



LIVE HIGH OPTIMIZING CADET ATHLETICS AT THE HUMAN PERFORMANCE LAB

WRITTEN AND PHOTOGRAPHED BY LEWIS CARLYLE TRAIN LOW

C1C Matt Alexander rubs the dirt from his hands and steps up to the plate, his bat poised above his shoulders as he stares intently at the pitcher standing atop the mound in the center of the baseball diamond. Alexander lowers his stance, adjusts his grip and digs his cleats into the dirt of the batter's box. The pitcher pivots, rolls forward and unleashes a fastball at 85mph.

Across the athletic complex, on the Falcon soccer field, midfielder C1C Kelsey Yip charges into the goal keeper's box, sizing up a cross served up by the wing. She leaps into the air—now shoulder to shoulder with the keeper—going up for the header as the ball floats over the 18 and across the mouth of the goal.

On the ice inside Clune Arena, C2C Jacques Lamoureux rams his shoulder into the opposing forward, sending him crashing into the glass. He acquires the stolen puck, shaves his skates to a stop and then tears off towards the opponent's goal. Skirting one defender, he draws back and rockets a slap shot at the tiny thread of open net the goalie has left unattended.

In the boxing gym, pugilists dodge flying fists; on the tennis court, players return speeding serves; in the volleyball gym, defenders dive to deflect kill shots; and so the endless pattern of athletics continues, with cadets striving to become faster, stronger and more dangerous every day. Practice, determination and perseverance are their ammunition—their training designed with one goal in mind: to be the best. Yet in today's arena, work ethic alone is no longer enough to keep competitors on the cutting edge, which is why athletes are turning to the 21st Century science of the Academy's Human Performance Lab.

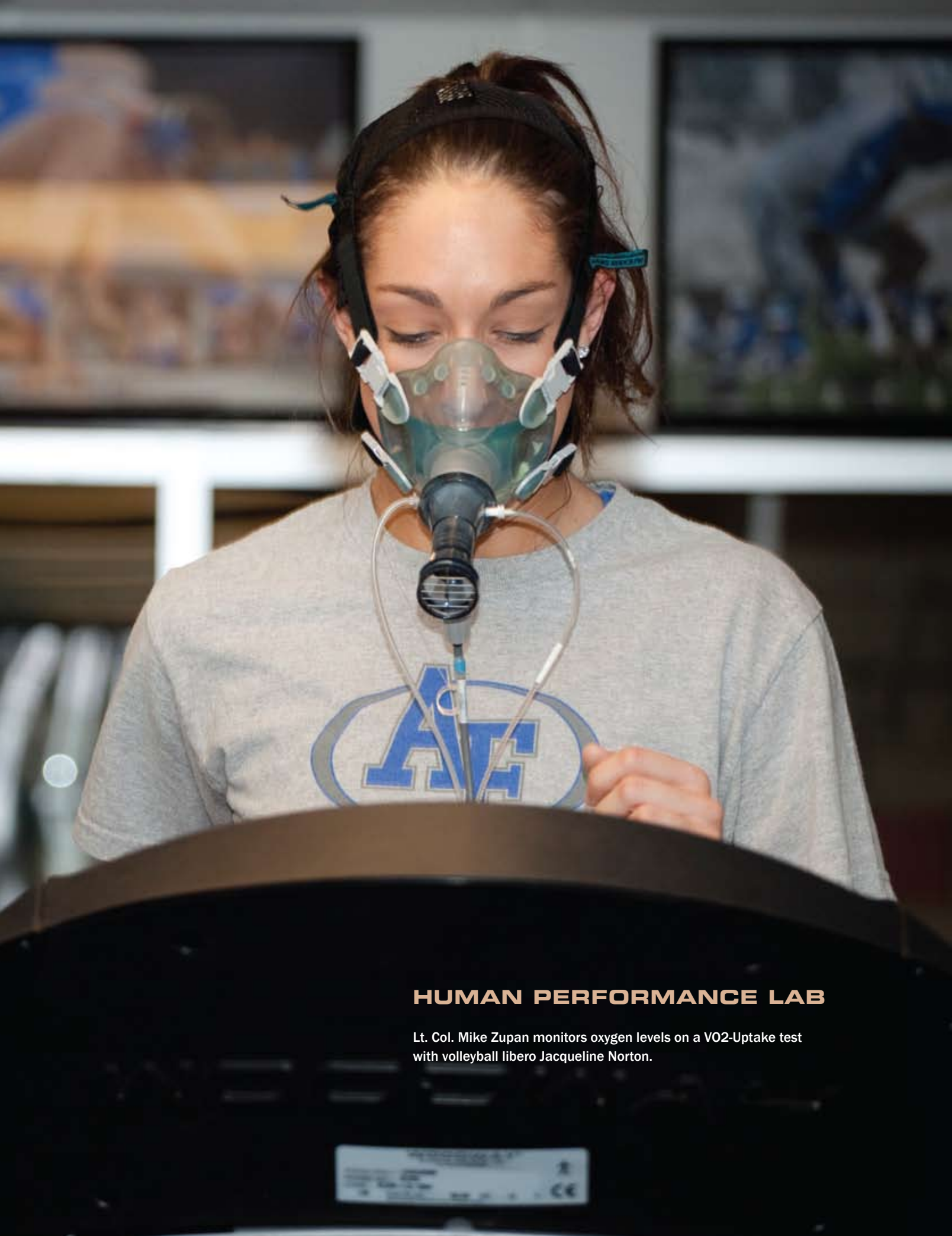
Lt. Col. Mike Zupan is serious about sports technology. As one of the chief scientists at the Human Performance Lab, he has seen the progression of sports science through years of injury assessment and training development. The lab itself is an all-encompassing conditioning resource that athletes can use to optimize their workouts and practice routines. Filled with high tech equipment designed to assess everything from visual acuity to lean body mass to power output, the lab is the perfect place for both cadets and coaches to learn about making every workout count.

