Build Your Engine

Maximize Your Fitness With Targeted Conditioning Training

"Conditioning is really nothing more than how well you're able to maintain your strength, speed, and power over the course of a fight" - Ultimate MMA Conditioning

While the fitness athlete isn't in a physical fight with an opponent, we are fighting against the clock, the weight on the barbell, or our body weight in gymnastics movements. The constantly changing workout times, reps, loads, and modalities mean that developing a robust conditioning foundation is crucial to our progress in our sport.

This PDF will cover the foundations of energy systems development for athletes wanting to improve their fitness for CrossFit, Hyrox, and other functional fitness activities.

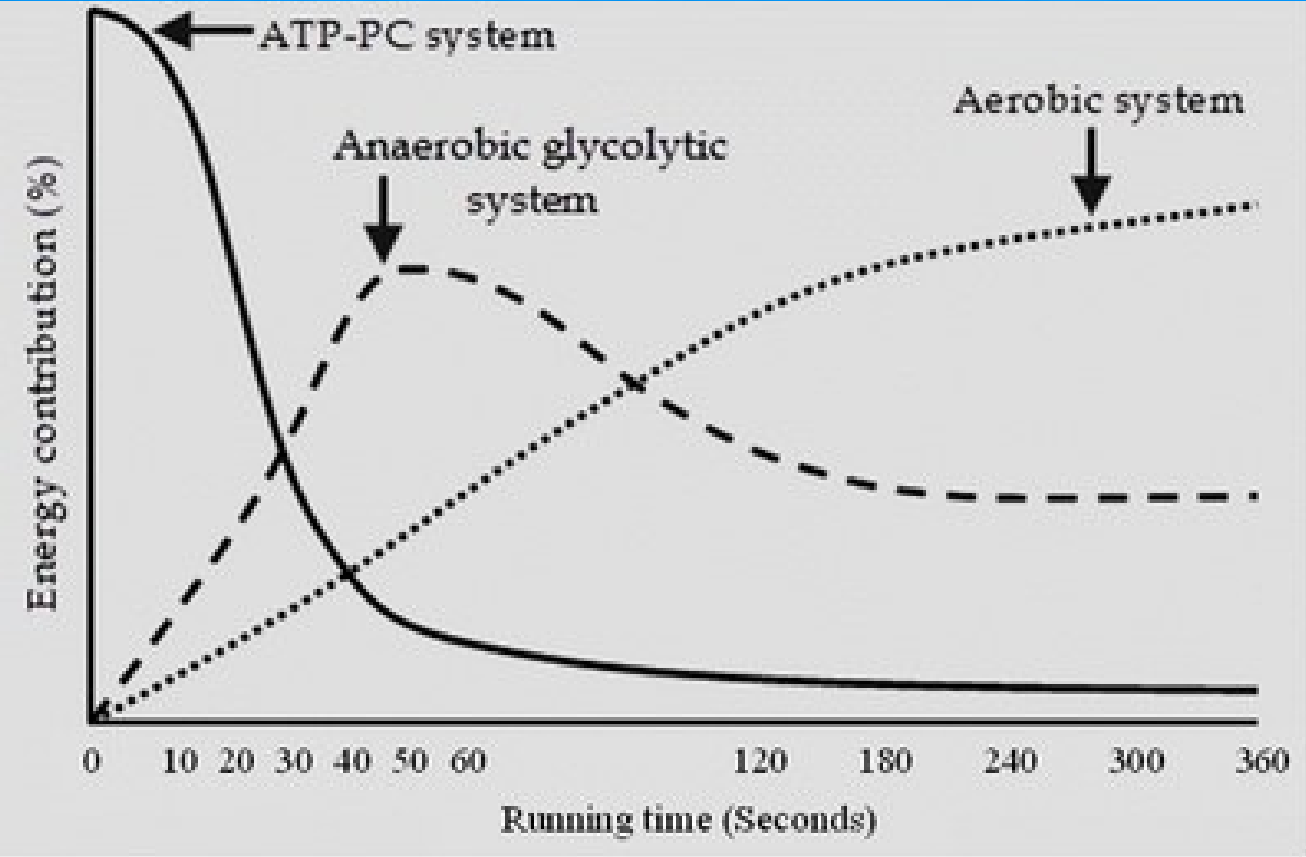
Build Your Engine Podcast Series:

- Episode 1 - Rethinking Conditioning for Fitness Athletes
- Episode 2 - How Energy Systems Drive Performance
- Episode 3 - Conditioning WODs You Need to Train
- Episode 4 - Wrist vs Chest Strap Heart Monitors

Part I – Energy Systems Overview

We need a basic understanding of the human body's energy systems to best program conditioning work to maximize our functional fitness performance. During activity, our body relies on three different systems to create energy based on the time and intensity of exercise:

- Phosphagen, also known as the ATP-PC system
- Anaerobic glycolytic system
- Oxidative or aerobic system



These three systems can be divided into two subset categories: the anaerobic, which does not rely on oxygen for energy production, and aerobic, which requires oxygen to produce energy.

