mission so she is prepared to be successful. Whether it is peace keeping or humanitarian operations to middle to high intensity conflicts, she must be fit to fight and survive. What is certain is that no training, no matter how good, can prepare a anyone for the reality of battle. The most that can be done is to instill basic responses, physical conditioning, and mental toughness. History has shown that physical conditioning can assist to achieve success on the battlefield.

In the fall of 2000, the Centre for Military and Strategic Studies at the University of Calgary prepared an overarching review of how the CF and security policy should evolve over the next half decade. This report produced 27 recommendations. One of these recommendations assessed the health and safety of military personnel. The findings illustrate that CF personnel have been sorely tested. Such issues as Gulf War syndrome, post traumatic stress syndrome, family difficulties, fatigue and exhaustion, poverty, the deterioration of training, and the recruitment crisis meant that the CF have been stretched to the limit of what they can accept and manage.[22] This has attributed to excessive stress and consequently in many cases poor health. One of the key remedies to

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[20] Ibid.,7.

[21] Ibid., 8

[22] Jim Ferguson, *To Secure a Nation: The Case for the New Defence White Paper* (Calgary: University of Calgary, 2002), 17.

dealing with stress is both good mental and physical fitness.[23] It is the aspect of physical fitness of the CF that will be the focus of this paper.

Therefore, in support of maintaining a fit military force, how does the CF sustain its fitness level to meet its national and international mandate? The CF current employs the EXercise PREScription or CF EXPRES system to assess the basic fitness of CF personnel. The subject of this paper is to examine the manner in which the current CF EXPRES test is being administered to its members in order to maintain fitness levels to meet both day-to-day and operational requirements. The intent is to look at this issue from a CF- wide perspective and not to propose changes specifically to the Army, Navy or Air Force. Currently, the CF EXPRES test focuses on passing a test rather than maintaining a fitness level that is required to meet immediate operational requirements.

The aim of this paper is to demonstrate the deficiency of the current system and to propose changes in order to resolve these shortcomings. To achieve this aim, an examination of the current system will be discussed to show how the CF has arrived at the current state that it finds itself with regard to physical fitness. It will examine the fitness level of those that have applied to join the military and for those members within the CF. This will involve a historical review and clearly demonstrate that the current fitness evaluation is not meeting its goals.

The testing method will be examined in conjunction with an assessment of the effectiveness and rationale of the physiological evaluation of the test. The overall process will then be assessed to determine if the current testing procedure is appropriate in order to achieve the aim of maintaining an acceptable level of fitness within the CF.

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[23] Julian Ford, http://www.ncptsd.org/facts/veterans/fs_managing_stress.html; Internet; accessed 13 December 2004.

This will involve the review of various NATO and non-NATO countries and take lessons learnt from their current systems as well as assessing the relevance of fitness within the construct of the "revolution in military affairs."[24]

Leadership responsibilities will also be reviewed and the role that they must play for a successful physical fitness program. Finally, based on the information presented, recommendations will be made to improve the current system.

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Elinor Sloan, *The Revolution in Military Affairs: Implications for Canada and NATO* (McGill-Queen's University Press, Montreal & Kingston, 2002), 3. This work refers to a major change in the nature of warfare brought out about by the innovative application of technologies which combined with dramatic changes in military doctrine and the operational and organizational concepts, fundamentally alters the character and conduct of military operations. This will be discussed in more detail later in this paper.

# CHAPTER 2

## BACKGROUND

The CF defines fitness as "the physical ability and energy to accomplish assigned tasks, to meet unforeseen emergencies with vigour and alertness, to have the ability to effectively withstand stress, and persevere under difficult operational circumstances."[25] Prior to 1972, a common physical fitness test for the CF had been developed which included muscular strength, endurance, and agility components of physical fitness. This program was discontinued shortly after its implementation because it was found that extreme stress was placed on simply passing the test with little to no emphasis on development and maintaining a constant level of fitness.[26] It was followed by a test, which allowed the individual to chose between the one and one half mile, a two-mile walk, or a 750-yard swimming test. The 1.5 mile test was, in any event, an unrealistic evaluation of general fitness since the minimum standard of performance could be achieved by individuals who were essentially sedentary but would spend a few weeks each year preparing for the run or even worse, not prepare at all. Further it provided little real indication of the soldier's ability or inability to meet occupational requirements in the field. However, as a result of problems directly related to the run, the CF Surgeon General concluded that this method of fitness assessment carried an unacceptable level of risk for participants aged thirty years and over, and all fitness testing ceased in September

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[25] Steve Lee, "Physical Fitness and Performance Standards for the Canadian Army," *Canadian Defense Quarterly*, April 1990, 32.

[26] Ibid., 32.

1980.[27] Based on a report conducted by Defence and Civil Institute of Environmental Medicine (DCIEM) in 1981, it reported that a great majority of CF personnel are unfit and a significant percentage are also reported to be obese.[28] That in itself emphasized the necessity to establish realistic minimum performance standards for members of the CF, standards which are task-specific and which can be tested effectively and objectively.

Therefore, in 1985 the CF briefed a Human Rights Commission (HRC) team on the process of the development of the model for the Minimum Physical Fitness Standard (MPFS) and received approval in principle. The model was later formalized and published as the CF method for the development of physical fitness standards.[29] After the HRC team gave their approval, the CF MPFS program underwent further intensive research and development during the next few years. The following five steps were used in the development of the CF MPFS:

a. identification of the most physically demanding common tasks related to the operational requirements of the CF;
b. identification of physical capabilities required to successfully complete the selected work tasks, and development and\or selection of appropriate laboratory tests which predict the capability to complete these tasks;

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Ibid, 32. There were numerous cases where those tested suffered either heart attacks, or less serious injuries.

Department of Defence, *Physical Fitness in the Canadian Forces - An Appraisal* (Toronto: Defence and Civil Institute of Environmental Medicine (DCIEM Report No. 81-R-35, 1981), 6.

[29] P.Chahal, S.W. Lee, M. Oseen, M. Singh, and G. Wheeler, "Physical Performance and Work Performance Standards: A Proposed Approach," *International Journal of Industrial Ergonomics,* 1992, 130**.**

c. quantification of physical capacity required for completion of laboratory test and field task performance;

d. statistical analysis of data to determine population performance characteristics on different tests and predictive relationships among laboratory and field task variables; and

e. determination of acceptable level for the performance standards.[30]

As a result of this development, the CDS approved the establishment of the CF EXPRES program and MPFS for physical fitness for the CF in September 1988.[31] It addressed fitness as well as developing task related physical fitness standards. This program emphasized a fitness evaluation that predicted present levels of physical fitness and extensive programming to ensure the maintenance of physical fitness and/or improvement to attain and maintain the MPFS.

The CF EXPRES test is predictive in nature rather than absolute. It predicts one's ability to accomplish the CF five common tasks (casualty evacuation, sea evacuation, sandbag carry, low/high crawl, and entrenchment dig) through the evaluation of aerobic efficiency (step test), muscular strength (handgrip test), lower body muscular endurance (sit-ups), and upper body muscular endurance (push-ups). These predictive evaluations are influenced by different factors such as age, weight, oxygen uptake, final heart rate, and a person's physiology.

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[30] Ibid., 132.

[31] Ibid., 135.

Standards were established based on age and gender by evaluating aerobic efficiency as measured by $VO_2$max levels through the four tests mentioned above.[32] $VO_2$max is defined as "the maximum amount of oxygen you can take in and utilize measured in mL.kg.min."[33] There comes a point where the body simply cannot increase the amount of oxygen it consumes and utilizes, despite an increase in exercise intensity. This level of oxygen intake is known as the $VO_2$max. Graphically this is explained below.

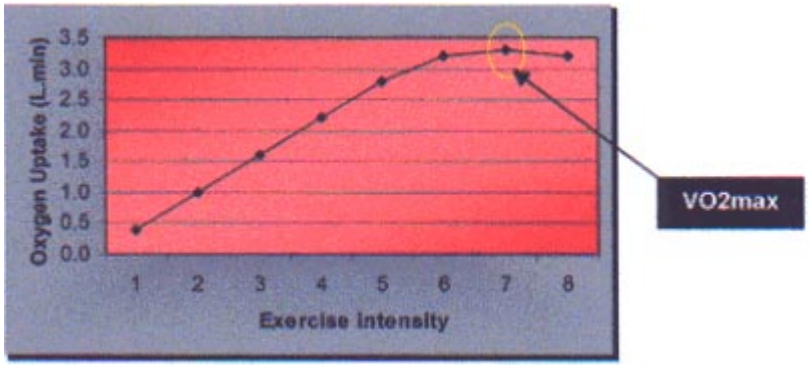


Figure 1: $VO_2$max

The horizontal axis represents exercise intensity. The vertical axis represents oxygen uptake. Where the line levels off illustrates a plateau in oxygen uptake and despite an athlete running faster or longer no more oxygen would be processed by the respiratory system. There were, however, limitations to the CF MFPS.

The major limitation of a task based physical performance test is the length of time and number of people required for its administration. Therefore, the CF EXPRES

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[32] Ibid., 146.

[33] Sport Fitness Advisor http://www.sport-fitness-advisor.com/disclaimer.html; Internet; accessed 13 January 2005.

test was established, which is the current physical fitness assessment programme with the CF.

The CF EXPRES evaluation was derived from the Canadian Standardized Test of Fitness.[34] The CF EXPRES Programme consists of four components:

a. a pre-test screening designed to ensure the absence of health risk factors prior to testing (this screening includes a health appraisal and analysis of resting blood pressure and heart rate);
b. a physical fitness evaluation consists of an aerobic, muscular strength, upper and lower body muscular endurance, and body composition measurements;
c. an exercise prescription consists of an individually tailored physical fitness training programme based on evaluation results of sufficient frequency, duration and intensity to ensure improvement or maintenance of physical fitness (unit training programmes can be used as part of the prescription); and
d. training (the primary objective of the programme is to promote habitual participation in effective training programmes).[35]

For the body composition measurements, the Body Mass Index (BMI) was applied. BMI is a measure of body fat based on height and weight that applies to both adult men and women. The calculation for BMI is determined by the weight in kg/ (height in meters).[2] BMI is not the only indicator of health risk. It is just one of many factors used to identify potential issues related to developing chronic diseases, such as,

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[34] ParticipAction, *EXPRES The Exercise Prescription* (Toronto, MacMillan of Canada, 1986).

[35] Canadian Standardized Test of Fitness (Ottawa Fitness Canada, 1981).

heart disease, cancer, or diabetes. Other factors that may be important to look at when assessing one's risk for chronic disease include: diet, physical activity, waist circumference, blood pressure, blood sugar level, cholesterol level, and, family history of disease.[36] As a general guideline, the chart below indicates the range of what a BMI measurement equates to with respect to weight status.[37]

| BMI | Weight Status |
|---|---|
| Below 18.5 | Underweight |
| 18.5 – 24.9 | Normal |
| 25.0 – 29.9 | Overweight |
| 30.0 and Above | Obese |

Table 1. BMI vs Weight Status

The BMI indicator was used with the CF EXPRES program from 1990 to 1992. It was subsequently removed from the fitness evaluation because it was being utilized as a primary tool to release members from the CF. Its original intent was to be used as an indicator to suggest that individuals had not been able to obtain an acceptable fitness level and therefore identify additional health issues which may require further examination by a health professional. While the BMI table was viewed as having a great deal of face validity, it lacked scientific credibility in a number of other areas. Two of its main weaknesses were related to the following:

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[36] Department of Health and Human Services. "BMI - Body Mass Index: BMI for Adults: What Does This All Mean?" http://www.cdc.gov/nccdphp/dnpa/bmi/bmi-means.htm; Internet; accessed 7 Feb 2005. Two people can have the same BMI, but a different percent body fat. A bodybuilder with a large muscle mass and a low percent body fat may have the same BMI as a person who has more body fat because BMI is calculated using weight and height only. This is a good reminder that BMI is only one piece of a person's health profile. It is important to talk with one's doctor about other measures and risk factors. (e.g., waist circumference, smoking, physical activity level, and diet.).

Ibid., http://www.cdc.gov/nccdphp/dnpa/bmi/bmi-means.htm; Internet; accessed 7 Feb 2005

a. the programme lacked the empirical evidence needed to clearly link BMI results with the completion of any particular military task, that is to say, any clearly defined "Bona Fide Occupational Requirement" or BFOR; and
b. because there was no connection between the policy and any valid BFOR, the policy was believed to contravene the Canadian Human Rights Act; prohibition against discrimination on the basis of physical handicap.[38]

For muscular strength within the CF EXPRES fitness evaluation, the current measurement is determined by the sum of the right and left hand maximal handgrip force as measured with an isometric dynamometer and the number of push-ups and sit-ups that can be completed in one minute measures muscular endurance. The maximal oxygen uptake ($VO_2$max) is predicted indirectly from the measurements of heart rate during a sub-maximal step-test.

The CF EXPRES test is reported to be a reasonable measure of general physical ability and is considered to be appropriate for gross fitness evaluation for large populations.[39] However, in a study conducted in 1986 for the Defence and Civil Institute of Environment Medicine (DCIEM), the findings indicate that the CF EXPRES test may not be sufficiently sensitive to detect minor improvements in fitness that may occur as the result of a training program. In their study, after 12 weeks of hydraulic resistance

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[38] Department of National Defence, Military message DGPCOR 164 311500Z July 1992 (Ottawa: DND, Canada, 1992), 2.

[39] G.M. Andrew, J.T. Bryant, S.W. Lee, J.M. Stevenson, R.D. Swan, and J.M. Thomson, *Development of Minimum Physical Fitness Standards for the Canadian Armed Forces: Phase III*. (Kingston, ON: School of Physical and Health Education, Department of Mechanical Engineering, Queen's University, 1986), 18.

training, laboratory tests indicated significant improvements in measured fitness variables of participants; the EXPRES did not, however, detect these changes.[40]

With respect to the EXPRES test, minimum standards were established for each category, which each member of the CF was required to meet. This testing scheme has been in place since 1 April 1991. As a form of motivation, those candidates that achieved high standard on the EXPRES test are exempt for one year and therefore are not tested for a two-year period. The aim of this exemption was to serve as a motivational tool to promote and increase greater fitness with the CF. This program received widespread acceptance and as an additional by-product reduced the number of annual evaluations by approximately 20 percent.[41]

In 1996, the Canadian Forces Personnel Support Agency (CFPSA) requested a further analysis of the MPFS. The Ergonomics Research Group of Queen's University conducted this re-validation which was designated MPFS 2000. The reason for this re-validation was that, since the inception of MPFS in 1988, the military substantially downsized as a result of the reduction in military spending. The Federal government directed that defence spending be decreased by 23 percent and that the CF were to be reduced from 100,000 to 60,00 by the end of the 1990s.[42] As downsizing had a significant effect on the number of deployments, fitness became that much more

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[40] Department of National Defence, *Relationship of Field Tests to Laboratory Tests of Muscular Strength and Endurance and Maximal Aerobic Power* (Downsview,ON: Defence and Civil Institute of Environment Medicine, Report No. 86-R-22, 1986), 10.

[41] Department of National Defence,

important. It became so increasingly important that it compromised those in the CF who must be capable of performing their assigned tasks and those among CF personnel who must be able to deploy and effectively operate. The MPFS 2000 study had to comply with the Canadian Human Rights Act and careful consideration had to be given to meet bona fide occupational requirements (BFOR).

A BFOR is a condition of employment, which is enforced with the belief that it is essential for safe, efficient, and reliable job performance. In terms of risk, the policy states that a BFOR should be enforced to protect the public or co-workers from unnecessary risk. Risk to others should be given greater consideration than risk to the individual performing the job.[43] It is known that work within the CF requires versatility. This provision is described under the heading "Universality of Service (U of S) for Canadian Forces" in section 15(9) of the Human Rights Act.[44] The policy states "members of the Canadian Forces must at all times and under any circumstances perform any function that they may be required to perform."[45] This characterizes all work apart from typical day-to day duties essential to the job and therefore a BFOR. The principle of U of S clearly implies that combat duty is a primary responsibility while performance of trade is secondary.

Additionally, the study had to re-evaluate the five common tasks used in MPFS 1988, quantification of the physical requirements associated with performance of these tasks, and examine specific fitness and health attitudes towards lifestyle behaviours in the

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[43] Department of Justice, *Bona Fide Occupational Requirement Policy* (Ottawa: Canadian Human Rights Commission, 1985), Chapter H-6.

[44] Ibid., Chapter H-6.

[45] Ibid., Section 15(9).

CF. As a final product, the study was required to establish a bona fide minimum physical fitness standards for CF personnel. The study involved 623 CF personnel with ages ranging from 19 to 53 years with a mean age of 32.5 and comprised of 207 women and 416 men. It concluded that the following indicators should be used to form the predictors of performance as the basis for the MPFS 2000 standard: a $VO_2$max measurement in conjunction with the 20 meter shuttle run, sit-ups, push-ups, the combined handgrip, a vertical jump, and leg dynamometer.[46] In order to pass the MPFS 2000, the $VO_2$max, the push-ups, sit-ups, and the handgrip test must achieve a minimal score. If the performance for the leg dynamometer and vertical jump tests are below a threshold level, zero points are allocated but the individual does not fail the test unless the total score of the first four tests is less than 100 points.[47] This study has not yet been accepted as it is under review by the Assistant Deputy Minister Human Resources Military (ADM (HR-Mil)) and currently the CF EXPRES testing format from 1988 is currently being used to assess fitness within the CF.[48] The standards for the MPFS 2000 can be found Appendix 1.

