

# The AFM – CrossFit Final Report

## **SUBMITTED BY:**

**Author:** Howard A Wenger, PhD  
December 11, 2006

## **SUBMITTED FOR:**

**CANADIAN FORCES  
PERSONNEL SUPPORT AGENCY**



**AGENCE DE SOUTIEN DU PERSONNEL  
DES FORCES CANADIENNES**

**Scientific Authority:** Wayne S. Lee, Ph.D.  
Director Human Performance Health Promotion  
Canadian Forces Personnel Support Agency

INTRODUCTION .....	4
1. GENERAL PRINCIPLES THAT GUIDE EXERCISE AND TRAINING .....	6
1.1. TRAINING BY OBJECTIVES .....	6
1.2. SAFETY .....	6
1.3. ADAPTATION.....	7
1.4. PROGRESSION .....	7
1.5. SPECIFICITY.....	8
1.6. INDIVIDUALIZATION.....	8
1.7. MAINTENANCE .....	9
1.8. RECOVERY, REST, AND REGENERATION.....	9
1.9. VARIETY .....	10
1.10. SKILL .....	11
1.11. ENERGY SUPPLY VS. ENERGY DEMAND.....	11
1.12. PERIODIZATION.....	13
2. PRINCIPLES THAT GOVERN EXERCISE PRESCRIPTION.....	16
2.1. THE FITNESS PRINCIPLE:.....	16
2.1.1. DEFINING THE FITNESS COMPONENTS.....	17
2.2. STRENGTH PRESCRIPTION PRINCIPLES .....	19
2.3. POWER PRESCRIPTION PRINCIPLES .....	24
2.4. PRESCRIPTION PRINCIPLES FOR AEROBIC FITNESS.....	25
3. HOW DO THE EXERCISE PRESCRIPTIONS IN THE ARMY FITNESS MANUAL RELATE TO <i>THE GENERAL FITNESS PRINCIPLES</i> .....	27
3.1. INTRODUCTION .....	27
3.2. TRAINING BY OBJECTIVES PRINCIPLE:.....	28
3.3. THE ADAPTATION AND PROGRESSION PRINCIPLES: .....	30
3.4. OVERLOAD: .....	30
3.5. THE SPECIFICITY PRINCIPLE:.....	30
3.6. THE INDIVIDUALIZATION PRINCIPLE: .....	31
3.7. THE MAINTENANCE PRINCIPLE:.....	31
3.8. THE RECOVERY, REST, AND REGENERATION PRINCIPLE:.....	31
3.9. THE VARIETY PRINCIPLE: .....	32
3.10. THE SKILL PRINCIPLE:.....	32
3.11. THE ENERGY SUPPLY VS. ENERGY DEMAND PRINCIPLE: .....	32
3.12. THE PERIODIZATION PRINCIPLE:.....	32
4. HOW DO THE EXERCISE PRESCRIPTIONS IN THE ARMY FITNESS MANUAL RELATE TO <i>THE EXERCISE PRESCRIPTION PRINCIPLES</i> ? .....	33
4.1. THE FITNESS PRINCIPLE:.....	33
4.2. THE STRENGTH PRESCRIPTION PRINCIPLES: .....	34
4.3. THE POWER PRESCRIPTION PRINCIPLES: .....	36
4.4. THE AEROBIC PRESCRIPTION PRINCIPLES:.....	36
5. HOW DO THE EXERCISE PRESCRIPTIONS IN CROSSFIT RELATE TO <i>THE GENERAL FITNESS PRINCIPLES</i> .....	37
5.1. THE TRAINING BY OBJECTIVES PRINCIPLE:.....	38
5.2. THE ADAPTATION AND PROGRESSION PRINCIPLES: .....	39
5.3. THE SPECIFICITY PRINCIPLE:.....	42

5.4.	THE INDIVIDUALIZATION PRINCIPLE: .....	43
5.5.	THE MAINTENANCE PRINCIPLE: .....	43
5.6.	THE RECOVERY, REST, AND REGENERATION PRINCIPLE:.....	43
5.7.	THE VARIETY PRINCIPLE:.....	45
5.8.	THE SKILL PRINCIPLE: .....	45
5.9.	THE ENERGY SUPPLY VS. ENERGY DEMAND PRINCIPLE: .....	46
5.10.	THE PERIODIZATION PRINCIPLE:.....	47
6.	HOW DO THE EXERCISE PRESCRIPTIONS IN CROSSFIT RELATE TO <i>THE EXERCISE PRESCRIPTION PRINCIPLES</i> ? .....	53
6.1.	THE FITNESS PRINCIPLE:.....	53
6.2.	THE STRENGTH PRESCRIPTION PRINCIPLES: .....	54
6.3.	THE POWER PRESCRIPTION PRINCIPLES: .....	61
6.4.	THE AEROBIC PRESCRIPTION PRINCIPLES:.....	62
7.	RECOMMENDATIONS:.....	65
7.1.	General Recommendations .....	65
7.2.	Specific Recommendations.....	68
8.	References.....	82
	APPENDIX 1.....	85

## INTRODUCTION

This report reflects deliverables 1, 2, and 4 in draft form as per the contract for services between H.A. Wenger Consulting Inc. and the Canadian Forces Personnel and Support Agency [CFPSA]. Deliverable 3 was accomplished by a conference call with PSP staff and individuals from Gagetown on December 11, 2006.

The deliverables as stated were:

1. Examine the principles and programs in the Army Fitness Manual [AFM] to establish how it could link to special programs such as Crossfit.
2. Examine the Crossfit training methods [including the 8-week and 9-week proposed programs] to determine which parts are compatible with the Army Fitness Manual.
3. Meet with Gagetown Infantry School personnel regarding their vision of integrating the Crossfit program into the AFM.
4. Prepare a report which articulates how the author sees Crossfit and/or its components being incorporated into the AFM including drawings if appropriate.

1. This report is organized as follows:

1. A summary of the **general training principles** that have been established through research and professional practice and have been documented in the peer reviewed research and professional literature.
2. A summary of the training **principles that guide exercise prescription** and have been established through research and professional practice and have been documented in the peer reviewed research and professional literature.
3. A discussion of how the *Army Fitness Manual* adheres to the general training principles.

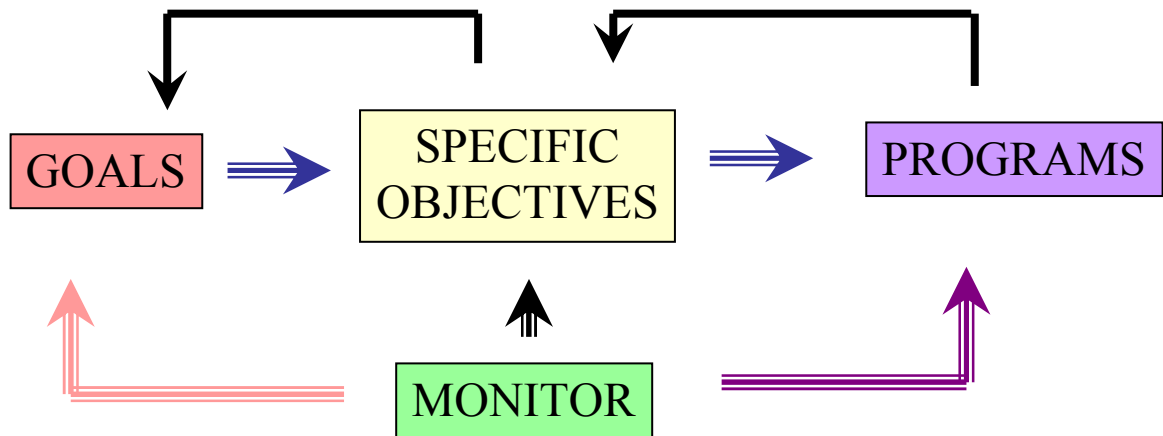
4. A discussion of how the *Army Fitness Manual* adheres to the exercise prescription principles.
5. A discussion of how the *CrossFit program* adheres to the general training principles.
6. A discussion of how the *CrossFit program* adheres to the exercise prescription principles.
7. Recommendation as to how and in what form the CrossFit program[s] could be incorporated into the physical preparation of Land Force personnel.
8. References

# 1. GENERAL PRINCIPLES THAT GUIDE EXERCISE AND TRAINING

## 1.1. TRAINING BY OBJECTIVES

This principle dictates that for a training program to be optimally effective, first establish the general goals you want to achieve, then more specific objectives that will facilitate the achievement of the goals, then the programs that will allow you to meet the objectives. It implies that regular evaluation occurs to determine if goals and objectives are being met and then altering programs accordingly. Figure 1 below illustrates this link between goals, objectives, programs, and monitoring.

Figure 1:



## 1.2. SAFETY

This principle is fundamental to any program but should be stated. Training prescriptions, facilities, equipment, clothing, and environment need to be of a standard that does not put the individual at unreasonable risk of injury. This includes the intensity, frequency, duration, and type of exercise; the safe organization of the facility; equipment that is well maintained and readily operated; clothing that is appropriate for weather, work, and impact. Risk management should be a strategy before undertaking any training session.

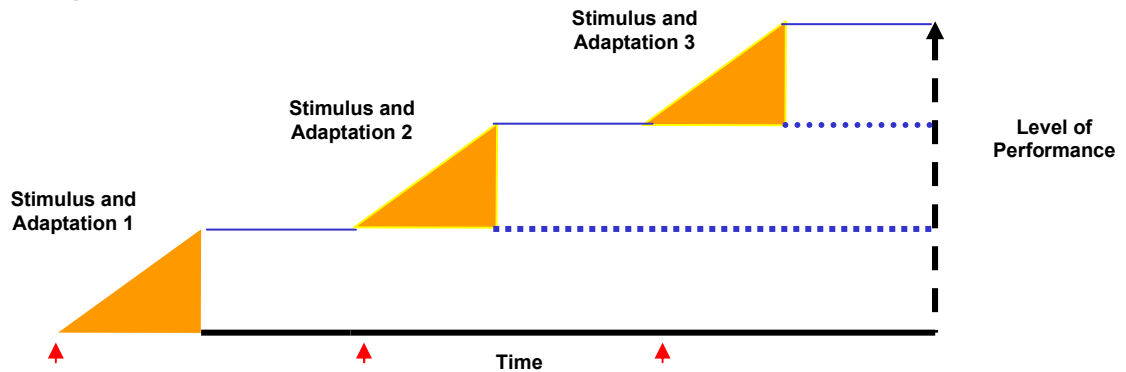
### 1.3.ADAPTATION

This is the basic principle in training program design. The human body is very adaptable and, within our genetic limits, will change its structure [anatomy] and function [physiology] to meet regularly imposed challenges. To improve our anatomy and physiology, we must *overload* our body beyond what it is normally required to do. This forces the body to adapt to meet these new demands. This principle also implies that if the body is *under loaded* below what it normally does, then the adaptation will be to decrease its anatomical and physiological state to a lower level.

### 1.4.PROGRESSION

Once the body has adapted to a particular training load, the new load becomes the regular challenge and to get further adaptations, a further “overload” must be imposed. This progression of loading usually happens every 2 to 6 weeks and is in small doses of from 5 to 10%. The progressions can happen by increasing the absolute load for example increasing the weight on a barbell by 2 kg or the decreasing the run time of a 2.4 k run by 20s. They can also be progressed by increasing the relative load for example, increasing the load on a barbell from 60% of your max weight to 65% or increasing the heart rate at which you run the 2.4 k from 70% of maximum heart rate to 75%. Figure 2 below illustrates the adaptation to an overload and the progression to achieve further adaptations.

Figure 2:



Progression also is recommended in a different context - skill acquisition and the mastering of complex movements and tasks. There should be a progression from simple to the complex movements and a focus on safe and mechanically efficient movement patterns and an opportunity to establish the preferred motor patterns.

### 1.5.SPECIFICITY

This principle is directly linked to the overload principle and states that the adaptation that occurs in response to an overload is specific to the type of overload and only occurs in those systems which are overloaded. For example, if the resistance training program is bicep curls, then those muscles that perform that action will adapt and will be specific to that movement. It implies that if a particular training effect in a particular system has been achieved with a particular training program, then that system must have been overloaded. Many training programs are directed at achieving adaptations in a specific system(s) and other systems also improve because they were also overloaded to some degree.

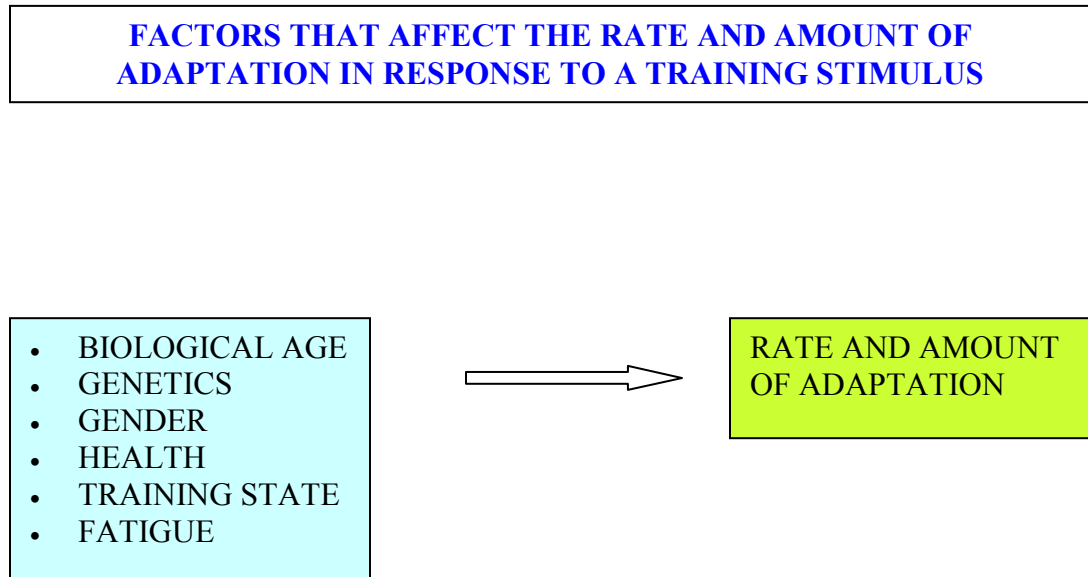
In the learning and practice of skilled movements, it is important that the types of movements that are used to enhance our structure or our function will also enhance those skills that lead to the achievement of our goals and objectives. This does not mean that every activity in our training programs should simulate performance objectives. There are many instances when fundamental movement patterns need to be strengthened or reinforced before a more highly related complex skill is trained.

### 1.6.INDIVIDUALIZATION

This principle reinforces that different individuals will respond to different extents to the same stimulus. The figure below illustrates that the adaptation that will occur is dependent on each person's unique genetic endowment; age, training state, health, and degree of fatigue [see figure 3 below].



Figure 3:



### 1.7.MAINTENANCE

The training effect you build in response to an exercise overload is quite fragile. When you cease training the benefits you acquired begin to decline. However, fitness can be maintained for more than a few months by: reducing the frequency of training **to** 1/3 of that which was used during training; by decreasing the duration **by** 1/3; but keeping the intensity at the same level as in the training period. This principle offers a strategy to maintain the acquired fitness when other demands are imposed that restrict the training time.

### 1.8.RECOVERY, REST, AND REGENERATION

This principle has 3 parts that relate to the definitions of these terms:

- 1.8.1. *Recovery* is the time(s) during a single training session when exercise is stopped to permit refueling of depleted energy stores, removal of fatiguing waste products [such as lactic acid], or to rehydrate. This can occur on a scheduled basis such as between sets in resistance training or between high power work bouts in interval training, or it can happen by opportunity in short breaks during intermittent sports or in high power occupational work.

1.8.2. *Rest* is the time between training sessions. In the hours and days following training, the body rebuilds broken down structures within cells to a level higher than pre-exercise. This rest period requires 48-72 hours following very high intensity exercise and from 12 to 24 hours for lower intensity work bouts. This is also a period when replacement of the fuel store, glycogen, takes place in response to an intake of carbohydrates. The consequence of exercising the same muscles and systems during the rest window is that the building of the training effect is restricted.

In practice, it is common to train the same systems and/or muscle groups on consecutive days if the intensity is low and the duration reasonable short [ $< 1$  hour] and to train systems and/or muscle groups on alternate days if the intensity is high and/or the duration is long [ $> 1$  hour]. However, well-trained athletes will often combine 2 high intensity training sessions on consecutive days in the same muscle groups or systems but reduce the duration of each session. This would then be followed by a lower volume, lower intensity training day.

1.8.3. *Regeneration* is the time during a 4 to 6 week intense training cycle in which the loads over a 1 week period are dramatically reduced in intensity, duration, and frequency. This period is often called *unloading* and is used to regenerate neural and endocrine levels and to avoid overtraining symptoms. Common practice is to formally schedule these unloading weeks every 4 to six weeks depending on the training intensity and the training maturity of the individual.

## 1.9. VARIETY

In order to insure that the widest range of muscles and systems benefit from the training sessions, it is important to add a variety of different types of activities and actions into the training regimen. Cross-training with activities that use large muscle groups in multi-joint actions is very effective for both aerobic and anaerobic training. Blending different single and multi-joint actions with a variety of grips, loading modalities and body positions during resistance training can enhance whole body strength and power gains.

## 1.10. SKILL

Regardless of the nature of the load that is to be imposed and what the desired outcome is, there is a skill associated with that action or activity. Learning the skill should be one of the first steps in the training program to insure both safety and efficiency. When a skill is performed in a mechanically efficient way, more load can be moved per unit of force applied or more speed or acceleration can be achieved with the same metabolic cost. Therefore, it is important to learn the skills of running, rowing, cycling, swimming, marching, bench press, squat, dead lift, cleans, pull ups, or push ups as you use those exercise modes in training. This is especially important for more complex movements which require neural links in multi-joint actions.

## 1.11. ENERGY SUPPLY VS. ENERGY DEMAND

This principle dictates that the rate and volume of the energy demands of exercising muscle must be matched by energy supply. We have 3 different metabolic pathways in muscle with different rates of supply [power] and different total amounts they can produce [capacity]. The complete description of these 3 systems is not appropriate here but the salient points are outlined below. It is important to realize that these systems are linked to 3 different types of muscle fibers [motor units] that make up our muscle.

