



# Sports: At Coto Research Center

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The article from Delta Air Lines Inflight Magazine, published in July 1982, discusses the emerging field of biomechanics and its potential to revolutionize sports performance. Biomechanics, the computer analysis of athletic motion, is predicted to significantly enhance athletes' abilities, potentially leading to unprecedented sports achievements. The article highlights the work of Gideon Ariel, head of the Coto Research Center, who uses \$3 million worth of computer technology to analyze and improve athletes' performance. The technology involves filming athletes in action and converting the footage into stick figure frames for detailed computer analysis. The article also discusses the potential of biomechanics to improve sports equipment design and manufacturing techniques. However, it notes that biomechanics cannot measure psychological factors that affect performance. The article concludes by discussing the potential role of computers as special assistant coaches, helping to analyze and adapt team strategies.

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Below find a reprint of the 4 relevant pages of the article "Sports: At Coto Research Center" in "Sky Delta Air Lines Magazine":



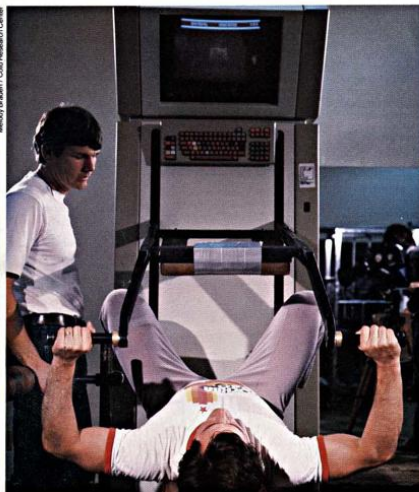


JULY 1982

**SKY**  
DELTA AIR LINES INFLIGHT MAGAZINE

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## MODE: Sports



At Coto Research Center, \$3 million worth of computer technology helps athletes improve abilities.

Power hitters slugging 60 homers a season ... running backs rushing for 3,000 yards a year ... milers streaking across the finish line in 3:30 ... pole vaulters clearing the bar at 20 feet.

These unparalleled sports achievements are within the grasp of athletes who seek greatness and goals through the new science of biomechanics: the computer analysis of athletic motion.

In its infancy, biomechanics is already doing more to raise the limits of human performance than all the steroids ever injected. And by the year 2000, computerized exercise equipment and ultra-sophisticated measuring devices will be as much a part of the training room, clubhouse and

health spa as Nautilus equipment is now.

"Anything you can do, you can do better through biomechanics - even if you're a superstar," declares Gideon Ariel, the Vince Lombardi of biomechanics. "Some superstars could do 50 percent better."

That's because the John McEnroes, Walter Paytons and Sugar Ray Leonards of today simply haven't reached their physical limits yet. But tomorrow's stars will approach the threshold of their own athletic perfection through biomechanics, says Ariel.

He heads the Coto Research Center in Coto de Caza, California, a sports clinic which relies on \$3 million worth of computer technology to enhance athletes'

physical rehabilitation and improve the performance.

Experts like Ariel film an athlete in action using highspeed movies which are converted to frames of stick figures for computer analysis. Detailed calculator then are made of body movement, timing and forces that create or result from movement.

The information gained can do more to improve performance than weeks of practice. For example, Ariel's computer showed that U.S. Olympic discus thrower Mac Wilkins was not striding right, causing his front leg to absorb energy that could otherwise be utilized in his throw. Wilkins changed his stride and shattered the world record at the time by nearly six feet.

When Jimmy Connors' serve was computer analyzed, Ariel discovered that the tennis star's feet were leaving the ground at a crucial moment, reducing the velocity of his serve by 20 miles per hour. Connors made the necessary adjustments and sped up his serve.

The feats of today's stars could seem commonplace by the year 2000, says Bo Ward, conditioning coach for the Dallas Cowboys. "If we do a biomechanical analysis on (running back) Tony Dorsett and find he's playing at only 60 percent of his physical capabilities, we'd help him make few adjustments. Then there'd be no reason why he couldn't rush for 3,000 yards season."

"Computers will help improve the quality of players and, as a result, there isn't a single record that couldn't be broken."

Although biomechanics will identify weaknesses and assign proper training instructions and adjustments, it can't measure one very important factor: the athlete's state of mind. "Biomechanics can't consider his psychological makeup, desire to achieve or other outside factor which could affect performance," admit Ariel.

Nevertheless, Ariel, who is chairman of the Biomechanical Committee of the U.S. Olympic Committee, believes the new science will help the athlete "to the point where the body is performing at its peak when the anatomical structure can't perform any better."