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[46] J.M. Deakin and S.W. Lee, *Development and Validation of Canadian Forces Minimum Physical Fitness*, Report Prepared for Canadian Forces Personnel Support Program (Kingston, ON: Ergonomics Research Group Queen's University, 31 March 2000), 26. A leg dynamometer is a apparatus that is used to measure maximal leg extension strength. Participants stand on the base plate with the back and the buttocks against the wall, knees bent to 135 degrees and the handle bar held with the arms fully extended. The bar is pulled upward by extending the legs. Two trials are performed and the best score is recorded.

[47] Ibid., iv.

[48] Since the completion of the MPFS 2000 study, ADM HR (Mil) has been briefed on several occasions. He directed that all the environmental chiefs be briefed and to and seek their support prior to going to Armed Forces Council. There was support from all ECSs for MPFS 2000 with the Navy having some reservation regarding the impact on women and older men. ADM HR (Mil)'s major concern was the significant change from MDFS 1988 and MPFS 2000 as well as the impact on women and older men. On the surface it appeared the standard would be more demanding. Several attempts, by the CFPSA staff, were made to demonstrate that the impact was minimal if individuals stayed active but the data showed it would be more demanding for these 2 groups. In the final analysis, ADM HR (Mil) decided he was not prepared to suggest such a major change at this time since MPFS 1988 is accepted and the change was too great. Subsequently, MPFS is on hold until further notice.

**Factors Influencing Physical Fitness**

In order to understand where the CF stands with respect to its level of fitness it is necessary to appreciate the key factors that establish an overall fitness grading. The first of these factors is cardiovascular fitness. Cardiovascular fitness is dependent on a number of factors including age, gender and activity level. It is well known that, with increasing age, aerobic capacity declines by a reported 9-10 percent per decade after age 25.[49] A physiological relationship has been linked to a decrease in total muscle mass and strength, in maximal heart rate, in stroke volume and in cardiac output based on gender.[50] Differences in cardiovascular fitness between men and women are also related to physiological variations. $VO_2$max (mL/kg/min) for men is typically 15 to 20 percent greater than that for women of comparable age and training level.[51] This can be accounted for by differences in body composition, such as, total body muscle versus fat mass, and hemoglobin content and is illustrated in Appendix 2.[52]

Activity level is another important determinant of physical fitness. It is known that a sedentary lifestyle is related to low levels of aerobic fitness. Even highly trained

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[49] P.C. Thomas, *Guidelines for Exercise Testing and Prescription* (Philadelphia: American College of Sports Medicine, 1991), 65. .

[50] S. Andreoni, J.A. Neder, L.E. Nery, A.C. Silva, and B.J.Whipp, "Maximal Aerobic Power and Leg Muscle Mass and Strength Related to Age in Non-Athletic Males and Females," *European Journal of Applied Physiology & Occupational* Physiology,79, 1999: 525**.**

[51] Thomas, Guidelines for Exercise…, 73.

[52] P.O. Astrand, "Human Physical Fitness with Special Reference to Age and Sex," *Physiological Review*, 36 (August 1956): 307.

individuals experience a reduction in $VO_2$max after a period of inactivity.[53] Reductions of 16 percent in $VO_2$max have been reported after 12 weeks from the cessation of physical activity.[54] In 1994, King-Lewis & Allsopp studied changes in various measures of health and physical fitness of Navy personnel following a 16-week deployment at sea. Among those participants who led a sedentary lifestyle before deployment, resting heart rate, maximum heart rate during a submaximal exercise test and recovery heart rate (60 seconds after cessation of test) all increased significantly after 16 weeks away at sea. Those participants who were physically active prior to deployment also experienced an increase in recovery heart rate, reflecting a reduction in fitness level. These changes can be linked to the limited capacity for sustained physical activity at sea. It was further reported that the cessation of regular activity had the largest effect on those individuals who were at the highest levels of fitness prior to deployment.[55]

An increase in physical activity can markedly improve physical fitness. Moderate training can increase maximal oxygen uptake of sedentary adults by at least 15 to 30 percent.[56] Increases of this magnitude have been reported after only six to ten weeks of

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[53] Busby-Whitehead, A.P., L.C. Becker, J.L. Fleg, G. Gerstenblith, J. Goldberg, J.M. Hagberg, L.I. Katzel, F.C. O'Connor, E.G. Lakatta, G.E Lakatta S.P. Schulman, "Continuum of Cardiovascular Performance Across a Broad Range of Fitness Levels in Healthy Older Men." *Circulation*, (August 1996): 363.

[54] Ibid., 365.

[55] Allsopp, A.J. and P.W. King-Lewis, "Changes in Selected Parameters of Health and Physical Fitness Following a Sixteen-Week Deployment at Sea," *Journal of the Royal Naval Medical Service*, September, 1994, 26. Understandably, if a fit individual reduces their fitness regime, their fitness level will fall at a greater rate than those that are not as active.

[56] R.J. Shephard, "The Development of Cardiovascular Fitness," *Medical Services Journal of Canada,* no. 21, 1965, 540.

training for 15 to 45 minutes per day, four days a week.[57] Similar relative improvements have been observed in both men and women.[58] Training effects on tests of muscular strength and endurance have also been reported. Four to ten weeks of training has been associated with increases of 6 to 10 percent in vertical jump height, and 7 percent in handgrip strength.[59] Larger improvements in the order of 15 to 30 percent have been reported in sit-up and push-up performance after training programs of 6 to 10 weeks in duration.[60] Taken together, this evidence suggests that if a sedentary individual fails to meet a minimum level of performance on physical fitness tests by a margin of 10 to 25 percent, it is quite possible that these deficiencies can be improved through an appropriate training program.

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[57] M.M. Cowan, and L.W. Gregory, "Responses of pre- and Postmenopausal Females to Aerobic Conditioning," *Medicine and Science in Sports and Exercise*, 17, 1985, 40.

[58] P.K. Pedersen and K. Jorgensen, "Maximal Oxygen Uptake in Young Women with Training, Inactivity, and Retraining," *Medicine and Science in Sports,* (April, 1978): 235.

[59] J.P. Drummond , H.T. Ford, and J.R. Puckett, "Effects of Three Combinations of Plyometric and Weight Training Programs on Selected Physical Fitness Test Items," *Perceptual and Motor Skills*, 1983, 920.

[60] E.J. Marcinik, J.A. Hodgdon, C.E. Englund, and J.J. O'Brien, "Changes in Fitness and Shipboard Task Performance Following Circuit Weight Training Programs Featuring Continuous or Interval Running," *European Journal of Applied Physiology,* 56, 1987: 135.

# CHAPTER 3

## PAST AND CURRENT FITNESS LEVELS WITHIN THE CF

While the CF EXPRES program for physical fitness is the cornerstone of the CF physical fitness programs, it must be emphasized that the CF MPFS is just that - the minimal level of fitness required by CF members to permit them to meet the physical demands of the common tasks. It is not an ideal or optimal level of fitness. Over the past three decades, a number of studies have examined the fitness of CF personnel. In 1979, Myles and Allen predicted the aerobic fitness of CF personnel using a submaximal cycle ergometer test. They tested 3781 participants; 3171 men and 610 women, who were at various stages of their military careers. The study was cross-sectional in design, resulting in inferences related to the relationship between fitness level and years of service. Upon entry into the CF, $VO_2$max values were ~47 mL/kg/min for men and ~37 mL/kg/min for women aged 17 to 24. For participants at the

the exception that the lowest $VO_2$max levels for men was quite high at 41.1 mL/kg/min compared to 32.4 mL/kg/min.[62] [63] Jetté and Sidney, who studied almost 20,000 Canadian military personnel, reported $VO_2$max values in the high-end range of the previous studies (men averaged 46 mL/kg/min and women averaged 36 mL/kg/min). A summary of these studies is displayed in Table 1.[64]

| Study | Gender | Number of Participants | Age of Participants (range or mean) | Mean Predicted $VO_2$max (mL/kg/min) |
|---|---|---|---|---|
| Myles & Allen, 1979 | Men | 3,171 | 17-55 | 32-45 * |
| | Women | 610 | 17-29 | 34-36* |
| Stevenson et al., 1988 | Men | 166 | 17-53 | 41-48 ** |
| | Women | 220 | 18-50 | 34-37** |
| Jetté & Sidney, 1990 | Men | 17,098 | 32 | 46 ** |
| | Women | 2,087 | 26 | 36 ** |

Table 2: History of fitness levels in the Canadian Forces.

* $VO_2$max was predicted by sub maximal bicycle test.
** VO2max was predicted by sub maximal step test.

Since CF personnel are required to perform physically demanding tasks as part of day-to-day duties, it would be expected that they be more fit than the general population. However, the aerobic fitness levels reported in Table 2 are not markedly different than the fitness levels of the Canadian civilian population during a similar time period in

[62] Andrew G.M., J.T Bryant, J.M.Deakin, S.L. French, J.T Smith, J.M. Stevenson, and J.M. Thomson, "Development of Physical Fitness Standards For Canadians Armed Forces Younger Personnel," *Canadian Journal of Sport Sciences,* 17, (March 1992), 216.

[63] Andrew G.M., J.T Bryant , J.M.Deakin, S.L. French, J.T Smith, J.M. Stevenson, and J.M. Thomson, "Development of Physical Fitness Standards for Canadian Armed Forces Older Personnel," *Canadian Journal of Applied Physiology,* (January 1994) 84.

[64] M. Jette, J. Campbell, J. Mongeon, and R. Routhier, "The Canadian Home Fitness Test as a Prediction of Aerobic Capacity," *Canadian Medical Association Journal*, (April 1976): 681.

Table 3, which at first glance is somewhat surprising.[65]

| Study | Gender | Number of Participants | Age of Participants | Mean $VO_2$max (mL/kg/min) |
|---|---|---|---|---|
| Shephard, 1966 (Review) | Men<br>Women | 177<br>48 | 20-50<br>20-50 | 39-48*<br>30-36* |
| Bailey, Shephard, Mirwald & McBride, 1974 | Men<br>Women | 351<br>383 | 20-49<br>20-49 | 27-36*<br>24-31* |
| Canadian Standardized Test of Fitness, 1986 | Men<br>Women | ***<br>*** | 20-49<br>20-49 | 37-51**<br>26-37** |

Table 3: History of aerobic fitness levels of untrained Canadian civilians.

* $VO_2$max was measured by using either a treadmill or a bicycle ergometer.
** These are normative values calculated from the percentile range of 41-60.
*** Number of subjects in this age range was not reported. However, 15,519 were tested in total from the ages 7 to 69 years.

However, upon further examination the results bear a certain amount of validity as the average CF member comes from the Canadian population. Where there is a deviation to both charts is with the special groups within the CF, such as, Airborne Forces, Search and Rescue Technicians, CF fighter fighters, army engineer combat divers, navy shallow and deep-sea divers, as well as those CF members that are involved with the Joint Task Force anti-terrorist organization. The MPFS 2000 findings also support this observation, and consequently for those members of the CF that are employed in specialty roles, there are separate more stringent fitness standards that must be achieved.[66]

However, more recently, the results with respect to members of the CF are not very flattering. Based on a data query taken by the Directorate of Human Recourses

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Ibid., 682.

[66] J.M. Deakin and S.W. Lee, *Development and Validation of...*, 78

Information Management (DHRIM) requesting CF EXPRES results of the CF by rank from 1 April 1999 to 1 April 2004, the following information was provided. In general the officer corps is fit by the CF EXPRES test standard and less that five percent of the officership is not able to pass the fitness test. Based on a force of approximately 60, 831 with approximately 14,266 officers, this presents 713 officers who are not able to pass the EXPRES test. However, for the Non Commissioned Members (NCM1000hicth ccouent s

pass the CF EXPRES test was 11.25.[69] The table below supports this statement.

| Year | A Total Booked | B Passed | C Failed | D Exempt | E Medically Referred | F No Show/ Cancelled | G Total= A+ D-F | H C+E/G= % Failed |
|---|---|---|---|---|---|---|---|---|

grand total of 4,382 treatments (mean of 2.1 treatment by case). This represents approximately one quarter of the soldiers that had deployed in Bosnia during this period.[70]

The mean age of CF members seen in physiotherapy was 32.9 with a range from 18 to 56 years old. Overall, only 30.1 percent of all cases referred were acute (Priority one) while about 67 percent of all injuries were sub acute (Priority 2)-chronic (Priority 3) lesions. The injuries to the lower limb were the single leading cause for PT treatment (41.8 percent) followed by the spine (28.5 percent) and the upper limb (21.5 percent). The most affected joints were the knee (37 percent) and ankle (34.5 percent), the shoulder (66 percent), and the lumbar spine (50 percent), in the lower limb, upper limb, and spine categories, respectively. The fact that most injuries were classified as sub-acute and chronic suggests that a majority of patients had either an overused injury or an exacerbation of a pre-existing condition. One could hypothesized this later finding is related to the aging CF population or to a certain level of de-conditioning.[71] Clearly there is a relationship between physical fitness and injury rates. Since 2000 the number of sick days within the military has increased by 1.2 percent per annum.[72] The percentage of personnel that have a BMI over 30, which is considered obese, has increased from 20.6

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[70] The first six rotations during this time frame deployed on average 1100 all ranks with the last two rotations reduced to approximately 750 as the mission was being transferred to the European Union.

[71] Department of Defence, *The Canadian Forces Deployed Physiotherapy Capability: Lessons Learned from Op Palladium in Bosnia*. Report Prepared for the CF Medical Group (Laval University, Quebec, 2005), 1.

[72] Department of National Defence. *Transcript for Briefing to the Senate Standing Committee on National Security and Defence* (Ottawa: DND Canada, February 2005),19.

percent to 23.1 from 2000 to 2004.[73] Fitness can play a significant part to reducing these figures and consequently improving productivity and quality of life.

**Fitness of Reserve Personnel**

CF fitness standards, which are age and gender adjusted, came into effect 1 April 1991, complete with appropriate administrative measures for those who failed to meet the minimum requirement. To add to the concerns with respect to fitness within the CF, the EXPRES test was only applied to the Regular, Special, or the Reserve Force personnel on continuous service exceeding 180 days.[74] The remainder of the Reserve Force members serving under Class "A" and "B" periods of service for 180 days or less were exempt from the standard and its accompanying administrative measures. There was also exemption for CF personnel located outside Canada who were not located near the appropriate CF testing facilities. In order to illustrate the concern of the current policy regarding physical fitness with the reserve component of the CF, the following recent deployment of a reserve company on NATO operations clearly demonstrates a deficiency.

Prior to a recent deployment of a company of reservists to Bosnia, a company from the Fort Garry Horse (FGH) trained as part of a composite reserve company (CRC) in support of ROTO 12 in OPERATION PALLADIUM in November 2002. This company was to augment a regular force unit in a six-month tour in the Balkans. In the

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Department of National Defence. *CF Health and Lifestyle Information Survey 2004* (Ottawa: DND Canada), Chapter 5.

[74] Canadian Forces Administrative Order CFAO 50-1, paragraph 6. In this directive it states that commanders of commands are delegated the authority to determine the necessary level of fitness required for the Reserve Force. As each Commander of a Command may interpret this differently, it becomes difficult to establish a holistic policy for the CF.

first three days of the pre-deployment training twelve soldiers out of 120 were on light duties as they had come physically unprepared for duty. This represents ten percent of the company, which were not able to deploy to Bosnia and consequently the remainder of the company had to absorb this loss. The soldiers' injuries were due to muscles unable to support joints under stress, the immune system began to falter and poor decision-making and leadership occurred as fatigue overwhelmed the body and the mind. Based on this example, the officer commanding the CRC company stated, "fitness was certainly the overriding difference between the most effective and least effective soldiers and leaders."[75]

In order to further amplify this issue, the author of this paper had recently deployed on a six month NATO mission with HQ SFOR from 31 October 2003 to 11 May 2004 and during this period there were two instances where candidates could not be employed in the Balkan theatre of operations because they could not pass the CF EXPRES test. This caused a certain amount of embarrassment as well as not being able to fill a specific skill set that was required at an operational headquarters. These positions were taken on by Canada at the NATO manning conference and due to lack of physical fitness these positions could not be filled.[76]

The breakdown of the fitness culture within the CF begins with the application of policy where the standards do not apply to reservists on Class "A" and "B" service at 180

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[75] Department of National Defence, "Reserve Fitness and Addressing the Fitness Delta." *The Bulletin, The Army Lessons Learnt Centre*, 10 (3) (Ottawa: DND Canada, 2004), 3.

[76] Every year NATO conducts a manning conference in order to fill positions for mission to meet the NATO mandate. Each country volunteers its services based on what they can offer to NATO. In this particular example, the requirement was for a policy advisor for the NATO POLAD at HQ SFOR, as well a communications position within the same HQ.

days or less, leaving one third of the available workforce falling under no national policy requirement to be fit and leaving their respective leadership without the tools to enforce any sort of fitness requirement. What aggravates this situation are organizations that are not likely to deploy, such as National Defence Headquarters, and tend not to emphasize physical fitness in their daily routine. This has all contributed to such a high failure rate on a fitness system whose current standards are not terribly difficult. Potential solutions to resolve this and other issues will be dealt with later in this paper.