The three systems and their basic properties are:

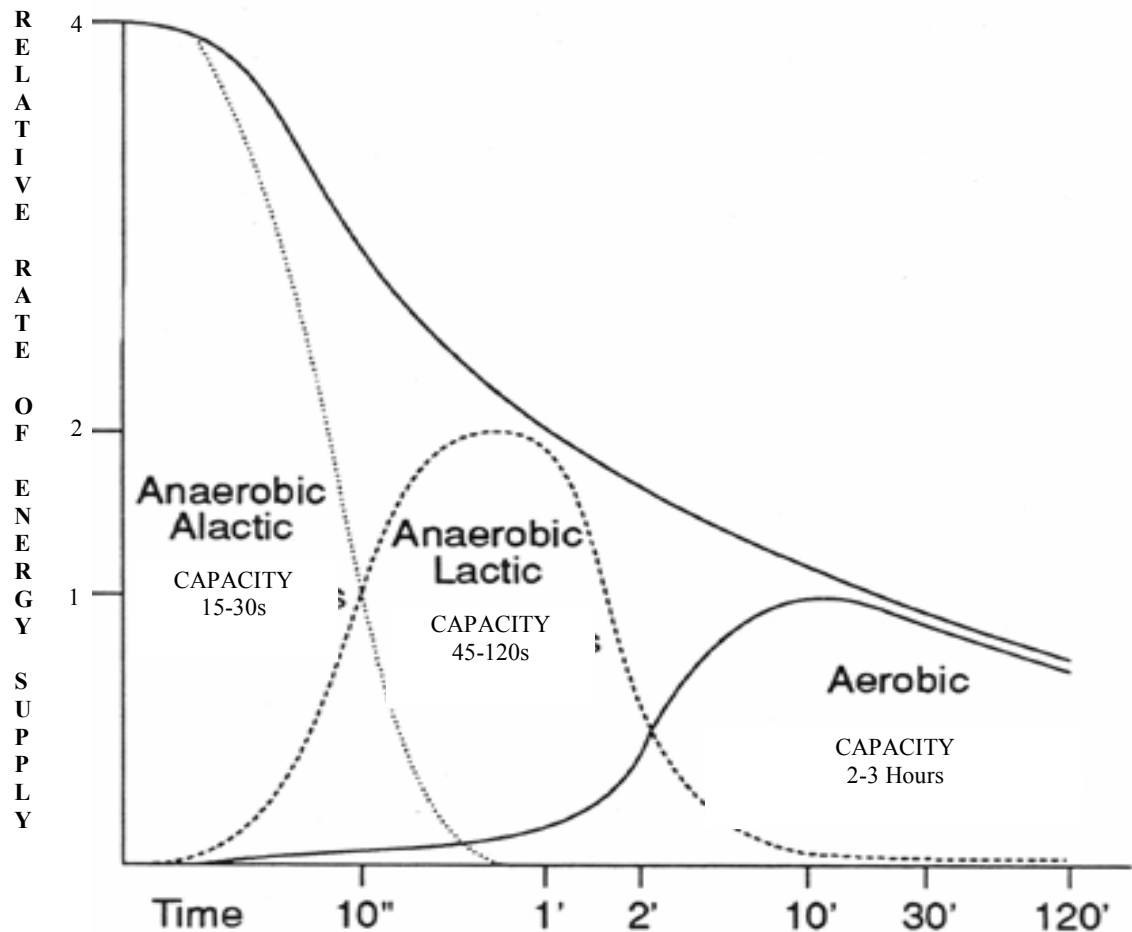
- 1.11.1. *Aerobic* – Uses oxygen in the process of providing energy and, has a low rate of energy supply [power] but can supply large volumes [capacity] of energy before fatigue. Therefore, it is said to be a low power, high capacity system. This system is the primary source of energy supply for slow muscle fibers that perform low power, long duration type work. Recovery can take 12 to 24 hours to rehydrate and replace glycogen stores.
- 1.11.2. *Anaerobic Lactic* – Does not use oxygen in the process of providing energy but results in the formation of lactic acid as a by-product. It provides energy at about twice the rate of the aerobic system but the lactic acid will depress this system after

approximately 45 – 90s. Therefore, it is said to be a moderate power, moderate capacity system. This energy supply system is a primary source of energy for the 2 fast types of muscle fibers that perform moderate and high power types of work for relatively short durations. Recovery takes from 20 minutes to 2 hours to remove lactic acid. It is fastest when low intensity active exercise is used.

- 1.11.3. *Anaerobic Alactic* – Does not use oxygen in the process of providing energy and uses the limited stores of high energy phosphates that are in the muscle. It provides energy at approximately 4 times the rate of the aerobic system and twice the rate of the anaerobic-lactic system but fatigues within 20-30s due to depletion of these stores. This energy supply system is the primary energy supply in the fast muscle fibers during explosive power and heavy load types of work. Recovery takes from 20s to 3 minutes to replace phosphagens and is fastest if there is no or very light activity.

Figure 4 below illustrates the power and capacity of these different energy supply systems. Although they are unique systems, they are also linked. When challenging the capacity of the alactic system, the power of lactic system is also being overloaded; when challenging the capacity of the lactic system, the power of the aerobic system is being overloaded. Although there are optimal intensities and durations for work intervals and recovery periods for the power and capacity of these metabolic systems, manipulating the work and recovery times can result in adaptations in more than one metabolic system.

Figure 4: The Power and Capacity of the Energy Supply Systems



## 1.12. PERIODIZATION

This principle is a combination of many of the above principles and is used primarily in the development of elite athletes. However, there are parts of this principle which offer sensible direction to the development of any exercise prescription

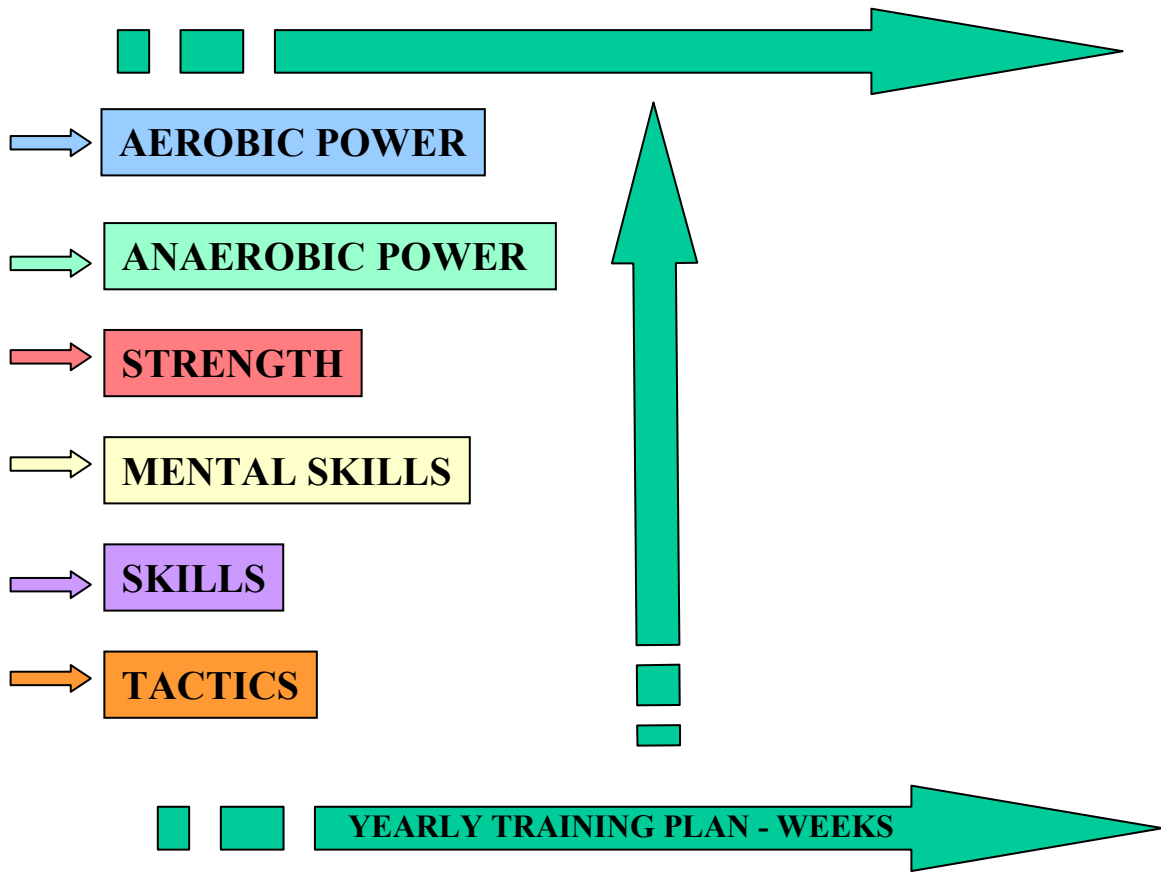
1.12.1. It embraces *training by objectives* and extends this to suggest that there should be an annual plan that has at least 4 phases:

1.12.1.1. A general preparation phase in which general fitness components are developed;

- 1.12.1.2. A specific preparation phase in which training focuses on specific actions associated with the goals and objectives of the training;
  - 1.12.1.3. A pre-competition period, which includes the competition intensity, a reduction in training volume to reduce the fatigue, a focus on the mental, technical, and tactical aspects of the performance;
  - 1.12.1.4. A competition period.
- 1.12.2. It adheres to *overload* and *progression* in the general and specific preparation phases and to *specificity* in the specific and pre-competition phases.
  - 1.12.3. It advocates *maintenance* when shifting training focus from one fitness component to another in the general preparation phase and in the post competition period.
  - 1.12.4. *Recovery and rest* are implied in the training days within the weekly training cycles of the general, specific, and pre-competition periods. The *regeneration* principle is evident in the unloading weeks recommended every 4-6 weeks in the general and specific training phases.
  - 1.12.5. *Variety* is a cornerstone of the periodized training models in resistance training as well as for aerobic and anaerobic energy system training. This includes altering loads and sets as well as types of actions and activities.
  - 1.12.6. *Skill* is certainly a focus of the periodized model in the specific preparation and pre-competitive phase and certainly should be in the general preparation phase as it is here where technique is critical for the optimal loading of the important components of the fitness profile.
  - 1.12.7. Periodization also involves 2 other concepts referred to as *vertical and horizontal integration*. Vertical integration involves giving different emphasis to all the training variables within a particular training phase. Horizontal integration involves giving

different emphasis to the same variable in different training phases [see figure 5].

Figure 5: A model to illustrate the concepts of horizontal integration of some factors that are important in the preparation of athletes across time and the vertical integration of all factors at any one time in the year



## 2. PRINCIPLES THAT GOVERN EXERCISE PRESCRIPTION

### 2.1. THE FITNESS PRINCIPLE:

Figure 6 below depicts 11 components of physical fitness. This figure is not intended to be exclusive but rather to reflect what many professionals in the industry would consider as part of the whole “physical fitness” profile. Depending on the goals and objectives of the individual, each of these would have a different relative importance and thus would require differences in training emphasis. For many, as each of these components is enhanced through training, an enhanced ability to perform specific skills should also be improved. Thus it is important during training to forge a link between physical fitness and the performance of sport-specific or occupation-specific skills.

Figure 6: The Fitness Components





## 2.1.1. DEFINING THE FITNESS COMPONENTS

### 2.1.1.1. Strength

This is the ability of our muscles to generate high force in a particular movement at a specific speed. It is dependent on the size of the muscles doing the work and on the effectiveness of the nervous system to recruit the muscle(s). Strength type efforts require energy from the anaerobic energy systems.

### 2.1.1.2. Strength Endurance

This is the ability of our muscles to perform repeated contractions at submaximal loads. It is dependent on the maximal strength of the muscles, the magnitude of the submaximal load in relation to maximal strength and the effectiveness of the energy supply systems to meet the demand.

### 2.1.1.3. Power

Power is the product of force and velocity or, in fitness terms, the product of strength and speed. It is dependent on the rate at which we can generate force. This is often referred to as explosive power because of the importance of acceleration to this characteristic. Power can be increased by moving light loads quickly, by attempting to accelerate heavy loads [even if the load doesn't move quickly], or by doing plyometric training.

### 2.1.1.4. Power Endurance

This is not often included in a fitness profile but for occupations or tasks that involve repeated high power intervals or extending a single power interval for longer periods of time, it is important. It is commonly trained by pushing a power task until failure and/or repeating power tasks with only partial recovery.

### 2.1.1.5. Speed

Speed fitness is the ability of muscle(s) to contract at high velocity. It is highly dependent on the amount of fast muscle fibers we have and is linked to our ability to accelerate, the maximum strength of the muscle, and the magnitude of the load. Common training protocols for speed development

include light resistance, high speed work and assisted high speed work.

#### 2.1.1.6. Aerobic [cardio-respiratory] Fitness:

This is the ability of the heart, blood, blood vessels, lungs, and muscles to take up, deliver, and utilize oxygen to produce energy. They are often called the oxygen transport system and are also important for the delivery of nutrients, fuels, hormones, removing waste products, and for heat acclimation. It is associated with our ability to work at low power outputs for prolonged periods of time, to work at relatively high power outputs that last 3-10 minutes, and with the ability to recover after very high intensity work.

#### 2.1.1.7. Agility

Agility is the ability to change the position of our body quickly and accurately within a confined space. It is trained by forcing changes in directions quickly and with precision at both known and unknown positions.

#### 2.1.1.8. Balance

Balance is the ability to maintain equilibrium [control over our center of gravity] while lifting loads, carrying objects, moving on uneven or unstable surfaces, or while suspended. Learning skills through exposure and mastery is the key but it is also related to well-developed fitness components such as strength, power, and flexibility

#### 2.1.1.9. Coordination

Coordination is the ability to use our senses such as hearing, touch, vision, and kinesthetics to perform complex movements with skill and accuracy. Learning complex common and task-specific skills through progression and repetition is important in the development of coordination.

#### 2.1.1.10. Flexibility

Flexibility is the ability of our muscles and joints to move through their full range of functional motion. Flexibility can be limited by bony structures, ligaments, imbalance of muscle groups around a joint, injury, or stiffness in the muscles and

other soft tissue. Changes in flexibility due to the latter can happen in the short term through static stretching. For long term changes, PNF [or CRAC] stretching is more effective. If muscle strength imbalance is a problem, then strengthening the weaker muscle groups is recommended.

#### 2.1.1.11. Body Composition

Body composition is not often included as a fitness component but because it can have a significant effect on many of the others, it is worthy of inclusion. If body fat is too high, it is detrimental to relative strength and endurance, power and power endurance, speed, aerobic fitness, the ABC's, and flexibility. Increasing lean muscle mass is part of the solution but so is decreasing fat-mass through creating a reasonable negative energy balance through proper nutrition and exercise.

## 2.2. STRENGTH PRESCRIPTION PRINCIPLES

This section will address the principles that govern the *prescription* of some of the above fitness components particularly strength, strength endurance, power, power endurance, and aerobic fitness.

2.2.1. Strength as a fitness component is generally expressed in 3 ways.

2.2.1.1. *Absolute strength* is expressed as the maximum load that can be moved in a particular movement at a specified speed. It is usually measured in a single repetition but could be expressed over a fixed number of repetitions

2.2.1.2. *Relative strength* is expressed as the maximum load that can be moved in a particular movement at a specified speed described per unit of body weight.

2.2.1.3. *Strength endurance* is expressed as the ability to move submaximal loads repeatably without undue fatigue.

2.2.2. To increase *absolute strength*, resistance training has to increase the size of the muscle(s) [hypertrophy] and/or improve

the ability of the nervous system to recruit the existing muscle more effectively.

2.2.3. To increase *relative strength*, resistance training needs to improve recruitment of muscle but must guard against increasing size to any extent.

2.2.4. To increase *strength endurance*, resistance training needs to increase absolute strength so that any submaximal load becomes a lower percentage of maximum, build tolerance to fatigue through repeated efforts against the submaximal load, or enhance efficiency so that the same work or power can be accomplished with less metabolic cost.

2.2.5. The elements in a resistance training prescription that have been shown to effect these strength changes are called the acute training variables and they are:

1. muscle action;
2. loading and volume;
3. exercise selection and order;
4. rest periods;
5. repetition velocity (tempo);
6. frequency

#### 2.2.5.1. Muscle Action

The main *muscle actions* in resistance training programs are concentric and eccentric actions with isometric actions providing a secondary stabilizing role. To get the most effective hormonal response for increasing muscle size, training should include both concentric and eccentric actions.

#### 2.2.5.2. Loading and Volume

**Load** refers to the amount of weight or resistance in an exercise set and is generally agreed to be the most important variable in a resistance training program. It is usually determined by either a repetition maximum [RM] or by some percentage of 1RM.

Prescribing the load by the RM method is the most practical because it eliminates doing repeated 1RM testing.

The RM continuum links training loads to different training effects keeping in mind that training effects are not exclusive to a particular RM load but rather are more predominant in a particular range of loads [see Table 1 below].

Table 1:

<b>DESIRED TRAINING EFFECT</b>	<b>LOAD EXPRESSED AS RM RANGE</b>
RELATIVE STRENGTH	3-8 RM [QUITE HEAVY]
HYPERTROPHY [SIZE]	8-12 RM [MODERATE]
STRENGTH ENDURANCE	>20 RM [LIGHT]

*Volume* describes the total amount of work performed in a single training session and is typically called the volume load and is commonly determined as the sum of the repetitions in each set x the load or resistance used in those repetitions. To prescribe *Training Volume* the prescription would include the # of sets; the #reps per set; the load [usually in RM]; and the number of sessions per week. For example:

3 SETS: 15 REPS [15RM]; 3 X WEEK

### 2.2.5.3. Exercise Selection and Order

*Exercise Selection* is choosing exercises for a resistance training program. The most commonly accepted classification is single-joint and multi-joint exercises.

- *Single-joint exercises* [for example bicep curls] are often used to isolate specific muscle groups and have a lower risk of injury because of the lower level of skill and technique involved.

- *Multi-joint exercises* [for example squats and bench press] are more demanding on the nervous system but are regarded as most effective for increasing overall strength because they allow a greater total weight to be lifted, force the nervous system to recruit muscles in sequence and, elicit greater increases in the acute levels of anabolic hormones.

Depending on the goal of the program, both single and multi-joint exercises should be incorporated into resistance training programs since weakness in single joint actions can limit multi-joint strength.

*Exercise Order* refers to the sequence of exercises performed in one training session. The preferred sequence is performing multi-joint exercises before performing single-joint exercises. This maximizes the total resistance lifted during an exercise session and therefore results in a greater overall strength gain. This presents logistical problems when training large groups at the same time and individuals are assigned to “stations” and move in a circuit fashion. In this case, order is difficult to establish.

#### 2.2.5.4. **Rest Periods**

*Rest periods* are the time given for recovery between sets and between exercises in the same set in which exercises are performed as “successive sets” [all sets of one exercise are completed before moving on to the next exercise]. In this case, rest periods are important because they contribute to the overall intensity of a session and can affect the training outcome. Some circuit training sessions are organized as “alternating sets” where one set of each exercise is completed before doing the next set of all exercises. In this case, adjacent exercises are organized to challenge different muscle groups so rest between sets and exercises are not necessary. This allows for economy of time but is not the preferred system to achieve hypertrophy.

