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Workshop Proceedings

Firefighter Physical Fitness/Wellness Workshop

Prepared for: **Force Enhancement and Fitness Division**
Department of Aerospace Physiology and Human Performance
USAF School of Aerospace Medicine
311th Human Systems Wing
Brooks Air Force Base, TX

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Deputy Chair, Human Performance, USAFSAM/FP

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20 November 1998

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This document contains proceedings for the workshop held at Wright-Patterson AFB on 5 & 6 August 1998 relating to firefighter fitness/wellness. A CSERIAC Review & Analysis containing information relevant to firefighter fitness and wellness issues may be found in *A Review of Firefighter Physical Fitness/Wellness Programs: Options for the Military* (RA-98-003).

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This ***Proceedings*** document summarizes briefings and discussions that took place during the Firefighter Physical Fitness Workshop, sponsored by the USAF School of Aerospace Medicine and supported by the Crew System Ergonomics Information Analysis Center (CSERIAC), held at the Hope Hotel and Conference Center, Wright-Patterson AFB, OH on August 5 & 6, 1998. The purpose of this meeting was to attain a consensus among a group of subject-matter experts on the strengths and weaknesses of the current DoD Firefighter Physical Fitness Program, as well as three other candidate programs. Excerpts from the briefings and the main points of the discussion are documented here.

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TABLE OF CONTENTS

FOREWORD 2

FIREFIGHTER PHYSICAL FITNESS/WELLNESS WORKSHOP 3

EXECUTIVE SUMMARY 4

U.S. DEPARTMENT OF DEFENSE INTERIM FIREFIGHTER PROGRAM 12

DEPARTMENT OF DEFENSE INTERIM PROGRAM DISCUSSION 14

CANADIAN FORCES/DEPARTMENT OF NATIONAL DEFENCE FIREFIGHTER FITNESS PROGRAM 15

CANADIAN FORCES/DEPARTMENT OF NATIONAL DEFENCE FIREFIGHTER FITNESS PROGRAM DISCUSSION 16

FITNESS/WELLNESS PROGRAMS 17

FITNESS/WELLNESS DISCUSSION 18

ACQUISITION DISCUSSION 19

SUMMARY 20

FOREWORD

The publication documents the proceedings of a firefighter fitness/wellness workshop held in conjunction with a CSERIAC *Review & Analysis* entitled, *A Review of Firefighter Physical Fitness/Wellness Programs: Options for the Military.* Military and civilian subject-matter experts gathered at Wright-Patterson AFB in August, 1998 to reach consensus on these issues. This report was performed by the Crew System Ergonomics Information Analysis Center (CSERIAC) for the Air Force's School of Aerospace Medicine, Department of Aerospace Physiology and Human Performance.

This work was conducted under Department of Defense Contract Number SPO700-98-D-4001. The CSERIAC director during this period was Mr. Mathias Kolleck. The program manager was Ms. Barbara Palmer; Mr. Jon Carroll had primary responsibility for authoring this document. This project benefited greatly from the project suggestions and editorial comments from CSERIAC Chief Scientist Dr. Michael Fineberg.

PROCEEDINGS

FIREFIGHTER PHYSICAL FITNESS/WELLNESS WORKSHOP

US AIR FORCE SCHOOL OF AEROSPACE MEDICINE

AUGUST 5 & 6, 1998 WRIGHT-PATTERSON AFB, OHIO

This ***Proceedings*** document summarizes briefings and discussions that took place during the Firefighter Physical Fitness/Wellness Workshop, sponsored by the USAF School of Aerospace Medicine and supported by the Crew System Ergonomics Information Analysis Center (CSERIAC), held at the Hope Hotel and Conference Center, Wright-Patterson AFB, OH on August 5 & 6, 1998. The purpose of this meeting was to attain a consensus among a group of subject-matter experts on the strengths and weaknesses of the current DoD Firefighter Physical Fitness Program, as well as three other candidate programs. Dr. Stefan Constable of the Department of Aerospace Physiology and Human Performance, USAF School of Aerospace Medicine, conducted the workshop and gave opening remarks. Presentations were then given by Ms. Barbara Palmer of the CSERIAC Program Office, Mr. Wade Grimm and CMSgt. Jim Podolske of HQ AFCESA/CEXF, Dr. Wayne Lee and Mr. Gaetan Perron of Canadian Forces Personnel Support Agency/Canadian Department of National Defence, and Capt. Derek Cossey and 1Lt. Sarah Dahl of HSC/YAMD. Discussion followed, and the main points of the discussion are documented here.