The Phosphagen/ATP-PC system and the Glycolytic systems can produce huge amounts of energy because they do not rely on oxygen to produce ATP. Think of ATP as energy currency. Their downside is that they can only produce these high energy levels for a short time.

Fortunately, for longer-duration activities, our oxidative system (aerobic system) can provide prolonged energy production without fatigue, but at lower levels than the anaerobic systems can because it relies on oxygen to produce ATP.

The Phospagen / ATP-PC System

The ATP-PC system provides energy for short, high-intensity activities lasting up to 10-15 seconds. It uses stored ATP and phosphocreatine (PC) in muscles to produce energy quickly. It's the fastest but least sustainable energy system, powering activities like sprinting, jumping, or a single heavy lift.

Glycolytic System

The glycolytic system provides energy for moderate to high-intensity activities lasting from 30 seconds to <2 minutes. It breaks down glucose (stored as glycogen in muscles) to produce ATP, but this process generates lactate, which can cause muscle fatigue. This system works during efforts like 400m sprints or a set of high-rep weightlifting.

Aerobic or Oxidative System

The oxidative system is the primary energy source for low to moderate-intensity activities lasting 2 minutes or longer. It relies on oxygen to break down carbohydrates, fats, and proteins for ATP production, making it slower but highly sustainable. This system powers activities such as long-distance running, cycling, or everyday endurance tasks.

Constant Collaboration

The ATP-PC, glycolytic, and oxidative systems are not mutually exclusive; they often work simultaneously to provide energy. While each system is dominant at different times based on the intensity and duration of activity, they overlap and support each other continuously.

When an activity starts, the body doesn't wait to decide which system to use. All three systems kick in, but the proportion of energy from each varies depending on the duration and intensity of the activity.

For example, during a 200m sprint, the ATP-PC system provides initial power, while the glycolytic system produces ATP within seconds to sustain the effort. Meanwhile, the oxidative system works in the background, even if it isn't the primary energy source.

In a high-intensity workout like CrossFit, the ATP-PC system powers the first few reps, the glycolytic system takes over for sustained work in the middle of a set, and the oxidative system helps with recovery between sets.

During a long-distance run, the oxidative system is the primary source, but the ATP-PC and glycolytic systems still contribute during bursts of speed or when tackling a hill.

Training across all three systems enhances overall energy capacity. For instance, while the ATP-PC system might primarily drive a short sprint, improved aerobic conditioning (oxidative system) helps replenish phosphocreatine faster, boosting performance in repeated sprints. This is why low-intensity steady state that builds your aerobic base can be extremely valuable for functional fitness activities.

Similarly, the glycolytic system can support brief anaerobic bursts during more extended efforts, while the oxidative system aids in clearing lactate buildup, preventing premature fatigue.

In short, fitness athletes must develop all three energy systems to maximize their performance in metcons.

Energy Systems Thresholds

Now that we understand the energy systems, we need to understand two important thresholds.

The first is our Anaerobic Threshold, which is the exercise intensity at which your body starts accumulating lactate in the blood faster than it can be cleared. It's the tipping point where aerobic metabolism shifts more toward anaerobic metabolism and exercise intensity cannot be maintained continually.

Image riding slowly on an exercise bike. Start at a pace you know you can do for an hour. But every few minutes, you increase the pace. Eventually, you will hit this anaerobic threshold where fatigue starts accumulating, and you realize you won't be able to continue that pace much longer. This represents your anaerobic threshold.
Improving your anaerobic threshold you to maintain a higher intensity for a longer duration without fatiguing.

The second threshold appreciate is your VO_2 Max, which is the maximum amount of oxygen your body can utilize during intense exercise. It measures your aerobic capacity, reflecting the maximum rate of oxygen consumption during physical exertion.

A higher VO2 max enables athletes to perform at a high intensity for more extended periods without fatiguing as quickly.

With a higher VO2 max, the body becomes more efficient at delivering oxygen to muscles, aiding quicker recovery between exercises and intervals. This recovery is crucial in CrossFit, where rapid transitions between exercises are common.

A higher VO2 max allows a CrossFit athlete to perform better in mixed-modality workouts, as it supports aerobic efforts that can delay the onset of anaerobic fatigue.

CrossFit relies on powerful, explosive movements that often require a mix of aerobic and anaerobic systems. A higher VO2 max allows for more efficient oxygen use, so athletes can produce greater power output for longer durations.

One of the best workouts to target your VO2 Max comes from OG CrossFit coaching legend Kenny Kane, and it's:

Part A.
Row 500m as fast as you can. Record the time. Rest 2:1. So if the row took your 1:30, rest 3:00.

Part B.
After the rest, row as many meters as possible in the time that the 500m effort took you. Ideally, you are rowing 500m. Rest 2:1 again.

Part C.
Finish the effort by rowing however many meters you got in Part B for time. Ideally, you will be able to do 500m again.

Part II – Training Strategies to Build Your Engine

Now that we understand the body's energy systems and their function let's dive into how to train to improve our performance.

Throughout this section we will refer to heart rate zones as we discuss training intensities. Refer to this chart for a visual of the zones we reference.