Table 2: The standard prescription for rest periods in training sessions where exercises are completed in successive sets:

GOAL OF THE PROGRAM	REST PERIOD BETWEEN SETS
RELATIVE STRENGTH	3-5 minutes
ABSOLUTE STRENGTH [HYPERTROPHY]	1-2 minutes
STRENGTH ENDURANCE	30-60 seconds

#### 2.2.5.5. Repetition Velocity [Tempo]

Although this area has not been investigated to a sufficient extent, it is important to know that hypertrophy is related to amount of time the muscle is under tension. The recommended velocity standard for hypertrophy is a 2s concentric: 1s pause: 4s eccentric as this should maximize the time under tension although there is some support for a 2: 1: 2 tempo. For general strength programs a 1-2s concentric: 1-2s eccentric is recommended. For power gains, it is important to try to contract fast even if the load is too heavy to move fast. Some practitioners refer to the pause phase as the isometric phase although not all of the time between the concentric and eccentric phases involves isometric contraction.

#### 2.2.5.6. Frequency

**Training Frequency** is the number of training sessions per week and is dependent on the type of training, the training status and recoverability of the individual. The rest interval between sessions must be sufficient to let the individual recover but not so long as to lose the training effect built after the last session. It is recommended that untrained individuals perform a whole body program *2-3 days per week*. As training status increases, the frequency can be increased to *3-4 days per week*. When programs are split [into upper and lower body or different body areas] then *4-6 days per week* is fine with no one area being loaded more than twice per week.

These six acute training variables are the ones most commonly recognized.

However, recent research on cellular adaptations in muscle to resistance training has suggested that up to 13 acute training variables can affect strength and should be considered in training prescriptions and future research [the six above as well as: % and total time in concentric and eccentric contractions; recovery time between reps; time the muscle is under tension; occurrence of muscle failure; range of motion; rest time between exercise sessions; the specific form of exercise. These all likely impact on the nature of the training effect but we know little about how this happens].

### 2.3.POWER PRESCRIPTION PRINCIPLES

Power is described as the product of the force we produce in a muscle or muscle group times the velocity at which the muscle moves the load. It is therefore the product of strength and speed.

- 2.3.1. Resistance training programs that enhance power either move low loads at high speed or attempt to move heavy loads at high speed even though the load moves slowly.
- 2.3.2. Another consideration in power development is increasing the rate of force development even though the peak velocity may not change. This is important in activities where acceleration is as or more important than the peak velocity. In this case plyometrics [where a muscle is rapidly stretched and then forcefully contracted] such as bounding are effective. Attempting to accelerate high loads explosively in multi-joint movements, such as in Olympic lifts has also resulted in significant power improvements.
- 2.3.3. Since power movements often involve multi-joint actions in task specific movements, mastering the skills will effectively enhance the power performance. Training therefore should involve time to develop and master task-specific skills and then overload with a power stimulus.



2.3.4. Power endurance is crucial for many occupational and sport performances but the science has not provided insights to effective training strategies. It would seem that extending short term high power intervals to failure and/or reducing the recovery interval between high power bursts would challenge this ability and therefore elicit power endurance adaptations. A reasonable caveat would be that this type of training be prescribed for those with a good strength and power base, a good aerobic base for recovery, and well-developed skills in the specific tasks.

## 2.4. PRESCRIPTION PRINCIPLES FOR AEROBIC FITNESS

There are two different types of prescriptions for building aerobic fitness: **continuous** or **interval training**.

2.4.1. The intensity of continuous training to get improvement in aerobic fitness is the “just talk” pace or between 60-90% of HR<sub>max</sub>. For the less fit the lower end of the range is recommended. As fitness improves then a higher relative intensity is necessary to achieve improvement. As intensity approaches 90% of HR<sub>max</sub>, rest periods are inserted to allow recovery. The exercise now becomes **interval training**.

Table 3: The FITT Prescription for Aerobic Fitness

<b>FREQUENCY:</b>	<b>3-5 days/week</b>
<b>INTENSITY:</b> reserve [HRR]	<b>60-90% HR<sub>max</sub>; 40-85% VO<sub>2</sub> reserve [VO<sub>2</sub>R]; 40-85% HR</b>
<b>TIME [Duration]:</b>	<b>20-60 min continuous or intermittent intervals of aerobic activity/day</b>
<b>TYPE [Mode]:</b>	<b><i>Continuous or Interval activity</i> that uses large muscle groups and challenges the oxygen transport system.</b>

2.4.2. There are two systemic adaptations that occur to enhance aerobic fitness. Changes to structural components of the oxygen transport system such as the heart, blood, blood vessels, lungs and muscles; and changes to the aerobic energy supply system in the muscles that are recruited to do the work.

When the intensity is low [ $<85\%$  HRmax] and the duration is longer [30-60+ min] the structural adaptations occur to enhance the uptake and delivery of oxygen to the muscles and the capacity of the aerobic energy supply system is enhanced. This is also the exercise prescription that increases aerobic efficiency by decreasing the oxygen cost per unit of work performed.

When the intensity increases [ $>85\%$  HRmax] and the duration is decreased [ $< 30$  min] and the work is either continuous or interval, the systemic changes to the oxygen transport system also occur but it is the power of the aerobic energy supply system that is primarily improved.

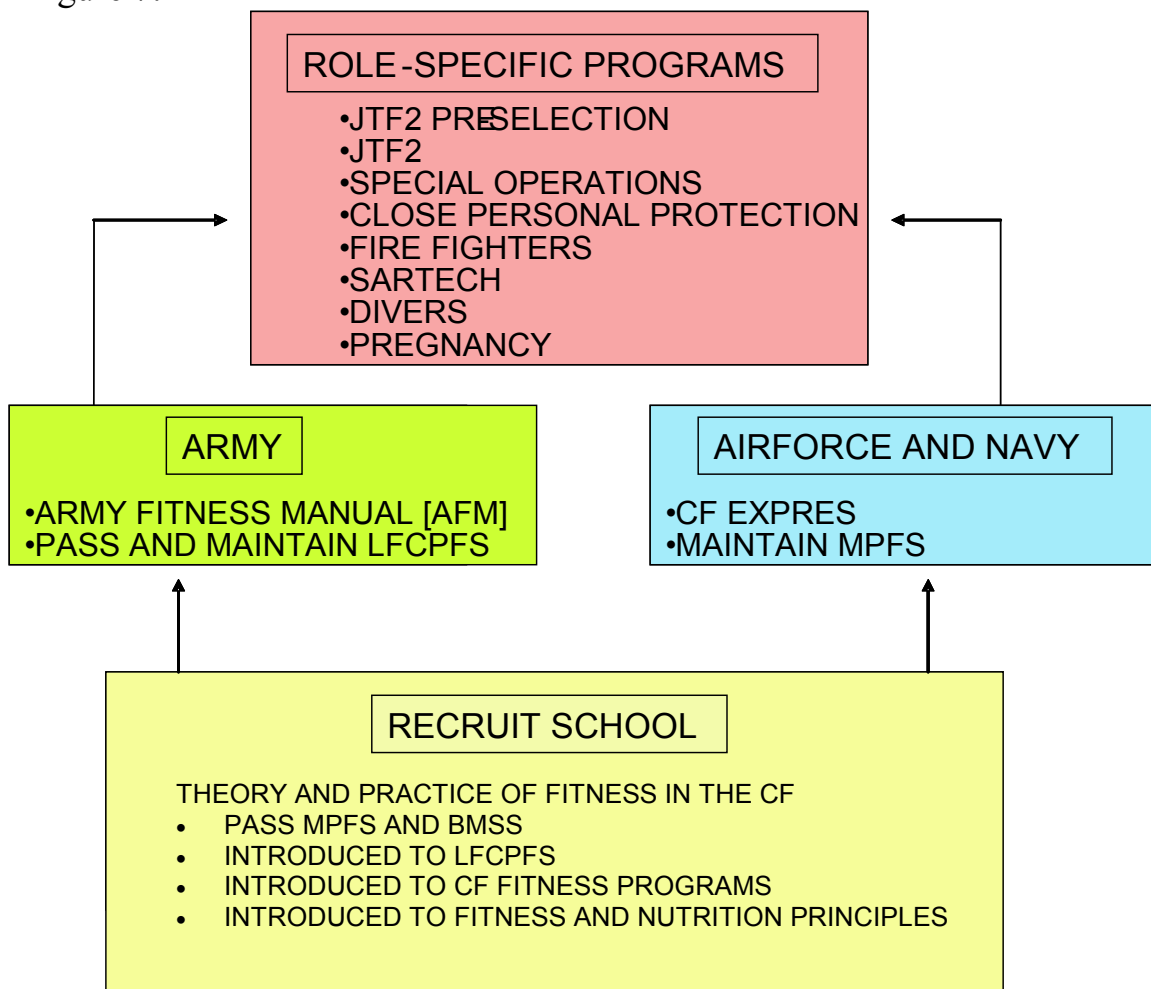
Therefore, when increasing aerobic fitness is the goal, both low intensity, long duration continuous exercise and high intensity, shorter duration continuous or interval work should be prescribed.

### 3. HOW DO THE EXERCISE PRESCRIPTIONS IN THE ARMY FITNESS MANUAL RELATE TO *THE GENERAL FITNESS PRINCIPLES*

#### 3.1. INTRODUCTION

Figure 7 below is a model showing how the fitness programs in the CF are currently organized from recruit school upon entry into the forces, to the specific requirements of the army, navy, and air force. It also shows that there are role-specific programs and standards that branch across elements.

Figure 7:



For the programs in the CF where formal standards must be met for entry into a job or trade and maintenance of a standard is required throughout tenure in the trade, Bona Fide Occupational Requirements [BFOR's] have been or are being developed through contracts with researchers at selected

universities in Canada. These BFOR's become "performance objectives [PO's]" and are mandatory requirements.

After these BFOR's are established, fitness programs are then designed to provide effective strategies to reach and maintain the standards. As a part of the fitness program design, fitness checks are developed to help instructors or an individual monitor the status of the different fitness components. These fitness checks are "enabling objectives [EO's]" and are not mandatory.

### 3.2. TRAINING BY OBJECTIVES PRINCIPLE:

Figure 8 below is a model that shows the sequence of program development from general goals to specific objectives and then to program design and assessment. This model has been used for the development of all the CF endorsed fitness programs. Specifically, the AFM was designed in accordance with figure 8 below and reflects the Training by Objectives principle.

Figure 8:

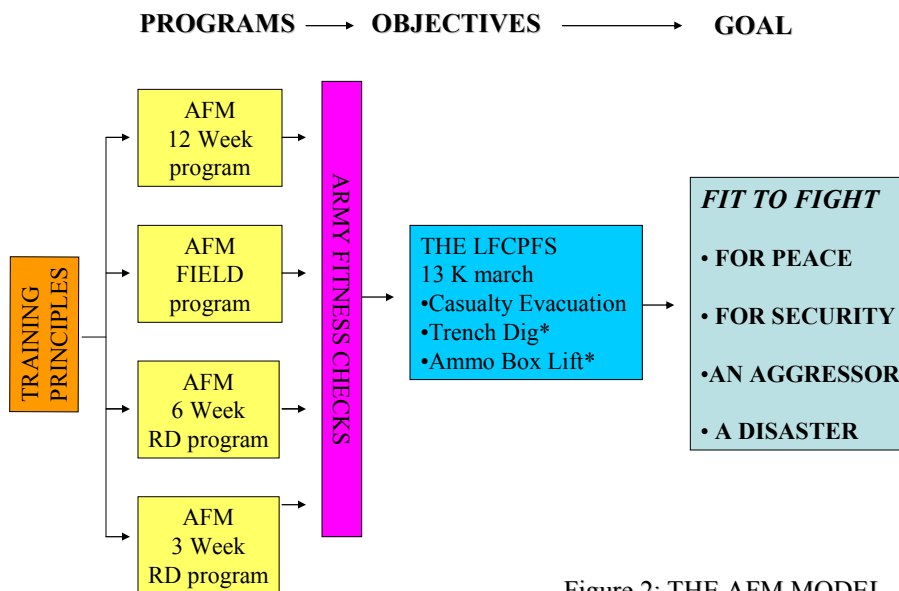


Figure 2: THE AFM MODEL

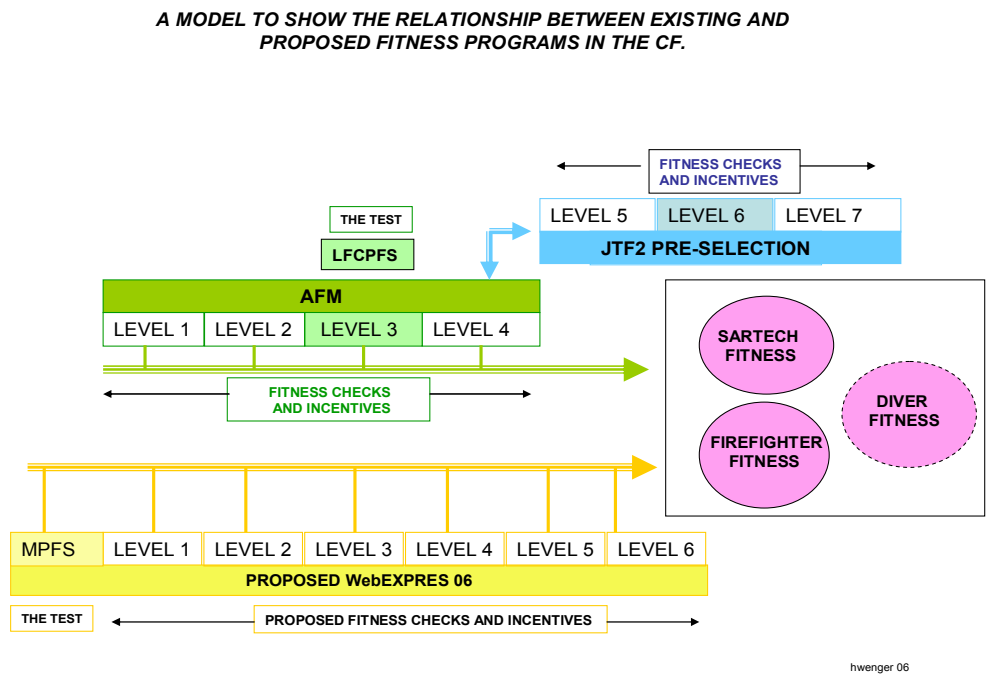
hw06

The fitness levels in each of the components that were necessary to meet the BFOR's at a single test were established and designated as Level 3. Then incremental levels were set to provide a progression from the Minimum Physical Fitness Standard [MPFS] to Level 3 and

then to a higher incentive Level 4. These levels became the fitness checks that individuals or groups could undertake at any time to assess their fitness status in these components and to determine if they had sufficient fitness to meet the performance based LFCPFS. The items in the LFCPFS were developed as BFOR's to meet the operational environments [OE] at the time [1990's]. The current OE certainly contains many of the same demands but also has some new ones that should be assessed and, if necessary, new assessment techniques added to the LFCPFS. The fitness checks at Level 3 were not standards but rather a means to enable soldiers to monitor fitness status and progress.

CF EXPRES, the AFM, and the JTF2 pre-selection programs have all been used as springboards into programs designed to help CF personnel meet trade-specific standards that have been developed through BFOR research. Figure 9 below is a model that depicts the links between these programs. Some programs lead to tests which are performance objectives and passing is mandatory. Most programs have fitness checks built in to enable individuals to assess status of selected fitness components or monitor progress.

Figure 9:



The programs in the AFM and the fitness checks were developed in adherence to a number of the established training and exercise principles discussed in section 1. These are highlighted below.

### 3.3. THE ADAPTATION AND PROGRESSION PRINCIPLES:

Overload is prescribed with increases in aerobic, strength, and power loads within each week of the 12 and 8 week Garrison programs as well as the 6 and 3 week rapid deployment programs and the 4 week field training program. Progressions occur from week to week through increases in intensity, frequency, or duration of the activity.

### 3.4. OVERLOAD:

This is achieved in aerobic intervals by prescribing repeated 1 or 2 minute work intervals at VO<sub>2</sub>max pace followed by a recovery interval of the same duration. Progressions occur by increased pace, length of work interval and/or number of repetitions. These intervals also overload the anaerobic lactic capacity to enhance both strength and power endurance.

Overload is achieved in continuous aerobic runs by running at the “just talk” pace and progressions achieved by keeping the relative loading constant as aerobic capacity improves and by increasing the duration of the runs each week where they are prescribed. When weightload marches are prescribed, the overload is accomplished by wearing kit and progression achieved by increasing the load, the pace, and/or the duration of the march.

Although there is reference to the importance of correct technique for performance and safety, there is no specific instruction on fitness or task-specific skills and progressions from simple to more complex type skills. This should be addressed both for safety and to enhance the strength, power, and metabolic capability in the complex tasks.

### 3.5. THE SPECIFICITY PRINCIPLE:

All programs target the fitness components that are linked to the tasks in the LFCPFS. Additionally, tasks in the LFCPFS such as weightload marching, casualty evacuation, trench dig, and ammo box lift are incorporated and progressively loaded by speed, load, duration, frequency, reps and/or sets. The energy systems specific to the tasks in the LFCPFS are also loaded through their specific power or capacity. Alternative exercises such as rope climb, beam and wall mounts, log,

barrel, and tire lifts, support, carry and press give a field option that is task and implement specific.

There are no time targets established in the AFM prescriptions and therefore no “simulation” during training of settings where physically demanding complex tasks are performed in restricted time periods. These types of settings are reflected in the items of the LFCPFS.

### 3.6. THE INDIVIDUALIZATION PRINCIPLE:

The training programs use relative loads as the stimulus which allows each individual to use loads that are specific for their gender, age, fitness level, and fatigue state. Aerobic interval intensities are prescribed based on the fitness check accomplished every 4 weeks. Aerobic continuous prescriptions are based on the “just talk” pace which is specific to the aerobic capacity of each individual. Strength loads are based on “repetition maximums” which will vary the load depending on the strength of the individual. Power prescriptions focus on maximum speed or explosive jumps which are specific to each individual. These relative loadings allow each person to get their optimal stimulus for adaptation.

### 3.7. THE MAINTENANCE PRINCIPLE:

Maintenance is addressed in the AFM [p. 26] and describes the strategies to use when there is a need to cease training but retain the fitness that one has already acquired.

