



# Walking on Air

## The invention of Air Shoe

### DAILY HAMPSHIRE GAZETTE



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In 1978, Dr. Gideon Ariel and his company, Computerized Biomechanical Analysis (CBA), designed shoes that allow wearers to "walk on air". The shoes were developed following a study on the efficiency of shoe design, with the aim of making them more efficient. The shoes are filled with air, providing a cushioned step and a rolling effect when walking or running, which could potentially reduce problems such as leg muscle issues, shin splints, and bone spurs.

In addition to the shoes, CBA has also developed a compact exercise machine and a tennis racket with a pivoting handle for improved shock absorption and accuracy. The company is also conducting a study for the Department of Defense on how to make foot soldiers more efficient.

Dr. Ariel, a former Israeli Olympian, has been named director of computerized biomechanical analysis for the U.S. Olympic Committee. He is helping to operate training camps and is involved in a project to establish more such camps across the nation. The camps aim to prepare U.S. athletes to compete more effectively against Soviet Bloc nations in the Olympics.

CBA's computerized biomechanical analysis has also been used to provide insights and recommendations for improving the performance of athletes in various sports, including golf, weightlifting, figure skating, swimming, and football.

The Pony Shoe Company has acquired a new shoe design that could revolutionize sports footwear and everyday shoes. The design, created by Ariel, a University of Massachusetts doctoral graduate, is expected to be used in various sports, including basketball and football, and could potentially be used in everyday footwear. Ariel also designed an innovative exercise machine that uses a computer-controlled hydraulic system instead of traditional weights. The machine is more compact and easier to use than traditional weight machines. Ariel is also involved in designing a new tennis racket that could reduce the risk of "tennis elbow". The racket uses a rotating handle to absorb the impact of the ball, reducing strain on the elbow and improving shot accuracy. Former U.S. Treasury secretary William Simon is interested in manufacturing the new tennis rackets.

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Below find a reprint of the 5 relevant pages of the article "Walking on Air" in "Daily Hampshire Gazette":

# DAILY HAMPSHIRE GAZETTE

NORTHAMPTON, MASS., WEDNESDAY, AUGUST 30, 1978

## rs eye banks

Fed Solomon with a political mission to the Soviet Union... he was not involved in any transaction... the dollar figure has been put... the dollar figure has been put... the dollar figure has been put...



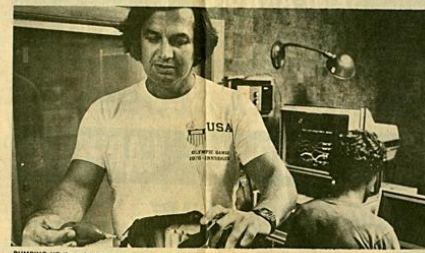
This photo of the Three County Fairgrounds was taken this morning by helicopter Terrence Mulvaney of Amherst whose hot air balloon will be at the fair daily through Sept. 9. The 14th fair opens tomorrow.

## Trade I cuts do

TORONTO (AP) — Word of the U.S. trade deficit... the dollar fell 1.4 percent... the dollar fell 1.4 percent... the dollar fell 1.4 percent...

## Computer helps design shoe that walks on air

AMHERST — Walking on air. The very thought is as pleasant as the expression is used casually to describe emotionally inspiring success. But now a computer and a former Olympic athlete have merged knowledge and technology as they could make "walking on air" totally commonplace.



PUMPING UP the sole prepares the new "air shoe" for use. It was designed by Computerized Biomechanical Analysis in Amherst, and CBA president Dr. Gideon Ariel is getting the shoe ready. (Richard Carpenter Photo)

# Beating Soviet Blocs at their own game

By MILTON COLE  
AMHERST — It would be ironic, indeed, should "capitalism's answer to communism" result in the U.S. Olympians defeating the Russians at the 1980 games in the capital of communism, Moscow.

And, said a man who played a big role in creating the capitalistic answer to communism, such a victory is well within the realm of possibility.  
Dr. Gideon Ariel of Belchertown, head of Computerized Biomechanical Analysis of Amherst, has been named director of computerized biomechanical analysis for the U.S. Olympic Committee.

The former Israeli Olympian is helping in the operation of the two training camps already set up (at Squaw Valley in California and Colorado Springs, Colo.) and the up-to-25 camps that may be in operation throughout the nation prior to the 1980 games.

The camps, along with the key camp at Squaw Valley in California, will aim to prepare U.S. athletes to meet the challenge of the Soviet Bloc nations that have done so well in recent Olympics and other world games.