“The goals of the instructors here are three fold,” Zupan explains. “Teaching is our number one priority. We also work with the Academy's athletes and the general cadet population. With the athletes, we're working on improving their fitness and their training by helping the strength and conditioning coaches optimize their routines.”

One of the most valuable tools at Zupan's disposal is the DEXA, or Dual Energy X-ray Absorptiometry. “It's a total body scan,” he describes, “which has the ability to differentiate tissues in the body. It can show fat mass, and also what we call fat-free mass, which consists of muscle, bone, and connective tissue, such as ligaments and tendons. We can also use it to measure bone density, which is important for athletes who are low weight—cheerleaders, gymnasts and the like. If their bone mass needs improvement, we can then recommend the cadet to clinic for possible calcium and vitamin D supplements.” ▷

Impulse Strobe Glasses—worn by boxer Casey Habluetzel—use an electronic polarizing filter to block light intermittently, turning one's vision into a strobe effect. Cadets use these glasses to impair their vision while practicing catching skills. Placing limitations on sight helps to improve visual concentration and focus.





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Lt. Col. Mike Zupan monitors oxygen levels on a VO₂-Uptake test with volleyball libero Jacqueline Norton.

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For coaches, one of the most important factors to building a winning team is maintaining healthy athletes. Teams must not only maintain fitness, but make steady improvements throughout the season. Any player will tell you that stagnation does not win conference championships.

With Zupan's help, coaches can determine whether or not their athletes are responding to training. "We run a body composition test with the DEXA," he says, "which measures fat loss and the increase of lean body mass. If an athlete is losing fat and gaining muscle, that's what we're looking for. For our endurance athletes, we can determine if they may be sports-anemic—not clinically anemic—but anemic for athletic performance. We've seen that with some of our cross-country runners; in that case, we'll send them up to the Cadet Clinic for iron supplements."

As any basic cadet clawing her way through the obstacle course in Jacks Valley can attest, the air at the Academy is much thinner than at sea level. Sitting at 7,200ft, USAFA's athletes train under a different set of conditions than athletes at most other schools. Oxygen is less prevalent at high altitudes, making it difficult for cadets to reach their peak performance. Like most things, Zupan has a plan for this too. "In the next few weeks," he says, "we'll be setting up our altitude training tent."

Used at training facilities the world over, this ten by ten foot tent is designed to regulate the amount of oxygen within the contained atmosphere of the enclosure. Athletes who train within this enclosure can experience various levels of simulated elevation. "We can take it up to 14,000ft," Zupan continues, "simulated altitude, by decreasing the oxygen content from 21 percent down to about 14 percent. We also have a new controller which enables us to pump extra oxygen into the tent to simulate sea-level. The abundance of oxygen allows athletes to train harder because they are not limited by their cardiovascular system. They can push their muscles to the true max during this hyperoxic training."

The new training theory is live high—train low. Cadets at the Academy are living at a high elevation. As a result, their bodies compensate for the lack of oxygen by generating more red blood cells. With richer blood, the body has the potential to deliver more oxygen to the muscles, thus peaking performance. The elevation tent provides the missing oxygen, enabling cadets to maximize their workouts.

The center also has a treadmill called The Force. "Basically," Zupan describes, "we strap a person in with a belt and have him or her run. We can monitor distance, speed and heart rate. It's a lot like a sled you might see a football player pulling in the weight room, or a even a parachute harness for wind resistance training. Yet this is a much more controlled environment for exact load and power measurement."

While power, speed and endurance are all essential to an athlete's performance, there is another characteristic which is often overlooked as a critical component: vision. Without it, even the most powerful slugger will hit nothing but air when taking on a fastball.

"When you have both eyes working together," Zupan explains, "you get better depth perception, which helps the athlete to better see the baseball, tennis ball or hockey puck in space." The Human Performance Lab offers an assortment of vision training assistance,



ranging from a simple set of beads on a string (to train binocular vision and improve depth perception) to the advanced light grids which exercise an athlete's eye-hand speed and coordination while working to improve peripheral vision. Perhaps the most comprehensive of these tests is the Makoto Triaction, a machine which incorporates the entire gambit of sight and sound to measure reaction time, hand-eye coordination and visual precision.

Zupan says, "One thing we've learned is that eye fatigue becomes a factor late in the game, especially during a multi-game tournament."



Hockey goalie Stephen Caple works out on the Makoto Tri-action. Athletes must respond to a random series of flashing light and sound by punching illuminated panels in a three dimensional space.

Players whose eyes become tired in the third or fourth quarter will often make simple mistakes, such as missing a pass or dropping a ball. Training the eyes like you would any other part of your body helps to hone their ability to stay sharp long into a match.

As both sports medicine and athletic training programs continue to advance, Zupan is hopeful for the future. “I’d like to see every team at the Academy utilize this lab to their fullest capacity,” he muses. “Right now, that becomes a matter of educating the coaches and showing them what we can do for them.”

It has been estimated that more than 90 percent of an athlete’s time on the field occurs during practice. With such a large commitment devoted to training, it seems only natural that coaches would want to optimize that time to its fullest potential. The history of sports has shown us that contests are won or lost by a fraction of a second. When everything is on the line—when your entire season comes down to the last pitch, the final down, or the essential buzzer beater, needless to say—it pays to be prepared. ▣