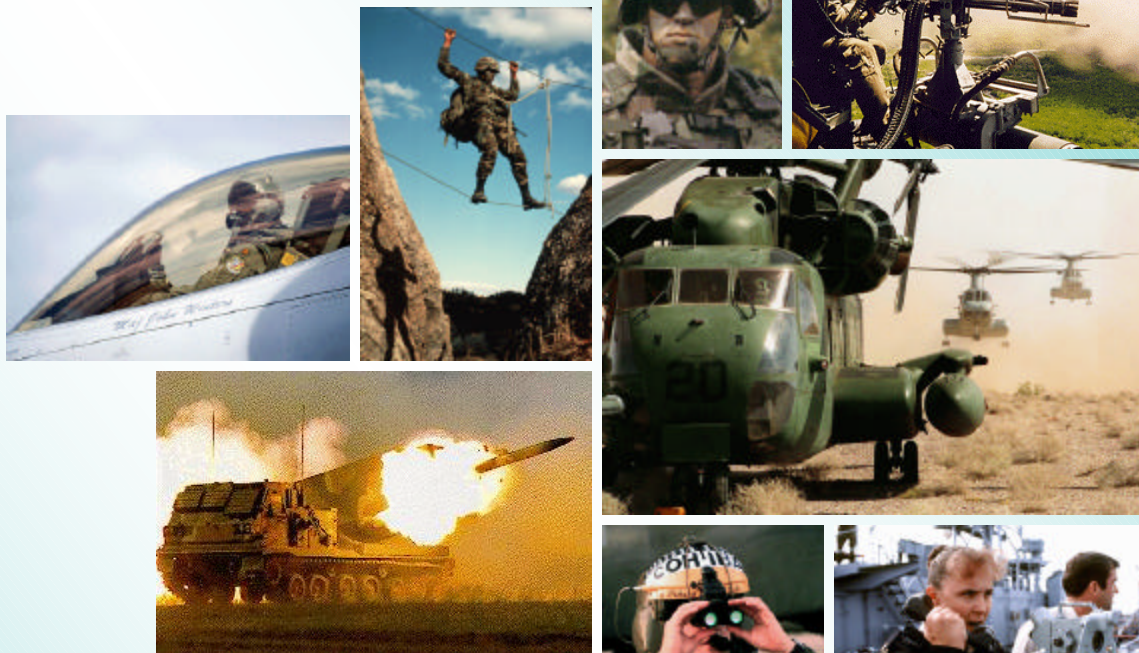


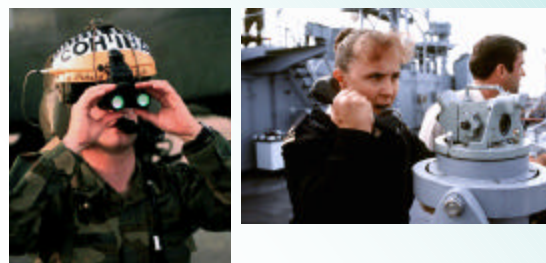
# Summary Report

## RESEARCH WORKSHOP ON PHYSICAL FITNESS STANDARDS AND MEASUREMENTS WITHIN THE MILITARY SERVICES



31 August 1999 - 2 September 1999

Washington Dulles Airport Hilton  
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The Secretary of Defense (should) revise the Department's physical fitness regulations to establish a mechanism for providing policy and research coordination of the military services' physical fitness and body fat programs.

— GAO Report  
1998

## Foreword

The concept for this workshop originated with the current revision of DoD Instruction 1308.3, "DoD Physical Fitness and Body Fat Program Procedures", 30 August 1995, which began early in 1999. This revision was, in part, a response to a 1998 General Accounting Office report critical of the broad guidance given to the services in establishing physical fitness requirements and the resulting lack of uniformity. The GAO report stated that "--- the Secretary of Defense (should) revise the Department's physical fitness regulations to establish a mechanism for providing policy and research coordination of the military services' physical fitness and body fat programs". The DoD Instruction is currently under revision. The current version of the Instruction responds to this guidance.

This workshop was intended to serve as a tool in developing consensus in this revision process. Unfortunately, delays in its scheduling postponed the workshop until the revision process was well underway. Nevertheless, the workshop addressed many of the points of contention that were arising during the revision, and presented an opportunity to conduct a line by line review of the Instruction while the principals were gathered together. The workshop Read Ahead Paper (Appendix A) gives further background, goals and questions that were addressed by the workshop attendees. The agenda is found in Appendix B and list of attendees in Appendix C. A CD-ROM collection of the presentation materials is available upon request.

Body fat standards and assessment are in most cases an integral part of each service's physical fitness program. However, since considerable effort and progress has already been made in this area, these were intentionally excluded from specific consideration during this workshop, allowing more time and attention to be given to the physical capacity components (aerobic capacity, muscular strength, strength endurance).

The Consensus Statement found at the beginning of this report represents the consensus opinion regarding key issues of commonality of standards and testing, approaches for establishing standards, and the future for occupationally driven standards. Although agreement on common general fitness standards and measurement procedures was not achieved, considerable progress was made in comparing and describing the existing procedures used in developing standards, documenting objective criteria that exist, and comparing the validity of the fitness methodology that is available. The workshop brought about a common information base and discussion that should facilitate future work in this area between the services.