**Health and Lifestyle Information Survey (HLIS)**

In 2000, a CF Health and Lifestyle Information Survey (HLIS) took place. This survey was conducted as a census of all serving Regular and Primary Reserve Force members. Approximately 50 percent of regular force personnel replied to the survey whereas only 30 percent from the Reserve Force completed the survey.[77] The purpose of this research was to provide a comprehensive assessment of the reported health status and relevant lifestyle activities of the Forces population. The aims were to support the planning and evaluation of health promotion programs, identify specific deployment and occupational health issues, establish sound baseline measures for further trend analysis, and to provide guidance in the identification and prioritization of overall program needs. Some of the major findings from this survey were:

a. Mental Distress: A significant proportion of Regular Force members report some form of mental distress during the month preceding the survey, most commonly as occasional feelings of nervousness or restlessness. Less than 5

[77] Department of National Defence. *CF Health and Lifestyle Information Survey 2000* (July 2002), 3.

percent experience any of these feelings most or all of the time over this time period. CF members are more likely than other Canadians to experience mental distress, and, consistent with general population, mental distress is more common among women and younger members. Nonetheless, only about one member in ten consulted a health professional about their emotional or mental health in the year preceding the survey. However, CF members are twice as likely as other Canadians to use mental health services.[78]

b. BMI Forty percent of CF Regular force members consider themselves to be overweight, while 51% consider themselves to be just about right. By comparison, 42% of members have a body mass index (BMI) of 27 or higher, which is considered to be the best practical objective indicator of being overweight. The proportion with a BMI of 27 or higher also increases with age, for CF men and women.[79]

c. A significant proportion of Reserve members report some form of mental distress during the preceding month, most commonly as occasional feelings of nervousness (53%) or restlessness (47%). Fewer indicate occasional feelings of sadness (26%), hopelessness (18%) or a sense that everything is an effort (31%). Less than five percent experience any of these feelings most or all of the time over this time period.[80]

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[78] Ibid., 1.

[79] Ibid., 82.

[80] Ibid., 3.

d. Just over forty percent of Reserve members consider themselves to be overweight, with this proportion higher among women. BMI measurements indicate that the same proportion is overweight. Most of those members who consider themselves overweight would like to lose weight, but only about three-quarters say they are motivated to do so.[81]

The overall self-reported results of the finding from the HLIS survey indicate that the health status of Regular Force members is relatively good, but somewhat less so than the Canadian population-at-large in all groups except women aged 20 to 35. One in five CF members report excellent overall health (compared with one-quarter of all Canadians), while another four in ten rate their health as very good, and only eight percent consider it to be fair or poor. Consistent with the general population, excellent health status is marginally higher among women members and declines with age. These results indicate that a more robust fitness program is required to improve the CF's overall fitness in order to meet the high demands placed on Canada's military. Part of a thorough fitness process includes an appropriate testing process to validate fitness. The next portion of this paper will deal with this issue.

**Assessment for Physical Fitness Testing**

The organization that is responsible for administering the physical fitness testing for members of the CF is the CF Personnel Support Agency (CFPSA). The primary mandate of the CFPSA Fitness and Sports staff is, "To enhance the quality of life of the military community and contribute to the operational readiness and effectiveness of the

[81] Ibid., 3.

Canadian Forces."[82] This is accomplished by serving the physical education needs of Regular Force Military personnel and those Reserve personnel on extended periods of service with the Regular Force. Members of CFPSA, specifically the Personnel Support Program (PSP) staff, administer the fitness requirements for the CF.

Establishing an appropriate testing mechanism for physical fitness within the military is no simple task as there are numerous factors that must be taken into account in order for the evaluation to be valid. A key area that needs to be considered is the gender differential between men and women in general terms and within the CF. Canadian women have been defending Canada since 1885 during the North West Rebellion in the Indian Territories. Little did they know that they would be part of a battle, which would mark the first use of the machine gun by Canadian troops in Canada, and the last use of the bow and arrow in conflict.[83] By the end of WWII, 45,695 women had joined Canada's various forces.[84] They were primarily employed in administrative, communications, logistics, and medical support roles. Since then women have been fully integrated into all arms of the service. Therefore, since full employment is available to women, this subjects them to the universality of service and associated fitness standards. However, the physiological make up for women is different than men and there is a requirement to compare the two genders in order to establish appropriate and comparatively fair physical fitness levels within the CF.

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[82] Department of National Defence. *Canadian Forces Personnel Support Agency Five-Year Business Plan*. (Ottawa: DND Canada, April 2003), 12.

[83] Maggi Siggins, *Riel: A Life of Revolution* (Toronto: Harper Collins, 2003), 399.

[84] Jeffrey A. Keshen, *Saints, Sinners, and Soldiers Canada's Second World War* (Vancouver: UBC Press:, 2004), 176-177.

As a starting point, most women have lower $VO_2$ max levels than men, and thus have a lower capacity for endurance activity.[85] This can be explained biologically and physiologically in that women are generally smaller than men and therefore have smaller organs and less volume such as hearts, lungs, blood volumes, cardiac outputs, hemoglobin, and red blood cells. The magnitudes are seen below and are measured in systolic ejection volumes:[86]

| | Women | Men |
|---|---|---|
| Rest | 68ml | 88ml |
| Exercise | 100ml | 134ml |

Table 5: Systolic Ejection Volume

The female's heart rate tries to compensate by increasing and being greater than the male's, but the cardiac output for an activity of a given intensity is still lower:[87]

| | Women | Men |
|---|---|---|
| Q max | 18.5 l/min | 24.1 l/min |

Table 6: Cardiac Output

Heart rates are as follows: [88]

| | Women | Men |
|---|---|---|
| Exercise Intensity 50% | 140 | 130 |
| As a % of maximum 70% | 168 | 154 |

Table 7: Heart Rates

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R. Henane, "Physiological Limitations of Female Personnel in the Armed Forces." *International Review of the Army, Navy and Air Force Medical Services*, 54(2), 1981: 108.

[86] P.O. Astrand and K. Rodahl, *Textbook of Work Physiology* (New York: McGraw Hill, 1986), 246. Blood pressure measurements typically contain two numbers. The higher is called systolic blood pressure and represents the pressure in the arterial system caused by the heart as blood is being pumped out. The lower number is called the diastolic pressure and represents the portion of time when the heart muscle is resting and filling with blood.

[87] Ibid., 285.

[88] Ibid., 291

Thus, it can be seen that generally, women must work harder physiologically than men, to do the same amount of work. This has been clearly observed in the preliminary work conducted for the Canadian Army trainability study with weight loading marching and the preceding standards study.[89]

A further explanation for the higher heart rate in females is related to the blood hemoglobin (Hb) content. The Hb concentration of females is 11 to 14 percent less than in males. Expressed in grams of Hb per litre of blood, women have about 139 grams to men's 158 grams, or about 20 gm/l less. Since each gram of Hb binds approximately 1.34 ml of $O_2$, there is a deficiency of about 27 ml per litre of blood for the female. In order to work at a given intensity, the deficiency is compensated for by a higher heart rate.[90] Therefore on average, women are biologically disadvantaged in the area of the aerobic endurance component of doing physical work.

With respect to muscular strength, based on studies conducted in the 70s it was determined that the average body strength for women was 63.5 percent of men, with a range of 35 to 86 percent.[91] It was also stated that the average male was 30 to 40 percent stronger than the average female, but this varied with muscle groups. The same study concluded that women have the equal relative, lower body strength as men. However the differences in absolute strength, which is required in doing a given task, must be the main

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[89] P. Chahal, R. Couture, S.W. Lee, M. Oseen, M. Singh, and G.D. Wheller, *Development of Forces Mobile Command Army Physical Fitness Standards* (Edmonton: University of Alberta, 1991), 17.

P.O. Astrand and K. Rodahl, *Textbook of Work Physiology…*, 295.

L. Laubach, "Comparative Strength of Men and Women," *A Review of the Literature. Aviation Space and Environmental Medicine*, 47(5), 1976: 538.

concern. The differences at maturity are due to the following. Males:

a. are about 13 cm taller;
b. have 18 to 22 kg more lean body mass (LBM);
c. have 3 to 6 kg less fat weight;
d. have a different distribution of LBM (higher percentage in upper body which gives the males a biomechanical leverage advantage on tests of the upper body);
e. have larger muscle fibers;
f. have faster force- time reactions (better neuro-muscular responses); and
g. have higher androgen levels (especially testosterone – males produce 5 to 10 mg/day versus a female production of about 0.1 mg/day).[92]

The use of the relative strengths approach regarding female strength is useful in developing training programs, but in the final analysis of job performance, a 50 kg backpack will weigh the same for a person regardless of size or gender. In conclusion, women are also biologically disadvantaged in the area of the strength component of doing physical work. The main question for the military is how to assess fitness on an equitable level for both males and females in uniform.

While the CF EXPRES program for physical fitness is the cornerstone of the CF physical fitness programs, it must be emphasized that the CF Minimum Physical Fitness Standard will be just that - the minimal level of fitness required by CF members to permit them to meet the physical demands of the five common tasks. It is not an ideal or

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[92] W. Hosler and J. Morrow, "Strength Comparisons in Untrained Men and Women Athletes," *Medical Science Sports Exercise*, Vol 13 no.3 (July 1981): 196. Androgen is any hormone that promotes the development of or maintenance of male sexual characteristics including but not limited to body hair, distribution patterns, changes in vocal characteristics, and body shape. Testosterone is the most familiar androgen.

optimal level of fitness. It is recognized that there may be other physical fitness standards required to assess functional physical fitness of individuals or groups in the CF. However, the CF EXPRES evaluation consists of four items:

a. 20 Metre Shuttle Run (MSR) to predict maximum oxygen uptake (VO2max);
b. grip strength dynamometer to predict muscular strength;
c. push-ups to predict upper body muscular endurance; and
d. sit-ups to predict abdominal muscular endurance.[93]

The purpose of the evaluation is to assess the relative overall fitness level of the member in order to provide an appropriately prescribed, personalized exercise program. The evaluation procedure requires approximately 30 minutes per member to complete. The Personal Support Program (PSP) staff gathers information by observing such things as the member's weight, posture and bearing, and by asking about:

a. current health status
b. job (physical demands, stress, shifts, travel);
c. family responsibilities;
d. leisure interests (part-time job, social services);
e. experience levels in physical activity;
f. normal weekly physical activities; and
g. lifestyle habits (smoking, drinking, sleep).[94]

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[93] Department of National Defence. *EXPRES Test Manual* (Ottawa: DND, Canada, 1998), 23.

[94] Ibid., 32.

This general military standard contains aerobic, muscular strength, endurance and power components. Attainment of the MPFS is indicative of one's ability to perform "common military tasks" regarded as instrumental to operational effectiveness. The minimum physical fitness standards based on age and gender for all CF personnel are as follows: [95]

| CF EXPRES EVALUATION SCORES | MALE | | FEMALE | |
|---|---|---|---|---|
| | 34 YEARS AND UNDER | 35 YEARS AND UNDER | 34 YEARS AND OVER | 35 YEARS AND OVER |
| VO2 MAX STEP TEST | 39 | 35 | 32 | 30 |
| 20 MSR LEVEL | 6.0 | 5.0 | 4.0 | 3.0 |
| HAND GRIP | 75 | 73 | 50 | 48 |
| SIT-UPS | 19 | 17 | 15 | 12 |
| PUSH-UPS | 19 | 14 | 9 | 7 |

Table 8: CF EXPRES Evaluation Scores

The CF EXPRES must be achieved annually by all CF members except:

a. those members who qualify for an exemption under the CF EXPRES Incentive Program (to be explained later);

b. those members who, on an annual basis, meet approved Environmental or Trade specific standards of a physical requirement exceeding that of the MPFS;

c. those members excused for medical reasons or due to training or release requirement; and

[95] Department of National Defence. Canadian Forces Administrative Order 50-1, Annex B.

d. those members excused due to posting location.[96]

As a part of the validation of EXPRES test for upper body muscular endurance, it was decided that both males and females would complete the standard (toe fulcrum) push-ups. Contrary to popular opinion, the knee fulcrum push-up was not based on physiological or anatomic male\female differences. Its basis was that the women in the original study (Canadian Standardized Test of Fitness) had difficulty doing toe fulcrum push-ups so an alternative (knee fulcrum) test provided sufficient numbers upon which a standard could be based. Queens University was contracted to analyze women's performance and recommend appropriate numbers for use in the fitness test with respect to the toe fulcrum push-up. In the interim, Director Physical Education, Recreation and Amenities (DPERA) suggested that females complete 9 push-ups, if 34 years and under and 7 push-ups if 35 years and older. The Queens University study validated the use of these numbers for toe fulcrum push-ups for females and accordingly they are the standard for female performance on this test.[97]

The Canadian Aerobic Fitness test (CAFT) or also known as the "Step Test" is used in lieu of the 20 MSR in order to evaluate aerobic fitness under the following conditions:

a. CF personnel of all ages who consider themselves unfit to attempt the 20 MSR and who indicate as such in the evaluation form DND 279. In such cases, the fitness staff will complete a DND 582 (Round Trip Memorandum) and will send

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Department of National Defence. *EXPRES Test Manual*…, 36.

[97] Department of National Defence. *Review of Upper Body Physical Fitness Test for Women in the Canadian Forces.* (Toronto: Canadian Research and Development, 1989), 25.

the member to a Medical Officer (MO). If the member is diagnosed by the MO as unfit for 20 MSR, but fit for Step-Test, the fitness staff may proceed with a Step-Test;

b. CF personnel 40 years of age and older who do not score the required minimum number of points on the Canadian Physical Activity Fitness & Lifestyle Appraisal (CPAFLA) Healthy Physical Activity Participation Questionnaire; and
c. CF personnel posted in locations where 20 MSR cannot be conducted for logistics reasons (i.e. no gym floor, no 20 MSR qualified fitness instructors).[98]

**Incentive Program**

The CF has also implemented an incentive component of the CF EXPRES test. This program applies to general military evaluations and is designed to promote the demonstration of a superior level of physical fitness rather than performance at the minimal level in the MPFS. Through this program, a member may qualify for exemption from the CF EXPRES evaluation for one reporting year. To qualify, a member must meet the MPFS for all components of the EXPRES evaluation while also attaining the

[98] CFAO 50-1. The CPAFLA is a fitness questionnaire that is completed jointly by the examiner and the CF member being tested. It determines general lifestyle and health indicators such as potential high blood pressure, injuries, etc. If the examiner feels at anytime the member is not fit for the test, they will recommend that they see a medical doctor before preceding with any fitness evaluation

designated incentive standards below:[99]

| CF EXPRES EVALUATION ITEM | INCENTIVE SCORES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MALE | | | | | FEMALE | | | | |
| | AGE GROUP (YEARS) | | | | | AGE GROUP (YEARS) | | | | |
| | 17-19 | 20-29 | 30-39 | 40-49 | 50-59 | 17-19 | 20-29 | 30-39 | 40-49 | 50-59 |
| VO2 MAX STEP TEST | 57 | 48 | 45 | 39 | 35 | 39 | 37 | 33 | 31 | 30 |
| 20 MSR LEVEL | Stage 10 | Stage 10.5 | Stage 8 | N/A | N/A | Stage 6 | Stage 5.5 | Stage 5 | N/A | N/A |
| MUSCULAR STRENGTH AND ENDURANCE | 169 | 174 | 162 | 149 | 132 | 112 | 107 | 99 | 90 | 75 |

Table 9: CF Incentive Scores

**Note** - The muscular strength and endurance score is taken as the sum of the hand-grip, push-up and sit-up scores during a member's CF EXPRES evaluation.

## Testing of Recruits

The Basic Recruit Training Course (BRTC) and Basic Officer Training Course (BOTC) insists that all members to attain a specific physical fitness standard. Therefore, the recruits in these programs are required to complete the same physical fitness standards as identified in the CF MPFS. In addition, members are required to:

a. climb a rope (conducted by Fitness staff as training objective);
b. scale a wall (conducted by Fitness staff as training objective);
c. carry a person or victim (referred to as Fireman's Carry is a performance check conducted by Fitness staff) of approximately equal weight and height a distance of 100 m in 120 seconds;

[99] Department of National Defence. Canadian Forces Administrative Order 50-1, Annex C.

d. complete an obstacle course circuit (conducted by Recruit Training staff as training objective);
e. complete a 13-km fighting order forced march (2 hrs 26 min) conducted by Recruit Training staff as training objective); and
f. perform chin-ups (conducted by Fitness staff as training objective).[100]

The last five items (rope climb, wall scale, person carry, obstacle course and forced march), although demanding a certain amount of muscular strength and skill, are not physical fitness standards. They are more correctly classified as operational or general job related requirements that evaluate motor skills necessary for an individual to perform potential CF tasks. Although some or all of these activities may be evaluated concurrent with the physical fitness items, they should not be considered to be physical fitness standards. The actual recruit physical fitness standards are only established for the 20 MSR/step-test, sit-ups, push-ups and handgrip.[101]

From a testing process, recruits are first tested by their respective recruiting centre prior to arriving at the Canadian Forces Leadership and Recruit School (CFLRS), in St. Jean, Quebec. During week two of arrival, all recruits must attempt the CF EXPRES. If they pass they meet the fitness requirement and are no longer tested while in basic training. If they fail, they are re-tested at week seven. If they pass they meet the standard but if they failed they will finish the course and at week ten, which is the last day of the course, these individuals are sent to the Personnel Awaiting Training (PAT) platoon for 3 weeks where the only thing they have to do is to continue their physical training in order to be re-retested at the end of the 3 week period. If they pass they will be sent to

[100] Department of National Defence. EXPRES Test Manual…, 62.