EXECUTIVE SUMMARY

The *Review & Analysis* entitled, "*A Review of Firefighter Physical Fitness/Wellness Programs: Options for the Military*," was based on an extensive search of firefighter fitness literature, both civilian and military, and analyzed four candidate firefighter fitness programs originally identified: The U.S. Department of Defense Interim Program, IAFF/IAFC Fire Service Joint Labor Management Wellness/Fitness Initiative, National Fire Protection Association's NFPA 1583, and the Canadian Forces/Department of National Defence Firefighter Physical Fitness Program. The first-order analysis documented in the *Review & Analysis* suggested that two programs should be evaluated in more detail, the Department of Defense Interim Program and the Canadian Forces/Department of National Defence programs. Further inquiry via the written reviews of the *Review & Analysis* by subject-matter experts and especially the discussions at this workshop revealed a clear qualitative distinction between them:

<u>Canadian Program</u>

- *Task-based rather than physical-fitness test-based (content vs criterion validity)*
- *More complete and better-developed science base*
- *More recent task criterion review/analysis of on-the-job firefighting activities*
- *Tech transfer free of cost--Canadian program represents multi-year million $$-plus investment*

<u>DoD Interim Program</u>

- *Science base more modest*
- *Statistical correlations in model are not strong*
- *Validity is weaker*
- *Task analysis is dated and not well-documented*
- *Criterion task was quite rigorous but not representative of wide range of firefighting activities*
- *No strength or body composition standards*
- *Lack of cross-validation of model*
- *Very small number of women in sample; separate female model would be required*

Therefore, the consensus finding of the panel members was to recommend the adoption of the Canadian firefighter fitness program as the task-based test battery component of a revised Department of Defense firefighter fitness and wellness program program. However, it was further recommended that the current Department of Defense fitness self-evaluation and exercise prescription tools (cycle ergometry and strength assessments) be retained. It is expected that these tools will fill a potential void at those units where exercise physiology expertise is not easily at hand. Obviously, fitness improvements observed with these measures will ultimately be reflected in the ten-component Canadian task-based test.

A decision regarding the wellness programs analyzed in the *Review & Analysis* was more problematic. It was difficult to discriminate differences among candidate programs, since no metrics were available against which to quantify their successes. In general it was thought that these offerings lacked maturity, detail, and "blueing." That is, extant programs may not be specific to U.S. military firefighter needs. As none of the programs evaluated were truly off-the-shelf programs, some further refinement and implementation issues must be worked through.

Finally, specific action items were initially identified over the near-term to support the final development and acquisition part of the program (Phase II).

<u>Recommendation Summary</u>

- ***Adopt the task-based, Canadian Forces/Department of National Defence firefighter fitness test as the Department of Defense program test component***
- ***Retain the Department of Defense aerobic and strength testing tools for self-evaluation and exercise prescription***
- ***Further detail the IAFF/FC wellness program component for Department of Defense implementation with the inclusion of emotional quotient evaluations***

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INTRODUCTION

Dr. Stefan Constable

Introductory remarks were provided by Dr. Constable, including a background discussion on firefighter fitness within the U.S. Air Force, and some of the issues surrounding cycle ergometry as an accurate measurement of fitness.

The US Air Force Office of Civil Engineering (AFCESA) had decided earlier to review existing firefighter fitness programs, and then to produce a report to be used as a reference during the acquisition process. Dr. Constable was tasked by the Office of Civil Engineering with planning and assistance in this research effort that would assist in fielding an updated program for firefighters.