This report is both a synthesis of the material presented and, in some cases, a summary of individual presentations. An attempt has been made to draw a coherent picture of similarities and differences in physical fitness standards and measurements as they now exist in the services.

This report was prepared by James A. Vogel, Ph.D. of SHERIKON, Inc., the organization that was under contract to support the arrangements and conduct of this meeting. The contract was funded by the Military Operational Medicine Research Program, U.S. Army Medical Research & Materiel Command, Fort Detrick, Frederick, MD (62787 A845).

30 December 1999  
LTC Karl E. Friedl  
Chair, Joint Technology Coordinating Group 5

## Consensus Statement

All military personnel regardless of occupational specialty, unit assignment, age or gender should acquire a base level of general physical fitness. This physical fitness promotes a standard of physical readiness commensurate with the active life style and deployability of the military profession. Such a DoD-wide generalized fitness standard will enhance overall health, physical well being, military readiness and appearance. This base level of fitness can then be used as a springboard to train personnel for further physically demanding occupational specialties or unit assignments and deployable combat readiness.

Although physical fitness has been shown to predict objective criteria, such as health indicators or performance of common physical tasks, their application is not yet sufficiently accepted to be able to employ them in establishing general fitness standards. Therefore, until such objective criteria are further developed and accepted, this general requirement should be based on the common goal of motivating service members toward good fitness habits, physical training participation and a healthy life style. Since the services have different missions, approaches and capabilities in meeting these general goals, flexibility is needed in meeting a common DoD-wide standard. Thus, in the near term, each service should derive its own standard based on population normative distribution statistics, trainability of its population and available health or performance criteria unique to its service, that will accomplish these goals. All services currently use this approach. The standard should include aerobic fitness, muscle strength, and/or muscle endurance, and body fat components measured by accepted scientifically based procedures, and are gender and age dependent where appropriate. Considerable commonality in fitness and body fat methodology already exists amongst the services. Testing methodology should take gender and body size factors into consideration.

This base level general fitness standard does not represent the higher requirements of physically demanding occupations or combat readiness. Occupations require specific combinations and levels of the fitness components. Combat readiness requires an overall higher level and more specialized form of fitness and more specialized training to achieve these higher standards. While most services have considered, and in some cases (such as the Air Force) fielded, occupational physical selection standards and tests, potential exists for the future development of a second tier of occupational physical performance standards for those occupations with demanding physical tasks. Manual materials handling (lifting) and load bearing are two primary examples of physical tasks within many occupations for which standards can be set and tested. This matching of individual capability to job physical task demands will lead to improved job performance, job satisfaction, retention, and reduced injuries and lost duty time. Such development should take into consideration equipment and task modification and training procedure factors before standards are set.

In general, DoD, through the DoD Instruction, should provide guidance and limits to the services for consistency for the broadest policy issues. These include: a) all service members will be tested for physical fitness to meet a standard commensurate with the promotion of a healthy life style, physical activity and physical readiness; b) testing will include the components of aerobic capacity, strength/strength endurance and body fat; c) this base level standard should be derived from service unique population normative distributions; and d) test methods should be scientifically and physiologically valid. DoD should encourage the services to work toward developing additional objective criteria, such as injury incidence or lost duty time, upon which to base this generalized fitness standard and to further define the physically demanding tasks of occupations upon which to establish a second tier of occupational physical performance standards.

Generalized fitness standards promote physical readiness commensurate with active life style and deployability of the military profession.

Base level general fitness standards do not represent the higher requirements of physically demanding occupations or combat readiness.

## Current Policy

A key issue in understanding existing differences in the services' general fitness standards is the variation in criteria employed in setting requirements and whether these criteria require gender and age adjustment.

### I. Current Physical Fitness Policy: Standards and Assessment

#### I.A. Introduction

- I.A1. At the Department of Defense level, physical fitness doctrine is described in DoD Directive 1308.1, *DoD Physical Fitness and Body Fat Programs*, 20 July 1995 and DoD Instruction 1308.3, *DoD Physical Fitness and Body Fat Programs Procedures*, 30 August 1995. In response to a 1998 GAO report and recommendations, Instruction 1308.3 is currently undergoing revision and is scheduled for issuance on 7 January 2000. The Office of the Deputy Assistant Secretary of Defense coordinates action for the fitness directive and instruction for Personnel Support, Families and Education, Directorate of Community Support Policy.
- I.A2. The GAO report driving the revision (Report # NSIAD-99-9, *Gender Issues: Improved Guidance and Oversight are Needed to Ensure Validity and Equity of Fitness Standards*, dated 17 Nov 98) contended that current DoD fitness instructions permitted the services to institute disparate policies and standards, an undesirable situation. Their recommendations included:
- Revise to clearly state that the objective of the Physical Fitness Program is to enhance general fitness and health. It is not intended to address capability to perform specific jobs or missions.
  - Establish clear policy for age and gender-based adjustments in fitness and body fat standards that are scientifically based.
  - Establish a mechanism for providing policy and research coordination of the military services' physical fitness and body fat programs.
  - Ensure that the services implement existing requirements that personnel be tested in three areas: cardiovascular endurance, muscular strength and body composition.
  - Ensure that all service members be tested for fitness, regardless of age.
- I.A.3. The GAO recommendations appear, in part, to reflect existing differences in the services' approaches to setting and assessing service-wide general fitness standards and how these are affected by gender and age. A key issue in understanding these differences stems from the variation in criteria employed in setting requirements and whether these criteria require gender and age adjustment. The 1995 version of the DoD Instruction allows for wide latitude in approach, a situation DoD intends to clarify.