### 3.8. THE RECOVERY, REST, AND REGENERATION PRINCIPLE:

Recovery periods between aerobic intervals are prescribed for each training session. Recovery intervals between sets in resistance exercises are not prescribed since the programs are designed as alternating sets in circuits with different muscle groups loaded as the circuit progresses. This allows for economy of time but may not be the best prescription for hypertrophy or power endurance. Rest intervals between days are built in with at least 48 hours between strength and power training and at least 24 hours between aerobic training sessions. Regeneration periods are incorporated every 4 weeks with the shorter duration fitness checks acting as an unloading week. This is not ideal since the intensity of the fitness checks is high but the reduced volume provides some regeneration.

### 3.9. THE VARIETY PRINCIPLE:

Variety is evident in the use of weightload marching and running as the aerobic stimulus [with some additional benefit from the circuit nature of the resistance training]. The resistance training offers significant variety from machines to free weights to body weight and partner resistance to alternative field-based equipment and task-specific training such as casualty evacuation, trench dig, and ammo box lift. These variations can be included within a session, across sessions within the same week, or across weeks.

### 3.10. THE SKILL PRINCIPLE:

Although the AFM provides drawings of each exercise in the resistance training programs and discusses technique for safety reasons, it does not provide precise descriptions of proper technique for resistance exercises, marching, other LFCPFS tasks or running. This was considered to be the responsibility of the PSP or military staff but should have been included for standardization. There is a skill emphasis reflected in the multi-joint exercises built in to each circuit [such as presses, squats, dead lifts, pull-ups, push-ups, core exercises, weightload marching, casualty evacuation, trench dig and the alternative exercises using ropes, beams, barrels and logs but not formal descriptions.

### 3.11. THE ENERGY SUPPLY VS. ENERGY DEMAND PRINCIPLE:

The AFM focuses on developing the power and capacity of the 3 different energy supply systems through interval, continuous training, through circuit-type resistance training, through sprint and plyometric sessions, and through varying the load, duration, reps and/or sets of the LFCPFS specific tasks. Explosive power work and heavy load resistance exercise tax the ***anaerobic alactic power***; extended sprints, and 8-12 RM resistances tax the ***anaerobic alactic capacity*** and the ***anaerobic lactic power***; extended running intervals and resistance sets will challenge the ***anaerobic lactic capacity*** and ***aerobic power*** [*VO<sub>2</sub>max*]; and the long duration runs and marches will load the ***aerobic capacity***.

### 3.12. THE PERIODIZATION PRINCIPLE:

Many of the means by which the AFM is periodized have been addressed above in the *training by objectives, adaptation, progression, maintenance, recovery, rest and regeneration, variety, and skill principles*. Additionally, the AFM has horizontal integration in the 12 and 8 week garrison programs in the physical preparation components.



This is reflected in the increased inclusion of task-specific training sessions as the weeks progress and increased intensity or duration in the non-specific training periods.

#### 4. HOW DO THE EXERCISE PRESCRIPTIONS IN THE ARMY FITNESS MANUAL RELATE TO *THE EXERCISE PRESCRIPTION PRINCIPLES*?

##### 4.1. THE FITNESS PRINCIPLE:

The AFM directly addresses the fitness components as follows:

- 4.1.1. *Strength* with the 5 different upper body circuits, 5 lower body circuits, 4 abdominal core circuits and alternative exercises which can be substituted for stations within the above circuits. There are options that include free weights, machines, body weight, partner resistance, military type loads and include both single and multi-joint exercises.
- 4.1.2. *Strength endurance* with repetitions in the 15-20 per set, sets from 2-4 per resistance training session, weightload marches, and task-specific carries, lifts and digs.
- 4.1.3. *Power* with 10-40 meter sprints and plyometrics
- 4.1.4. *Power endurance* with multiple sprints and combined plyometric routines.
- 4.1.5. *Speed* with the sprints and acceleration running.
- 4.1.6. *Aerobic power* with interval runs of 1-3 minutes at VO<sub>2</sub> max pace, resistance training circuits with limited recovery between stations, and weightload marches at over 6 k/h with over 20 kg pack.
- 4.1.7. *Aerobic capacity* with continuous runs of 30-40 minutes at the “just talk” pace and weightload marches at 5-6 k/h for up to 2 hours

- 4.1.8. *Flexibility* with the loading of agonist and antagonist muscles around joints [such as biceps and triceps, quads and hamstrings etc.] and with the static stretching included in the warm-up and cool-down [this is directed more at short-term flexibility rather than chronic improvements].
- 4.1.9. *Body composition* with directions on acquiring and maintaining a healthy body weight as well as reference to the CF Weight Wellness Program. A new CF venture – the Top Fuel for Top Performance – is an excellent document that now should be incorporated into the manual.
- 4.1.10. *Agility, Balance, and Coordination* with body weight exercises, multi-joint exercises, partner resistance exercises, and the task-specific exercises of weightload marching, casualty evacuation, and the trench dig. These 3 components should be addressed more directly, particularly as they relate to different conditions in the new operational environments.

#### 4.2. THE STRENGTH PRESCRIPTION PRINCIPLES:

- 4.2.1. Absolute strength, relative strength, and strength endurance are addressed with RM loads and repetitions in the specified ranges.
- 4.2.2. The 6 acute training variables are addressed as follows:
- 4.2.2.1. The AFM prescribes both eccentric and concentric exercises in all circuits as described in the *muscle action* variable.
- 4.2.2.2. The AFM prescribes *load and volume* for increases in strength through increases in muscle size [hypertrophy] and in strength endurance through high repetitions, lower load resistance exercise. The relative loadings [rather than absolute] permit the repetitions in the appropriate range to elicit the desired strength outcomes. It does not address increases in relative strength with high load, low repetition prescriptions but does so in programs which utilize body weight and fixed loads in alternative exercises. The high load, low rep prescriptions were not included for free weight

and machine loaded exercises due to risk of injury in novice subjects.

*With a focus on technique, spotting, and development of a reasonable strength base prior to undertaking this type of training, the risk of injury would be reduced.*

4.2.2.3. The AFM prescribes both single and multi-joint exercises in all the prescribed circuits for *exercise selection*. It also prescribes multi-joint body weight, partner resistance, and alternative exercises to provide a closer link to task-specific exercises like lifting, raising, pushing, pulling, jumping, and throwing.

4.2.2.4. *Ordering exercise* from multi-joint to single joint was not incorporated into the programs because they were circuit in nature. There is no prescription of progressions from single joint to multi-joint exercise neither for skill development nor from basic multi joint to more complex multi- joint exercises. This would permit an opportunity to build strength in weaker isolated movements and to develop the skill sets for the complex tasks.

4.2.2.5. The AFM does not prescribe *recovery periods* between sets because of the circuit nature of the programs. However, were a soldier to select the successive set protocols, recommended recovery times would be helpful. *Rest* between exercise sessions is addressed by scheduling at least 24 hours between aerobic power or capacity training and at least 48 hours between strength, strength endurance, and power and speed sessions.

4.2.2.6. The AFM meets the basic frequency recommendations of 2-3 sessions per week for aerobic, strength, and power prescriptions with the lower end of the range on 4 days per week training and the upper end on the 5 day per week option. Due to the circuit nature of the strength workouts, aerobic fitness does receive an extra stimulus on strength days and with the weightload march there is an additional strength stimulus on those task-specific training days.

Increasing frequency for the more high fit population should be an option as it would augment improvements achieved through higher intensity and larger volume loads alone.

#### 4.3. THE POWER PRESCRIPTION PRINCIPLES:

4.3.1. The AFM meets the power prescription principles through the prescription of explosive plyometric exercises using body weight and medicine balls as well as acceleration sprints. It does not address the use of power lifting and Olympic lifts, the beneficial effects of which are well-documented. This exclusion is likely due to the high skill level required and safety concerns if proper technique is not taught and enforced when high loads are used.

4.3.2. The AFM does not address power endurance except in the acceleration sprints [and to some extent in the aerobic interval training]. It also tends to avoid failure in strength and power training by prescribing “failure minus one” for repetitions rather than “failure”. This again is likely due to avoiding injury under fatigue conditions and to emphasize volume in a work interval rather than tolerance. They are both important to a soldier when performance must be maintained in stressful, threatening, and dangerous environments. A focus on power endurance would augment the AFM significantly especially if packaged with the highly task-specific training modalities like lifting, climbing, carrying, jumping, and low profile running.

#### 4.4. THE AEROBIC PRESCRIPTION PRINCIPLES:

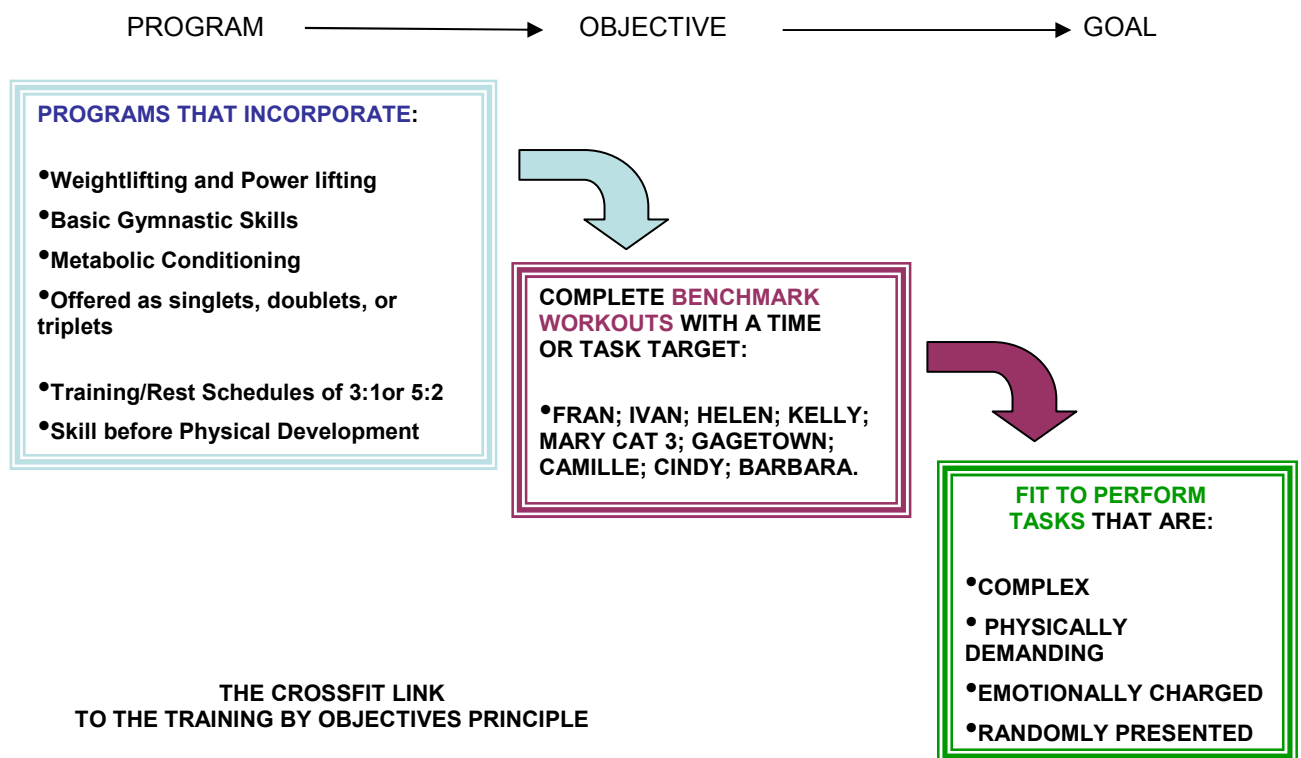
4.4.1. The AFM does adhere to the aerobic fitness prescription principles with frequency, intensity, time, and type of activity in both continuous and interval patterns. The frequency varies from 2-3 times per week; the duration from 30- 45 minutes; the intensity is prescribed relative to VO<sub>2</sub>max; and the type of activity is running. In the 8 and 12 week Garrison programs, continuous running is phased out as the weeks progress and weightload marching is inserted with progressions in pace, distance, and weightload to prepare for the 13km weightload march in the LFCPFS. In the 6 and 3 week rapid deployment

programs, the weightload march occurs once per week with progressions and there is an option for a second day each week. The circuit nature of the strength programs with no recovery between stations also provides an additional aerobic stimulus in the Garrison and rapid deployment training schedules.

## 5. HOW DO THE EXERCISE PRESCRIPTIONS IN CROSSFIT RELATE TO *THE GENERAL FITNESS PRINCIPLES*

In this section, I have addressed *the programs, program organization, and scheduling* as presented by CrossFit and not *the philosophy* as stated in the CrossFit Journal. [I intend to vette this through Greg Glassman to insure it is an accurate reflection before the final report].

Figure 10:



hwenger06

### 5.1.THE TRAINING BY OBJECTIVES PRINCIPLE:

As indicated in figure 10 above, the general goal of CrossFit is to develop the fitness of individuals to a place where they can optimally perform life, sport, or occupational skills that are complex, physically demanding, randomly presented, and often occur in emotionally charged environments. They suggest two different ways to monitor fitness.

5.1.1. Using benchmark workouts that use time for completion of a fixed number of tasks or number of task completions in a fixed time.

5.1.2. They have developed 5 tests [see CFJ, April 2003] to evaluate fitness using 5 different workouts and assigning points based on performance of those workouts.

5.1.3.

These are performance based tests that offer an incentive to participants and an assessment of the ability to perform the package of exercises. However this type of assessment does not reflect the strengths and weakness in specific fitness components.

5.1.4. The programs feature 3 “modalities”: Weightlifting and Power lifting [**W**]; Gymnastics and Body Weight exercises [**G**]; and Metabolic Conditioning [**M**] and are prescribed as a single modality; as a couplet; or a triplet in a 3:1 or 5:2 training day: rest day pattern.

Therefore CrossFit does follow the *training by objectives* principle. However, there is no research link between the objectives [successful completion of the benchmark standards] and the army objective of a successful completion of the LFCPFS although the exercise and skill elements included in the W, G, and M modalities suggest that there is a direct link.

There has been no rigorously controlled research to indicate whether or not the benchmark workout standards would be as or more effective than the AFM in achieving a successful LFCPFS.

*LFC and PSP should regularly review the operational environment to insure that fitness is being evaluated and developed in accordance with the operational demands.*

## 5.2. THE ADAPTATION AND PROGRESSION PRINCIPLES:

5.2.1. Each exercise session in CrossFit has either: a time limit in which to accomplish as many reps as possible of the prescribed exercises; or a prescribed number of exercises to be accomplished in as short a time as possible. With these time or task challenges there is a significant *overload* imposed on the nervous system, endocrine system, cardio-respiratory, and/or musculo-skeletal system to elicit an *adaptation*.

5.2.2. Loads are applied as relative to body size with body weight type exercises and as absolute loads with fixed weights or medicine balls. This absolute loading can be problematic in that smaller individuals incur greater relative loads than do larger individuals. This can be a safety concern, a problem in comparing performances between individuals, and does not allow the same repetition range for all individuals across the workout.

However, CrossFit does offer a scaling tool to compare individual performances across different body weights. This can offer a solution to the performance issue but not to the safety or repetitions issues. Also, it does take some time to do the scaling calculation so a timely performance comparison is not always possible. A single weight does facilitate administration of a workout, especially with large groups, and the performance should be an individual target rather than between individuals. This advantage has to be weighed against the disadvantage of giving different relative loads to people of different size and strength and the risk that a fixed absolute load can increase the risk of injury for some smaller, older and less strong individuals. A motivational strategy proposed by CrossFit is to post times and/or reps after the workout so that the comparison is always front and center. This strategy could still be maintained by using relative rather than absolute loads and then scaling of performance scores would not be necessary.

5.2.3. The “random” selection of different exercises for a workout of the day [WOD] is conveyed by CrossFit as being the way that life and our occupational environments present physically demanding challenges. That is the case in performance settings but can result in a frequency of loading during training that is too low to elicit the desired training effect or too high so that overuse injuries result. Although the 8 and 9 week proposed programs do prescribe fixed workouts for each day and at CrossFit gyms across North America, I have been told that it would be unusual for the WOD to be used as the workout template in classes or private lessons. In these cases, random selection would not be an issue as long as the intensities, frequencies and actions were prescribed appropriately. CrossFit does recommend that individuals either create their own workout schedule or use the WOD’s posted on the CrossFit website when they complete the 8 and/or 9 week proposed programs. The frequency would then continue to be an issue.

*As an aside here, does the CF want its soldiers to be responsible for the design of their own workouts at the end of an 8 or 9 week cycle with little understanding of the principles of prescription?*

*Progression* is evident in the CrossFit programs on a number of levels.

5.2.4. When there is a time or task-specific challenge in a workout, *progression* is achieved by encouraging either a greater number of tasks or reps per timed session or a shorter time to complete a fixed number of tasks.

5.2.5. Progression in skill from simple to complex is a special feature of CrossFit. For example, they progress from a shoulder press [simple] to a push press [intermediate] to a push jerk [complex] skill and there is sound instruction on good technique at the simple level before progressing to the more complex levels.

5.2.6. In the above example, progression occurs on load, speed, and power as well as on the extent to which there is a demand on agility, balance, and coordination.



- 5.2.7. It is also a good example of exercises that emphasize a core to extremity sequence and large to smaller muscle groups. This is consistent with many task-specific demands in life, sport, and physically demanding vocations.
- 5.2.8. This same progression is evident in the sequence of air squat to squat to front squat to overhead squat and from dead lift to sumo dead lift and high pull to clean. The emphasis is on mechanics of the exercise first to consistency in technique to increases in intensity. This facilitates skill and encourages safety.
- 5.2.9. Lastly, in regards to progression, CrossFit recommends 3 stages of development in their program:

5.2.9.1. **Stage 1:** *Relatively or completely unfamiliar with the many of the prescribed exercises and unaccustomed to elite athlete training.*

Begin by learning the movements for a month or two until you can correctly perform the prescribed exercises or substitutions. Then perform the workout of the day under no load progressing to partial load to finally the prescribed load with quality technique.

5.2.9.2. **Stage 2:** *Some or many of the prescribed exercises are unfamiliar but you are acquainted with elite athlete training.*

Begin by following the prescribed workout of the day [WOD] with recommended substitutions for those exercises where you do not have the equipment or the skill. Develop quality technique in the unfamiliar exercises and progress from unloaded to partial load to the prescribed load and exercises and high quality technique.

5.2.9.3. **Stage 3:** *Largely familiar with Olympic weightlifting, power lifting and the recommended gymnastics exercises and accustomed to elite athlete training.*

Begin with the WOD and polishing your technique under unloaded then partially loaded and then the workout as prescribed.

### 5.3.THE SPECIFICITY PRINCIPLE:

The majority of exercises prescribed in the CrossFit program are linked to movements, tasks, loads, and intensities that are common in the operational environments of the army.