A roundtable discussion was conducted with workshop attendees, and then Dr. Constable outlined the project's goals, which consisted of the following:

- *Build a* Review & Analysis *that serves as a springboard for further program critique*
- *Evaluate* Review & Analysis *findings/language, especially the Executive Summary*
- *Reach science consensus through in-depth critique*
- *Identify important policy/programmatic issues*
- *Consensus on above topics, the workshop findings, will be incorporated into a Proceedings Document and will support a General Officers decision briefing*

DEVELOPING THE REVIEW AND ANALYSIS – CSERIAC'S INVOLVEMENT

Ms. Barbara Palmer

After presenting attendees with an overview of CSERIAC's mission and capabilities, Ms. Palmer detailed CSERIAC's involvement in developing the *Review & Analysis* and the methodology used to compile the data. Ms. Palmer described the process employed to survey the literature and CSERIAC's use of commercial and government literature databases.

CSERIAC was tasked with gathering information pertaining to major fitness and wellness programs already in existence for firefighters, both domestically and abroad, in addition to the training, testing, fitness standards and wellness components of the AF/DoD Interim Program, NFPA, IAFF/IAFC, and Canadian Forces/Department of National Defence firefighter fitness programs.

Following the initial information collection phase, a draft *Review & Analysis* was constructed and then sent to workshop participants for evaluation. A list of questions and comments regarding both the existing programs and the draft *Review & Analysis* was presented during this period. Some comments from reviewers included:

About the current AF/DoD Program:

- *Based on sound research and is task-related*
- *Test equipment is in place, test is confidential, can be monitored by firefighters, can be done in the fire station*
- *Fitness program is individualized*
- *It does include a physical evaluation*
- *The evaluation is based on measurement of the range of physical abilities*
- *There is a prescribed training program*
- *Test doesn't encompass all of the physical abilities needed in firefighting*
- *No development of job-relevant goals and standards*
- *A health education/wellness program is not provided*
- *Weight-lifting performance is affected by training; is this considered?*
- *Aerobic-only test does not allow for assessment of other key components of the job*
- *The current test does not encompass all of the physical abilities found to be needed in firefighting*
- *Strength tests should be reviewed and maybe altered*
- *Adding health and wellness would be a plus*
- *Change should be made toward the Canadian program, although without apology for asking firefighters to lift a normal human's weight*

Other comments:

- *Relationship between body fat and performance (Brooks study) and as a primary risk factor (AHA) implies that body fat should be included*
- *Expedience and cost should be the last criteria in selecting or designing a test program*
- *Must incorporate valid, defensible standards*

- *If current AF aerobic test is to be continued, it needs to have criterion-related validity established with respect to firefighter tasks*
- *Re: Brooks study: Why was 40 yards used as the longest distance in the dormitory firefighter task? How was 77 kg weight chosen to represent the victim?*
- *Uniqueness of AF-specific tasks (e.g., jet fuel) must be addressed in any new job analysis*
- *Agree with Myrhe's choice of 36 ml/kg/min*
- *Could strength and body fat standards be obtained easily from other programs?*
- *Does firefighter-specific counseling provide any benefit?*
- *Why is the IAFF/FC wellness program recommended?*
- *Do any of the health/wellness programs "work?"*
- *Medical pre-screening--cost, number of CF firefighters who did not pass?*
- *Is the Canadian standard a cut-off score or a norm-referenced score? The Air Force standard?*
- *Is the perception that job-task tests are stronger vis a vis ADA and the Civil Rights Act accurate?*
- *To what extent do the AF and CF/DND programs predict successful performance?*
- *Job-related tests give personnel something meaningful to shoot for*
- *How does the industrial/organizational psychology domain view content validity?*
- *What are other ways to establish passing or cut scores?*
- *Need more studies on heat stress and activity*
- *Separate review needed on litigation related to firefighters and testing*

U.S. DEPARTMENT OF DEFENSE INTERIM FIREFIGHTER PROGRAM

Mr. Wade Grimm/CMSgt. Jim Podolske

Mr. Grimm and CMSgt. Podolske provided a review of the Department of Defense firefighter fitness program.