### I.B. Current Policies

- I.B.1. Table 1 lists and compares the basic characteristics of the physical fitness programs of the four services. All services, with the possible exception of the Marine Corps, currently state that the goal of their physical fitness program is to promote general physical readiness and good health. Health promotion is not listed as a Marine Corps objective in their order although it is implied. None of the services include occupational requirements as a goal in setting these standards, as suggested by the GAO. The Air Force does have job selection criteria involving lifting capacity, but this is separate from their general physical fitness standards. All services are now complying with the DoD guidance that standards be age and gender adjusted where physiologically appropriate and that all ages be tested (Table 2).
- I.B.2. Currently, the Air Force does not meet the guidance of including muscle strength measures in their assessment battery. Plans are now underway to rectify this with the addition of several strength measures. The other services test the upper body (arm/shoulders) and the trunk or abdominal area (curls, sit-ups, crunch) (Table 2).
- I.B.3. Aerobic capacity is measured by all services. Although there are other differences in such parameters as age categories and exact test event (e.g., 1.5 vs. 2 vs. 3 mile run), these differences are generally minor and not of great significance. Comparison of these method variations will be discussed later in the assessment section of this report. The one exception is the Air Force's use of a cycle ergometer test to predict aerobic capacity, as opposed to timed run tests used by the other services.
- I.B.4. Body weight and body fat assessment is an integral part of the fitness test battery with the exception of the Marine Corps, which monitors this separately. Body fat standards and methodology are already similar between services and were therefore not included in the focus of this workshop.
- I.B.5. In the absence of documented objective criteria upon which to base their general fitness requirements, all services currently utilize population normative statistical approaches and accepted norms. These approaches are discussed in the next section.

### **Current Policy**

All services currently utilize population normative statistical approaches and accepted norms.

## Current Policy

Promotion of general physical readiness is stated as a goal of the physical fitness programs of each of the services; occupational requirements are not a goal of any of these standards.

**Table 1: Comparison of Basic Characteristics of the Physical Fitness Programs of the Four Services**

	Army	Air Force	Navy	Marine Corps
<b>Reference</b>	Regulation 350-41, 600-9, and 600-63, FM 21-20	Instruction 40-501 and 40-502	Instruction 6110.1E	Order 6100.1c
<b>Objective/Goal</b>	Combat and operational readiness Health life style Military appearance	Motivate to train Fit and healthy force	Optimal health Stamina for optimal readiness	Overall fitness Mission/combat readiness
<b>Components</b>	Aerobic capacity Upper body/trunk strength Body fat	Aerobic capacity Body fat	Aerobic capacity Upper body/trunk strength Flexibility Body fat	Aerobic capacity Upper body/trunk strength Body fat
<b>Test Items</b>	2 mile run; Push-up; Sit-up; Body fat by tape	Submax cycle ergometer prediction of VO <sub>2</sub> max Body fat by tape	1.5 mile run/walk, or 500 yd swim, Curl-up, Push-up Body fat by tape	3 mile run; Ab crunch Pull-up(M)/Flexed arm hang(F); Body fat by tape
<b>Bases for Standard</b>	Population reference norms	Accepted health/fitness norms	Accepted health/fitness norms	Population reference norms
<b>Future Plans</b>	Add motor efficiency component, battle focused assessment	Add strength/flexibility components		Push-ups for females

**Table 2: Comparison of Physical Fitness Assessment Standards, Adjusted for Age and Gender, Across the Four Services (Minimums)**

**Current Policy**

The Air Force tests once yearly and the other services test twice yearly. Failure of one test event results in a failure of the fitness evaluation for all services.