[101] Ibid., 38.

their new unit with their certificate but no graduation. If they failed then CFLRS will apply for their release.

From statistics provided from the CFLRS, on average twenty percent of trainees will fail the EXPRES test and of those that failed, approximately fifty percent will require another attempt to pass the minimum standard.[102] An interesting point from this is why are recruits failing the EXPRES test when they had already passed the test at the recruiting center? Finally, the recruit base is and will continue to be drawn from a generation of youth who are statistically more overweight and less active therefore requiring more fitness guidance and training.[103] This concern will be addressed in the way ahead portion of this paper.

On the surface it would appear that the testing regime is robust and there are policies in place to deal with failures and an environment exists which provides the opportunity for members of the CF to excel with respect to physical fitness. However, on 7 February 2005 Associate Deputy Minister Human Resources (Military) (ADM HR (Mil)) briefed the Senate Standing Committee on National Security and Defence on the issue of the number of sick days that were accumulated over the period November 2003 to May 2004 within the CF. In support of that briefing, the Surgeon General for the CF briefed the Senate Committee on Social Affairs, Science and Technology on the same issue. The following points were provided in relation to sick leave for the CF. From November 2003 to May 2004, there was a total accumulation of 118,448 sick days. Of

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[102] Statistics provided by the CFLRS Operations Officer. E-mail sent 14 March 2005.

[103] G. Neil Conacher, **"**The Royal College and the Dying Joy of Learning," *Canadian Medical Association Journal* (January 2001): 13.

those total sick days, 42 percent was for mental health reasons, 23 percent was for MSK, and 35 percent was for other.[104] Therefore, 65 percent of the total sick days may have been a direct link to the physical levels or lack thereof causing a such a high number of days prescribed by the health care professionals of the CF. It is not to suggest that the diagnosis in these cases were not warranted but rather that with a more robust and fit force, it is very conceivable that the number of days could have been significantly reduced in relation to a direct link of fitness level and the ability to deal with issues such as mental health and MSK injuries. More specifically, for the mental health issues which represents 49,748 days in the six month period, 36 percent was for depression, 28.5 percent was for PTSD, 17.8 percent was for adjustment disorder, 3.8 percent was for anxiety, and 13.9 percent was for other reasons.[105] Again it would be inappropriate to suggest that a more robust fitness program or level of fitness would eliminate these levels but there is ample evidence to suggest that a greater fitness level would assist in reducing these figures and consequently assist in fulfilling the operational tempo of the CF. More importantly, such programs may assist individuals in coping with a difficult period in their personnel and military lifestyles.

However, the significant number of members of the CF that are not able to pass the minimum standard clearly shows there is a lack of enforcing a policy where the

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[104] Department of National Defence. *Transcript for Briefing to the Senate Standing Committee on National Security and Defence* (Ottawa: DND Canada, February 2005), 18. Other refers to OBGYN, cardio, cancer, neurological, urol, and miscellaneous issues. An important point to take into account is that the 118, 448 days does not include the two days of sick leave that a member of the CF may take without medical authority. Currently, CF medical authorities are not tracking the two days taken off from work for medical reasons. Therefore, it is highly likely that the 118, 448 figure could be significantly increased. Based on information from the same brief, the number of sick days from 2000 to 2004 has increased by 1.2 percent per annum indicating a link between poor fitness and injuries.

[105] Ibid., 20.

standards are not unreasonable. There is an uncomfortable percentage of CF members who are not fit to fulfil their terms of service due to a lack of overall fitness.[106] In the end this violates the terms of the universality of service that all members are responsible to uphold. In an operational context, the Commanding Officer of the Theatre Support Element for OPERATION APOLLO stated in November 2003:

> … the overall fitness level at Camp Mirage was extremely low. Many of the personnel were not in sufficient shape to handle the rigors associated with the extreme environment…and few were capable of moving fwd to Afghanistan should the need arise.[107]

With a physical fitness assessment system that has been in place since 1988, it may be difficult to precisely identify either the strengths or weaknesses of the evaluation process. Therefore, in the next portion of this paper, a quick overview of the fitness programs of three countries will be presented. From this perspective, several proposals will be examined in an attempt to improve the state of establishing and maintaining a sound physical fitness baseline to support both national and international Canadian military operations.

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[106] Based on the preliminary HLIS 2004 results, 17.9 percent of the CF were not able to pass the EXPRES test. An additional 6.2 percent were medically excused. This equates to just over 24 percent that have not passed the EXPRES test from January to November 2004.

[107] Department of National Defence. *After Action Report for Theatre Support Element for OPERATION APOLLO* (Ottawa: DND Canada, November 2003), 5. Camp Mirage was the theatre support unit for the Canadian Forces personnel deployed for OP APOLLO.

# CHAPTER 4

## FOREIGN PHYSICAL FITNESS TESTS: A COMPARATIVE ASSESSMENT

Prior to proposing solutions to improving the current fitness situation with the CF, it is prudent to provide a brief investigation into what other countries have implemented with respect to assessing and maintaining its Armed Forces' physical fitness level. The three countries that will be examined will be, the British Army, the Singaporean Armed Forces, and the United States Air Force.

### British Army Fitness Policy

The present British Army physical fitness policy was implemented in 1999 following extensive scientific study. The policy takes account of the diversity of vocations and roles across the Army, whilst recognizing issues such as gender and age. The British Army views the fitness policy as an important component in the promotion of general health. Fitness assessment and testing has been made deliberately simple to administer with only minimal resources required. With respect to an entrance fitness test, all Army recruits undergo physical selection tests prior to enlistment. The purpose of these entry tests is to:

a. Ensure basic levels of physical condition are achieved;

b. Match individual fitness potential to specific trades; and

c. Minimize risk of injury during training.[108]

On completion of the physical and other aptitude tests, soldier recruits are badged to specific trades for initial training. As these tests are related to employment, they are

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[108] Ministry of National Defence, *British Army Fitness Policy Director Individual Training* (A)/11815/1 9 (Upavon: MOD UK, 15 March 2004), 1.

gender and age free. Officers follow a slightly different system although they are tested physically before entry and have defined standards to achieve before they can be commissioned out of training.[109] All officers and soldiers undergo the following physical assessment and testing in service:

a. Personal Fitness. The Basic Personal Fitness Assessment (BPFA) is an individual assessment of health and fitness conducted by each soldier every 6 months. The assessment comprises: press-ups, sit-ups and a 2.4km run in sports clothing. Individuals are allocated a grade according to age and gender. Those with unsatisfactory grades in any element of the assessment follow a protocol of rehabilitation support (including medical advice) to assist them to regain fitness. The test standards can be seen in Appendix 3.[110]

b. Vocational Fitness. The Army Basic Combat Fitness Test (BCFT) comprises a march over 12.8km within 2 hours carrying a load appropriate to the specific vocation (between 15 – 25kg). The test is conducted annually and as a vocational test, is age and gender free. Failure to complete the test satisfactorily initiates a remedial protocol and further attempts at the test. Persistent failure to complete the test can lead ultimately to dismissal from the Army.

c. Swimming. Swimming training in the Army is mandatory. All soldiers undergo the Military Swimming Test (MST) during initial training. Once passed, it does not have to be taken again. The test comprises: a jump into water; tread water for 2 minutes; 100 metres swim; exit the pool unaided. Dress for the test is

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[109] Ibid., 1.

[110] Ibid., 2.

a swimming costume. This is mentioned because in Canada, the initial swim test is done in combat clothing.

For the Territorial Army (TA), they conduct the BCFT annually, although march distance is 6.4km with a one-hour time limit and they are not required to do the BPFA. With respect to age limits, from age 50 years, fitness testing is strongly encouraged but is no longer mandatory.[111]

**Singaporean Armed Forces Fitness Test**

The Individual Physical Proficiency Test (IPPT) system for the Singaporean Armed Forces (SAF) was first implemented in 1980 to promote the attainment of physical fitness and is now the SAF's basic physical evaluation, providing a comprehensive physical test protocol on a mass scale. This test is used for all services within the SAF, which accounts for approximately 350,000 members of which 35,000 are members of the regular Armed Forces. All members, conscripts and regular force personnel must participate in a fitness test on an annual basis. The test in both gender and age focused.

The IPPT test protocol assesses the upper and lower limbs muscular endurance and power, the body agility, body movement co-ordination and aerobic fitness that is essential for a soldier in a combat environment. It is therefore an important tool to evaluate the basic physical fitness level of soldiers as it forms the foundation stone of a soldier's combat fitness.

There are currently three types of physical fitness test for uniformed regular servicemen: the IPPT, the Alternate Aerobic Fitness Test (AAFT), and the Submaximal

[111] Ibid., 2.

Proficiency Fitness Test (SPFT).[112] The complete individual physical proficiency test (IPPT) consists five test stations to measure the components of physical fitness: muscular strength, endurance and power, agility, speed, co-ordination and cardiovascular endurance. The standards cater to the servicemen of different age group and medical status. The test stations are as follows:

a. Sit-up. This is a measurement of abdominal endurance. Participants are required to execute the maximum number of bend-knee sit-up in one minute.

b. Standing Broad Jump Station. This is a measurement of lower limbs extensor muscle power. Participants are given two attempts, which is executed consecutively. The best attempt will be recorded.

c. Chin-Up Station. This is a measurement of upper limbs muscular strength and endurance. Participants are permitted to use any method of hand grasp to execute the maximum number of chin-up.

d. 4 x 10m Shuttle Run. This is a measurement of speed, agility and co-ordination. Two attempts will be given and the best time will be recorded. The second attempt will be taken after the whole detail has finished the first attempt.

e. 2.4-km Run. This is a measurement of cardiovascular and the lower limb muscular endurance. Participants are required to complete the 2.4-km run in the fastest time.[113]

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[112] Singapore Armed Forces, Training Directive 6/2002, 4 September 2002, 1.

[113] Ibid., 2.

For those service personnel who are 40 to 44 years, they are required to take the 3-station IPPT, which consists of sit-ups chin-ups, and the 2.4-km run. The test standards are identified in Appendix 4.

There exists an alternative form of aerobic fitness test for regular servicemen who are medically exempted from the 2.4-km run known as the Alternative Aerobic Fitness Test (AAFT). It is applicable to regular uniformed personnel up to the age of 44 years. In consists of either:

a. 500m Swim Test. This is a measurement of cardio-respiratory endurance (aerobic) fitness. Participants are required to complete the 500m swim (10 laps) in a 50m swimming pool in the fastest time; or

b. 8 Km Stationary Cycle Test. This is a measurement of cardio-respiratory and lower limb muscular endurance. Participants are required to complete the 8-km cycling against a resistance of 100 watts in the fastest time.[114]

For those service personnel who are aged 45 years and above, there is a submaximal proficiency fitness test (SPFT). The SPFT is a single test item conducted on a stationary bicycle to measures the cardio respiratory fitness at a submaximal level where maximum heart rate is avoided. The $VO_2$max is predicted from the heart rate response to the submaximal exercise. It allows a participant to perform at a lower level of intensity whilst still being able to predict the participant's cardio-respiratory fitness level.

As a form of incentive to motivate ex

a. Gold Award. The Gold Award carries a monetary incentive of $200 and a Gold IPPT Badge; and

b. Silver Award. The Silver Award comes with a $100 monetary incentive and a Silver IPPT Badge.[115]

The result of the annual fitness test within the SAF is tied into promotability. In order to be promoted, the service personnel must the fitness test. If they do not they are not promoted until this is achieved.[116] In order to be exempt from the fitness program, the individual must have a medical reason. As this is seen as a formal process, an IPT board sits to validate the reason for exemption. For those that fail the fitness test, they receive a record of verbal warning. Subsequent failures result in up to two letters of warning indicating that if they do not pass the test within six months then a letter goes on their personnel file in addition to a monetary fine. A second letter of warning with a monetary penalty may be issued if the member is not successful within another six months to pass the test. A final letter of review is issued if the member still does not pass one's test, which is then used to effect discharge from the SAF.[117]

The Singaporean model is an example of a very active and robust model that demonstrates seriousness about achieving and maintaining a sound fitness level for its personnel. With both financial incentives and promotion requirements tied directly to one's fitness level, this program is highly motivated in preserving a fit culture within the SAF.

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[115] Ibid., 4.

[116] Ibid., B-1

[117] Ibid., 6-7.

**United States Air Force (USAF) Fitness Program**

The USAF has recently implemented their new fitness program as of 1 January 2004. It is based on a look and feel approach where body measurements are taken and testing for aerobic, upper and lower body strength are assessed. The assessment is both age and gender sensitive. A maximum score of 100 is possible. The USAF fitness program is a commander-driven program and it forms the backbone in order to achieve a high level of fitness for USAF. The program promotes aerobic and muscular fitness, flexibility, and optimal body composition of each member in the unit. The categories for testing are:[118]

| Ratings are as follows:<br>**Fitness Level** | **Score Required** |
|---|---|
| **Excellent** | 90 or above |
| **Good** | 75 - 89.9 |
| **Marginal** | 70 - 74.9 |
| **Poor** | Less than 70 |

Table 10: USAF Fitness Levels vs Scores required

Overall fitness is directly related to health risk, including risk of disease (morbidity) and death (mortality). A composite score of 70 represents the minimum accepted health, fitness and readiness levels. Health and readiness benefits continue to increase as body composition improves and physical activity and fitness levels increase.

[118] Department of the Air Force, Air Force Instruction 10-248: Fitness Program, 1 January 2004, 16.

Members are encouraged to optimize their own fitness and readiness by improving their overall fitness.

Fitness categories determine how often a person must be re-tested. Those who score in the good and excellent category are re-tested annually. Those who score in the "Marginal" category are re-tested every six months. Those who score in the "Poor" Category are re-tested every three months. Additionally, those in the Marginal or Poor Category attend mandatory physical fitness education classes.[119]

Under the new program, fitness points are awarded in four areas: aerobic (running), body-composition, push-ups, and crunches. Those who are not medically cleared to run take the ergo-cycle test for the aerobic portion. Members receive a composite score on a 0 to 100. In order to measure performance, the USAF uses a composite scoring mechanism in order to determine individual fitness. The composite score is based on the following maximum component scores: 50 points for aerobic fitness assessment, 30 points for body composition (abdominal circumference), 10 points for push-ups and 10 points for crunches. The USAF believes that that the best single indicator for overall level of conditioning is the aerobic fitness level, which is reflected in the scoring criteria.[120] A sample of the age and gender-specific fitness score charts is provided in Appendix 5. The score is determined by the following formula:
Composite score = Total component points achieved X 100 [121]

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[119] Ibid., 16.

[120] Bruce Callander, "Jumper to Airmen: Get in Shape," *AIR FORCE Magazine*, January 2004, 73.

[121] Department of the Air Force, Air Force Instruction 10-248…,15.

The USAF has recognized that body composition may be an indicator related to health issues in the future for individuals with specific abdominal measurements. Excess abdominal fat is an independent risk factor for disease, therefore, the evaluation of abdominal circumference is used to assess health risks associated with being overweight. There is an increased risk of chronic diseases (cardiovascular disease, high blood pressure, cancer and non-insulin dependent diabetes) for men who have an abdominal circumference that is greater than 40 inches and for women who have an abdominal circumference greater than 35 inches regardless of age or height. Extremely low body weights have also been associated with diseases and disorders related to malnutrition.[122] This is very much in line with the international INTERHEART study and metabolic syndrome issues which will be mentioned in the next section of this paper.

If a member fails a fitness test, the Commanding Officer will allow that individual six months in order to improve one's fitness. If after six months the fitness level has not improved, the Commanding Officer will convene a Fitness Review panel to review the member's case. This review may result in an administrative action with a plan to improve the individual's fitness level. At this point the Commanding Officer may restrict promotion and/or employment that may have serious career implications. If the member does not improve for 12 months or has four poor fit fitness scores in a 24-month, the Commanding Officer will make a recommendation whether to apply for the individual's release.[123]

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[122] Ibid., 33.

[123] Ibid., 26.

In the final analysis, the USAF model allows Commanders and supervisors to incorporate fitness into the AF culture, establish an environment for members to maintain physical fitness and health, and meet expeditionary mission requirements in order to deliver a fit and ready force. The annual fitness assessment provides commanders with a tool to assist in the determination of overall fitness of their military personnel.

This brief overview of fitness programs in other countries demonstrates that modern military forces rely on the strength of its members in order to assist the government of the day achieve goals on national and international levels. The ability of the military to assist the government is directly proportional to the quality of its membership. Sound leadership, relevant training, and commitment at all levels are imperatives for success. With respect to the CF, it is an organization that is a tangible expression of Canada's beliefs and a mechanism where Canadian values and ideals can be extended to the global stage. They are, in fact, as the Honourable Bill Graham, the Minister of National Defence stated, "ambassadors and promoters of Canadian values"[124] Fitness has its part to play on the national and global stage and the next portion of this paper will deal with the potential solutions to resolve some of the shortcoming of the CF EXPRES test.

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[124] Department of National Defence, "General Rick Hillier Today Assumed Command of the Canadian Forces as Chief of the Defence Staff," http://www.forces.gc.ca/site/newsroom/view_news_e.asp?id=1585: Internet accessed 15 February 2005.

