Chapter 12 – Fitness Requirements for Offshore Rescue

by

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INTRODUCTION

Fitness standards have been employed by the police, fire fighters, industry, transport, and defence [1 – 7]. These standards include measures of strength, endurance, anthropometrics, flexibility, motor skills, and cardiovascular capabilities.

The general approach employed to produce a scientifically underpinned and defensible fitness standard for offshore rescue was as follows:

- Identify the critical and generic tasks associated with maritime search and rescue;
- Establish minimum performance requirements for safe and successful work;
- Measure the physiological demand of these tasks (metabolic/musculoskeletal);
- Measure crew maximum performance on these tasks and on potential easy to measure predictive tests; and
- Identify the final physical fitness tests which may be a combination of predictive tests and direct work simulations.

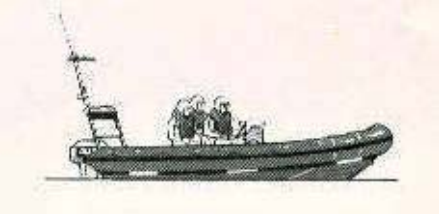
METHODS

Questionnaire Administration

To develop the fitness standard for the Royal National Lifeboat Institution (RNLI), in the United Kingdom and Ireland, 2000 questionnaires were administered to lifeboat crew with a 50% return rate. Additionally, 50 out of a possible 233 stations were visited to identify and measure the physiological demands the critical tasks.

The critical and most demanding physical tasks for the two boat types were identified as:

All Weather Lifeboats (ALB)
Man overboard recovery (MOB)
Equipment (Salvage pump) carrying
Casualty handling



Inshore Lifeboats (ILB)
Man overboard recovery (MOB)
Anchor recovery
Getting back into the boat

Evaluation of the Critical Tasks

Following this, the minimum performance requirements for these tasks were identified by consultation with operations experts. Isometric and dynamic simulations of the critical tasks were developed. The following

tests were administered on a sample of volunteer subjects (N=56) who were members of the RNLI lifeboat crew:

Maximal performance on:

1) The critical field tasks.
2) Simulations of the critical field tasks.
3) Physical selection tests which may predict performance on the field tasks or simulations:
    a) Strength: Back, Biceps 15° and 90°, Triceps (at nose and waist height), Trapezius, Grip, Grip Endurance.
    b) Anthropometrics: Height, Weight, Biacromial breadth, Circumferences: biceps, waist, forearm, wrist, shoulder, chest, hip height, arm and hand length.
    c) Skinfolds: chest, triceps, subscapular, biceps, abdomen, suprailiac.

Correlation of the Critical Tasks with the Simulated Tasks

To determine if the simulations are valid measurements of performance on the work tasks in the field, the maximum performance on the field task (i.e. MOB recovery) and maximal performance on the simulation were correlated. The relationships between performance on the field/simulations and performance on the physical selection tests determine if any of the physical selection tests can predict critical task performance.

RESULTS

Overall the measures of back strength, grip endurance, and grip strength were determined to be predictive of task performance, and with the calculation of prediction intervals the required levels of strength and endurance were established to ensure 95% of individuals who are capable of performing the critical tasks are accepted into the RNLI. These predictive physical selection tests are currently administered to potential and existing lifeboat crew to ensure they are fit for purpose. Existing crew members are also required to demonstrate competence on the critical tasks in the field after one year of experience. In addition, a cardiovascular step or walking test was recommended to ensure that the crew members posses the minimum level of cardiovascular fitness to cope with an emergency response or multiple recoveries.

CONCLUSION

As a result of the present project it is possible to recommend a minimum fitness standard based on the critical generic tasks undertaken by lifeboat crew. Some of the tests are direct measures of performance and therefore simulate a critical task. Others are indirect tests based on the relationship between the PST and performance on the critical tasks. The latter approach to testing is easier to administer, but has more inherent error.

Table 12-1: Performance Requirements (kg) for ILB and ALB Prospective Lifeboat Crew Members

Predictive Tests (potential and current crew members)	Field Tests (current crew members)
Back Strength (kg) (predicting anchor recovery time) FAIL **38** BORDERLINE **43** **PASS** **77** **GOOD PASS**	Rescue a 35 kg "dummy" over the relevant ILB using Method of Best Practice (MOBP).
Grip strength (kg) (predicting anchor recovery time and anchor freeing) FAIL **29** BORDERLINE **32** **PASS** **46** **GOOD PASS**	Pull a rope with a resistance of 15 kg 50 m in 45 s.
	Crew should be able to re-board the boat via the stern.

Predictive Tests (potential and current crew members)	Field Tests (current crew members)
Back Strength (kg) Requirements for ALB lifeboat crew (predicting casualty handling and salvage pump) FAIL **30** BORDERLINE **34** **PASS** **66** **GOOD PASS**	1.5 m lift of 35 kg using lifeline strops.
30s Grip endurance (kg) Requirements for ALB lifeboat crew (predicting casualty handling and salvage pump) FAIL **11** BORDERLINE **12** **PASS** **20** **GOOD PASS**	10 m carry of 20 kg, repeat using right and left hands, using MOBP.
10s Grip endurance (kg) Requirements for ALB lifeboat crew (predicting casualty handling and MOB recovery) FAIL **22** BORDERLINE **25** **PASS** **41** **GOOD PASS**	Stretcher carry for 10 m with a resultant load of 35 kg, use MOBP.
Grip Strength (kg) Requirements for ALB lifeboat crew (predicting casualty handling and salvage pump and MOB recovery) FAIL **32** BORDERLINE **35** **PASS** **53** **GOOD PASS**	

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