- 5.3.1. The exercises feature lifting, supporting, pushing, pulling, pressing, jumping, throwing, catching, swinging, climbing, twisting, running and jumping. The emphasis on basic and advanced gymnastic skills such as the pull-ups, kips, push-ups, dips, rope climb, and handstands using floor, high bar, parallel bars, and rings is an excellent reflection of many tasks specific requirements in being fit to fight disasters or insurgents.
- 5.3.2. There are many situations in the “fit to fight” environment which demand accomplishing complex skills at high intensity in a short time frame or completing a fixed package of actions as fast as possible in an emotionally-charged environment. The time-specific and/or task-specific design of the Crossfit workouts mirrors these settings.
- 5.3.3. Challenges to the anaerobic power and capacity and the aerobic power energy supply systems is strong due to the time and or task-specific targets presented for each workout and matches the specific demands in the field to insure optimal strength and power outputs over extended periods. This is a strength of the Crossfit program that pursues adaptations to the fitness components of strength endurance and power endurance as well as aerobic power.
- 5.3.4. The lack of prolonged, low power work that challenges aerobic capacity is a concern. The 400, 600, 800 meter runs and intervals in the CrossFit workouts focus on anaerobic lactic capacity and aerobic power and will enhance the VO<sub>2</sub>max. This improvement in the oxygen transport system is important for both recovery

from high intensity work and for performing longer duration activities. As well, at least for low and moderately fit individuals, improvements in aerobic power [VO<sub>2</sub>max] are linked to improvements in aerobic capacity and the ability to work at low power for extended periods of time [2+ hours]. However, improvements in mechanical and metabolic efficiency that enhance long duration work outputs are primarily achieved through long-duration, low-power exercise. This is especially important for long duration weightload marches in the heat. This type of training is infrequent in the WOD's offered through the CrossFit website and is only minimally addressed in the proposed 8 and 9 week programs.

#### 5.4. THE INDIVIDUALIZATION PRINCIPLE:

There are elements of the CrossFit programs that address individualization and others that do not.

5.4.1. The prescription of body weight exercises like pull-ups push-ups, dips, rope climbs and sit-ups as well as “metabolic” exercises such as running, cycling, rowing, and skipping offer loads that accommodate individuals of different abilities, age, genders, and training state.

5.4.2. The prescription of fixed loads in many of the resistance training exercises precludes older, weaker [males and females], and lower fit individuals from optimal overloads and presents some risk of injury. This could be avoided by prescribing relative loads or prescribing progressions from simple to complex skills and from no load to light to moderate to the prescribed absolute load for each workout. They do encourage this progression BUT the prescriptions for their WOD's and benchmark workouts do not include the progressions. It is left up to the individual to determine the appropriate progression.

#### 5.5. THE MAINTENANCE PRINCIPLE:

There is no discussion of maintenance strategies for those times when regular workouts are not possible or when shifting training emphasis

#### 5.6. THE RECOVERY, REST, AND REGENERATION PRINCIPLE:

This principle is not consistently addressed in Crossfit prescriptions or is ignored in the quest to enhance tolerance to high intensity work and fatigue.

5.6.1. Recovery is scheduled between sets in some workouts [e.g. Barbara] but most often the frequency and duration of recovery periods seem arbitrary. This is intentional [*I believe*] to insure that participants are pushing their performance under fatigue conditions. Therefore, typical prescriptions in CrossFit give a fixed number of reps of an exercise and sets of a group of exercises to be completed in as short a time as possible or a fixed time frame to complete as many prescribed tasks as possible. This is neither right nor wrong; it is simply a difference in the goal and therefore in the way the overload is applied but does ignore the importance of a repetition maximum range for eliciting different types of strength improvements.

5.6.2. The focus in traditional prescriptions is to insure a specific volume overload by providing sufficient recovery between sets. The focus in the Crossfit prescription is to overload the ability to do high strength and power work over extended periods and under fatigue conditions to build strength and power endurance. The training effect achieved is different under these two different types of loading.

5.6.3. The Crossfit program recommends a 3:1 or 5:2 work days to rest day ratio. The 3:1 is generally accepted as the optimal pattern especially for high intensity programs but results in different days off each week which can be problematic with job and family commitments. The 5:2 is used to fit in rest with the normally scheduled weekends and is a common pattern. The AFM uses a 2:1; 3:1 pattern that protects Sunday but allows for an optional day on Saturday. There does not seem to be much difference in the effects they produce over time but quality of workouts can deteriorate in the later days of the 5:2 programs.

5.6.4. The Crossfit program does not build in unloading weeks on a regular pattern but suggest that when workout quality deteriorates extra rest days are needed. This lack of a regular pattern is not consistent with common practice in prescription for elite athletes

or high intensity occupational pursuits and puts the individual at more at risk of overtraining and stress related injuries – especially with the focus on high intensity, fatigue based training.

#### 5.7.THE VARIETY PRINCIPLE:

The CrossFit prescriptions are rich in variety and it is a strength of the program.

- 5.7.1. They prescribe variations on all major strength and power exercises, incorporate a variety of gymnastic skills, and vary the aerobic activities.
- 5.7.2. Variation is also evident in the reps, sets, loads, and tempo of the exercises.
- 5.7.3. Participants are also encouraged to participate in a broad range of sporting activities although time for these is not specifically scheduled.
- 5.7.4. There may be so much variation within some elements that some do not get sufficient frequency to insure an optimal overload across the weeks and months.

#### 5.8.THE SKILL PRINCIPLE:

The CrossFit program involves multi-joint complex exercises almost exclusively.

- 5.8.1. CrossFit emphasizes the importance of proper mechanical execution of skills in the weightlifting, power lifting, and gymnastics modalities and provide clearly written, diagrammatic, and video descriptions of the critical joint actions and sequences upon which to focus.
- 5.8.2. They also have clear progressions outlined for developing the complex skills through learning to properly execute component skills within the complex ones.

- 5.8.3. There is also an emphasis on proper mechanical execution of skills for the fitter individuals during their attempts to set new time or task-specific targets.
- 5.8.4. The prescription of complex weightlifting, power lifting, and gymnastics skills insures development of agility, balance, and coordination – at least in athletic and vocational skills that are similar to those movements.
- 5.8.5. Although they have included most of the fundamental movement patterns, a case could be made that some are missing, such as strength and power movements using adduction and abduction at the shoulder and hip. These would be important in zigzag running tasks, throwing, and moving heavy objects to the side in a single arm action.

*Both the AFM and CrossFit should give better instruction on mechanically correct running, jumping, and throwing activities.*

**5.9. THE ENERGY SUPPLY VS. ENERGY DEMAND PRINCIPLE:**  
The CrossFit program focuses on developing the power and capacity of the 2 anaerobic energy supply systems through high load, high power and moderate load, moderate power exercises performed with time and task-specific targets.

- 5.9.1. The time and task-specific targets insure a significant challenge to the capacity of the both of the anaerobic systems and mirrors one of the programs priorities – to enhance strength and power endurance.
- 5.9.2. Aerobic power [VO<sub>2</sub>max] is challenged through interval run training and through short circuit-type resistance training. The web based programs also use rowing erg intervals to achieve improvements in aerobic power.
- 5.9.3. There is a conscious effort to avoid low intensity, long duration runs, rows and marches that would enhance aerobic capacity. Considering the importance of long distance weightload marches in the LFCPFS and in the current operational environment, this type of training should be included.

The 8 week proposed program from Gagetown does include (1) 2.4 k run in weeks 1 and 8 and (1) 5 k run in week 2. The 2.4 k run is more for aerobic power than for capacity so there is only one direct challenge to the capacity of the aerobic system over the 8 weeks. The (1) weightload [ruck] march prescribed in each of weeks 1, 3, 4, 6, and 8 have no pace or duration prescribed. If the intention is for these to be in excess of 1 hour at a pace of 5.5 to 6 k/h, this would be effective in challenging the aerobic capacity. Not including the 2.4 k runs, this is only 6 training sessions for aerobic capacity IF the weightload marches exceed 1hr at the appropriate pace and load.

The 9 week proposed “austere” program includes (2) 2.4 k runs; (2) 5 k runs; (1) 8 k and (1) 10k run as well as (2) 6 k weightload marches at a rapid pace of 6.4 k/h [*note discrepancies in pace in the proposed program*][a 2.4 k run for time in days 1, 15; a 5 k run for time in days 12, 34; an 8 k run for time on day 17; and a 10 k run on day 28]. Even including the 2.4 k runs as aerobic capacity, this is only 8 aerobic capacity training sessions in 9 weeks.

#### 5.10. THE PERIODIZATION PRINCIPLE:

CrossFit claims to not be periodized but rather to be randomized in the prescriptions.

5.10.1. The assertion is that if the situations in life, sport, and physically demanding occupations are presented to us in random fashion, then training to meet these challenges should also be random. This is likely true in how we *practice* the use of our skills and fitness to permit us to respond to different tactical and environmental settings. However, the risk of doing the fitness and skills training in this fashion is that the training at required frequency, load, duration and actions may not be optimal to achieve our desired fitness and skill outcomes.

5.10.2. The CrossFit web prescriptions are based on the workout of the day [WOD] which they claim are randomized and run this risk. The proposed 8 week program and the 9 week austere program have a fixed workout schedule and, as such, are not

random variations. However, the rationale behind the fixed pattern in the proposed programs is not clear, does not adhere to the CrossFit template, and presents other issues that will be addressed in later sections.

5.10.3. CrossFit has a unique prescription pattern [see below].

Table 4: The scheduling of training modalities [elements] in the 3:1 and 5:2 work day; rest day patterns. Note: M [metabolic exercises]; G [Gymnastics and Body weight exercises]; W [weightlifting and power lifting exercises][see p.3 CFJ, February, 2003 for exercises that fall into these different modalities]

3:1 WORK DAYS: REST DAYS

DAY	1	2	3	4	5	6	7	8	9	10	11	12
	M	GW	MGW	OFF	G	WM	GWM	OFF	W	WM	WMG	OFF

5:2 WORK DAYS: REST DAYS

DAY	1	2	3	4	5	6	7
	M	GW	MGW	MG	W	OFF	OFF

DAY	8	9	10	11	12	13	14
	G	WM	GWM	GW	M	OFF	OFF

DAY	15	16	17	18	19	20	21
	W	MG	WMG	WM	G	OFF	OFF

5.10.3.1. They blend in 3 different modalities [weightlifting and power lifting exercises [W], gymnastics and body weight exercises [G], and metabolic exercises [M]] into a 3:1 or 5:2 work day to rest day schedule [CFJ, Feb 2003].

5.10.3.2. These modalities are prescribed in single or combined patterns that are repeated across weeks. The MGW sequence is consistent as is the singlet, couplet, triplet sequence. It is recommended that the couplets [GW, WM, or MG] are



packaged with a fixed number of tasks or reps performed in as short a time as possible. The triplets are packaged with a fixed time to accomplish as many tasks or reps as possible. There is no stated reason why couplets have the task priority and triplets have the time priority. This time and task priority is not followed in the proposed programs.

The table below shows the recommended CrossFit pattern in a 9 week [5: 2] schedule in comparison to the proposed 8 and 9 week programs. Note the sequential MGW pattern and the order of singlet, couplet, and triplet workouts in the recommended pattern and the lack of pattern and order in the two proposed programs.

DAY	1	2	3	4	5	6	7
<b>CROSSFIT TEMPLATE</b>	M	GW	MGW	MG	W	OFF	OFF
<b>8 WEEK PROPOSED</b>	WM	GW	M	GWM	M	OFF	OFF
<b>9 WEEK PROPOSED</b>	G	WM	M	GWM	G	OFF	OFF

DAY	8	9	10	11	12	13	14
<b>CROSSFIT TEMPLATE</b>	G	WM	GWM	GW	M	OFF	OFF
<b>8 WEEK PROPOSED</b>	G	WM	M	GWM	G	OFF	OFF
<b>9 WEEK PROPOSED</b>	MG	W or G	GWM	G	GW	OFF	OFF

DAY	15	16	17	18	19	20	21
<b>CROSSFIT TEMPLATE</b>	W	MG	WMG	WM	G	OFF	OFF
<b>8 WEEK PROPOSED</b>	M	GW	GW	G	W	OFF	OFF
<b>9 WEEK PROPOSED</b>	G	M	GWM	M	M	OFF	OFF

DAY	22	23	24	25	26	27	28
-----	----	----	----	----	----	----	----

<b>CROSSFIT TEMPLATE</b>	M	GW	MGW	MG	W	OFF	OFF
<b>8 WEEK PROPOSED</b>	GW	M	GWM	W	GWM	OFF	OFF
<b>9 WEEK PROPOSED</b>	GWM	M	MG	MG	GWM	OFF	OFF
<b>DAY</b>	<b>29</b>	<b>30</b>	<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>
<b>CROSSFIT TEMPLATE</b>	G	WM	GWM	GW	M	OFF	OFF
<b>8 WEEK PROPOSED</b>	GWM	W	MG	W	WM	OFF	OFF
<b>9 WEEK PROPOSED</b>	MG	GW	G	MG	GWM	OFF	OFF

<b>DAY</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>	<b>41</b>	<b>42</b>
<b>CROSSFIT TEMPLATE</b>	W	MG	WMG	WM	G	OFF	OFF
<b>8 WEEK PROPOSED</b>	G	WM	GW	W	M	OFF	OFF
<b>9 WEEK PROPOSED</b>	MG	WM	M	G	W or G	OFF	OFF

<b>DAY</b>	<b>43</b>	<b>44</b>	<b>45</b>	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>
<b>CROSSFIT TEMPLATE</b>	M	GW	MGW	MG	W	OFF	OFF
<b>8 WEEK PROPOSED</b>	W	G	W	GWM	W	OFF	OFF
<b>9 WEEK PROPOSED</b>	GWM	WM	G	M	G	OFF	OFF

<b>DAY</b>	<b>50</b>	<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>	<b>56</b>
<b>CROSSFIT TEMPLATE</b>	G	WM	GWM	GW	M	OFF	OFF
<b>8 WEEK PROPOSED</b>	WM	GW	M	GWM	M	OFF	OFF
<b>9 WEEK PROPOSED</b>	MG	WM	MG	W	G	OFF	OFF

<b>DAY</b>	<b>57</b>	<b>58</b>	<b>59</b>	<b>60</b>	<b>61</b>	<b>62</b>	<b>63</b>
------------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

<b>CROSSFIT TEMPLATE</b>	W	MG	WMG	WM	G	OFF	OFF
<b>9 WEEK PROPOSED</b>	MG	W	MG	GW	G	OFF	OFF

5.10.3.3. The 3:1 is a common work: rest ratio in many periodized models and the 5:2 is a compromise that is often used to protect weekends although not as theoretically sound since there is a risk of reduced volume and injury in work days 4 and 5. This is alleviated to some extent in the recommended CrossFit program by prescribing couplets in day 4 and singlets in day 5

5.10.3.4. The most common pattern for the 3:1 schedule is to have a “hard training day” following a rest day. CrossFit program does not do this except on W days. A single modality day following 2 rest days should facilitate skill development in a rested condition and can certainly be justified from that point of view.

*This pattern that they recommend is not followed in the proposed 8 week or 9 week programs in either the 3:1 or 5:2 work days: rest days schedules. The 8 and 9 week proposed programs demonstrate no obvious pattern in the presentation of the W, G, or M, elements or the singlet, couplet, triplet pattern, or in the task or time priorities. The patterns that are in the proposed programs risk underloading on some actions and risk overuse injuries in others.*

5.10.4. Periodization is evident in the way in which CrossFit adheres to the *training by objectives, adaptation, progression, rest, variety, and skill principles* above.

5.10.5. The sporadic inclusion of appropriate recovery intervals, omission of scheduled unloading weeks, not addressing maintenance strategies, and consecutive days of loading on the same actions at high intensity are inconsistent with acceptable periodization models.

- 5.10.5.1. Although recovery is important for re-fueling, re-hydrating, and removing fatiguing waste products, it is also important as a safety precaution to prevent injuries when technique breaks down due to fatigue.
- 5.10.5.2. The unloading periods instituted in periodized programs every 4-5 weeks are also important to prevent overtraining due to chronic loading of our neuro-endocrine systems. This latter issue could be rectified by formally instituting a low volume, low intensity “technique and testing” week every 4-5 weeks [*see section 7: Recommendations*].
- 5.10.5.3. The issue of limited or restricted recovery in the heavy training sessions is not easily rectified since it is part of the goal of the CrossFit program but adherence to the singlet, doublet, triplet and ordering the M, G, W workouts in the proposed programs would be a partial solution. Team workouts involving a sequential completion of exercises by each member of the team provides recovery intervals based on the number of team members.
- 5.10.5.4. The issue of prescribing maintenance programs could be addressed with some examples of how the prescriptions could be reduced in frequency and duration but not in intensity during periods when normal frequency is not possible.
- 5.10.6. There is certainly some vertical integration evident in the published CrossFit programs as demonstrated in the pattern of W, G, and M exercises in both the 3:1 and 5:2 schedules. There is horizontal integration in the published prescriptions in the progressions from simple to complex skills, and from no load, low volume to heavy load and higher volume.  
*The two types of integration are not consistent in the proposed 8 and 9 week programs. The horizontal integration could be more effectively accomplished by prescribing the less complex W, G, and M workouts early and then progressing to more complex ones and finally to some of the creative workouts proposed in the 9 week austere program.*

## 6. HOW DO THE EXERCISE PRESCRIPTIONS IN CROSSFIT RELATE TO *THE EXERCISE PRESCRIPTION PRINCIPLES*?

### 6.1. THE FITNESS PRINCIPLE:

CrossFit proposes 10 different fitness components which they refer to as physical skills [CFJ, October 2002]. Seven of these are the same as those in section 1 [strength, power, agility, balance, coordination, cardio-respiratory (aerobic) fitness, and flexibility]. They also include stamina which could be interpreted as strength and/or power endurance. Their 10<sup>th</sup> component is accuracy and although not included in the list given in section 1, it is certainly important for performance. They do call their list *physical skills* rather than *fitness components* which is why accuracy has a prominent place in their list but is not included as a fitness component. They do not include body composition or speed, the former probably because it is not a skill per se and the latter because it is part of the power equation and/or because it has a high metabolic component and is included as part of that modality [*Howie – check this out with Greg*]. Their programs are designed to improve these components but the evaluation techniques are performance oriented and therefore do not assess individual components independently. Crossfit addresses the components of fitness [p. 16-19] as follows:

- 6.1.1. *Strength* with Olympic lifts and progressions, multi-joint free weight resistance exercises, body weight exercises, gymnastic exercises, and military specific loads in the proposed 9 week austere program along with weightload marches
- 6.1.2. *Strength endurance* with the time and task specific targets for the resistance exercises and military task-specific field exercises, as well as weightload marches.
- 6.1.3. *Power* with high load, explosive Olympic lifts and progressions as well as explosive, low resistance training, jumps and sprints.