- *The program currently requires participation in the Air Force Cycle Ergometer Program, with the fitness standard at Level III, i.e., the current AF-wide passing score.*
- *Every sixteen weeks, strength and aerobics are assessed, and a training prescription is generated. There is no associated strength standard.*
- *There are no administrative sanctions at this time for this interim program.*

The history of the Air Force/ Department of Defense firefighter fitness program began in the late 1970s and early 1980s. A task analysis was performed after interviewing fire chiefs from several Strategic Air Commands regarding their most common firefighting tasks. Although documentation of the process is incomplete, these tasks were used to generate the current firefighter fitness program.

Some of the research conducted by the developers of the Department of Defense firefighter fitness program was presented. In the CSERIAC *Review and Analysis, A Review of Firefighter Physical Fitness/Wellness Programs: Options for the Military*, two firefighting tasks were described that arose from the earlier task analysis by Strategic Air Command fire chiefs, to simulate emergency activities that were most physically taxing. The two tasks were a B-52 "crash" aircrew rescue and a structural search and rescue mission that took place in either a multi-story smokehouse or in a standard air base dormitory. The structural task was selected for use in the 1997 study because it lent itself to standardization of conditions.

Structure Task

- *Three story dormitory (two flights of 16 steps)*
- *Simulated victim (weight 77kg)*
- *Firefighter conducting rescue was in turnout gear with SCBA carrying two lengths of hoseline and a water thief*
- *Rescue starts 10 yards from entry. Firefighter climbs to the third floor, where SCBA is activated. Rescuer crawls 38.5 yards to the "victim" and tows victim to stairwell door & out to the landing*

Data gathered from this experiment was used to establish relationships between measures of physical fitness and performance on this task. It should be noted that the researchers originally specified that two sets of the task were to be completed consecutively, but since some subjects were too fatigued to complete one set, this requirement was dropped.

DEPARTMENT OF DEFENSE INTERIM PROGRAM DISCUSSION

A number of questions were asked during the Department of Defense Interim Program presentation. One of the concerns with the current program was that a fitness standard based on adequate experimental methodology had yet to be developed. Without this, a standard might not be legally defensible in court.

It was noted that the model described in the 1997 research paper was never fully implemented or cross validated. That is, while measures of body strength, body composition, and VO_2max were part of the model documented in this paper, a fitness evaluation based on this model was never implemented. Further, the model should have been cross-validated (tested on a second population) in order to establish its criterion validity.

There was also a concern that the standard cut-off time was determined without any scientific data on structural burn time, or content validity analysis. Additionally, the current program lacks a comprehensive wellness component primarily because the USAF has Health and Wellness Centers (HAWC's) already accessible to military personnel. It was also established that it is necessary to design a test that can be conducted using equipment already in the inventory, in order to minimize acquisition costs associated with the adoption of a new program.

CANADIAN FORCES/DEPARTMENT OF NATIONAL DEFENCE FIREFIGHTER FITNESS PROGRAM

Dr. Wayne Lee/Mr. Gaetan Perron

Dr. Lee and Mr. Perron began the briefing by providing background information on the Canadian firefighter fitness program. This included insight into many aspects of the program, including legal issues such as the Canadian Charter of Human Rights, and the Goose Bay grievance case, which resulted in the elimination of non-defensible program standards. Early experiences such as this led to the development of the current CF/DND program. The following aspects of the current program were covered in detail:

- *Role of predictive testing*
- *Pre-enlistment screening process*
- *Composition of circuit test*
  1. One-arm hose carry
  2. 3.5 m ladder raise
  3. 30.48m hose drag
  4. 10-rung ladder climb – three times
  5. High-volume hose pull
  6. "Forcible entry," moving a rubber tire by hitting it with a sledge hammer
  7. Victim drag
  8. 10-rung ladder climb— two times
  9. 3.5 m ladder lower
  10. Spreader tool carry which replaced a mannequin lift-and-carry task
- *Data collection*
- *Cut-off determination*
- *Implementation of program (timetable)*
- *Training for instructors*
- *Contractor participation obligation*
- *Career implications for non-compliance*
- *Presentation of program informational literature and videotape regarding the program*

CANADIAN FORCES/DEPARTMENT OF NATIONAL DEFENCE FIREFIGHTER FITNESS PROGRAM DISCUSSION

Workshop participants conducted a discussion following the Canadian presentation that dealt with several issues. It was emphasized that the needs of all services must be considered when adopting a US program. The candidate program must utilize equipment that is available to all branches, and the opportunity for individuals to conduct self-assessment is also important. Moreover, it was agreed that tasks must be representative of actual requirements at the fireground, and should be based upon studying actual incidents. Safety must be a priority in the testing process.