Biomechanics will assist the athlete in another way - improved sports equipment. "Bugging" golf clubs, tennis racquet and ski poles with electronic sensors already sprouting new designs and manu-

"Computers will help improve the quality of players and, as a result, there isn't a single record that couldn't be broken."

facturing techniques for sports equipment. Balls will bounce truer. Clubs will swing more effortlessly. Shoes will absorb more shock.

"Biomechanics will help create better equipment to reduce injuries and improve performance, and thus give the athlete a small but vital edge," said Dr. Peter Cavanagh, professor of biomechanics at Penn State University.

If a newly-designed shoe could make a marathon runner one-half of one percent more efficient, it could turn him from an also-ran into a champion, Dr. Cavanagh added.

But you won't have to be in the starting backfield of the San Francisco Forty-Niners or another Bruce Jenner to take advantage of biomechanics.

As a weekend athlete in the year 2001, you can head for the nearest biomechanics analysis center where your athletic performance and movements are measured and problems diagnosed by com-

puter. Armed with this knowledge, you make some simple adjustments and - BINGO! You serve harder, throw faster or drive a golf ball further.

Even if your only workout is with a can of beer while watching sports on TV, you will experience the effects on sports of this technology in the next century. Sports coverage as you know it today will be as antiquated as was listening to a static-marred broadcast of the 1940 World Series on a Crosley.

Joseph Deken, author of *The Electronic Cottage*, predicts: "The home computer user's display screen would provide a bank of selectable channels to display information from perhaps 30 simultaneous 'chalk talks.' As an added feature to sports coverage, extra channels could bring in a play-by-play transcript of the game, electronic 'scratch-pads' from coaches who diagram and analyze key plays and statistical data and summaries with predictions of all sorts of odds."

Computers will play another big role in the sports scene - as a special assistant coach. Computers already help college and pro teams in processing everything from scouting reports and draft picks to pass patterns. But in the near future, computer technician might well be the most valuable member of the team.

With the flicking of his computer key board, for example, the technician could help vault a cellar-dwelling baseball team into a pennant contender, claims Earl Shaw Cook, co-author of *Percent Baseball and the Computer*.

After being fed more than 750,000 statistics from about 12,000 games, Cook's computer came up with this 21st Century baseball strategy: Scrap the sacrifice bunt and go with the hit-and-run instead. Next, steal with two outs no issue an intention walk. Start the game with a relief pitcher for the first two innings, then bring in the regular starter for the next five and fins

Continued next page



Tennis pro Vic Braden, hooked to a computer by electrodes, demonstrates how movement and muscle response can be tested to improve play.

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## Sports

Continued from page S-7

off the final two innings with another reliever. Arrange the batting order according to the players' batting average, leading off with the best.

Purists may moan like a sore-armed pitcher, but computers are here to stay.

Says Dr. Deken, "There's no reason why any high school football coach can't use computer technology to adapt his team's play offensively and defensively to the analyzed strengths and weaknesses and patterns of the opponent."

The Dallas Cowboys are doing just that

and have been for some time. "Pro teams will have to go the way of the Cowboys if they want to win," says Gideon Ariel. "We've just developed a program called formation analysis. The computer detects weaknesses in the opposing team based on the position of the player, his physical strength and speed and reaction time. The computer simulates in game conditions how the opposing player will move and react on a given play."

The Cowboys' conditioning coach, Bob Ward, doubts that computers will really take over the game. "We'll use them to develop better game plans and educate our players about the opposing team. But in the final analysis, computers don't play the game. Humans do - and always will."

— Allen Zullo



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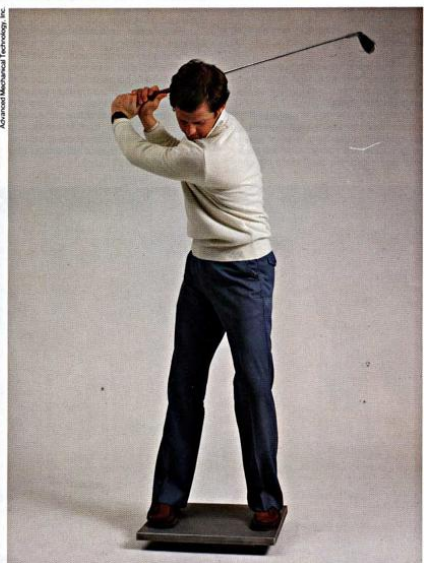
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The analysis of movement, using biomechanical testing equipment, can improve a golfer's game.