- 6.1.4. *Power endurance* with the time and task specific targets for the explosive resistance exercises and military task-specific field exercises.
- 6.1.5. *Speed* is included but not emphasized in the 400-800m sprint intervals with a time constraint and linked to the power training that is designed to improve the rate of force development.
- 6.1.6. *Aerobic power* with the interval runs and the limited recovery time between reps and sets, especially in the 3 element workouts.
- 6.1.7. *Aerobic capacity* is not emphasized in the web based prescriptions but gets some attention with a limited number of 5, 8, and 10k runs, particularly in the austere program and the (2) 6k weightload marches in the 9 week austere program.
- 6.1.8. *Flexibility* with the loading of agonist and antagonist muscles around joints [such as biceps and triceps, quads and hamstrings etc.] and with the static stretching in the warm-up and PNF stretching in the cool-down.
- 6.1.9. *Body composition* with nutritional advice in the CrossFit Journal on reducing carbohydrates, increasing protein and reducing the fat content of meals. Their nutritional information is not consistent with CF positions in the Top Fuel for Top Performance manual or the position of Health Canada, the Dietitians of Canada, or the American College of Sports Medicine.
- 6.1.10. *Agility, Balance, and Coordination* with gymnastics and body weight exercises, multi-joint exercises in the Olympic lifts and progressions. These 3 components could be addressed more directly in activities that require changing body direction rapidly and balancing on narrow bases of support that may mirror the new operational environment more closely.

## 6.2. THE STRENGTH PRESCRIPTION PRINCIPLES:

6.2.1. Most of the strength and power *prescription principles* are not addressed according to the principles of resistance training as stated by scientific and professional associations such as the American College of Sports Medicine, The National Strength and Conditioning Association or the Canadian Society for Exercise Physiology.

6.2.2. The weightlifting, power lifting, gymnastic and body weight exercises that are prescribed for strength or strength endurance all have either a repetitions per fixed time target [triplet] or a time for fixed repetitions target [couplet]. These are not linked to the load or repetition ranges that are prescribed by the above associations to achieve absolute or relative strength or strength endurance. There is no scientific evidence that the Crossfit prescriptions produce these specific adaptations to a lesser, similar or greater extent than the standard prescription practice.

6.2.3. The 6 acute training variables are addressed as follows:

6.2.3.1. Eccentric, concentric, and isometric *muscle actions* are prescribed in many of the weightlifting and gymnastics exercises and the stretch-shortening cycle is invoked in the jumps, lunges, Olympic lifts and progressions.

6.2.3.2. CrossFit does not prescribe *load* in terms of repetition maximums [RM] or as a % of 1RM which are the recommended prescriptions to provide relative loadings for individuals of varying strength and size. They use body weight [which is a relative load based on body size] in the gymnastic exercises and fixed loads for the weightlifting prescriptions.

*The fixed loads are problematic because smaller and weaker individuals of both genders and across ages will be disadvantaged in the volume of exercise before fatigue, their performance scores will be compromised, and there will be a greater risk of injury both in the early reps with a higher relative load and in the later reps as fatigue approaches.*

6.2.3.2.1. As mentioned earlier, the fixed load prescriptions for all individuals regardless of size or strength precludes

giving individuals the specific loads that elicit specific changes. For example, in “Carla”, the 95 lb deadlift could be a 5 RM load for a smaller person, a 12 RM load for another and a 20 RM load for a bigger, stronger individual. Therefore, each would be eliciting different adaptations and not necessarily the strength component they require.

*If load was prescribed relative to max rather than as a fixed absolute load, the time target could still be set to give the strength and/or power endurance stimulus, both goals could be achieved, and the performance comparison could be made directly. CrossFit does have a scaling tool but it is designed to equate performance scores and not to scale the load prior to the exercise.*

6.2.3.2.2. An advantage to a fixed load is that if there is a particular load that must be lifted, hoisted, pushed, or pulled in order to perform a job-related task, it can provide a realistic load that could be used to determine job readiness. Performance readiness, though, is a different issue than training to perform.

6.2.3.2.3. There is no rationale for the specific fixed loads. For example: why 95 lb deadlift in Carla; the 20lb medicine balls in Katrina; the 95 lb barbell for the thruster in Fran; 65 lb push-press in Ivan? These same questions hold for other non-named workouts prescribed in the 8 and 9 week proposed programs as well as WOD’s prescribed on the website.

*The proposed 9 week austere program does have some fixed load implements, equipment and containers that are used in the different workouts with gradations in the loading. If these are realistic options in the field, then they could be used in providing a degree of relative loading.*

6.2.3.2.4. There are no prescribed load progressions recommended for those who do not have sufficient strength or a staging point to progress from lower to the prescribed loads. A number of resistance training



workouts on the 8 week proposed program do not have loads prescribed.

*Relative loadings [e.g. RM] for W workouts would provide progressions for all those of differing size and strength.*

6.2.3.2.5. The safety issue of the fixed load is addressed in CrossFit by recommending that if the prescribed load is too heavy then individuals should reduce the load and then progress to the prescribed load. The same direction is given for complex tasks - that the person sufficiently masters the mechanics of complex exercises before inclusion in their workout. However, this is left to the individual to make this decision.

*Relative loads and having the skill progressions approved before moving on from the simpler to the more complex activities would dampen the injury issue. Providing graded absolute loads in different body weight categories would also be a better loading pattern than a single load for all.*

6.2.3.2.6. The rationale behind the number of reps in a specific workout is not clear and does not seem to have a theoretical base. For example: why are the reps in Cindy 5, 10, and 15 for pull-ups, push-ups, and squat; in Fran 21, 15, and 9 for the 95 lb thruster and pull-ups as a pair. *Again, smaller and weaker and less skilled individuals are faced with more strain and relative overload than bigger, stronger and more skilled ones. Going to failure on the body weight exercises rather than a fixed number of reps for everyone and a graded load for the thruster based on body size would be a better loading strategy*

6.2.3.3. CrossFit gymnastic and weightlifting prescriptions involve *exercise selection* that are all multi-joint with no single joint exercises recommended.

6.2.3.3.1. Although the established principles recommend both types in a resistance training program [see p. 21-22], the ones that provide a close link to task-specific exercises

like lifting, raising, pushing, pulling, jumping, and throwing are the multi joint, complex movements in the CrossFit prescriptions.

*They view this as a strength and from a performance perspective are right. The place where less complex single joint exercises can be beneficial is when a particular part of a complex movement is weak and jeopardizes the full action. That single joint movement may not get sufficient overload in the complex task so would need a single joint focus before being incorporated into the complex action.*

6.2.3.3.2. The reason for the inclusion of particular exercise(s) in a workout is not always clear or stated. In some cases such as: Ivan – pairing push and pull] and Cindy [UB push, pull, core, hip, and leg extension] the reason is clear. In other cases, the rationale is not there such as linking the power clean and the 400m run or in Carla linking the deadlift, 400m run, and the 65 lb thruster.

6.2.3.4. *Ordering exercise* from multi-joint to single joint is not incorporated into the CrossFit program because they do not prescribe single joint exercises.

6.2.3.4.1. CrossFit does recommend progressing exercises from the less complex to the more complex and from no load to a prescribed fixed load. However, this progression is not evident in the proposed 8 week and 9 week programs nor is it evident in the sequence of WOD's featured on the web. Again, it is the responsibility of the individual to scale their load and to decide at which level of complexity to begin and when to progress.

*There is no formal prescription of progressions for skill development or strength from basic multi joint to more complex multi- joint exercises. This would permit an opportunity to build strength and/or skill in weaker or lower-skill components before moving on to the more complex skills.*

6.2.3.5. CrossFit does not prescribe *recovery periods* between sets except for a few such as “Barbara”. This is because the adaptation they are targeting is strength and/or power endurance and the overload imposed is extending the reps or reducing the time frame for a fixed number of repetitions. *When there is a time priority, short, fixed recovery periods between sets or rounds could be included especially for level 1 and 2 workouts. When workouts are of a team nature and members of a team perform an exercise one at a time, the recovery is built in and is a function of the number of members on a team. Some thought can be given as to the number of team members in order to give the most appropriate amount of recovery.*

6.2.3.5.1. The main rationale for *recovery* between sets is to permit as high a volume as possible in a subsequent set. This is not the goal of Crossfit training. The volume of each subsequent set will be reduced due to accumulated fatigue but the goal is to keep mean power output as high as possible in this fatigued state to enhance power endurance.

*With no scheduled recovery between sets, the amount of rest time needed between training sessions to permit the required adaptation will likely have to be extended.*

*This is more of an issue in the **Task Priority** sessions when the quest is to complete a fixed number of tasks with a specific load in as short a time as possible which is likely to reduce recovery between exercises.*

*When a task priority workout is done in a **team setting** and the exercises are done to failure [rather than a fixed number], done one person at a time, and the score is a team score, the issue of recovery and more risk for the unfit is alleviated. However, if the load is a fixed load in a *W* activity, then the issue persists.*

*In the workouts that have a **Time Priority**, a fixed time is established to complete as many sets or rounds as possible. This would likely result in longer recovery*

*periods at least for the less fit individuals. In the team setting, in “Conga Line” fashion, recovery is built in.*

*There is no obvious rationale as to why workouts in the doublet are supposed to have the **task priority** and triplets have the **time priority**. This is not consistently followed in either of the proposed programs or in posted workouts of the day. Both types emphasize proper technique in order for a repetition to be counted. It would seem that either priority could be used in the couplets and triplets for team workouts and that the time priority [e.g. 20 or 30 minutes] should be preferred for level 1 and level 2 skill and fitness levels in individual workouts to insure sufficient training and development time and to allow more recovery between rounds.*

*Whether or not the “fatigue” or ‘exhaustion” training also puts regeneration at risk or increase the risk of acute injuries is not known but is a concern, especially with less fit and older individuals.*

6.2.3.5.2. *Rest between exercise sessions is often addressed by scheduling at least 24 hours between aerobic power or capacity training and at least 48 hours between strength, strength endurance, and power and speed sessions in the proposed 8 week program. However, the 9 week austere program has a number of examples when the same muscle groups are taxed in the same actions and intensity on 3 or even 4 consecutive days [for example: pull-ups – days 6, 7, 8, and 9; days 23, 24, 25; 43, 44, 45].*

*This is a concern as it puts the shoulder at high risk of an overuse injury – even for the very fit.*

6.2.3.6. The Crossfit template of sequencing the G, W, M elements in singlets, couplets, and triplets results in training frequencies of 3 sessions per week for the gymnastic, weightlifting, and metabolic modalities respectively.

*This is a somewhat different view than the traditional model of frequency being linked to muscle groups, energy systems and joint actions. The place where this prescriptive strategy could be a concern is in the metabolic modality in which the shorter sprints are the predominant activity and longer duration aerobic capacity sessions are infrequent. Although the prescriptive template in CrossFit, if followed, would provide 3 sessions per week in each of the modalities, the 8 week and 9 week programs do not follow the template. This results in frequencies of from 1-4 times per week for the modalities. Also, the frequency of 3 times per week is for the modality so individual exercises within the modality would receive less frequent overload.*

### 6.3. THE POWER PRESCRIPTION PRINCIPLES:

- 6.3.1. The CrossFit program gives power and power endurance a high priority. It prescribes exercises that maximize power outputs in multi-joint type actions by doing both high resistance and high speed workouts. A special feature is the power endurance prescriptions that force time constraints on a fixed number of tasks or the performance of as many reps of selected tasks in as short a time as possible.
- 6.3.2. The metabolic workouts challenge power output through relatively short [400-800m] sprint intervals and jumps. Running is the mode of choice in the proposed 8 and 9 week programs and the web based workouts also feature rowing and cycling. The plyometric work is also included in medicine ball drills using throwing and catching.
- 6.3.3. The weightlifting modality includes the Olympic lifts and lead-ups as well as power lifting exercises. The explosive movements against both low and high loads results in adaptations that enhance the energetics in the muscle as well as the neuromuscular expression of force, velocity, rate of force development, and power. The focus on good mechanical technique and the progressions in skill development are instrumental in maximizing power and in extending the duration of the power outputs.

6.3.4. The gymnastic modality uses skilled multi-joint actions on a high bar, rings, parallel bars, floor, and ropes. The focus is initially on skill development, then skill refinement, and finally loaded, explosive movements. All of these enhance the mechanical expression of power. As above, the emphasis on the mechanics of the skills affords enhanced power and power endurance.

6.3.5. Power development is the priority in the early repetitions which then shifts to power endurance as fatigue builds and power production falls.

*When the same absolute load is given to all individuals, the nature of the power stimulus varies. For larger, stronger, more powerful individuals, the absolute load is relatively lighter so higher speeds can be generated. For smaller, less strong and less powerful individuals, the load is relatively heavier, so the neural attempt to move explosively is the stimulus even though the speed of the movement is not as high as for the bigger, stronger individual. The use of the same relative load would alleviate this.*

#### 6.4. THE AEROBIC PRESCRIPTION PRINCIPLES:

6.4.1. The CrossFit prescriptions in the metabolic modality use relatively high intensity interval runs, rows, and cycling to challenge the power of the oxygen transport system and, in particular VO<sub>2</sub>max. In the proposed 8 and 9 week programs, they use 150, 400, 600, and/or 800m distances for time and usually intersperse those with either gymnastic or weightlifting exercises [for example “Camille”, “Helen”, and “Gagetown”]. These distances at VO<sub>2</sub>max pace with sufficient repetitions are appropriate for enhancing aerobic power.

6.4.2. In the proposed 8 week [5:2] program there is 1 week with 3 interval sessions; 3 weeks with 2 interval sessions; 2 weeks with 1 interval session; and 2 weeks with no interval sessions [see Appendix 1A].

6.4.3. In the 8 week [3:1] proposed program there is 1 week with 4 interval sessions [3 in a row]; 1 week with 2 interval sessions; 4

weeks with 1 interval session; and 2 weeks with no interval sessions.

6.4.4. In the 9 week [5:2] proposed program there is 1 week with 4 interval sessions [3 in a row]; 1 week with 3 interval sessions [in a row]; 4 weeks with 2 interval sessions; 3 weeks with 1 interval session [see Appendix 1B].

*The concern about the same type of load on consecutive days is the risk of overuse injuries.*

6.4.5. There is no pattern of progression in the distance or repetitions or the frequency of interval sessions over the 8 week or 9 week proposed programs.

*Re-scheduling these sessions to give consistent and progressive loadings would enhance the adaptation and reduce the risk of overuse injuries.*

6.4.6. The proposed 8 week proposed program includes (2) 2.4 k and (1) 5k continuous run and the 9 week program includes (4) 2.4k, (2) 5k, (1) 8k, and (1) 10k continuous run for time with the shorter distances more suited to aerobic power improvements and the longer distances stimulating adaptations in aerobic capacity as well.

6.4.7. The 8 week program [5:2] proposes 5 weightload marches [35 kg] with no prescription for distance or pace.

*Has the “common” load for the pack changed from 24.5 kg or is the 35 kg pack intended as an overload? There should be a progression in load over the 8 weeks and a progression in pace from the LFCPFS pace [5.33 k/h] to a pace above 6 k/h and with distances progressed to fit in with the training time.*

6.4.8. There are only 2 weightload marches proposed in the 9 week program with no load prescribed at a distance of 6k at as fast a pace as possible.

*The pace should probably be dictated to insure sound technique but still afford the pace overload [6-6.5 k/h].*

6.4.9. There are only 2 distance runs and 1 march prescribed in the last 5 weeks of the 9 week program.

*This should be increased to at least 1 per week to insure at least maintenance of aerobic capacity and the ability to march 13k with 24.5 kg pack in 2 h;26 min;20s.*



## 7. RECOMMENDATIONS:

### 7.1. General Recommendations

- 7.1.1. That a *CrossFit-type option* be included in the physical preparation of Land Force personnel.
- 7.1.2. That this option be *normally* available after successful completion of the level 3 fitness checks [and LFCPFS] in the AFM.
- 7.1.3. That the technique descriptions developed by CrossFit on paper and on video become a fundamental part of the preparation of CF personnel undertaking the CrossFit option. [They should even be used for other programs such as the AFM where no such instruction exists].
- 7.1.4. That this option be a 9 and/or 13 week program featuring 2 or 3 blocks with 3 loading weeks and a technique and testing week in each block [see section 7.2.1].
- 7.1.5. That this program be able to be extended following completion with some unique and some common elements and workouts inserted into the model.
- 7.1.6. That the CrossFit emphasis and instruction on skill development in the **G** and **W** modalities be embraced and implemented.
- 7.1.7. That the intensity dimension of CrossFit demonstrated in the time and task priority workouts be captured in the program.
- 7.1.8. That the team workout concept be incorporated to build a sense of team, to provide recovery between fatiguing work bouts, and to provide competitive incentives. [*This could also be done using the AFM circuits and programs*].
- 7.1.9. That the integration of Gymnastic and Body Weight exercises [G]; Metabolic Conditioning [M]; and Weightlifting, Power lifting and Olympic lifting [W] be adopted in the programming.

- 7.1.10. That the recommended CrossFit pattern of the 3 modalities [Gymnastics and Body weight exercises (**G**), Weightlifting and Power lifting (**W**), and Metabolic (**M**)] be incorporated in a 5: 2 work days: rest days schedule [section 7.2.1]. [Some other models are provided for consideration in Appendix 1]
- 7.1.11. That the CrossFit option be initiated by a testing week to determine AFM Fitness Check level and both skill level and fitness level in key activities in the [G], Weightlifting [W], and Metabolic [M] modalities as well as some benchmark workouts.
- 7.1.12. That, based on the skill and fitness levels, individuals be assigned to one of 3 levels in the **G** and **W** modalities as recommended by CrossFit.
- 7.1.12.1. **Level 1:** *Relatively or completely unfamiliar with the many of the prescribed exercises and unaccustomed to elite athlete training.*
- 7.1.12.2. **Level 2:** *Some or many of the prescribed exercises are unfamiliar but you are acquainted with elite athlete training.*
- 7.1.12.3. **Level 3:** *Largely familiar with Olympic weightlifting, power lifting and the recommended gymnastics exercises and accustomed to elite athlete training.*
- 7.1.13. That there are progressions in skill within each level and across levels to be achieved from week to week in the **G** and **W** modalities.
- 7.1.13.1. When satisfactory mastery of a skill [unloaded] in the [**W**] modality is achieved, progression in load occurs. When satisfactory completion of a skill [loaded] is achieved, progression to the next level of skill occurs [section].
- 7.1.14. Prescriptions in the **W** modality use relative or graded absolute loadings rather than a single absolute load [see sections 7.2.4 and 7.2.5].