# CHAPTER 5

## THE WAY AHEAD

Until recently, the relationship between fitness and military success has been relatively clear. Warfare has been essentially a contest of physical strength, endurance, military-related skills, and activities required on a continuous basis to be proficient. In effect, training programs involved participation in warfare activities, thereby developing skills while at the same time maintaining or improving fitness. The principle of task specificity was therefore fulfilled in conjunction with improved fitness and this proved to be a near ideal combination. Today and into the future, mechanization and automation advancements are creating a dissociation of physical fitness development from military skill requirements, thereby making this relationship less clear.

### Revolution in Military Affaires (RMA)

In a modern army, machines are now handling many demanding physical tasks that previously required muscle power. Vehicles and specialized equipment are used to move guns, ammunition and supplies, and instead of marching into battle, today's service member most often rides in some form of protective armoured vehicle, airborne platform or vessel afloat. Nevertheless, there are many responsibilities in the CF that continue to demand a high level of physical fitness, in terms of strength and endurance. Today's service member must be prepared to deploy anywhere in the world in all types of terrain and weather and be able to deliver a capability as directed by the commander's plan. In order to perform difficult tasks under hazardous conditions and maintain the ability to sustain a high degree of emotional strain without suffering psychological breakdown, a

good level of fitness is essential. For example, today's solder is required to carry more sophisticated equipment, global positioning systems, night vision goggles (NVG) and individual protective equipment. NVGs have made the 24-hour battle day a reality. Today's soldier must have the stamina to fight for longer periods of time without rest or sleep than in the past. Because of these factors, members of the CF must be physically fit more than ever before. Decision cycles have been become much more efficient through the use of the revolution in military affaires (RMA). RMA is the process where technology assists military operations to complete tasks more effectively. This then holds the potential to dramatically change many aspects of the character of modern warfare. A clear example of this is the greater emphasis of digitization on the battlefield that enables processes involved in the conduct of military operations to allow decision cycles to increase by a factor of ten.[125] To make matters more complex, the "Three Block War" will also have an impact on the soldier's ability to be successful and fitness has a role to play in this arena.[126] General Hillier, the current Chief of the Defence stated, " The threats we now face are far more complex. The proliferation of advanced weaponry (and the apparent willingness of individuals, groups and states to use them)… demonstrated the need to remain vigilant and prepared."[127]

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[125] Robert Leonhard, "A Culture of Velocity" in ed., *Digital War: A View from the Front Lines*, ed. Robert L Batemen III, 132-151 (California: Presido Press, 1999), 137.

[126] The term "Three Block War" is derived from United States Marine Corps General Krulak's vision that friendly forces could be called upon to carry out, on the same day, three very different types of operations within an area the size of three city blocks. He envisioned that "Block 1" could involve humanitarian operations, while "Block 2" would involve stability, peacekeeping and nation building operations and concurrently "Block 3" would require war fighting operations.

[127] Department of National Defence. *Concepts for Future Army Capabilities*, (Kingston: DND Canada, 2003), i.

**Leadership**

So where does the CF stand with respect to deficiencies when it comes to fitness within the military? The present fitness policy as outlined in CFAO 50-1 is not universally applicable to the CF. A substantial portion of the workforce has been excluded for a myriad of reasons encapsulated under the major headings of finance and feasibility.[128] Any attempt to resolve this impasse by policy makers has met with a "can't do" attitude as to why a total fitness policy will not work. This scenario not only creates uncertainty and confusion for individuals and the chain of command, but could also create a legal dilemma in which the standard policy is unenforceable in the eyes of the law with respect to equal and fair treatment. The Universality of Service (U of S) applies to all the CF equally, but fitness as a main component of U of S only applies to those who are employed on a full time basis. However, in this age of the "Total Force" concept, multiple deployments, shrinking workforce and budgets, and the need to meet the internal and external commitments of Canada, the resolution of the fitness issue becomes paramount.

Following in line with the strategy envisioned by the CDS through *Strategy 2020* and the *VCDS Corporate Priorities for Defence*, a progressive and enforceable Forces-wide fitness policy is required. Only then will the CF establish a critical portion of the foundation required to be able to meet its stated objectives of:

a. Develop and support a professional, effective and sustainable defence team;

b. Maximize effectiveness in the management of resources; and

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[128] From the DHIRM database, as part of the Total Force concept within the CF, the Reserve component forms approximately one–third or 30,000 members.

c. Ensure a capability to respond to domestic crises.[129]

Additionally, in *Duty With Honour*, a defining document for Canada's profession of arms, it has been directed by the CDS to "serve as the cornerstone document within the Canadian Forces professional development system."[130] It emphasizes, as part of the CF's fundamental beliefs and expectations:

a. the need for high levels of operational effectiveness and readiness which encompasses the requirement for individual physical fitness;
b. the need for each individual to be held accountable for his or her performance; and
c. the need for self discipline in regard to strengthening individuals to cope with the demands and stresses of operations. [131]

In line with the official policy line, there is a groundswell of support from all components and environments of the CF indicating a desire for a renewed fitness policy that encompasses all active components. This can be qualified based on the MPFS 2000 study conducted to make fitness standards more credible within the CF where considerable effort has taken place to improve overall fitness standards within the CF. Another interesting aspect of the MPFS 2000 study was a recommendation to changes to the incentive program; namely, the study suggested that the current policy of a year off for fit individuals does not adequately support the fit for life message that is being stated

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Information taken from two defence web sites accessed on 1 March 2005. These sites are: http://cds.mil.ca/pubs/strategy2k/s2k06_e.asp#1 and http://vcds.mil.ca/dgsc/pubs/change/corporate/corporate04_05_e.asp

[130] Department of National Defence. *Duty with Honour: The Profession of Arms in Canada*.(Ottawa: DND Canada, 2003), 1.

[131] Ibid., 14.

within the MPFS 2000 program.[132] Commanders at all levels are in support of a robust fitness program which has been brought on by the number of high tempo operations that the CF has been committed to and the realization that fit personnel are a more efficient and dependable resource.[133] Lieutenant General Jeffrey (retired), the Chief of the Land Staff in 2002 stated, "Physical fitness is essential to being an effective soldier…It ensures vigour, alertness and stamina in operations and in the performance of your duties."[134] The Base Commander of CFB Esquimalt stated in 2003,

> Over the past five years the annual CF EXPRES results for the Formation have proven somewhat discouraging. Statistics for this fiscal year indicate that (of the pers evaluated)…48% met the min level and …24% were below the min CF standard.[135]

The Vice Chief of the Defence State stated in 2003 the importance of fitness for the reserve component of the CF, "It is essential that fitness is not simply something that is interjected for a requirement course or deployment. The CF continues to rely on reservists in domestic and international operations…."[136] The history of a culture of fitness within the CF is inconsistent when viewed in its application and promulgation towards the entire force. The foundation and perception of fitness has been forged and ingrained respectively both within and outside the CF, however, the enforcement of the set standard and the application of a fitness regime is inconsistent. Additionally, the

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[132] J.M. Deakin and S.W. Lee, *Development and Validation of Canadian Forces…,*76.

[133] The feedback received from the Director Military Employment Policy (DMEP) working groups, which has representation from all Environmental Chiefs and a host of representatives from associated organizations within the CF.

Comments provided to DMEP Working Group on physical fitness.

[135] Ibid.

[136] Ibid.

cultivation of a fitness culture has been based on negative reinforcement meaning that all incentives to be fit, outside of personal pride, health and survival, are based on administrative action taken against the individual. What needs to occur is an awards-based program where individuals are rewarded for high levels of fitness. This could be provided by way of additional leave granted, additional points allocated in national merit boards, promotions based on the ability to pass the fitness test much like the SAF who have strictly imposed this requirement on their members in the reserve and regular forces.[137]

The next breakdown point occurs primarily outside of operational units where fitness may be relegated to a secondary or at times non-existent concern as work priorities and lack of leadership allow fitness testing to fall to the wayside. Further deterioration of the fitness culture lies with the confusion of the system in regard to clear guidelines for failure, retesting, administrative action, medical, provision of facilities, and human rights concerns. Testing is inconsistent with those reservists working less than 180 days compared to those that need to be tested if employed for more than 180 days. In the research conducted for this paper, there does not appear to be any cases where members of the CF were released due to failure of the CF EXPRES test. Human rights issues are always at the forefront of concerns relating to fitness, which could often blur that aspect of Universality of Service.

These sensitive issues take time to resolve and it is essential that they be dealt with appropriately. However, in the final analysis, if an individual is unable to pass a

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[137] The issue of providing an imperative incentive would not be setting a precedent in the CF. Currently, a certain proficiency level in bilingualism is essential for promotion to high ranks as well as graduating from the Royal Military College. Fitness levels could also be implemented in the same manner.

fitness test of a low standard, it is fair to assess and question that person's ability to perform under the universality clause. Based on the HLIS 2004 results, 18 percent had indicated that they had not taken part in an EXPRES test, and not for medical reasons.[138] This represents approximately 10,800 members of the CF that did not take the fitness test when they were required to do so. There may be extenuating circumstances in some cases where valid reasons not to be tested are acceptable. However, such a large number would suggest that the leadership at all levels are not fully engaged to ensure all members under their command fulfill their responsibilities to be ensure tested as required on an annual basis

As a matter of providing a solution there are several issues, which must be dealt with. First, if a culture of fitness is to be firmly established and maintained, the need for a clear and sustainable policy that applies to all components/sub-components should be made a baseline requirement. Second, the effort must be made to enforce the policy through leadership and consistency in application. The third consideration is to provide positive reinforcement in conjunction with associated accountability measures which links the successful completion of annual fitness tests with such policies as promotion boards, terms of service, and selection for key appointments. This mechanism, which directly connects fitness to an award based construct, should be established to provide incentives to meet fitness standards. These initiatives are but a few plausible approaches

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[138] Department of National Defence. *CF Health and Lifestyle Information Survey 2004* (February 2005), 82.

that would go a long way in reinforcing the promotion of fitness through incentives using a more robust fitness program for the CF.[139]

Based on the universality of service principle derived from the National Defence Act, all members of the CF are required to meet certain standards in both health status and fitness level. For all components of the CF the "soldier first" axiom holds true and the three pillars of fit, employable and deployable remains the legal cornerstone upon which the current fitness policy was established.[140] For CF personnel to whom the current policy applies, the bottom line on fitness testing is that the rules and processes are in place to deal with those who are unable to meet the basic fitness standards through either medical or administrative procedures, although these remain somewhat convoluted as mentioned above. A more comprehensive policy, implemented with the full support from the senior leadership of all services, is the key to success. Additionally, CFPSA has in place basic fitness tests for terminal fitness failures that are legally sustainable yet remarkably they have never actually been applied despite an estimated annual 11.2% in 2003/04 and 17.6 percent in 2004 (May to November) failure rate amongst those tested. It would appear that the current fitness policy is not being applied to its full extent either through testing or administrative follow-up.

Interesting enough the CF is not legally required by the National Defence Act to provide facilities equipment or fitness training to CF personnel. The legal position of the Director of Law Human Resources (DLaw (HR)) is, "We (the CF) are not legally

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[139] Based on the results from the MPFS 2000, it is estimated that only 3 percent of the CF population would qualify for an incentive standard.

[140] Department of National Defence. *Defence Plan 2001: The Department of National Defence and the Canadian Forces Internal Annual Business Plan for Fiscal Year 2001/2002* (Ottawa: DND Canada, 2001), 2-1. This is part of the strategic vision of the CF.

required by the National Defence Act to provide facilities, equipment or fitness training to CF personnel but it does behoove us to do so."[141] This legal opinion provided by DLaw (HR) summarizes the requirements of the total fitness obligations of the CF. In reality the CF sets the basic fitness standard prior to enrollment, requires applicants to meet the standard, and informs members of the need to meet the standard on an annual basis. As such this fitness requirement is as much a part of the basic skill set as other basic requirements such as health standards and is set as a constant throughout a member's career. This does not mean that the CF should not promote fitness through programs that facilitate a member's ability to maintain fitness. On the contrary, the CF does have a moral responsibility as well as a vested interest to assist in the maintenance of fitness within the CF. CFPSA spent approximately 33 million dollars in 2003/04 on various fitness program as it sees the logic to do so and the direct benefit to the CF and its members.[142] A robust policy needs to reflect, within reason, the requirement to provide the necessary measures to assist members through program fitness manuals, allowing time to train, providing equipment, to maintain individual fitness; however, it should clearly outline the fact that the onus remains with the member.

**INTERHEART Study and Metabolic Syndrome**

Another area that could enhance the fitness program is the establishment of more preventative measures with respect to overall health levels. Part of the mission of CFPSA is to provide an environment that is predictive in nature and to alert the CF member of any harmful issues prior to attempting the CF EXPRES test. This is why the

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[141] Commander A.V. Wirth, DLaw HR, E-mail sent to author, 4 October 2004.

[142] Department of National Defence. *Five year Strategic Plan for Canadian Forces Personnel Support Agency* (Ottawa: DND Canada, 2003), 30.

CPAFLA survey is completed before each test. Thought it meets the needs of the PSP staff, there are other indicators that could also be used to assist the assessors in determining suitability to conduct the CF EXPRES test. Recently, a major Canadian-led global study was conducted which used nine easily measurable factors that were indicators to predict potential heart attack victims. This study is known as the INTERHEART study. INTERHEART looked at more than 29,000 people in 52 countries and from all inhabited continents of the world. The study was presented on 29 August 2004 at the European Society of Cardiology (ESC) Congress in Munich, Germany by Dr. Salim Yusuf, a professor of medicine at the Michael G. DeGroote School of Medicine at McMaster University in Hamilton, Ontario, Canada. He is also the director of the Population Health Research Institute at McMaster University and Hamilton Health Sciences, and this establishment assisted in coordinating the study.[143]

The study found that the two most important risk factors are cigarette smoking and an abnormal ratio of blood lipids, or fat-like substances found in your blood and body tissues. Together these tow factors predicted two-thirds of the global risk of heart attack. Additional risk factors are high blood pressure, diabetes, abdominal obesity, stress, a lack of daily consumption of fruits and vegetables and a lack of daily exercise. Regular consumption of small amounts of alcohol was also found to be modestly protective. Worldwide, these nine factors collectively predict more than 90 per cent of the risk of a

[143] Salim Yusuf, "Effect of Potentially Modifiable Risk Factors Associated with Myocardial Infarction in 52 countries (The INTERHEART Study): case-Control Study" *Lancet* vol 364 (11 September 2004): 912.

heart attack. The World Health Organization, the World Heart Federation, and the International Clinical Epidemiology Network all endorsed the INTERHEART study.[144]

Related to the INTERHEART study is a condition called metabolic syndrome or referred to as MSX or Syndrome X, which is characterized by a group of metabolic risk factors in one person. They include:

a. Central obesity (excessive fat tissue in and around the abdomen);
b. Atherogenic dyslipidemia (blood fat disorders — mainly high triglycerides and low HDL cholesterol — that foster plaque buildups in artery walls);
c. Raised blood pressure (130/85 mmHg or higher);
d. Insulin resistance or glucose intolerance (the body can't properly use insulin or blood sugar);
e. Inability to blood clot;
f. Increase in cardiovascular disease (CVD);
g. Hardening of the arteries [145]

The underlying causes of this syndrome are overweight, obesity, physical inactivity and genetic factors. People with the metabolic syndrome are at increased risk of coronary heart disease, other diseases related to plaque buildups in artery walls which could lead to stroke, peripheral vascular disease, and Type 2 diabetes. The metabolic syndrome is identified by the presence of three or more of these components:

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[144] Ibid., 914.

[145] Barbara Caleen Hansen, **"**The Metabolic Syndrome X", *Annals of the New York Academy of Sciences*, vol 892 (Spring 1999): 897.

a. Central obesity as measured by waist circumference:

i. Men — Greater than 40 inches

ii. Women — Greater than 35 inches

b. Fasting blood triglycerides greater than or equal to 150 mg/dL

c. Blood HDL cholesterol:

i. Men — Less than 40 mg/dL

ii. Women — Less than 50 mg/dL

d. Blood pressure greater than or equal to 130/85 mmHg

e. Fasting glucose greater than or equal to 110 mg/dL[146]

Metabolic syndrome is usually accompanied by the body's inability to produce enough insulin and the body goes into a state of insulin resistance.[147] The safest, most effective

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[146] Ibid., 352. Triglycerides are the body's storage form for fat. Most triglycerides are found in adipose (fat) tissue. Some triglycerides circulate in the blood to provide fuel for muscles to work. Extra triglycerides are found in the blood after eating a meal—when fat is being sent from the stomach to tissue for storage. High triglycerides may suggest a high fat content in the body. Additionally about one-third to one-fourth of the fat in blood or blood cholesterol is carried by high-density lipoprotein (HDL). HDL cholesterol is known as the "good" cholesterol because a high level of it seems to protect against heart attack. (Low HDL cholesterol levels [less than 40 mg/dL] increase the risk for heart disease). Medical experts think that HDL tends to carry cholesterol away from the arteries and back to the liver, where it's passed from the body. Some experts believe that HDL removes excess cholesterol from plaque in arteries, thus slowing the buildup.