Test Item	Army			Air Force			Navy			Marine Corps		
	Age	Male	Female	Age	Male	Female	Age	Male	Female	Age	Male	Female
<b>Aerobic Capacity</b>	2 Mile Run			Submaximal Cycle Ergometry (ml/kg-min VO <sub>2</sub> max)			1.5 Mile Run/Walk			3 Mile Run		
	17-21:	15:54	18:54				17-19	12:45	15:00	17-26:	28 min	31 min
	22-26:	16:36	19:36	<24:	27	35						
	27-31:	17:00	20:30	25-29:	27	34	20-29	13:45	15:45	27-39:	29 min	32 min
	32-36:	17:42	21:42	30-34:	27	32						
	37-41:	18:18	22:42	35-39:	26	31	30-39	15:30	17:15	40-45:	30 min	33 min
	42-46:	18:42	23:42	40-44:	26	30						
	47-51:	19:30	24:00	45-49:	25	29	40-49	16:30	18:15	46+:	33 min	36 min
	52-56:	19:48	24:24	50-54:	24	28						
	57-61:	19:54	24:48	55-59:	22	27	50+	17:00	19:00			
62+:	20:00	25:00										
<b>Upper Body Strength</b>	Push-Ups in 2 Minutes			(Under Development)			Push-Ups in 2 Minutes			Pull-ups(M), Flexed Arm Hang(F)		
	17-21:	42	19				17-19	38	18			
	22-26:	40	17							17-26	3	15 sec
	27-31:	39	17				20-29	29	11			
	32-36:	36	15							27-39	3	15 sec
	37-41:	34	13				30-39	23	5			
	42-46:	30	12							40-45	3	15 sec
	47-51:	25	10				40-49	20	5			
	52-56:	20	9							46+	3	15 sec
	57-61:	18	8				50+	19	5			
62+ :	16	7										
<b>Abdominal Strength</b>	Sit-Ups in 2 Minutes			(Under Development)			Curl-Ups in 2 Minutes			Sit-Ups in 2 Minutes		
	17-21:	53	53				17-19	45	40	17-26	50	50
	22-26:	50	50									
	27-31:	45	45				20-29	40	33	27-39	45	45
	32-36:	42	42									
	37-41:	38	38				30-39	32	27	40-45	45	45
	42-46:	32	32									
	47-51:	30	30				40-46	29	24	46+	40	40
	52-56:	28	28									
	57-61:	27	27				50+	27	22			
62+:	26	26										

## Standard Setting

Physical readiness can be represented by performance of common military tasks or performance of emergency tasks.

## II. Approaches and Considerations in Setting Fitness Standards

### II.A. Introduction

II.A.1. Considerable time was spent during the workshop in exploring various approaches to setting base level general physical fitness standards. Currently, all services directly or indirectly employ an empirical approach, that is, setting standards based on the normal distribution of scores, setting the standard or passing score at some percentile of that distribution. This may also be supplemented with input from published norms from the literature, for example from the American College of Sports Medicine or the Aerobics Institute, or with scores that present a training incentive.

### II.B. Empirical Approach

II.B.1. The Army's system is representative of this empirical approach. Based on a population study of over 2500 soldiers from 13 locations and representative of all ages, genders and occupational categories, the Army established the test standard (minimum passing score) at the eighth percentile of the population. The disadvantage of this distribution statistics approach is that the overall fitness of the service, rather than fitness level of each member, is deemed adequate to meet the needs of that service. Thus this approach implies that the purpose of fitness is to have servicemembers contribute to the maintenance of the existing normative population characteristics. The other services use a similar approach, if not quite so well defined, with the addition of adjusting for accepted published values from the scientific community to insure that they are sufficiently demanding and yet achievable. The Air Force gauges their standards against accepted scientific recommendations and scientific peer review. The Marine Corps factors in a motivation factor, referred to as a "gut check" to insure a maximal challenge to the Marine.

### II.C. Criterion Approach

II.C.1. It was agreed that these empirical approaches are necessary until suitable and acceptable objective criteria are developed, making possible a criterion approach to establishing fitness requirements. This involves identifying appropriate criteria and then relating them, through correlational analysis, to fitness test scores. *Physical readiness* (ability to perform military duties) and *good health* (freedom from illness and injury) were generally agreed upon as suitable criteria for base level general fitness.

II.C.2. Taking this one step further, these criteria must then be represented by measurable events. It was suggested that physical readiness can be represented by a) performance of common military tasks or b) performance of emergency tasks. A metric, or at least a pass/fail score is then established for the performance of these tasks.

II.C.3. It was suggested that the second criterion, health, be represented by a) incidence of injuries and acute illness or b) lost duty time due to injuries and illnesses.

## II.D. Task Criterion

II.D.1. The use of military task performance to establish general fitness standards has received a good deal of attention, particularly from Allied nations. Early work by the U.S. Army to use the performance of “common soldiering tasks” to set a baseline level of fitness was never implemented due in part to the perception that it would lead to reduced fitness standards. The performance of common emergency shipboard tasks by the U.S. Navy have been studied but not utilized specifically in setting service-wide general fitness standards.

II.D.2. The Royal Netherlands Army has used common soldier tasks with which to establish general fitness standards. Their approach consisted of:

- a. Selection of the most demanding common Army tasks
- b. Selection of ‘critical task elements’ within these tasks
- c. Development of task tests for these elements
- d. Selection of quantifiable tests predictive of these performance tasks

The critical task elements were identified as:

- a. Loaded marching
- b. Repetitive lifting
- c. Digging
- d. Carrying

A corresponding task test was developed for each element in graded quantifiable metric, e.g., marching at a selected speeds and distances with designated loads.

Two standards for general physical fitness were then established:

- a. An absolute standard (for young men) using a traditional field fitness test of a 12 minute run (2400 meters), push ups (20) and sit ups (30) which is based on their predictive power of these four critical task elements
- b. A basic standard that is age and gender related for the performance of the four task tests (a score on each of the task tests)

II.D.3. The Canadian Forces selected four “Army Field Tasks” upon which to establish their physical fitness maintenance standard: a maximal dig, ammunition box lift, casualty evacuation, and weight load march. These four common tasks were judged to be “most demanding” and “most representative” of military tasks upon which to base a base level physical fitness requirement.