7.1.15. Within the CrossFit template [section 7.2.1], specific exercises within each modality should not be scheduled on more than 2 consecutive days to reduce the risk of overuse injuries.

7.1.16. That a pool of exercises be developed within each singlet, couplet, and triplet for each level of skill and fitness so that substitutions can be readily made at the appropriate level.

[Continued on next page]

## 7.2. Specific Recommendations

7.2.1. The following suggested schedule for CrossFit workouts is a template that follows the CrossFit recommendation. Deviation from the template may need to occur depending on such factors as equipment, facility availability, and other concurrent military activities.

<b>DAY</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>
<b>TEMPLATE</b>	<b>M</b>	<b>GW</b>	<b>MGW</b>	<b>MG</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>
<b>TEMPLATE</b>	<b>G</b>	<b>WM</b>	<b>GWM</b>	<b>GW</b>	<b>M</b>	OFF	OFF
<b>DAY</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>
<b>TEMPLATE</b>	<b>W</b>	<b>MG</b>	<b>WMG</b>	<b>WM</b>	<b>G</b>	OFF	OFF
<b>DAY</b>	<b>29</b>	<b>30</b>	<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>
<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>	<b>41</b>	<b>42</b>
<b>TEMPLATE</b>	<b>M</b>	<b>GW</b>	<b>MGW</b>	<b>MG</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>43</b>	<b>44</b>	<b>45</b>	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>
<b>TEMPLATE</b>	<b>G</b>	<b>WM</b>	<b>GWM</b>	<b>GW</b>	<b>M</b>	OFF	OFF
<b>DAY</b>	<b>50</b>	<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>	<b>56</b>
<b>TEMPLATE</b>	<b>W</b>	<b>MG</b>	<b>WMG</b>	<b>WM</b>	<b>G</b>	OFF	OFF
<b>DAY</b>	<b>57</b>	<b>58</b>	<b>59</b>	<b>60</b>	<b>61</b>	<b>62</b>	<b>63</b>
<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>64</b>	<b>65</b>	<b>66</b>	<b>67</b>	<b>68</b>	<b>69</b>	<b>70</b>
<b>TEMPLATE</b>	<b>M</b>	<b>GW</b>	<b>MGW</b>	<b>MG</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>71</b>	<b>72</b>	<b>73</b>	<b>74</b>	<b>75</b>	<b>76</b>	<b>77</b>
<b>TEMPLATE</b>	<b>G</b>	<b>WM</b>	<b>GWM</b>	<b>GW</b>	<b>M</b>	OFF	OFF
<b>DAY</b>	<b>78</b>	<b>79</b>	<b>80</b>	<b>81</b>	<b>82</b>	<b>83</b>	<b>84</b>

<b>TEMPLATE</b>	<b>W</b>	<b>MG</b>	<b>WMG</b>	<b>WM</b>	<b>G</b>	OFF	OFF
<b>DAY</b>	<b>85</b>	<b>86</b>	<b>87</b>	<b>88</b>	<b>89</b>	<b>90</b>	<b>91</b>
<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>	OFF	OFF

*In the CrossFit template above [table 7.2.1], each modality is trained 3 times in each week. In weeks where a modality is trained as a singlet, it is also trained as a couplet and a triplet. If a modality is not trained as a singlet in a particular week, it is trained as 2 couplets and a triplet. In a 3 week training block, each modality is trained twice as a singlet, 3 times as a triplet and 4 times as a couplet*

*In table 7.2.1 the schedule is the recommended CrossFit template, in which each training week begins with a singlet and follows 2 rest days on a weekend. This allows for technical instruction and practice as well as training focused on selected exercises in that modality under rested conditions. The prescription of a couplet and singlet on days 4 and 5 follows a triplet on day 3. This attempts to keep the quality of the work in the latter days of the week from being impaired by fatigue from earlier in the week.*

*The testing and technique weeks are scheduled following 3 training weeks to monitor progress, provide technical instruction, and for some regeneration . These weeks can be inserted every 4, or 5 weeks depending on length of time for training and availability of testing equipment, facilities, and weather. They are scheduled as single modality tests and technique but could involve a multi-modality benchmark workout. The benchmark workouts may be better placed in the training weeks since they would reduce the regeneration effect.*

*For two other schedule options for consideration see Appendix 1.*

7.2.2. That both team and individual workouts be prescribed and teams organized as much as possible by body size and skill/fitness level. [However this could interfere with the team building process so, if this is the case, consider relative loadings to equate team performances].

7.2.3. That each prescription for **G** type individual workouts uses an absolute number of reps and for team workouts uses reps to failure.

*The load is relative so individuals of different body mass have the same relative load to overcome and therefore the stronger ones will do more sets per unit of time or the same number of reps in a shorter time period.*

*The downside of reps to failure is that the number of reps will be greater in the stronger individuals so the repetition ranges will vary and they will be getting somewhat different adaptations. If teams are matched as above, team performances can be compared and competition encouraged*

7.2.4. That each prescribed workout in the **W** modality prescribes relative [RM] rather than absolute loads [fixed weight], where possible.

*This would make performance comparisons between individuals of different body size more equitable on both task and time priority workouts but would require a range of loads available for each workout and individuals knowing what their RM loads are.*

*In team workouts, relative loads [or graded loads according to body size-see below] would allow direct comparison between teams and similar individual loadings.*

7.2.5. The option to a relative load is to use a graded load depending on body weight. *For example* on the shoulder press, push press, push jerk skill sequence:

Body weight less than 70 kg:	15 kg
Body weight between 70-80 kg:	20 kg
Body weight between 80-90 kg:	25 kg
Body weight over 90 kg:	30 kg

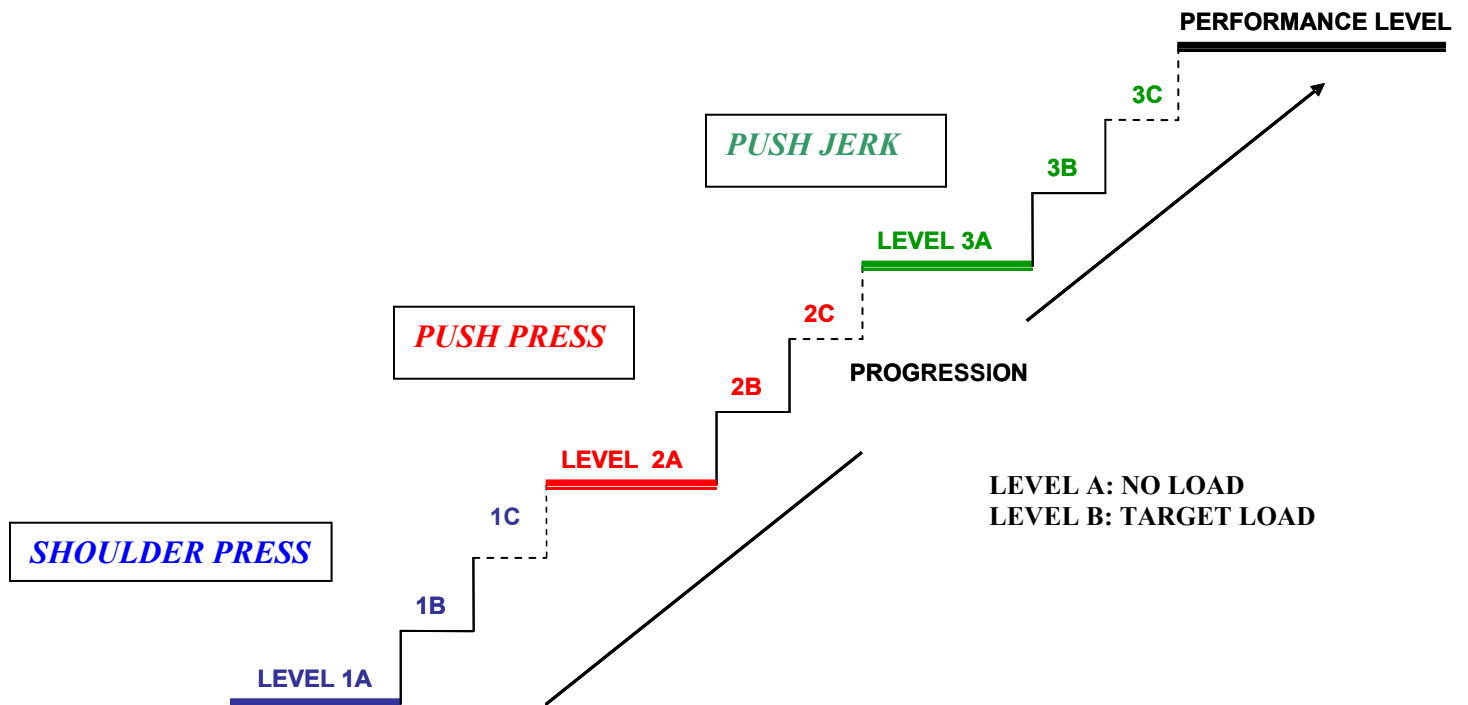
*This graded loading does remove some of the advantage that larger individuals would have from a performance perspective and would give individuals of different body mass a similar relative load for the strength adaptation. It would be easier logistically since only a few loading options would have to be*

available for a workout. Graded loads for each *W* exercise would have to be established.

The same absolute load for everyone is not recommended because it would result in a different training stimulus to different body sizes and a large absolute load can increase the risk of injury for smaller, weaker, and older individuals.

7.2.6. That prescriptions in the [W] modality are progressed in skill and then in load until the target skill and load are achieved.[For the Skill and Fitness level recommended by CrossFit see section 7.1.9]

For example: level 1 [low or no skill in that activity] would be unloaded until the skill level was satisfactory, then progressed to the target load. When the skill in the loaded mode was satisfactory, the progression in skill to level 2 [moderate skill]; would occur. When that skill level is satisfactory in the unloaded condition, then load would progress to the target load etc.



In accordance with the CrossFit descriptions above, soldiers would be assigned to one of the 3 levels based on skill [1, 2, or 3] and then progress on

loads [A to B or even C] in that skill. Then progress to the next skill level. In this example the lower level skill [shoulder press] is progressed from unloaded to target load, then to the moderate level skill [push press] unloaded to target load, and then to the higher level skill, the push jerk unloaded to target load. These progressions should occur across the 9 or 13 weeks.

7.2.7. That the **G** modality would not require load progressions since they are body weight exercises which are relative loads [see section 7.2.2]. They would build in *formal* progressions on skill that would require some degree of mastery before moving to higher order skills. For example, if a pull-up [*not likely if AFM level 3 is already achieved*] cannot be done then negatives or jump-ups would be prescribed initially.

*Thus in level 1 and level 2 prescriptions there would be progressions from lower level skills in the early weeks to moderate level skills and finally to the higher order skills in the later weeks of the program. Hopefully [!] there would be no level 1 [and few level 2] workouts in the latter weeks of the program. If fitness check level 3 in the AFM is the springboard into Crossfit then ability in such exercises as push-up, pull-up, sit-up, bench press, and squat should be [somewhat(!)] established and the need for skill progressions would be minimal.*

7.2.8. The **M** modality utilizes short sprint intervals, aerobic intervals from 400 to 800 meters, continuous runs from 2.4 to 10 km, and weightload marches. These should also feature progressions when prescribed as a single modality. For example:

7.2.8.1. Sprints should be progressed on distance and reps since pace will be maximum;

7.2.8.2. Aerobic intervals should be progressed on pace rather than all-out, distance [time], and reps.

7.2.8.3. Continuous runs should be progressed on distance and using the just talk pace as a relative load.



7.2.8.4. Weightload marches should progress on load, pace, and distance with LFCPFS as the base from which to progress the load and pace.

7.2.8.5. I would think that M type activities nested in couplets and triplets should also be progressed as above.

7.2.9. That test and technique weeks be scheduled every 4 weeks [Table 7.2.1] to instruct, monitor progress, and to unload [*somewhat!*]. The testing and technique pattern is intended as a model and not to be restrictive. There are 2 test and technique sessions proposed for the **G** and **W** modalities and 1 for the **M** modality in each T and T week. This week could include a multi-module benchmark workout in place of a single element although it would decrease the regeneration effect and might be better placed early in a training week in place of a couplet or triplet.

Two different skills should be tested and refined on each **G** and **W** test day and the 5 k run is a good test of choice on the **M** day in the first two testing sessions and the 6 k weightload march be the test of choice on the **M** testing day in the last 2 T and T sessions.

7.2.10. Within the CrossFit template [Table 7.2.1], exercises within each modality should not be scheduled on more than 2 consecutive days. For example, in week 2 if pull-ups are part of the **G** workout on day 9, they should only be scheduled again on either day 10 or 11 [preferably on day 11].

7.2.11. That singlet, couplet, and triplet workouts consider the 3 levels of skill and fitness and that there are loading progressions in each skill level from no load to target load. Instructors should dictate when an individual should progress to the next skill level. The combination of intensity and skill complexity should progress across the 13 weeks with more instruction and skill development early and more intense complex workouts as the weeks progress.

7.2.12. That the innovative equipment and implements used in the workouts of the proposed 9 week austere program be incorporated into the exercises in the **W** modules for variation from the traditional equipment.

- 7.2.13. That single modality **G** or **W** days include more than one exercise from that modality. It should involve complex skills and/or progressions and have both technical instruction and a training focus. For example, dead lifts, cleans, and presses are component parts of the clean and jerk so include at least 2 of these in singlet **W** workouts with less complexity and load for level 1 and 2 individuals and more complexity and load for level 3 individuals.
- 7.2.14. That singlet **M** days be either longer duration runs [5-10k], or weightload marches with full pack load, a pace that meets or exceeds 6 km/h and distance of 6+ km [1 hour duration]. When the **M** modality is scheduled in a couplet, either sprints, short intervals, or the shorter continuous runs [1.6 to 2.4 km] should be prescribed. When the **M** modality is scheduled as a triplet, sprints or short intervals would be the exercise of choice. Similar type sessions in the **M** modality should not be scheduled on consecutive days [e.g. aerobic intervals].
- 7.2.15. That couplets or triplets have **either** a *task* **or** *time* priority. *The CrossFit rationale for couplets having a **task** priority [fixed number of tasks or reps completed as fast as possible with technique] and triplets having a **time** priority [as many of the prescribed tasks as possible in a fixed time] is not clear and is not adhered to in either the proposed 8 or 9 week program.*
- 7.2.16. That the proposed warm-up and cool-down from the 9 week proposed program be used as a template.

[Continued on next page]

7.2.17. That the exercises in each modality and skill level be selected from the following CrossFit options. This table is meant to illustrate increases in skill complexity from level 1 to level 3. It does not suggest that higher levels of skill no longer require the training of lower level skills. It is also a guideline for progressions of the skills in each modality.

<i>EXERCISES BY MODALITY</i>			
<i>LEVEL</i>	<i>GYMNASTICS</i>	<i>METABOLIC CONDITIONING</i>	<i>WEIGHTLIFTING</i>
<b>LEVEL 1</b>	PULL-UP NEGATIVES JUMP UPS JUMPS WALL SQUAT BACK EXTENSION UPPER BODY PUSH-UP CURL UP LOW BENCH DIPS WALL HANDSTAND	CONTINUOUS RUNS 2.4; 3.6 and 4.8 k  INTERVAL RUNS 400 and 800 m  WEIGHT LOAD MARCHES 6 k	SHOULDER PRESS UNLOADED/LOAD  BENCH PRESS UNLOADED  BACK SQUAT UNLOADED  FRONT SQUAT UNLOADED  DEADLIFT UNLOADED  CLEANS UNLOADED
<b>LEVEL 2</b>	AIR SQUAT PULL-UP PUSH-UP DIP SIT-UP LUNGES PRESS TO HANDSTAND	CONTINUOUS RUNS 2.4; 4.8 ; and 7.2 k  INTERVAL RUNS 400 and 800 m  WEIGHT LOAD MARCHES 5 and 6 k	DEADLIFT LOADED  CLEANS LOADED  PUSH PRESS LOADED  PUSH JERK UNLOADED  MEDICINE BALL LIFTS  BENCH PRESS LOADED  SQUATS LOADED
<b>LEVEL 3</b>	KIP-UP HANDSTAND PUSH-UP ROPE CLIMB MUSCLE-UP L SITS	CONTINUOUS RUNS 2.4; 4.8; 7.2; and 10 k  INTERVAL RUNS 400 and 800 m  WEIGHT LOAD MARCHES 6 k	SNATCH UNLOADED/LOADED  CLEAN AND JERK UNLOADED/LOAD  MEDICINE BALL THROWS

7.2.18. That the following CrossFit program be considered as the working model for implementation. It is meant to be a model or template and variation is encouraged within the modalities and workouts.