[147] American Heart Association, "Syndrome X or Metabolic Syndrome," http://www.americanheart.org/presenter.jhtml?identifier=534; Internet; access 1 March 2005. Insulin acts like a key, which can open a door on the cell's surface. When we eat food, the pancreas releases insulin, which attaches to a cell's receptor site and causes the entry of glucose into the cell. This causes the efficient burning of glucose within the cell. Simply stated, Insulin Resistance is the condition that results when factors cause the number of insulin receptors on your cells to decrease. Over time, the above factors affect the body's cells to properly utilize insulin to convert glucose to energy. Instead, more glucose is converted to fat and the body continues to gain more and more weight. Eventually, many related health functions fail, which could cause numerous serious diseases - including Metabolic Syndrome, diabetes and cardiovascular disease. Without enough insulin receptor sites on your cell's surface, glucose cannot properly enter the cell and instead it remains in the blood stream (often causing elevated blood sugar). When this happens, glucose is sent to the liver where it is converted to fat, which is stored throughout the body.

and preferred way to reduce insulin resistance in overweight and obese people is weight loss and increased physical activity. Other steps for managing metabolic syndrome are also important which requires medical intervention for:

a. Routinely monitor body weight (especially the index for central obesity), blood glucose, lipoproteins and blood pressure;
b. Treat individual risk factors (hyperlipidemia, hypertension and high blood glucose) according to established guidelines; and
c. Carefully choose anti-hypertensive drugs because different agents have different effects on insulin sensitivity. [148]

**Applicability to the CF**

What does the INTERHEART study and metabolic syndrome mean in relation to the CF EXPRES test. In order to provide a protective network for examiners, prior to the test, a measurement of the waist, in conjunction with the blood pressure measurement, which is already taken, could be conducted to provide an initial assessment of a potential medical issue for CF members. One component of the CF that is pursuing a proactive approach towards better health in relation to MSX is the Air Force. As part of the AF's capability framework, they are undertaking a transformational attitude towards fitness within the CF. As such their vision for operational professionalism means, "having personnel with the appropriate training, attitude, physical capacity and mental skills

[148] Hansen, **"**The Metabolic Syndrome X"…, 421. Hyperlipidemia is an elevation of lipids (fats) in the bloodstream. These lipids include cholesterol, cholesterol esters (compounds), phospholipids and triglycerides. They are transported in the blood as part of large molecules called lipoproteins. If our blood levels of cholesterol and triglycerides are too high, we are at risk for coronary artery disease.

needed to perform assigned tasks."[149] Additionally, the AF's vision statement on fitness is very clear. It states, "Develop physically fit and health-conscious Air Command member who are capable of performing strenuous duties, at minimal notice, in a variety of environments for extended periods."[150] This current policy has also suggested that the present fitness testing does not necessarily meet the new AF Vision to prepare their personnel to meet the transformational initiatives of moving from a primarily static, platform-based organization into an expeditionary, network-enabled, capability-based and results-focused Aerospace Force ready for the arduous nature of deployed operations. The AF has stated that the Wing Commanders and Headquarter Commanding Officers are to ensure their personnel meet the required physical fitness standards. They have also acknowledged that performance measuring ceases at the wing level and inconsistencies may exist with respect to the completion of fitness testing and remedial action for those who fail to meet the physical fitness requirements.[151] Currently, the Chief of the Air Staff is looking at using the indicators from metabolic syndrome to test its aircrew personnel as the Air Forces transitions to a more expeditionary force for future air operations. The AF have also acknowledged the issues related to metabolic syndrome and in a non-scientific study in Canadian Forces North Bay, it was estimated that there was a prevalence of 33 percent that may be affected by the metabolic syndrome.[152]

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[149] Department of National Defence. *Commander of Air Command, Air Command Physical Fitness Implementation Plan Version 2.0* (Ottawa: DND Canada, 17 August 2004), 2.

[150] Ibid., 2.

[151] Department of National Defence,. *Commander of Air Command*, *Air Command Physical Fitness Implementation Plan Version 2.0*, 17 August 2004, 2-3.

[152] Colonel R.A. Davidson, Metabolic Syndrome in the Canadian Forces, presentation to Chief of Air Staff in November 2004, 7.

The AF has also realized that the body mass index is yet another method of determining that there may be health issues that could be preventable if they are diagnosed in the early stages. Therefore, the current proposal is that if men have a waist circumference of over 102 cm (40 inches) or from women that have a waist circumference of over 88 cm (35 inches) and their BMIs are over 30, then they would be required to get a medical assessment to determine if there are any health issues.[153] This process is preventative in nature and is meant to assist the AF in reaching its goal as an effective expeditionary force. This process should be applied to the CF as a whole as a preventative measure and it also supports the CFPSA "fitness for life" message.

As mentioned earlier, the Body Mass Index was removed from the CF EXPRES test as it was used inappropriately to release members of the CF that did not fall within an acceptable BMI scale. As this was never the intent of the BMI initiative, it created conditions within the CF that forced the release of some members of the service – something it was not meant to do. However, the BMI scale does provide an indication that there may be an issue with respect to weight and fat content. Therefore, it is recommended that the BMI be re-instituted within the EXPRES testing procedure.

The BMI protocol is used by medical professionals in order to assist them in determining the potential health risks and therefore is a useful and valid tool to assist in assessing the overall fitness of an individual. The HLIS conducted in 2004 clearly illustrated that the overall BMI for the CF is going in the wrong direction.[154] Based on

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[153] Ibid., 13.

[154] In the HLIS in 2000, the percentage of obese CF personnel (BMI 30+) was rated at 20.6 percent and in HLIS 2004 the figure was 23.1 percent. This figure is higher than the Canadian Community Health

the initial purpose of this proposal, BMI figures should be used to provide yet another warning to the system as well as the individual that there may be a weight issue and possibly other concerns as mentioned above. In order for this to be effective it must not be used as a tool for release and it should be communicated as such to the leadership within the CF.

Finally, from the HLIS 2004 data, over 90 percent of CF personnel that are obese (30.0+) were able to pass the CF EXPRES test.[155] There are two deductions from this result. First, there is a significantly large number of members within the CF that are considered fit with a BMI over 30. Second, the test in its current form is not strict enough to assess a higher standard of fitness. This author suggests that more likely the test is not adequately rigorous which allows a high percentage of potentially obese members to pass the fitness test. Simply put, standards need to be higher to support the operational tempo of the CF.

What must be clear is the overall fitness of a member of the CF has a direct impact on one's ability to perform a multitude of tasks. Under the terms of the universality of service all members of the CF have the responsibility to remain fit. The overwhelming conclusion is that fitness programs enhance a person's quality of life, improve productivity, and bring about positive physical and mental changes. Not only are physically fit service personnel essential to the CF, they are also more likely to have enjoyable, productive lives. However, effective leadership is critical to obtaining sound

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Survey (CCHS), which is rated at 16.0 percent. The CCHS is conducted by Statistic Canada based on a survey of 130,000 Canadians. This information was obtained from the CF Health Care Centre in Ottawa.

[155] Department of National Defence, *CF Health and Lifestyle Information Survey 2004* (Ottawa: Decima Research Inc, 2005), Chapter 5.

overall fitness. Leaders at all levels must understand and practice the doctrine of physical fitness. They must be visible and active supporters of physical training programs. Their support will emphasize the importance of physical fitness training and will highlight it as a key element of achieving the CF's overall mission. Leaders must emphasize the value of physical training and clearly explain its objectives and benefits of the program. The sole responsibility of reinforcing a robust fitness program rests with leaders at every level.

A poorly designed and executed physical fitness program hurts morale. A good program is well planned and organized, has reasonable yet challenging requirements, and is competitive and progressive. Fitness is part of the command function and it must also have command presence and endorsement at every level with leaders setting the example. To foster a positive attitude, unit leaders and instructors must be knowledgeable, understanding, and fair but demanding. They must recognize individual differences and motivate soldiers to put forth their best efforts. However, they must also emphasize training to standard. Attaining a high level of physical fitness cannot be done simply by going through the motions. Relevant training is essential.

With any formal program a robust policy must be in place. The current fitness policy within the CF is not interconnected or cross-referenced with any other policy that can personally affect the member either positively or negatively, except Counseling & Probation (C&P). What is available is the Commanding Officer's ability to impose C&P should the member fail to meet the required fitness standard. However, more drastic action such as release is restricted in its applicability, as a member has the right to conduct the five basic tasks from which the fitness standard derives. However, the basic

task test has never been applied therefore indicating that no one is actually held fully accountable for his or her inability to meet the prescribed CF standard. This either indicates that all have met the standard or the standard is not being enforced. Thus in isolation, the current fitness policy does not possess adequate incentives for individual action but rather relies on individual supervision to enforce the standard.

A more enforceable and encompassing fitness policy needs to possess a series of interconnected incentives and outcome-based findings for some of the members of the CF to overcome their lethargic adherence to the fitness policy. In the end, motivation is the key. In motivational theory there are three basic principles that describe the logical outcomes that typically occur when policies follow this route:

a. Consequences, which have negative reinforcement, decrease a behaviour;
b. Consequences, which have positive reinforcement, increase a behaviour; and
c. Consequences, which give neither, extinguish a behaviour.[156]

These guidelines provide an excellent blueprint to influence the adherence to an institutional fitness policy. If the desired effect is to increase a specific behaviour, in this case fitness, then positive reinforcement would effectively bring about the desired behaviour. If you want to decrease a behaviour, then when the behaviour is shown, provide a negative reinforcement. Finally, if you want to maintain the status quo, then provide no consequence which is our current situation.

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[156] Steve's Primer, Practical Persuasion and Influence (West Virginia: University of West Virginia, 2004), 151

For fitness policy and promotion of a culture of fitness this means following through on the above principles. The negative reinforcement should continue to be enforced as a warning system to CF members and the subsequent penalties right up to release. However, the guidelines for its application should be clarified within the policy and a renewed effort at enforcement needs to be made. Positive reinforcement such as leave grants, criteria for promotion, additional points at national merit boards, pre-requites for attendance of career courses, and eligibility for meeting the conditions for conversion to further military terms of service needs to be considered. An introductory period of any new policy will be viewed as a negative reinforcement, so it needs to take a gradual approach to reach its end state. Finally, a renewed effort to provide a comprehensive policy that provides both negative and positive reinforcement will prevent the ignorance of, and in some cases non-adherence to a more comprehensive and robust policy by both the individual and the associated leadership.

# CHAPTER 6

## RECOMMENDATIONS AND CONCLUSION

With any policy within the CF the timing and rate of implementation is crucial in order to achieve any measure of success. The current CF EXPRES test is hindering and thus not meeting the needs of the operational tempo of the CF. Therefore, the following recommendations are submitted to improve a situation that requires repair:

a. Introduce a compulsory fitness standard for all components of the CF;
b. Eliminate the current incentive policy of not having to complete the EXPRES test for 24 months and replace it with mandatory annual testing regardless of performance. Incentives such as additional leave, directly connecting promotions and fitness results, attendance of career courses, Terms of Service conditions, needs to be rewarded for high levels of fitness;
c. Establish an extensive and comprehensive communication plan to gradually phase in the new CF EXPRESS test incentive standard mentioned above to replace the current basic standard over a three-year period by 2008. By 2010 replace the incentive standard with the MFPS 2000 standards as the de facto level of fitness required for the CF;
d. Establish a firm fitness policy with clear guidelines with respect to appropriate administrative measure for those personnel who are unable to meet the fitness standard. This entails additional fitness training and support to bring them up to the required standard;

e. Make the leadership at all levels accountable for ensuring that all members under their remit attempt the fitness test. This needs to be driven from the senior leadership with an accounting mechanism ensuring that this takes place;
f. Reinstate the BMI at testing so as to provide a predictive indicator of potential medical issues that can be addressed by medical professional. The BMI is not to be used as a tool to commence release proceedings;
g. Use abdominal measurement associated with the metabolic syndrome to determine potential health risk that can be addressed at the earliest opportunity;
h. Ensure CFPSA has the ability to effect the distribution of fitness/promotional material, and conduct fitness testing through the appropriate allocation from its current funding envelope;
i. Promote fitness on a continuous basis as a joint responsibility between the CF Health services and CFPSA;
j. Ensure that those who are about to commence basic military training are tested close to their date of arrival at CFLRS in order to avoid additional testing during basic training.
k. Medical staff to track all sick leave including the two days which currently do not require medical authority. This can be done in cooperation with the chain of command that would provide a semi- annual return to the medical staff.

The primacy to conduct and support operations for the CF must be at the forefront of the Canadian military. It relies on the fighting spirit of its members, which "impart to

individuals the moral, physical and intellectual qualities necessary to operate in conditions of extreme danger, to endure hardship and to approach their assigned missions with confidence, tenacity and the will to succeed."[157] It is apparent from this statement that fitness has a part to play. With the current average recruit age approaching 25 and the average age within the CF as 38, the current fitness standards do not meet the actual and perceived requirements of the CF as detailed by both the CDS and VCDS. Significant productivity has been lost in terms of days off due to various forms of illness that a vigorous fitness program would assist to reduce. The stigma that there is no time to do PT, needs to be eradicated from the CF, not because it is inappropriate for this type of attitude to be present, but rather to assist members in the CF to lead more healthier and productive lives. This will, in turn, support a military force that is finding itself undermanned and attempting to meet numerous deadlines in a short period of time. A healthier force will reduce sick days and assist in achieving the countless deadlines that need to be accomplished. The rigours and tempo of military operations requires a healthy and robust force to deal with the many challenges that deployed operations presents in the modern context. The military leadership has an obligation to ensure that time is built into the daily and weekly routine to allow for fitness training. Any compromise on this aspect of military life could affect the ability to successfully complete tasks either in a deployed or non-deployed status. In order to meet the CF requirements now and into the future, an all-encompassing fitness policy is required to promote and enforce fitness. By implementing a complete fitness policy the CF will realize a more complete and sustainable force better able to meet the commitments of Canada and the expectations of

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[157] Department for National Defence, *Duty with Honour: The Professional*…, 27.

Canadians. The men and women of the CF are an investment in capability that must be able to perform in order to better support Canada's values at home and abroad. The tools are at hand to accomplish the task.

## MPFS 2000 Scoring Tables[158]

| 20-MSR Stage | Points | mCAFT $VO_2$Max (mL/kg/min) | Points |
|---|---|---|---|
| 3.5 or Under | Fail | 32.60 and lower | Fail |
| 4.0 | 12.2 | 32.61 - 34.40 | 12.2 |
| 4.5 | 13.7 | 34.41 - 36.20 | 13.7 |
| 5.0 | 15.1 | 36.21 - 38.00 | 15.1 |
| 5.5 | 16.5 | 38.01 - 39.80 | 16.5 |
| 6.0 | 17.9 | 39.81 - 41.60 | 17.9 |
| 6.5 | 19.3 | 41.61 - 43.40 | 19.3 |
| 7.0 | 20.8 | 43.41 - 45.20 | 20.8 |
| 7.5 | 22.2 | 45.21 - 46.99 | 22.2 |
| 8.0 | 23.6 | 47.00 - 48.79 | 23.6 |
| 8.5 | 25.0 | 48.80 - 50.59 | 25.0 |
| 9.0 | 26.5 | 50.60 - 52.39 | 26.5 |
| 9.5 | 27.9 | 52.40 - 54.19 | 27.9 |
| 10.0 | 29.3 | 54.20 - 55.99 | 29.3 |
| 10.5 | 30.7 | 56.00 - 57.79 | 30.7 |
| 11.0 | 32.2 | 57.80 - 59.59 | 32.2 |
| 11.5 | 33.6 | 59.60 - 61.39 | 33.6 |
| 12.0 | 35.0 | 61.40 - 63.19 | 35.0 |
| 12.5 | 36.4 | 63.20 - 64.99 | 36.4 |
| 13.0 | 37.8 | 65.00 - 66.79 | 37.8 |
| 13.5 | 39.3 | 66.80 - 68.59 | 39.3 |
| 14.0 | 40.7 | 68.60 - 70.38 | 40.7 |
| 14.5 | 42.1 | 70.39 - 72.18 | 42.1 |
| 15.0 | 43.5 | 72.19 - 73.98 | 43.5 |
| 15.5 | 45.0 | 73.99 - 75.78 | 45.0 |
| 16.0 | 46.4 | 75.79 - 77.58 | 46.4 |
| 16.5 | 47.8 | 77.59 - 79.38 | 47.8 |
| 17.0 | 49.2 | 79.39 - 81.18 | 49.2 |
| 17.5 | 50.7 | 81.19 - 82.98 | 50.7 |
| 18.0 | 52.1 | 82.99 - 84.78 | 52.1 |
| 18.5 | 53.5 | 84.79 - 86.58 | 53.5 |
| 19.0 | 54.9 | 86.59 - 88.38 | 54.9 |
| 19.5 | 56.3 | 88.39 - 90.18 | 56.3 |
| 20.0 | 57.8 | 90.19 | 57.8 |

[158] All scores and tables for Appendix 1 are taken from, J.M. Deakin and S.W. Lee, *Development and Validation of Canadian Forces Minimum Physical Fitness*, Report Prepared for Canadian Forces Personnel Support Program (Kingston, ON: Ergonomics Research Group Queen's University, 31 March 2000), 90-97.