## II.E. Health Criterion

II.E.1. The selection of health as one of the criteria of general fitness is supported in part by data showing a relationship between injury rates and fitness test scores. Extensive data were presented from a wide variety of Army populations demonstrating the strong inverse relation between aerobic fitness as measured by two mile run time and the incidence rate of overuse and traumatic injuries. The relationship between the number of push-ups and sit-ups performed and injury incidence rates was less consistent but did show a relationship in some Army populations. Flexibility, on the other hand, exhibited a u-shaped relation, with higher rates of injury at the extremes of flexibility scores. Over all, traditional physical fitness test items do appear to be good predictors of the injury criterion of general health.

## Standard Setting

The selection of health as one of the criteria of general fitness is supported in part by data showing a relationship between injury rates and fitness test scores.

## Standard Setting

Standards for general fitness should be adjusted to account for the inherent physiological changes with age and for the physiological differences between genders.

### II.F. Age and Gender Considerations

II.F.1. The treatment of age and gender are necessary considerations in setting general fitness standards into today's military services. One perspective is that the performance of each physically demanding military task requires an absolute amount of fitness capacity (aerobic and/or strength or strength endurance), therefore the requirement for its performance should be absolute and not gender and age adjusted. However, when considering service-wide base level general fitness standards, most agree that these requirements should be adjusted for gender and age, reflecting well documented physiological differences that occur between genders and with increasing age. Thus, while occupational or mission fitness requirements may well be absolute (gender- and age-neutral), a general requirement based on overall readiness and good health would be age and gender adjusted to provide appropriate individual baselines and realistic training expectations.

II.F.2. Data were presented to illustrate these age dependent changes:

- a. Decrease of muscle mass by 6% per decade
- b. Age related loss of skeletal muscle mass is associated with decreased number of oxidative muscle fibers and reduced oxidative enzyme content
- c. Decreased pumping capacity of the heart (myocardial contractility and maximal cardiac output)
- d. Decline in maximal oxygen uptake (0.5 ml per kg-min or 1% per year in men, less in women)
- e. Reduction in muscle strength corresponding to loss in muscle mass
- f. Decline in maximal lifting capacity of 12% per decade
- g. After age 30, decline in Army fitness test events: 2 mile run (7%/decade), push-ups (16%/decade), sit-ups (17%/decade)

Physical training will diminish the magnitude of these changes to some extent but will not eliminate them. All of the services adjust their fitness requirements by age, differing only by the number of age groups and the maximal age tested.

II.F.3. With respect to gender differences, the following results were presented. Women, compared to men, on average are smaller and have gender-appropriate differences in body composition resulting in smaller physical capacities, including:

- a. 8% shorter stature
- b. 20% lower body mass
- c. 25-30% more fat mass (10-12% greater body fat)
- d. 40-45% less muscle mass
- e. 30% smaller muscle fiber cross sectional area
- f. 30% smaller lung capacity
- g. 25% lower cardiac output
- h. 25-30% lower maximal oxygen uptake
- i. 20% slower 2 mile run time
- j. 20-50% less muscle strength
- k. 30-50% less lifting capacity

II.F.4. It was concluded that in order to promote improvement in physical fitness levels and ensure maximum utilization of both genders in the services, standards for general fitness should be adjusted to account for the inherent physiological changes with age and for the physiological differences between genders.

## II.G. Trainability Consideration

II.G.1. 'Trainability' or 'training potential' was another factor that was considered in establishing general physical fitness requirements. While physiological characteristics determining fitness capacity have a strong genetic component so that potentially achievable fitness is not equal for all individuals, nevertheless, the capacity for improving one's fitness level through physical training is well known. Since there are well established benefits from high levels of fitness, such as military readiness, health and injury prevention, and job task performance, one could conclude that each service member should maximize their fitness level commensurate with their potential, and that this should be reflected in some manner in general fitness standards.

II.G.2. Data were presented showing that male strength fitness test scores (push-ups and sit-ups) can be improved by 10-60% with training, depending on initial pre-training levels. Two-mile run scores can be increased 5-12%. This is equivalent of improvements of 20-30 percentile rankings. Even greater increases may be gained in recruits and unfit personnel. Improvement in common military tasks performance with physical training have also been shown:

- a. Loaded marching (8-40%)
- b. Lifting (8-20%)
- c. Carrying (5-35%)
- d. Digging (8-18%)

No differences in the training response were found between genders when equated for initial state of training.

II.G.3. In summary, the consensus of the workshop was to recommend to DoD that there is currently an insufficient basis to recommend common service-wide fitness test standards since acceptable objective criteria are lacking. The future development of appropriate criteria upon which to base general physical fitness standards, along with proper considerations of training potential, should lead to more objective and supportable standards. These standards would be based on justified requirements rather than subjective levels that are empirically derived.

## **Standard Setting**

Each service member should maximize their fitness level commensurate with their potential; this should be reflected in some manner in general fitness standards.

## Assessment Methods

The performance runs used by the four services are generally comparable and interchangeable.

### III. Physical Fitness Assessment Methods

#### III.A. Introduction

III.A.1. Some commonality in general physical fitness testing already exists as illustrated in Table 3. With the exception of the Air Force, which is considering a proposal to use equipment for testing, the differences between assessment techniques are minimal. Comparisons of these different methodologies were presented at the workshop and are described in the following paragraphs.