WEEKS 1, 2, and 3

DAY	1	2	3	4	5
TEST AND TECHNIQUE	G	W	M	G	W
DAY	8	9	10	11	12
TEMPLATE	M	GW	MGW	MG	W
LEVEL 1	Technique and Task Priority  4.8k Run	Time Priority 20 min Modified IVAN  Pull ups Shoulder press [DB graded]	Time Priority 30 min  Team Workout  400 m Run [pace-slowest] Sit ups [Failure] Bench Press [graded]	Task Priority  Team Workout 5 per Team  "Conga Line" Pull-ups [Failure] Bar Dips [Failure] 3 sets  Then 1.6 k Run	Technique Dead lift Hang Clean Unloaded then 10 min for rounds of 10 reps
LEVEL 2		Time Priority 20 min Modified IVAN  Pull ups Shoulder/push press [DB graded]	For Rounds	For Time	Technique Dead lift Hang Clean Graded load then 15 min for rounds of 10 reps
LEVEL 3		Time Priority 20 min Modified IVAN Pull ups Push press [Bar Graded]			Technique Cleans [Bar] Push press Med Ball[20 lb] then 15 min for rounds of 20 reps
DAY	15	16	17	18	19
TEMPLATE	G	WM	GWM	GW	M
LEVEL 1	Time Priority 30 minutes  Practice Handstands Teams of 2	Task Priority Modified "Nancy" 400 m Run Back squats [Bar] 15 Reps 5 Rounds for Time	Task Priority Teams of 3 Conga line  Wall Handstands/ Handstands/ Handstand BT	Task Priority  Team Workout  "Conga Line" Pull ups [failure] Bench Press	Technique and Task Priority

LEVEL 2		<b>Task Priority</b> <b>400 m Run</b> <b>OH Squats [Bar]</b> <b>15 Reps</b> <b>5 Rounds for Time</b>			
LEVEL 3		<b>Task Priority</b> <b>400 m Run</b> <b>OH Squats</b> <b>[Graded]</b> <b>15 Reps</b> <b>5 Rounds for Time</b>			

WEEKS 4, 5, and 6

DAY TEMPLATE	22 W	23 MG	24 WMG	25 WM	26 G
ALL LEVELS	<p>Technique and Task Priority</p> <p>Technique 1st <b>Shoulder Press</b></p> <p><b>Push Press</b></p> <p><b>Push Jerk</b> [Bar load]</p> <p>Then: Complete 25 good reps and then progress to next skill 2min rest between sets;</p>	<p>Task Priority</p> <p>Team or Individual</p> <p><b>400 m Run</b></p> <p><b>21 Burpees</b></p> <p><b>21 Pull-ups</b></p> <p>3 Rounds for Time</p>	<p>Task Priority</p> <p>Two man Team</p> <p><b>Back Squat</b> [Bar] 100 reps each</p> <p><b>Assisted Pull ups</b> 100 Total</p> <p><b>1600 m Run</b></p> <p>For Team Time</p>	<p>Task Priority</p> <p>Team or Individual</p> <p><b>800 m Run</b></p> <p><b>1.5 lb Kettlebell Swings</b> [20 Reps]</p> <p><b>Cleans</b> [3/4 body wt] [10 reps]</p> <p>3 Rounds for Time</p>	<p>Technique and Time Priority</p> <p>Technique 1st <b>Kip-ups</b></p> <p><b>L- sits</b></p> <p><b>Rope Climb</b></p> <p>Then: 3 sets of 12 kips 15 s L-sit 1 20' Rope Climb</p>
DAY	29	30	31	32	33
TEST AND TECHNIQUE	G	W	M	G	W
DAY	36	37	38	39	40
TEMPLATE	M	GW	MGW	MG	W
ALL LEVELS	<p>Technique and Time Priority</p> <p><b>Weightload March</b></p> <p><b>5 k [55 min]</b></p> <p>LFCPFS load Focus on Pace and Technique</p>	<p>Task Priority</p> <p>Team or Individual</p> <p>Modified “Fran”</p> <p><b>Thruster</b> [Graded]</p> <p><b>Pull-ups</b></p> <p>21-15-9 reps</p> <p>For Time</p>	<p>Task Priority</p> <p>Team of 5 Done together Modified “Broomstick Mile”</p> <p><b>25 back squats</b> <b>25 Front Squats</b> <b>25 Overhead Squats</b> <b>Run 400 meters</b></p> <p><b>25 Shoulder Press</b> <b>25 Push Pres</b> <b>25 Push Jerk</b> <b>Run 400 m</b></p> <p><b>50 Squat Cleans</b> <b>Run 800 m</b></p>	<p>Task Priority</p> <p>Teams of 5 Conga Line</p> <p><b>Pull-ups</b>[Failure] <b>push-ups</b>[Failure] 3 sets Then: <b>2.4 K run</b></p> <p>For Time</p>	<p>Technique and Time Priority</p> <p>Teams of 2 Alternate and Critique Technique 1st</p> <p><b>Clean and Jerk</b></p> <p><b>Snatch</b></p> <p>Progress from Unloaded to Bar after 10 good reps of each. Then to 10 good reps of each with bar</p>

**WEEKS 7, 8, and 9**

<b>DAY</b>	<b>43</b>	<b>44</b>	<b>45</b>	<b>46</b>	<b>47</b>
<b>TEMPLATE</b>	<b>G</b>	<b>WM</b>	<b>GWM</b>	<b>GW</b>	<b>M</b>
<b>ALL LEVELS</b>	<p>Technique and Time Priority</p> <p><b>Ring Dips</b> Instruction and Practice only</p> <p><b>HS Push-ups</b> 10-8-6-4-2 reps Assisted or not</p> <p><b>Rope Climb</b> 1 after each set above</p>	<p>Task Priority</p> <p>Teams of 4 Conga Line</p> <p><b>Clean and Press</b> [Graded][Failure]</p> <p><b>800 m Run</b> Start when done The C and P</p> <p>3 Rounds for Time</p>	<p>Task Priority</p> <p>Team or Individual</p> <p><b>25 pull-ups</b></p> <p><b>25 OH Squats</b> [graded]</p> <p><b>400 m Run</b></p> <p>4 Rounds for Time</p>	<p>Task Priority</p> <p>Teams of 4 Conga Line</p> <p>Modified Elizabeth</p> <p><b>Clean</b> [Graded]</p> <p><b>Ring Dips</b></p> <p>21-15-9 reps 3 Rounds for Time</p>	<p>Technique and Time Priority</p> <p><b>Weightload March</b></p> <p><b>6 k</b> [60 min]</p> <p>LFCPFS load Focus on Pace and Technique</p>
<b>DAY</b>	<b>50</b>	<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>
<b>TEMPLATE</b>	<b>W</b>	<b>MG</b>	<b>WMG</b>	<b>WM</b>	<b>G</b>
<b>ALL LEVELS</b>	<p>Technique and Time Priority</p> <p><b>Clean and Jerk</b> Instruction and practice only</p> <p><b>Snatch</b> Instruction and Modified Isobel</p> <p>Graded load 35 Reps for time</p>	<p>Task Priority</p> <p>Teams of 5</p> <p><b>800 m Run</b></p> <p><b>Rope Climb</b></p> <p><b>Ring Dip</b></p> <p>Each Team completes the run and then must complete 10 ascents on the 25' rope and 100 ring dips</p>	<p>Task Priority</p> <p>Modified Gagetown</p> <p><b>400 m Run</b></p> <p><b>Thrusters</b> [Graded] 21 Reps</p> <p><b>30 Pull-ups</b></p> <p><b>800 m Run</b></p> <p><b>30 Pull-ups</b></p> <p><b>Thrusters</b> [Graded] 21 Reps</p> <p><b>400 m Run</b></p> <p>For Time</p>	<p>Task Priority</p> <p>Teams of 4 Conga Line</p> <p><b>Cleans</b> [Graded] [Failure]</p> <p><b>Bench Press</b> [Graded] [Failure]</p> <p>3 Rounds</p> <p>Then <b>2.4 k Run</b> Time is when all finish the run</p>	<p>Task Priority</p> <p>Barbara</p> <p><b>20 Pull-ups</b> <b>30 Push-ups</b> <b>20 Sit-ups</b> <b>50 Squats</b></p> <p>5 Rounds for Time</p> <p>3 minutes rest between rounds</p>
<b>DAY</b>	<b>57</b>	<b>58</b>	<b>58</b>	<b>60</b>	<b>61</b>
<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>

The next 4 weeks are included with the template only and the specific programs are not included. The workouts should follow the module templates and include progression in skill as well as load.

<b>DAY</b>	<b>64</b>	<b>65</b>	<b>66</b>	<b>67</b>	<b>68</b>
<b>TEMPLATE</b>	<b>M</b>	<b>GW</b>	<b>MGW</b>	<b>MG</b>	<b>W</b>
<b>ALL LEVELS</b>					
<b>DAY</b>	<b>71</b>	<b>72</b>	<b>73</b>	<b>74</b>	<b>75</b>
<b>TEMPLATE</b>	<b>G</b>	<b>WM</b>	<b>GWM</b>	<b>GW</b>	<b>M</b>
<b>ALL LEVELS</b>					
<b>DAY</b>	<b>78</b>	<b>79</b>	<b>80</b>	<b>81</b>	<b>82</b>
<b>TEMPLATE</b>	<b>W</b>	<b>MG</b>	<b>WMG</b>	<b>WM</b>	<b>G</b>
<b>ALL LEVELS</b>					
<b>DAY</b>	<b>85</b>	<b>86</b>	<b>87</b>	<b>88</b>	<b>89</b>
<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>



### 7.3. Other Recommendations

- 7.3.1. PSP personnel become certified in CrossFit techniques including skill instruction, progressions, scheduling, modalities and the activities within modalities.
- 7.3.2. PSP partner with the army to manage and instruct this program to provide professional expertise and consistency and to alleviate the load on military personnel.
- 7.3.3. That the LFC develops its own web site to present the Army-specific application of CrossFit for the physical preparation of soldiers rather than rely on the CrossFit Website.
- 7.3.4. As part of the above, that the nutritional information in the recently distributed CF manual “Top Fuel for Top Performance” be the nutritional guidance for our forces and not the information published on the CrossFit web site.

## 8. References

- American Dietetic Association, Dietitians of Canada, & American College of Sports Medicine. (2000). Joint Position Statement: Nutrition and athletic performances. Medicine & Science in Sports & Exercise, 2130-2145.
- Anderson, K., & Behm, D.G. (2005). The impact of instability resistance training on balance and stability. Sports Medicine 35(1), 43-53.
- Bird, S.P., Tarpinning, K.M., & Marino, F.E. (2005). Designing resistance training programmes to enhance muscular fitness. Sports Medicine, 35(10), 841-851.
- Bishop, D. (2003). Warm up I. Sports Medicine, 33(6), 439-454.
- Bishop, D. (2003). Warm up II. Sports Medicine, 33(7), 483-498.
- Boyle, M. (2004). Functional training for sports. Champaign, IL: Human Kinetics Inc.
- Cairns, S.P. (2006). Lactic acid and exercise performance. Sports Medicine 36(4), 279-291.
- Crewther, B., Cronin, J., & Keogh, J. (2005). Possible stimuli for strength and power adaptation. Sports Medicine, 35(11), 967-989.
- Crewther, B., Cronin, J., & Keogh, J. (2006). Possible stimuli for strength and power adaptation. Sports Medicine, 36(1), 65-78.
- Cronin, J., & Sleivert, G. (2005). Challenges in understanding the influence of maximal power training on improving athletic performance. Sports Medicine, 35(3), 213-234.
- CrossFit Journal (2002-2006).
- Delavier, F. (2006). Strength training anatomy (2<sup>nd</sup> ed.). Champaign, IL: Human Kinetics Inc.
- Finaud, J., Lac, G., & Filaire, E. (2006). Oxidative stress. Sports Medicine, 36(4), 327-358.
- Fleck, Steven J., & Kraemer, William J. (2004). Designing resistance training programs (3<sup>rd</sup> ed.). Champaign, IL: Human Kinetics Inc.
- Foran, Bill (Ed.). (2001). High-performance sports conditioning. Champaign, IL: Human Kinetics Inc.

- Fry, A.C. (2004). The role of resistance exercise intensity on muscle fibre adaptations. Sports Medicine, 34(10), 663-679.
- Gabriel, D.A., Kamen, G., & Frost, G. (2006). Neural adaptations to resistive exercise. Sports Medicine, 36(2), 133-149.
- Gamble, P. (2006). Implications and applications of training specificity for coaches and athletes. Strength and Conditioning Journal, 28(3), 54-58.
- Glaister, M. (2005). Multiple sprint work. Sports Medicine 35(9), 757-777.
- Hargreaves, M. (2005). Metabolic factors in fatigue. Gatorade Sports Science Institute, 35(3), 1-6.
- Hoffman, Jay. (2002). Physiological aspects of sport training and performance. Champaign, IL: Human Kinetics Inc.
- Hoffman, Robert & Collingwood, Thomas R. (2005). Fit for duty (2<sup>nd</sup> ed.). Champaign, IL: Human Kinetics Inc.
- Kibler, W.B., Press, J., & Sciascia, A. (2006). The role of core stability in athletic function. Sports Medicine 36(3), 189-198.
- Knapik, J.J., Sharp, M.A., Darakjy, S., Jones, S.B., Hauret, K.G., & Jones, B.H. (2006). Temporal changes in the physical fitness of US army recruits. Sports Medicine, 36(7), 613-634.
- Kraemer, W.J., & Ratamess, N.A. (2005). Hormonal responses and adaptations to resistance exercise and training. Sports Medicine 35(4), 339-361.
- Kraemer, W.J., Adams, K., Cafarelli, E., Dudley, G.A., Dooly, C., Feigenbaum, F.S., Fleck, S.J., Franklin, B., Fry, A.C., Hoffman, J.R., Newton, R.U., Potteiger, J., Stone, M.H., Ratamess, N.A., & Triplett-McBride, T. (2002). Position Stand: Progression models in resistance training for healthy adults. Medicine & Science in Sports & Exercise, 364-380.
- Midgley, A.W., McNaughton, L.R., & Wilkinson, M. (2006). Is there an optimal training intensity for enhancing the maximal oxygen uptake of distance runners? Sports Medicine, 36(2), 117-132.
- Murray, D.P., & Brown, L.E. (2006). Variable velocity training in the periodized model. National Strength and Conditioning Association, 28(1), 88-92.
- Newton, Harvey. (2006). Explosive lifting for sports (Enhanced ed.). Champaign, IL: Human Kinetics Inc.

- Pereira, M.I.R., & Gomes, P.S.C. (2003). Movement velocity in resistance training. Sports Medicine, 33(6), 427-438.
- Spencer, M., Bishop, D., Dawson, B., & Goodman, C. (2005). Physiological and metabolic responses of repeated-sprint activities. Sports Medicine 35(12), 1025-1044.
- Stone, M.H., Pierce, K.C., Sands, W.A., & Stone, M.G. (2006). Weightlifting: A brief overview. National Strength and Conditioning Association 28(1), 50-66.
- Stone, M.H., Pierce, K.C., Sands, W.A., & Stone, M.E. (2006). Weightlifting: Program design. Strength and Conditioning Journal, 28(2), 10-17.
- Stone, M.H., Sands, W.A., Pierce, K.C., Newton, R.U., Haff, G.G., & Carlock, J. (2006). Maximum strength and strength training - a relationship to endurance? Strength and Conditioning Journal, 28(3), 44-53.
- Stoppani, Jim. (2006). Encyclopedia of muscle and strength. Champaign, IL: Human Kinetics Inc.
- Verstegen, Mark. (2004). Core performance: the revolutionary workout program to transform your body and your life. New York, NY: Rodale
- Voight, M. (2006). Enhancing the quality of strength and conditioning training: A practical model. Strength and Conditioning Journal, 28(3), 70-74.
- Wirhed, Rolf. (1984). Athletic ability and the anatomy of motion. Orcbro, Sweden: Harpoon Publications AB.
- Zatsiorsky, Vladimir M., & Kraemer, William J. (2006). Science and practice of strength training (2<sup>nd</sup>. ed.). Champaign, IL: Human Kinetics Inc.

## APPENDIX 1

A table to show another option for the CrossFit template for a 13 week program including test and technique weeks. Other schedule recommendations are provided below.

<b>DAY</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>
<b>TEMPLATE</b>	<b>MGW</b>	<b>M</b>	<b>GW</b>	<b>WM</b>	<b>G</b>	OFF	OFF
<b>DAY</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>
<b>TEMPLATE</b>	<b>GWM</b>	<b>G</b>	<b>WM</b>	<b>MG</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>
<b>TEMPLATE</b>	<b>WMG</b>	<b>W</b>	<b>MG</b>	<b>GW</b>	<b>M</b>	OFF	OFF
<b>DAY</b>	<b>29</b>	<b>30</b>	<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>
<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>	<b>41</b>	<b>42</b>
<b>TEMPLATE</b>	<b>MGW</b>	<b>M</b>	<b>GW</b>	<b>WM</b>	<b>G</b>	OFF	OFF
<b>DAY</b>	<b>43</b>	<b>44</b>	<b>45</b>	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>
<b>TEMPLATE</b>	<b>GWM</b>	<b>G</b>	<b>WM</b>	<b>MG</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>50</b>	<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>	<b>56</b>
<b>TEMPLATE</b>	<b>WMG</b>	<b>W</b>	<b>MG</b>	<b>GW</b>	<b>M</b>	OFF	OFF
<b>DAY</b>	<b>57</b>	<b>58</b>	<b>59</b>	<b>60</b>	<b>61</b>	<b>62</b>	<b>63</b>
<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>64</b>	<b>65</b>	<b>66</b>	<b>67</b>	<b>68</b>	<b>69</b>	<b>70</b>
<b>TEMPLATE</b>	<b>MGW</b>	<b>M</b>	<b>GW</b>	<b>WM</b>	<b>G</b>	OFF	OFF
<b>DAY</b>	<b>71</b>	<b>72</b>	<b>73</b>	<b>74</b>	<b>75</b>	<b>76</b>	<b>77</b>
<b>TEMPLATE</b>	<b>GWM</b>	<b>G</b>	<b>WM</b>	<b>MG</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>78</b>	<b>79</b>	<b>80</b>	<b>81</b>	<b>82</b>	<b>83</b>	<b>84</b>
<b>TEMPLATE</b>	<b>WMG</b>	<b>W</b>	<b>MG</b>	<b>GW</b>	<b>M</b>	OFF	OFF
<b>DAY</b>	<b>85</b>	<b>86</b>	<b>87</b>	<b>88</b>	<b>89</b>	<b>90</b>	<b>91</b>

<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>	OFF	OFF
---------------------------	----------	----------	----------	----------	----------	-----	-----

In the above table the schedule is a suggested modification of the CrossFit template in which the MGW sequence is maintained but the training weeks commence with a triplet followed by a singlet, 2 couplets, and another singlet. The triplet in day 1 allows for high intensity, high volume work under rested conditions. The subsequent singlet should provide adequate rest to allow good quality in the next 2 couplets and finish the week with a singlet.

The truncated table below presents a template which would focus on the learning and development of skills. It features 3 singlets and 2 couplets per week.

<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>	OFF	OFF
<b>DAY</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>
TEMPLATE	G	GW	W	WM	M	OFF	OFF
<b>DAY</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>
TEMPLATE	W	WM	M	MG	G	OFF	OFF
<b>DAY</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>
TEMPLATE	M	MG	G	GW	W	OFF	OFF
<b>DAY</b>	<b>29</b>	<b>30</b>	<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>
<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>	OFF	OFF

<b>DAY</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>	<b>41</b>	<b>42</b>
TEMPLATE	W	WM	M	MG	G	OFF	OFF
<b>DAY</b>	<b>43</b>	<b>44</b>	<b>45</b>	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>
TEMPLATE	M	MG	G	GW	W	OFF	OFF
<b>DAY</b>	<b>50</b>	<b>51</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>55</b>	<b>56</b>
TEMPLATE	G	GW	W	WM	M	OFF	OFF
<b>DAY</b>	<b>57</b>	<b>58</b>	<b>59</b>	<b>60</b>	<b>61</b>	<b>62</b>	<b>63</b>

<b>TEST AND TECHNIQUE</b>	<b>G</b>	<b>W</b>	<b>M</b>	<b>G</b>	<b>W</b>	<b>OFF</b>	<b>OFF</b>
-------------------------------	----------	----------	----------	----------	----------	------------	------------