Zone	Training Effort	Rate of Perceived Exertion (RPE)	Fitness Goal
Zone 1	50-60% Max Heart Rate	2-3/10	Warm Up, Recovery (including active), Cool Down
Zone 2	60-70% Max Heart Rate	4-5/10	Building an Aerobic base, Fat-burning, Sustainable for long periods
Zone 3	70-80% Max Heart Rate	6-7/10	Improving Aerobic capacity and muscle strength
Zone 4	80-90% Max Heart Rate	8-9/10	Increasing the anaerobic threshold; helps improve performance in short-duration activities.
Zone 5	90-100% Max Heart Rate	9-10/10	Develop fast twitch muscle fibers for sprinting and power. Not good for long periods.

Strategy 1: Aerobic Pace Building

Zone 2 cardio, or low-intensity steady-state cardio, is the area most fitness athletes spend the least time training. This is relatively easy work that can be sustained for an extended period of time but has a few significant benefits:

- An increase in the density of mitochondria in the muscle cell, which is the part of the cell that makes energy.
- Increases heart efficiency by enlarging the left ventricle of the heart. This allows the heart to pump more blood with each heartbeat.

Programming Zone 2 work:

- Once or twice weekly workouts lasting 30-90 minutes
  - Start lower on the time domain and increase by 10-20% per session.
- Exercise at 60-70% of your maximum heart rate
  - There are many calculators online, but a simple formula is:
  - (220 – age) x 60%-70% = your Zone 2 heart rate
  - Using your heart rate to track requires the use of a heart rate monitor strap such as this Polar monitor.
- You can also perform Zone 2 cardio by following the "talk test." For the talk test, keep your intensity at a level that would allow you to talk to another athlete while performing, although you will still sound a little breathy during your exercise.

Aerobic Pace Example workout:

- AMRAP 40 (while controlling intensity to stay in the above-mentioned heart rate zone):
- 400m Row
- 200m Run
- 100m Farmers Carry 53/35s

Tempo Zone

This zone is where CrossFit athletes should, and probably already do, spend most of their time. This is the higher end of the Zone 3 heart rate, and athletes will be able to consistently do a lot of work for an extended period of time without blowing up.

If you are doing regular CrossFit-style metcons, you are already getting a lot of training in this 80-85% maximal heart rate, so you may not need accessory Tempo Zone work.

Example WOD "Kelly":

- Five rounds for time of
- 400m Run
- 30 Box Jumps
- 30 Wall Balls

Threshold Work (AET)

Now, we are training at 85-88% of maximal effort, just below our lactate threshold. This is also known as speed endurance and is the maximum amount of work that can be done while still in the oxidative energy system.

It's also the theoretical metabolic balance point of fuel utilization between fat & carbohydrate. At AET, you're at the highest power you can sustain while burning equal parts fat & carbohydrate fuel sources. In other words, you're maximizing your power while still utilizing at least 50% fat for fuel. Go beyond this threshold, and you begin to burn more sugars than fat; go below this threshold, and fat utilization goes up, and carbohydrate utilization goes down. This zone is the area right below your VO2 max. You can sustain work here for roughly 20 minutes.

We train this by finding your threshold and working out just below it. We then build up work periods over time.

To determine your threshold, perform a 20-minute max effort bike and record your average watts. Then multiply that number by .95 for your threshold power (FTP).

Then, we will train just below that threshold.

For example:

- Two rounds of 10 minutes at 100% percentage of your threshold power (FTP).
- Rest for 5 minutes between rounds
- Each week, increase the time duration by 10-20%.

Zone 5

We are training at 90% or greater of your maximum heart rate. This intensity is where we'll see Vo2max adaptations – maximizing the amount of oxygen your body can utilize during intense exercise.

Initially, athletes will need to start with short work intervals with a relatively longer rest period.

Example WOD:
On the Echo Bike
4x 1:00 All out, 1:00 rest

Progression: Each week for 3 weeks add 1:00 to the work duration and 1:00 to the rest duration. Keep increasing until you are at 4:00 of work at 100% of your power output and 4:00 of rest for four rounds. Then re-test your VO2 Max.

If you're ready to put this knowledge into action and make serious gains, it's time to level up with our Build Your Engine programs.

These programs are designed to **eliminate the guesswork** and deliver **proven, done-for-you plans** that will transform your fitness. You choose the modality, and we've got a specific program to help you push your performance further:

Build Your Engine: Air Bike Edition
Maximize your power output and endurance on the air bike with structured intervals and progressions tailored to your fitness level.

Build Your Engine: Rower Edition
Fine-tune your rowing technique while increasing your stamina, so you can crush WODs and stay consistent when it counts.

Build Your Engine: Running Edition
Develop the perfect blend of speed and endurance for running, designed to improve your work capacity and race performance.

Or bundle all 3 programs together for big savings!

Whether you're a beginner looking to build your base or an experienced athlete aiming for PRs, these programs will help you break plateaus and build the engine you need to excel in CrossFit.

Are you ready to go beyond the basics and crush your conditioning goals?

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