**Table 3. Comparison of Fitness Test Methodologies Across Services.**

Test Item	Army	Air Force	Marine Corps	Navy
1.5 mile run for time	Aerobic Fitness	2 mile run for time	Submax cycle erg.	3 mile run for time
		Predict $Vo_2$ max		
Upper Body Strength	Push-ups in 2 min	*Machine chest press	Dead hang pull-up(M); Flexed arm hang(F) to exhaustion	Push-ups in 2 min
Abdominal Strength	Sit-ups in 2 min abdominal test	*Machine	Sit-ups in 2 min	Curl-ups in 2 min
Flexibility	None	*Sit and reach	None	Toe touch
Leg Strength	None	*Leg press machine	None	None

\*Planned

## Assessment Methods

### III.B. Aerobic Fitness

III.B.1. Directly measured maximal oxygen uptake is considered the criterion standard for aerobic fitness. Thus, aerobic fitness tests are evaluated against measured maximal oxygen uptake. The correlation coefficients of these comparisons have been reported to be:

- |                               |                  |
|-------------------------------|------------------|
| a. Submaximal cycle ergometry | - 0.7*           |
| b. 12 minute run for distance | + 0.90           |
| c. One mile run for time      | - 0.79           |
| d. Two mile run for time      | - 0.76 to - 0.91 |
| e. Three mile run for time    | - 0.82           |

One would conclude from this that all of the performance runs used by the four services are generally comparable and interchangeable. They appear to be somewhat superior to submaximal ergometry in their ability to predict directly determined maximal oxygen uptake, but this also depends on motivation of individuals in field tests.

### III.C. Strength Fitness

III.C.1. Measures of upper body and abdominal muscular strength used by the Army, Navy and Marines (Table 3) are actually measures of strength endurance, i.e., ability to sustain submaximal contractions. The strength endurance measures selected by the services — push-ups, pull-ups, flexed arm hang, sit-ups and curl-ups — show considerable commonality and are all considered to be good measures of their respective muscle groups. Factor analysis studies indicate the comparability of the push-up, pull-up and flexed arm hang. These three tests have the highest factor loadings of some 20 tests that have been evaluated. A strong consideration in selecting muscular strength tests by the services is not only for their ability to represent the performance of a particular muscle group but also to permit ease in standardization and quantification. A key difference between the push-up and the other two tests of upper body strength is the need for the availability of pull-up bars, an item that the Army chose to eliminate in the 1970's. Tests for dynamic strength of the abdominal and hip extensor muscles are very similar between the services, although position used is slightly different. It is anticipated that proposed Air Force machine measures will evaluate comparable muscle groups.

### III.D. Age, Gender and Frequency

III.D.1. All four services have adopted the same test methods for both genders with the one exception for upper body strength by the Marine Corps, which now is reconsidering the flexed arm hang for women for lack of face validity. The inability of almost all women to do dead hang pull-ups was a major factor in the other services adopting the push-up over the pull-up because of the desire to have a common test for both genders. The Air Force administers their fitness test once yearly while the other services test twice yearly. Failure of one test event results in a failure of the fitness evaluation for all services.

### III.E. Summary

III.E.1. In summary, the Army, Navy and Marines test comparable muscle groups with comparable although not identical test events. Proposed Air Force machine measures will test comparable muscle groups but will make it difficult to compare standards with the other services.

The strength endurance measures selected by the services — push-ups, pull-ups, flexed arm hang, sit-ups and curl-ups — show considerable commonality and are all considered to be good measures of their respective muscle groups.

\* Possibly better correlations, based on new research

## Occupational Requirements

There is a desire to better match individual capability to the physical demands of a particular occupation, which would produce better manpower utilization, improve satisfaction and retention and reduce on-the-job injuries.

### IV. Occupational Physical Fitness Requirements

#### IV.A. Introduction

IV.A.1. The focus of the workshop was on the purpose, derivation and establishment of base level general physical fitness standards and assessment methods. Another level of fitness requirements that has been considered at one time or another is that for military occupational specialties. It was decided to include a review of this topic area in this workshop as there has been some interest in adding this in the future as a second tier of fitness requirements. This stemmed from the desire to better match individual capability to the physical demands of a particular occupation, which would produce better manpower utilization, improve satisfaction and retention and reduce on-the-job injuries. Thus far only the Air Force has a program in place, which evaluates lifting performance for occupational classification at time of enlistment. At the onset, any consideration to imposing another level of physical fitness standards to qualify for job assignment faces the fact that recruiting quotas are currently difficult to meet and retention rates are low. Both argue against implementation of additional standards.

#### IV.B. British Army Experience

IV.B.1 The British Army has an ongoing program to develop physical selection standards for new recruits and trainees. The standards are designed to be job-related and gender-free. Based on 132 identified tasks from 249 trades (occupations), 64 critical tasks were identified and quantified in the field. From this field analysis, four representative military (criterion) tasks performed at five intensity levels were constructed. The representative tasks were: single lift, carry, repetitive lift and loaded march. Trade entry qualification was classified in terms of performance on these four tasks. Candidate physical fitness test items were then evaluated for their predictive power on the performance of the representative tasks and selected through multiple correlational analyses. Selected test items included: height and weight, static arm endurance, static lift strength, dynamic lift strength, body fat % and lean body mass, back extension strength, multistage aerobic fitness test, and full heaves (dead hang pull-up). This test battery was found to predict successful performance in 86% of personnel.