A consensus was reached relating to personnel issues. In order to enculturate new standards within the Fire Service, compliance should be stressed from initial training. Exercise prescription and facilitating successful compliance should be a priority for the Trainer/Supervisor, and a complete understanding of the gravity of career actions for non-compliant individuals must be developed.

FITNESS/WELLNESS PROGRAMS

Ms. Barbara Palmer

Ms. Palmer presented the components of the various fitness/wellness programs, based on available documentation:

- **AF/DoD--none**

- **CF/DND**
  - lifestyle assessment
  - education
  - counseling
  - stress management
  - suicide prevention

- **IAFF/FC recommends**
  - marketing wellness services
  - behavioral health evaluation
  - counseling
  - critical incident debrief teams
  - chaplain's services

- **NFPA recommends**
  - education
  - counseling

Ms. Palmer then suggested these issues for discussion:

- Why does the AF/DoD need a health/wellness program?
- What components should comprise such a program?
- How could a health/wellness program meet needs of firefighters? Military firefighters? What are their unique needs?
- How can program effectiveness be measured?
- How can services best be marketed (i.e., their use encouraged?)

FITNESS/WELLNESS DISCUSSION

It was decided that the wellness component should be designed around the needs of a multi-service program, and should also be firefighter specific. Again, the lack of HAWCs in the other services, and civilian eligibility/ineligibility to utilize the HAWC program, is a prime consideration.

It was mentioned that surveys measuring an individual's EQ (Emotional Quotient) should be part of the program. The EQ consists of the skills and capabilities a person possesses that assist in coping with environmental pressures, and influence the total sense of well being. Stress management will also be a key component in the adoption of a wellness program.

The discussion concluded with an agreement that a workshop with multi-service expert representation is needed to fully develop the wellness component. Relevant parties dealing with health and wellness will be notified of the details at a future date.

ACQUISITION DISCUSSION

Capt. Derek Cossey/1Lt. Sarah Dahl

With respect to acquisition issues, the consensus was that the adoption of the Canadian program would be low-cost. A great deal of research and development has already been completed. However, modest additional analysis must be conducted to determine if the program is legally defensible in the United States. Some additional topics included:

- *Any new software that would be needed for the program should be developed to be compatible with older computers, to ensure the highest usability with lowest cost to the program*
- *Current cycle ergometry program with computer-based exercise prescriptions should be considered as an alternative to having an exercise physiologist for every location*
- *The fitness point of contact could be an Officer or NCO at the unit*

SUMMARY

Conclusions were reached and a preliminary timetable was established for development of an initial program. Action items are listed here, followed in parentheses by the office/unit responsible for the item.

- *The consensus was that the adoption/modification of the CF/DND Firefighter Fitness Program was the most logical course of action for the US DoD Firefighters (USAFSAM, DND, FPO)*
- *AFCESA will fund the beta testing in San Antonio, TX in Fall, 1998 (AFCESA, DND, FPO)*
- *Canadian instruction and consultation will also be funded by AFCESA, and will include a one-week workshop to train instructors (AFCESA, DND, FPO)*
- *Convene Tri-Service Firefighter Wellness Working Group (AETC)*
- *New task analysis based on forthcoming AETC survey (FEF/ILE)*
- *Cross-validate task-analysis findings with Canadian tasks (Contractor $5-10K)*
- *Review scientific adequacy of current DoD exercise prescription to support Canadian test (CF/DND)*
- *Review Canadian Forces/Department of National Defence medical and safety protocols (AFMOA)*
- *Establish formal MOU with Canadian Forces (AFILE)*
- *Enact Phase 1 test-scores data base (FPO)*