## Push Ups

| **Push-ups** | **Points** | **Push-ups** | Points | | Sit-ups | **Points** | **Sit-ups** | **Points** |
|---|---|---|---|---|---|---|---|---|
| 8 and Under | Fail | 53 | 30.5 | | 14 and Under | Fail | 55 | 31.9 |
| 9 | 15.0 | 54 | 30.8 | | 15 | 5.9 | 56 | 32.5 |
| 10 | 15.6 | 55 | 31.0 | | 16 | 6.5 | 57 | 33.2 |
| 11 | 16.1 | 56 | 31.2 | | 17 | 7.2 | 58 | 33.8 |
| 12 | 16.6 | 57 | 31.5 | | 18 | 7.8 | 59 | 34.5 |
| 13 | 17.2 | 58 | 31.7 | | 19 | 8.5 | 60 | 35.1 |
| 14 | 17.7 | 59 | 32.0 | | 20 | 9.1 | 61 | 35.8 |
| 15 | 18.1 | 60 | 32.2 | | 21 | 9.8 | 62 | 36.4 |
| 16 | 18.6 | 61 | 32.4 | | 22 | 10.4 | 63 | 37.1 |
| 17 | 19.0 | 62 | 32.7 | | 23 | 11.1 | 64 | 37.7 |
| 18 | 19.5 | 63 | 32.9 | | 24 | 11.7 | 65 | 38.4 |
| 19 | 19.9 | 64 | 33.1 | | 25 | 12.4 | 66 | 39.0 |
| 20 | 20.3 | 65 | 33.4 | | 26 | 13.0 | 67 | 39.7 |
| 21 | 20.7 | 66 | 33.6 | | 27 | 13.7 | 68 | 40.3 |
| 22 | 21.1 | 67 | 33.8 | | 28 | 14.3 | 69 | 41.0 |
| 23 | 21.5 | 68 | 34.0 | | 29 | 15.0 | 70 | 41.6 |
| 24 | 21.9 | 69 | 34.2 | | 30 | 15.6 | 71 | 42.3 |
| 25 | 22.2 | 70 | 34.5 | | 31 | 16.3 | 72 | 42.9 |
| 26 | 22.6 | 71 | 34.7 | | 32 | 16.9 | 73 | 43.6 |
| 27 | 22.9 | 72 | 34.9 | | 33 | 17.6 | 74 | 44.2 |
| 28 | 23.3 | 73 | 35.1 | | 34 | 18.2 | 75 | 44.9 |
| 29 | 23.6 | 74 | 35.3 | | 35 | 18.9 | 76 | 45.5 |
| 30 | 24.0 | 75 | 35.5 | | 36 | 19.5 | 77 | 46.2 |
| 31 | 24.3 | 76 | 35.7 | | 37 | 20.2 | 78 | 46.8 |
| 32 | 24.6 | 77 | 35.9 | | 38 | 20.8 | 79 | 47.5 |
| 33 | 24.9 | 78 | 36.1 | | 39 | 21.5 | 80 | 48.1 |
| 34 | 25.2 | 79 | 36.4 | | 40 | 22.1 | 81 | 48.8 |
| 35 | 25.6 | 80 | 36.6 | | 41 | 22.8 | 82 | 49.4 |
| 47 | 29.0 | 92 | 38.9 | | 42 | 23.4 | 83 | 50.1 |
| 48 | 29.2 | | | | 43 | 24.1 | 84 | 50.7 |
| 49 | 29.5 | | | | 44 | 24.7 | 85 | 51.4 |
| 50 | 29.8 | | | | 45 | 25.4 | 86 | 52.0 |
| 51 | 30.0 | | | | 46 | 26.0 | 87 | 52.7 |
| 52 | 30.3 | | | | 47 | 26.7 | 88 | 53.3 |
| | | | | | 48 | 27.3 | 89 | 54.0 |
| | | | | | 49 | 28.0 | 90 | 54.6 |
| | | | | | 50 | 28.6 | 91 | 55.3 |
| | | | | | 51 | 29.3 | 92 | 55.9 |
| | | | | | 52 | 29.9 | | |
| | | | | | 53 | 30.6 | | |
| | | | | | 54 | 31.2 | | |

| Combined Handgrip | | | | | | |
|---|---|---|---|---|---|---|
| **Score** | **Points** | | **Score** | **Points** | **Score** | **Points** |
| 49 and under | Fail | | 97 | 22.6 | | |
| 50 | 8.5 | | 98 | 22.9 | 146 | 37.3 |
| 51 | 8.8 | | 99 | 23.2 | 147 | 37.6 |
| 52 | 9.1 | | 100 | 23.5 | 148 | 37.9 |
| 53 | 9.4 | | 101 | 23.8 | 149 | 38.2 |
| 54 | 9.7 | | 102 | 24.1 | 150 | 38.5 |
| 55 | 10.0 | | 103 | 24.4 | 151 | 38.8 |
| 56 | 10.3 | | 104 | 24.7 | 152 | 39.1 |
| 57 | 10.6 | | 105 | 25.0 | 153 | 39.4 |
| 58 | 10.9 | | 106 | 25.3 | 154 | 39.7 |
| 59 | 11.2 | | 107 | 25.6 | 155 | 40.0 |
| 60 | 11.5 | | 108 | 25.9 | 156 | 40.3 |
| 61 | 11.8 | | 109 | 26.2 | 157 | 40.6 |
| 62 | 12.1 | | 110 | 26.5 | 158 | 40.9 |
| 63 | 12.4 | | 111 | 26.8 | 159 | 41.2 |
| 64 | 12.7 | | 112 | 27.1 | 160 | 41.5 |
| 65 | 13.0 | | 113 | 27.4 | 161 | 41.8 |
| 66 | 13.3 | | 114 | 27.7 | 162 | 42.1 |
| 67 | 13.6 | | 115 | 28.0 | 163 | 42.4 |
| 68 | 13.9 | | 116 | 28.3 | 164 | 42.7 |
| 69 | 14.2 | | 117 | 28.6 | 165 | 43.0 |
| 70 | 14.5 | | 118 | 28.9 | 166 | 43.3 |
| 71 | 14.8 | | 119 | 29.2 | 167 | 43.6 |
| 72 | 15.1 | | 120 | 29.5 | 168 | 43.9 |
| 73 | 15.4 | | 121 | 29.8 | 169 | 44.2 |
| 74 | 15.7 | | 122 | 30.1 | 170 | 44.5 |
| 75 | 16.0 | | 123 | 30.4 | 171 | 44.8 |
| 76 | 16.3 | | 124 | 30.7 | 172 | 45.1 |
| 77 | 16.6 | | 125 | 31.0 | 173 | 45.4 |
| 78 | 16.9 | | 126 | 31.3 | 174 | 45.7 |
| 79 | 17.2 | | 127 | 31.6 | 175 | 46.0 |
| 80 | 17.5 | | 128 | 31.9 | 176 | 46.3 |
| 81 | 17.8 | | 129 | 32.2 | 177 | 46.6 |
| 82 | 18.1 | | 130 | 32.5 | 178 | 46.9 |
| 83 | 18.4 | | 131 | 32.8 | 179 | 47.2 |
| 84 | 18.7 | | 132 | 33.1 | 180 | 47.5 |
| 85 | 19.0 | | 133 | 33.4 | 181 | 47.8 |
| 86 | 19.3 | | 134 | 33.7 | 182 | 48.1 |
| 87 | 19.6 | | 135 | 34.0 | 183 | 48.4 |
| 88 | 19.9 | | 136 | 34.3 | 184 | 48.7 |
| 89 | 20.2 | | 137 | 34.6 | 185 | 49.0 |
| 90 | 20.5 | | 138 | 34.9 | 186 | 49.3 |
| 91 | 20.8 | | 139 | 35.2 | | |
| 92 | 21.1 | | 140 | 35.5 | | |
| 93 | 21.4 | | 141 | 35.8 | | |
| 94 | 21.7 | | 142 | 36.1 | | |
| 95 | 22.0 | | 143 | 36.4 | | |
| 96 | 22.3 | | 144 | 36.7 | | |
| | | | 145 | 37.0 | | |

Vertical Jump

| Vertical Jump (in cm) | Points | Vertical Jump (in cm) | Points |
|---|---|---|---|
| 5 and Under | 0 | | |
| 26 | 11.2 | 58 | 31.7 |
| 27 | 11.8 | 59 | 32.4 |
| 28 | 12.5 | 60 | 33.0 |
| 29 | 13.1 | 61 | 33.6 |
| 30 | 13.7 | 62 | 34.3 |
| 31 | 14.4 | 63 | 34.9 |
| 32 | 15.0 | 64 | 35.6 |
| 33 | 15.7 | 65 | 36.2 |
| 34 | 16.3 | 66 | 36.8 |
| 35 | 16.9 | 67 | 37.5 |
| 36 | 17.6 | 68 | 38.1 |
| 37 | 18.2 | 69 | 38.8 |
| 38 | 18.9 | 70 | 39.4 |
| 39 | 19.5 | 71 | 40.1 |
| 40 | 20.2 | 72 | 40.7 |
| 41 | 20.8 | 73 | 41.3 |
| 42 | 21.4 | 74 | 42.0 |
| 43 | 22.1 | 75 | 42.6 |
| 44 | 22.7 | 76 | 43.3 |
| 45 | 23.4 | 77 | 43.9 |
| 46 | 24.0 | 78 | 44.6 |
| 47 | 24.7 | 79 | 45.2 |
| 48 | 25.3 | 80 | 45.8 |
| 49 | 25.9 | 81 | 46.5 |
| 50 | 26.6 | 82 | 47.1 |
| 51 | 27.2 | 83 | 47.8 |
| 52 | 27.9 | 84 | 48.4 |
| 53 | 28.5 | 85 | 49.0 |
| 54 | 29.1 | 86 | 49.7 |
| 55 | 29.8 | 87 | 50.3 |
| 56 | 30.4 | 88 | 51.0 |
| 57 | 31.1 | 89 | 51.6 |

## Leg Dynamometer

| Score | Points | Score | Points | Score | Points | Score | Points | Score | Points | Score | Points |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 234 | 29.2 | 274 | 34.0 |
| 78 and Under | 0 | 117 | 15.4 | 158 | 20.2 | | | 235 | 29.3 | 275 | 34.1 |
| 79 | 10.8 | 118 | 15.5 | 159 | 20.3 | 197 | 24.8 | 236 | 29.5 | 276 | 34.2 |
| 80 | 11.0 | 119 | 15.6 | 160 | 20.5 | 198 | 25.0 | 237 | 29.6 | 277 | 34.3 |
| 81 | 11.1 | 120 | 15.7 | 161 | 20.6 | 199 | 25.1 | 238 | 29.7 | 278 | 34.4 |
| 82 | 11.2 | 121 | 15.8 | 162 | 20.7 | 200 | 25.2 | 239 | 29.8 | 279 | 34.6 |
| 83 | 11.3 | 122 | 15.9 | 163 | 20.8 | 201 | 25.3 | 240 | 29.9 | 280 | 34.7 |
| 84 | 11.4 | 123 | 16.1 | 164 | 20.9 | 202 | 25.4 | 241 | 30.1 | 281 | 34.8 |
| 85 | 11.6 | 124 | 16.2 | 165 | 21.0 | 203 | 25.6 | 242 | 30.2 | 282 | 34.9 |
| 86 | 11.7 | 125 | 16.3 | 166 | 21.2 | 204 | 25.7 | 243 | 30.3 | 283 | 35.0 |
| 87 | 11.8 | 128 | 16.7 | 167 | 21.3 | 205 | 25.8 | 244 | 30.4 | 284 | 35.2 |
| 88 | 11.9 | 129 | 16.8 | 168 | 21.4 | 206 | 25.9 | 245 | 30.5 | 285 | 35.3 |
| 89 | 12.0 | 130 | 16.9 | 169 | 21.5 | 207 | 26.0 | 246 | 30.7 | 286 | 35.4 |
| 90 | 12.2 | 131 | 17.0 | 170 | 21.6 | 208 | 26.1 | 247 | 30.8 | 287 | 35.5 |
| 91 | 12.3 | 132 | 17.1 | 171 | 21.8 | 209 | 26.3 | 248 | 30.9 | 288 | 35.6 |
| 92 | 12.4 | 133 | 17.3 | 172 | 21.9 | 210 | 26.4 | 249 | 31.0 | 289 | 35.8 |
| 93 | 12.5 | 134 | 17.4 | 173 | 22.0 | 211 | 26.5 | 250 | 31.1 | 290 | 35.9 |
| 94 | 12.6 | 135 | 17.5 | 174 | 22.1 | 212 | 26.6 | 251 | 31.2 | 291 | 36.0 |
| 95 | 12.7 | 136 | 17.6 | 175 | 22.2 | 213 | 26.7 | 252 | 31.4 | 292 | 36.1 |
| 96 | 12.9 | 137 | 17.7 | 176 | 22.4 | 214 | 26.9 | 253 | 31.5 | 293 | 36.2 |
| 97 | 13.0 | 138 | 17.8 | 177 | 22.5 | 215 | 27.0 | 254 | 31.6 | 294 | 36.3 |
| 98 | 13.1 | 139 | 18.0 | 178 | 22.6 | 216 | 27.1 | 255 | 31.7 | 295 | 36.5 |
| 99 | 13.2 | 140 | 18.1 | 179 | 22.7 | 217 | 27.2 | 256 | 31.8 | 296 | 36.6 |
| 100 | 13.3 | 141 | 18.2 | 180 | 22.8 | 218 | 27.3 | 257 | 32.0 | 297 | 36.7 |
| 101 | 13.5 | 142 | 18.3 | 181 | 22.9 | 219 | 27.5 | 258 | 32.1 | 298 | 36.8 |
| 102 | 13.6 | 143 | 18.4 | 182 | 23.1 | 220 | 27.6 | 259 | 32.2 | 299 | 36.9 |
| 103 | 13.7 | 144 | 18.6 | 183 | 23.2 | 221 | 27.7 | 260 | 32.3 | 300 | 37.1 |
| 104 | 13.8 | 145 | 18.7 | 184 | 23.3 | 222 | 27.8 | 261 | 32.4 | 301 | 37.2 |
| 105 | 13.9 | 146 | 18.8 | 185 | 23.4 | 222 | 27.8 | 262 | 32.6 | 302 | 37.3 |
| 106 | 14.0 | 147 | 18.9 | 186 | 23.5 | 223 | 27.9 | 263 | 32.7 | 303 | 37.4 |
| 107 | 14.2 | 148 | 19.0 | 187 | 23.7 | 224 | 28.0 | 264 | 32.8 | 304 | 37.5 |
| 108 | 14.3 | 149 | 19.1 | 188 | 23.8 | 225 | 28.2 | 265 | 32.9 | 305 | 37.7 |
| 109 | 14.4 | 150 | 19.3 | 189 | 23.9 | 226 | 28.3 | 266 | 33.0 | 306 | 37.8 |
| 110 | 14.5 | 151 | 19.4 | 190 | 24.0 | 227 | 28.4 | 267 | 33.1 | 307 | 37.9 |
| 111 | 14.6 | 152 | 19.5 | 191 | 24.1 | 228 | 28.5 | 268 | 33.3 | 308 | 38.0 |
| 112 | 14.8 | 153 | 19.6 | 192 | 24.2 | 229 | 28.6 | 269 | 33.4 | 309 | 38.1 |
| 113 | 14.9 | 154 | 19.7 | 193 | 24.4 | 230 | 28.8 | 270 | 33.5 | 310 | 38.2 |
| 114 | 15.0 | 155 | 19.9 | 194 | 24.5 | 231 | 28.9 | 271 | 33.6 | 311 | 38.4 |
| 115 | 15.1 | 156 | 20.0 | 195 | 24.6 | 232 | 29.0 | 272 | 33.7 | 312 | 38.5 |
| 116 | 15.2 | 157 | 20.1 | 196 | 24.7 | 233 | 29.1 | 273 | 33.9 | 313 | 38.6 |

## Scoring Scheme for MPFS 2000

WOMEN

| Case | $VO_2$max (mL/kg/min) | Sit-ups | Push-ups | Combined Handgrip (kg) | Vertical Jump (cm) | Leg Dyna-mometer (kg) | Total Points |
|---|---|---|---|---|---|---|---|
| Highest Total Points | 47.6 | 57 | 34 | 73 | 37 | 182 | 141.6 |
| Enough Points to Pass | 31.1 | 38 | 4 | 87 | 34 | 201 | 104.2 |
| Lowest Total Points | 26.6 | 18 | 0 | 36 | 26 | 61 | 42.6 |

**MEN**

| Case | $VO_2$max (mL/kg/min) | Sit-ups | Push-ups | Combined Handgrip (kg) | Vertical Jump (cm) | Leg Dyna-mometer (kg) | Total Points |
|---|---|---|---|---|---|---|---|
| Highest Total Points | 53.6 | 64 | 46 | 136 | 49 | 240 | 188.8 |
| Enough Points to Pass | 34.1 | 32 | 15 | 97 | 30 | 150 | 104.3 |
| Lowest Total Points | 32.6 | 18 | 11 | 91 | 30 | 108 | 85.0 |