#### IV.C. U.S. Army Experience

IV.C.1. The U.S. Army carried out a similar project beginning in 1977 and continued on and off until mid 1990s. The original program evaluated the physical tasks of all occupations and clustered them by two demand criteria (lifting and aerobic) and three intensity levels, resulting in five clusters of occupations. All occupations were then classified into one of these clusters. Fitness tests and standards were developed to predict the acceptable performance of these cluster demands. This approach was later modified to use a modified Department of Labor Classification system using only lifting capacity in place of the military cluster standards. Neither system was ever fully implemented. Interest continues but with no definite plans for the future.

#### IV.D. U.S Air Force Experience

IV.D.1. The Air Force is the only service that has in place a job task requirements-based physical test and standards for occupational selection and assignments, referred to as the Strength Aptitude Test. It is a graded dynamic lifting test procedure administered at the time of induction at the Military Entrance Processing Stations. All Air Force occupations are assigned a passing standard on the strength aptitude test. Occupational tasks were objectively measured and converted into a equivalent performance standard on the aptitude test. The aptitude test has been successful and well received. Its translation to the other services is limited by the fact that it is one dimensional (lifting), which is characteristic of Air Force occupations.

## V. Conclusions

The foregoing review of the material presented at the workshop suggests that despite the resistance against uniform general fitness standards and methodology by the individual services, there is more commonality currently between the services than differences. All of the services (when the Air Force implements its current plan):

- a. Assess the same key components of fitness (aerobic, upper body and abdominal muscular strength, and body fat)
- b. Use an aerobic fitness test that is comparable (as judged against maximal oxygen uptake)
- c. Use upper body and abdominal strength endurance measures that are either very similar or comparable in terms of their physiological basis
- d. Currently base their standards on an empirical population statistics approach
- e. Adjust standards for both age and gender

The existing differences appear to be more related to tradition and desire for service uniqueness rather than true objective differences in service requirements. It was agreed that general fitness levels should be based on general military readiness and health criteria rather than mission or combat readiness requirements. The latter requires an additional level of physical fitness that should be imposed by the service or unit as needed.

## Conclusions

Despite the resistance against uniform general fitness standards and methodology by the individual services, there is more commonality currently between the services than differences.

## Appendix A: Read Ahead Paper

## Appendix A

### I Background

1. Significant progress has been made by the four military services in the past fifteen years toward implementing scientifically and mission related physical fitness and body weight/fat standards and test methods. This stemmed from a President Carter-commissioned study in 1981 to improve physical readiness in the armed forces, resulting in a DoD Directive that placed physical fitness goals and testing on a more objective and physiologically sound basis. Two developments, largely unforeseen in 1981, which have tended to confound these developments have been the a) major increase in total numbers and assignments of women into traditionally male occupations and b) the increasing difficulty in meeting accession quotas. The former presents the challenge of gender fair standards and test events while the latter raises the possibility for additional entrance and occupationally related retention standards and test procedures.

2. One result of the service's responses to these issues has been the implementation of disparate policies, standards and test methods across the four services. This in turn has led to concern voiced by such groups as the Defense Advisory Committee on Women in the Services (DACOWITS) and the General Accounting Office (GAO) for the lack of uniformity and apparent fairness in setting requirements and evaluation procedures across the services. Thus there has been increasing criticism of this disparity and a call for an effort to seek more commonality in physical fitness standards and methodology. Significant progress has been made recently toward reaching this objective in the area of body weight/fat standards and methodology. No effort, however, has yet been made toward some commonality in physical fitness.

3. While it is acknowledged that mission differences amongst the services will require ultimately varying fitness levels (e.g., infantry vs. aircraft maintenance), the base level of physical fitness expected of all service members to produce optimal health, military appearance and minimal physical readiness should be the same for all members of the four services. Furthermore, this base level of physical fitness, i.e., aerobic capacity and muscle strength, should be amenable to uniform methodology.

*Note: For the purposes of this meeting, we are using the term "base level" or "general" physical fitness to refer to the physical fitness requirement of each service for all service members, as contrasted to higher levels of fitness that may be required for a demanding occupational specialty or unit assignment.*

### II Objective

1. The objective of this meeting is to establish where commonality exists and, using this as a starting point, explore the possibility of developing uniformity in standards and test methods for physical fitness amongst the four services. Progress toward this goal should significantly enhance the credibility of the military's physical readiness programs. Different requirements and different evaluation methods for the same fitness components based on the same needs does a disservice to both service members and the separate services.

2. This meeting is intended to assist DoD in responding to GAO's recommendation (Report # NSIAD-99-9, "Gender Issues: Improved Guidance and Oversight are Needed to Ensure Validity and Equity of Fitness Standards", dated 17 Nov 98) that "--- the Secretary of Defense revise the Department's physical fitness regulations to establish a mechanism for providing policy and research coordination of the military services' physical fitness and body fat programs."

## Appendix A

### III Plan

1. This meeting will gather together both the operational (DoD and service POCs and physical training leadership positions) and the scientific community of each service so as to understand the current basis for each service's fitness policy, requirements and evaluation methods and then to explore where consensus can be developed in establishing uniformity in these areas.
2. Several allied military services will be invited to share their experience on the topics of establishing standards, selecting test methods, and the use of military task performance for evaluating fitness qualification.
3. Outcomes from this meeting will be considered for changes in the DoD Directive and Instruction for Physical Fitness.

### IV Questions and Issues to be Addressed

1. What requirements in your service drive the rationale for setting your base level of physical fitness required of all service members regardless of occupation or unit assignment? Can the services agree upon a set of factors (e.g., health, appearance and general physical readiness) that should be the basis for setting this level of physical fitness?
2. What components or aspects of physical fitness (exclusive of body fat) does your service believe should be included in your physical fitness requirement and be tested for (e.g., aerobic capacity, muscular strength, muscular endurance)? Can the services agree upon a common set of fitness factors that should be included in a base level fitness evaluation?
3. Does your service adjust base level fitness requirements for age? What is the basis for this adjustment? Is it necessary to test fitness at the upper most age categories? Can the services develop a consensus on the treatment of age in fitness policy?
4. How does your service adjust base level fitness requirements for gender? Can the services develop a consensus on how gender differences should be handled?
5. Does your service now, or is considering, adjusting fitness requirements for occupational specialty? What commonality exists between the services in this area?
6. What unique issues exist, if any, in your service that impact on setting fitness levels and choosing fitness test methods?
7. What is your service's philosophy about screening for fitness at the time of accession? What issues must be considered in developing the idea of a common fitness evaluation at the MEPS?
8. Does your service have any changes planned in the foreseeable future regarding your fitness policy?

## Appendix B: Workshop Agenda

## Appendix B

### Day One

- 0800 **Session 1:** Opening
- a. Welcome and Introduction  
(LTC Karl Friedl, JTCG5 Chairperson)
  - b. Goals and Plan  
(Dr. James Vogel, Workshop Chairperson)
- 0830 **Session 2:** Fitness Policy in the Services: History, Current Status and Future Plans
- a. DoD Physical Fitness Policy  
(COL Marcus Beauregard)
  - b. Fitness Requirements and Testing: Army (Fitness School)  
(LTC William Rieger)
  - c. Fitness Requirements and Testing: Army (DA-DCSPER)  
(LTC Francine LeDoux)
  - c. Fitness Requirements and Testing: Navy  
(LCDR Neal Carlson)
  - d. Fitness Requirements and Testing: Marines  
(LTC Leon Pappa)
  - e. Fitness Requirements and Testing: Air Force  
(MAJ Regina Watson)
- 1045 **Session 3:** Physical Fitness Requirements Derived from Research
- a. Population Statistical Basis for Establishing Base Level Physical Fitness Standards for the Army (Army Physical Fitness Test Study)  
(Dr. Lou Tomas)
  - b. Towards a Criterion for General Military Fitness  
(Dr. James Hodgdon)
  - c. The Air Force Approach to Physical Fitness  
(Dr. Stefan Constable)
- 1215 Lunch Break
- 1400 **Reconvene - Session 3 continued**
- d. Use of Fitness Training Potential in Establishing Fitness Standards  
(Dr. Jos van Dijk)
  - e. Canadian Perspective in Setting General Fitness Standards  
(Dr. Wayne Lee)
  - f. Task-based Physical Fitness Requirements for the Military  
(Dr. Frank Bertina)
  - g. Association of Occupational Injuries and Physical Fitness  
(Dr. Joe Knapik)
  - h. Age and Gender Considerations in Fitness requirements  
(Dr. John Patton)
- 1645 End of Day One

## Appendix B

### Day Two

0800

#### **Session 3 Continued**

- i. Discussion, Proposal and Reaction to a Common Base-level Fitness Requirement  
(LTC Friedl)

0900

#### **Session 4: Physical Fitness Assessment**

- a. Comparison of Different Methodologies for Assessing Aerobic Capacity (Do different approaches give the same answer?)  
(Dr. Patton)
- b. Comparison of Different Methodologies for Muscular Strength and Power (Is their Commonality?)  
(Dr. Knapik)
- c. Proposed Expanded Air Force Physical Fitness Test Battery  
(MAJ Neal Baumgartner)

1045

#### **Reconvene - Session 4**

- d. Summary Discussion  
(Leader: Dr. Hodgdon)

1200

Lunch Break

1300

**Special Session: Meeting of Service Representatives for the Coordination of DODI 1308.3**  
(Mr. William Gleason)

1700

End Day Two

### Day Three

0800

**Session 5: The Step Beyond General Fitness: Is there a Future for Occupational Fitness Requirements?**

- a. British Army Research and Experience with Occupational Standards  
(Dr. Mark Rayson)
- b. Air Force Research and Experience with Occupational Standards  
(Dr. Joe McDaniel)
- c. Army Research on Occupational Standards  
(Ms Marilyn Sharp/Dr. Patton)
- d. Navy Research on Occupational Fitness (Readiness-Reference Fitness Standards and Time-to-Failure Forecasting)  
(Dr. Ross Vickers)

0945

**Session 6: Summary and Development of a Consensus Statement**  
(Leader: LTC Friedl)

1100

Adjourn



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