## NORMS FOR $VO_2MAX$[159]

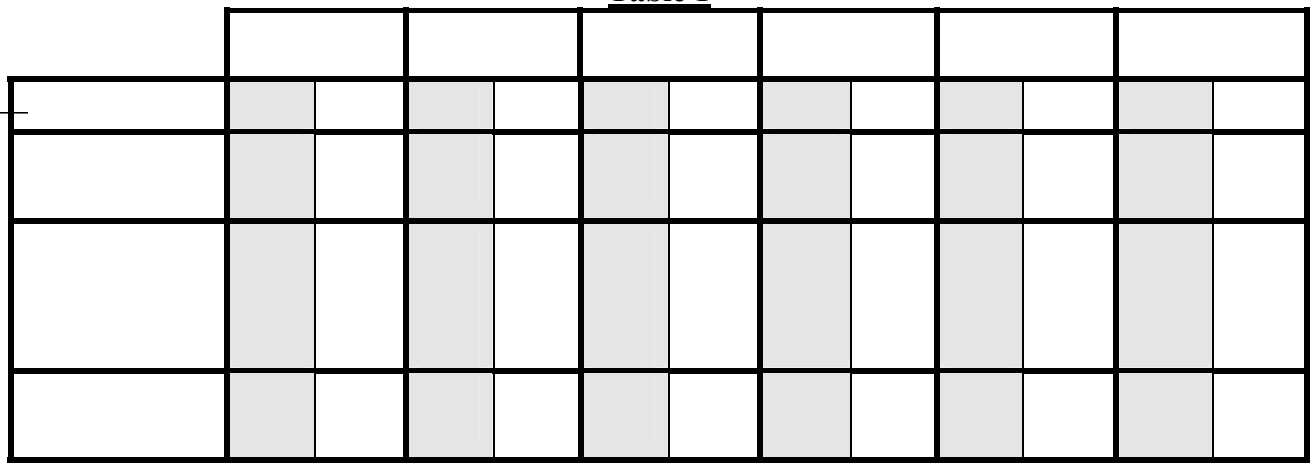
| MAXIMAL OXYGEN UPTAKE NORMS FOR MEN (ml/kg/min) | | | | | | |
|---|---|---|---|---|---|---|
| | 18-25 years old | 26-35 years old | 36-45 years old | 46-55 years old | 56-65 years old | 65+ years old |
| excellent | >60 | >56 | >51 | >45 | >41 | >37 |
| good | 52-60 | 49-56 | 43-51 | 39-45 | 36-41 | 33-37 |
| above average | 47-51 | 43-48 | 39-42 | 35-38 | 32-35 | 29-32 |
| average | 42-46 | 40-42 | 35-38 | 32-35 | 30-31 | 26-28 |
| below average | 37-41 | 35-39 | 31-34 | 29-31 | 26-29 | 22-25 |
| poor | 30-36 | 30-34 | 26-30 | 25-28 | 22-25 | 20-21 |
| very poor | <30 | <30 | <26 | <25 | <22 | <20 |

| MAXIMAL OXYGEN UPTAKE NORMS FOR WOMEN (ml/kg/min) | | | | | | |
|---|---|---|---|---|---|---|
| | 18-25 years old | 26-35 years old | 36-45 years old | 46-55 years old | 56-65 years old | 65+ years old |
| excellent | >56 | >52 | >45 | >40 | >37 | >32 |
| good | 47-56 | 45-52 | 38-45 | 34-40 | 32-37 | 28-32 |
| above average | 42-46 | 39-44 | 34-37 | 31-33 | 28-31 | 25-27 |
| average | 38-41 | 35-38 | 31-33 | 28-30 | 25-27 | 22-24 |
| below average | 33-37 | 31-34 | 27-30 | 25-27 | 22-24 | 19-22 |
| poor | 28-32 | 26-30 | 22-26 | 20-24 | 18-21 | 17-18 |
| very poor | <28 | <26 | <22 | <20 | <18 | <17 |

[159] Fitness Testing, http://www.topendsports.com/testing/vo2norms.htm ; Internet; accessed; 13 January 2005.

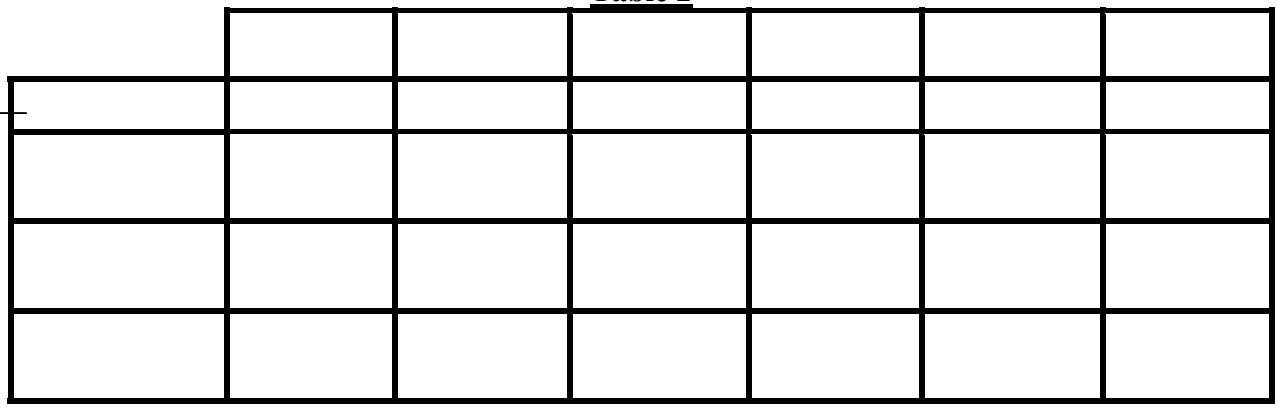
**AEROBIC FITNESS RUN (British Test)**[160]

**Table 1**



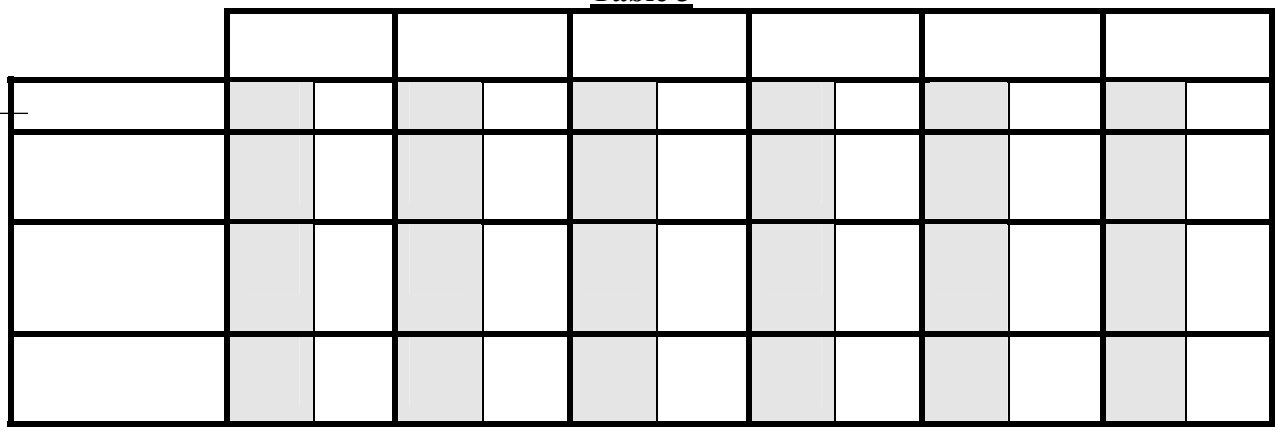
**SIT-UPS**

**Table 2**



**PUSH-UPS**

**Table 3**



[160] Ministry of Defence, British Army Fitness Policy DITrg(A)/11815/1 15 March 2004, 24-30.

## TEST STANDARDS FOR THE PHYSICAL FITNESS TESTS for SAF [161]

| AGE CAT | GRADE | Score | SIT-UP (REPS) | SBJ (CM) | CHIN-UP (REPS) | SHUTTLE RUN (SEC) | 2.4KM RUN (MIN: SEC) | AAFT | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 500M SWIM (MIN: SEC) | 8KM CYCLING (MIN: SEC) |
| CAT X Below 25 Yrs | A | 5 | >39 | >242 | >11 | < 10.2 | <10:21 | <9:01 | <11:01 |
| | B | 4 | 37-39 | 234-242 | 10-11 | 10.2-10.3 | 10:21-11:00 | 9:01-10:30 | 11:01-13:00 |
| | C | 3 | 34-36 | 225-233 | 8-9 | 10.4-10.5 | 11:01-11:40 | 10:31-12:00 | 13:01-15:00 |
| | D | 2 | 31-33 | 216-224 | 6-7 | 10.6-10.7 | 11:41-12:20 | 12:01-13:30 | 15:01-17:00 |
| | E | 1 | 28-30 | 207-215 | 4-5 | 10.8-10.9 | 12:21:13:00 | 13:31-15:00 | 17:01-19:00 |
| CAT Y 25 to 29 Yrs | A | 5 | >38 | >238 | >10 | <10.3 | <10:41 | <9:46 | <12:01 |
| | B | 4 | 36-38 | 230-238 | 9-10 | 10.3-10.4 | 10:41-11:20 | 9:46-11:15 | 12:01-14:00 |
| | C | 3 | 33-35 | 221-229 | 7-8 | 10.5-10.6 | 11:21-12:00 | 11:16-12:45 | 14:01-16:00 |
| | D | 2 | 30-32 | 212-220 | 5-6 | 10.7-10.8 | 12:01-12:40 | 12:46-14:15 | 16:01-18:00 |
| | E | 1 | 27-29 | 203-211 | 3-4 | 10.9-11.0 | 12:41-13:20 | 14:16-15:45 | 18:01-20:00 |
| CAT Y1 30 to 34 Yrs | A | 5 | >36 | >233 | >9 | <10.4 | <11:01 | <10:31 | <13:01 |
| | B | 4 | 34-36 | 225-233 | 8-9 | 10.4.-10.5 | 11:01-11:40 | 10:31-12:00 | 13:01-15:00 |
| | C | 3 | 31-33 | 216-224 | 6-7 | 10.6-10.7 | 11:41-12:20 | 12:01-13:30 | 15:01-17:00 |
| | D | 2 | 28-30 | 207-215 | 4-5 | 10.8-10.9 | 12:21-13:00 | 13:31-15:00 | 17:01-19:00 |
| | E | 1 | 25-27 | 198-206 | 3 | 11.0-11.1 | 13:01-13:40 | 15:01-16:30 | 19:01-21:00 |
| CAT Z 35 to 39 Yrs | A | 5 | >33 | >224 | >7 | < 10.6 | <11:41 | <11:16 | <14:01 |
| | B | 4 | 31-33 | 216-224 | 6-7 | 10.6-10.7 | 11:41-12:15 | 11:16-12:45 | 14:01-16:00 |
| | C | 3 | 28-30 | 207-215 | 4-5 | 10.8-10.9 | 12:16-12:50 | 12:46-14:15 | 16:01-18:00 |
| | D | 2 | 25-27 | 198-206 | 3 | 11.0-11.1 | 12:51-13:25 | 14:16-15:45 | 18:01-20:00 |
| | E | 1 | 22-24 | 189-197 | 2 | 11.2-11.3 | 13:26-14:00 | 15:46-17:15 | 20:01-22:00 |

## A SAMPLE OF UNITED STATES AIR FORCES FITNESS STANDARDS[162]

**Males 25-29**

| Aerobic Fitness | | | Body Composition | | Muscle Fitness | | | |
|---|---|---|---|---|---|---|---|---|
| 1.5-Mile Run Time (min.) | Bike Test ($VO_2$) | Component Points | Abdominal Circumference (inches) | Component Points | 1 minute Push-up (# Reps) | Component Points | 1 minute Crunch (# Reps) | Component Points |
| ≤9:36 | ≥54 | 50.00 | <32.5 | 30.00 | ≥57 | 10.00 | ≥53 | 10.00 |
| 9:37-9:48 | 53 | 47.50 | 32.50 | 28.75 | 56 | 9.75 | 51-52 | 9.50 |
| 9:49-10:12 | 51-52 | 45.00 | 33.00 | 27.50 | 55 | 9.50 | 50 | 9.00 |
| 10:13-10:36 | 49-50 | 43.50 | 33.50 | 26.25 | 54 | 9.25 | 48-49 | 8.75 |
| 10:37-11:06 | 47-48 | 42.00 | 34.00 | 25.00 | 52-53 | 9.00 | 46-47 | 8.50 |
| 11:07-11:36 | 45-46 | 40.50 | 34.50 | 23.75 | 48-51 | 8.75 | 44-45 | 8.25 |
| 11:37-12:12 | 43-44 | 39.00 | 35.00 | 22.50 | 45-47 | 8.50 | 42-43 | 8.00 |
| 12:13-12:54 | 41-42 | 37.50 | 35.50 | 22.35 | 41-44 | 8.25 | 40-41 | 7.75 |
| 12:55-13:36 | 39-40 | 36.00 | 36.00 | 22.20 | 37-40 | 8.00 | 38-39 | 7.50 |
| 13:37-14:24 | 37-38 | 34.00 | 36.50 | 22.05 | 34-36 | 7.75 | 36-37 | 7.40 |
| 14:25-14:54 | 36 | 32.00 | 37.00 | 21.90 | 30-33 | 7.50 | 34-35 | 7.30 |
| 14:55-15:18 | 35 | 30.00 | 37.50 | 21.75 | 27-29 | 7.40 | 33 | 7.20 |
| 15:19-15:48 | 34 | 27.00 | 38.00 | 21.60 | 25-26 | 7.30 | 31-32 | 7.10 |
| 15:49-16:24 | 33 | 24.00 | 38.50 | 21.45 | 23-24 | 7.20 | 30 | 7.00 |
| 16:25-16:54 | 32 | 21.00 | 39.00 | 21.30 | 20-22 | 7.10 | 28-29 | 6.00 |
| 16:55-17:36 | 31 | 18.00 | 39.50 | 21.25 | 17-19 | 7.00 | 27 | 4.00 |
| 17:37-18:12 | 30 | 15.00 | 40.00 | 21.00 | 15-16 | 6.00 | 25-26 | 2.00 |
| 18:13-18:54 | 29 | 12.00 | 40.50 | 18.00 | 13-14 | 5.00 | <25 | 0.00 |
| 18:55-19:42 | 28 | 9.00 | 41.00 | 15.00 | 11-12 | 4.00 | | |
| 19:43-20:36 | 27 | 6.00 | 41.50 | 12.00 | 10 | 3.00 | | |
| 20:37-21:30 | 26 | 3.00 | 42.00 | 9.00 | 9 | 2.00 | | |
| >21:30 | <26 | 0.00 | 42.50 | 6.00 | 7-8 | 1.00 | | |
| | | | 43.00 | 3.00 | <7 | 0.00 | | |
| | | | >43.00 | 0.00 | | | | |

**Females 25-29**

| Aerobic Fitness | | | Body Composition | | Muscle Fitness | | | |
|---|---|---|---|---|---|---|---|---|
| 1.5-Mile Run Time (min.) | Bike Test ($VO_2$) | Component Points | Abdominal Circumference (inches) | Component Points | 1 minute Push-up (# Reps) | Component Points | 1 minute Crunch (# Reps) | Component Points |
| ≤11:24 | ≥46 | 50.00 | <29.5 | 30.00 | ≥41 | 10.00 | ≥47 | 10.00 |
| 11:25-11:36 | 45 | 47.50 | 29.50 | 28.75 | 40 | 9.75 | 46 | 9.50 |
| 11:37-11:54 | 44 | 45.00 | 30.00 | 27.50 | 38-39 | 9.50 | 45 | 9.00 |
| 11:55-12:30 | 42-43 | 43.50 | 30.50 | 26.25 | 36-37 | 9.25 | 42-44 | 8.75 |
| 12:31-13:12 | 40-41 | 42.00 | 31.00 | 25.00 | 35 | 9.00 | 40-41 | 8.50 |
| 13:13-14:00 | 38-39 | 40.50 | 31.50 | 23.75 | 31-34 | 8.75 | 38-39 | 8.25 |
| 14:01-14:54 | 36-37 | 39.00 | 32.00 | 22.50 | 28-30 | 8.50 | 36-37 | 8.00 |
| 14:55-15:18 | 35 | 37.50 | 32.50 | 22.30 | 25-27 | 8.25 | 34-35 | 7.75 |
| 15:19-15:48 | 34 | 36.00 | 33.00 | 22.00 | 22-24 | 8.00 | 31-33 | 7.50 |
| 15:49-16:24 | 33 | 34.00 | 33.50 | 21.80 | 19-21 | 7.75 | 29-30 | 7.40 |
| 16:25-16:54 | 32 | 32.00 | 34.00 | 21.50 | 16-18 | 7.50 | 27-28 | 7.30 |
| 16:55-17:36 | 31 | 30.00 | 34.50 | 21.30 | 14-15 | 7.40 | 25-26 | 7.20 |
| 17:37-18:12 | 30 | 27.00 | 35.00 | 21.00 | 13 | 7.30 | 23-24 | 7.10 |
| 18:13-18:54 | 29 | 24.00 | 35.50 | 18.00 | 11-12 | 7.20 | 21-22 | 7.00 |
| 18:55-19:42 | 28 | 21.00 | 36.00 | 15.00 | 10 | 7.10 | 19-20 | 6.00 |
| 19:43-20:36 | 27 | 18.00 | 36.50 | 12.00 | 8-9 | 7.00 | 17-18 | 4.00 |
| 20:37-21:30 | 26 | 15.00 | 37.00 | 9.00 | 7 | 6.00 | 15-16 | 2.00 |
| 21:31-22:30 | 25 | 12.00 | 37.50 | 6.00 | 6 | 5.00 | <15 | 0.00 |
| 22:31-23:36 | 24 | 9.00 | 38.00 | 3.00 | 5 | 4.00 | | |
| 23:37-24:48 | 23 | 6.00 | >38.00 | 0.00 | 4 | 3.00 | | |
| [illegible] | [illegible] | 3.00 | | | 3 | [illegible] | | |
| 0.00 | | | 2 | 1.00 | | | >26:06 | 21 |
| | | | <2 | 0.00 | | | | |

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