The need for such camps became obvious in 1976 when the U.S. Olympians were defeated soundly in Montreal, failing to third place in the unofficial standings behind the Russians, who were No. 1, and the East Germans.

At the time Ariel, who has his Ph.D. from the University of Massachusetts Department of Exercise Science, returned from Montreal where he had observed, photographed and offered advice to U.S. athletes. He felt that unless drastic action was taken the U.S. was bound to grow weaker in relation to other nations, particularly the Eastern European nations.

At the time Ariel reported that it was obvious that the Communist Bloc countries were making preparedness of athletes for the Olympics a full-time job.  
"They make being an athlete a full-time profession. It is part of the state's policy to represent the nation in athletic events with the best possible people."

Spending a lot of money on such development, starting the training young, finding young people who have potential, and then spending years to train and prepare them for the Olympics or similar activities.  
"In this country we do it hit or miss. No one coordinates, no one provides the kind of coaching or facilities until just before the games and the four years between Olympic games, for instance, are really wasted."

As long as we have that kind of a system," Ariel had said in August of 1976, "then we are going to fall further and further behind the Communist nations."

## Gerry Ford can improve

By MILTON COLE  
AMHERST — What has the computerized biomechanical analysis at the firm of that name discovered?  
1. Nick Nicklaus and former President Gerald Ford can improve their golf game with a change in how they swing the club.

The analysis of the two golfers, done for a story in Golf Magazine, resulted in the summary finding that "neither man demonstrated outstanding physical traits such as muscular strength or body segment velocity."

"Nicklaus was able to recruit his body segments in a well-coordinated symphony of motion like a conductor directing an orchestra."

From a mechanical point of view, Ford is equally capable, relative to body strength and segment velocities.  
"In fact, Ford produced a higher club velocity although the timing was incorrect."

The summary also said "Nicklaus could improve his swing by increasing his club velocity by approximately 200 degrees per second, and this would improve his distance by as much as 15 additional yards."

Ford could increase his striking force by as much as 35 percent at impact by allowing the club to hit the ball at a more perpendicular angle. Improvement of his bodily coordination would increase the distance of his drive an additional 35-50 yards."

Interestingly, Ariel said Nicklaus was surprised by the finding and is working on his recommendations. And Gideon will be staying at the Ford's home in Palm Springs, Calif. next month and apparently will be offering advice on his golf game.

On weight lifting, the study showed that the Russians are consistently better because Americans have a tendency to try to get their weight under the bar too quickly, causing them to be off balance.  
Films of the Russian lifters, consistently outdoing the Americans, and of the U.S. lifters, showed the Russians lifted the weights and flowed their body under the bar much more efficiently than the Americans.

Thus came the assault of capitalism onto a communist idea.

The two doctors and a third partner have formed Life and Sports Systems Inc.

The corporation has three sports centers, complete with biomechanical analysis facilities tied into CBA in Amherst. One center is in New Jersey, another in Washington, D.C. and the third in Colorado Springs.

They have facilities and equipment and coaching to assist the super athletes, the Olympians or potential Olympians. And they have facilities for the general public's use, corrective facilities as a form of physical therapy for post-injury situations, and preventive programs to assist in cardiac, diabetic, and other cases.

"We have hired Olympic athletes to work with the public in these centers. They have been trained in the use of the equipment and in working with people, and are being paid for their efforts," noted Ariel.

Use same equipment  
"And that will mean they can use the same equipment for their training programs and get the same top coaching and the use of biomechanical analysis as part of their work conditions."

Meanwhile, the general public that would use the facilities for their own athletic or health purposes, and those people recovering from injury or undergoing preventive medical treatment would be charged for use of the facilities.

"They would be getting top-flight training using top-notch equipment in the finest facilities, and would be providing the money to run the training centers, to pay the salaries of the Olympians and to have the company turn a profit," said Gideon.

He envisioned at least 25 such centers by the time the training for the 1980 Olympic games is well under way and perhaps a 100 or more in the nation within the next decade.

One discussion right now is going on with the Penn Central people for a \$100 million complex in Southern California which would have the training center with all facilities, and hotels, shops, restaurants, etc.





DR. GIDEON ARIEL demonstrates how the computerized exercise machine his Computerized Biomechanical Analysis firm of Amherst designed, with computer operating hydraulic piston to provide the same resistance as weights used on traditional exercise machines. (Richard Carpenter Photo)

## SPORTS

The air shoe was born. The prototype is designed for athletes, and has been used successfully in practice by the members of the U.S. women's volleyball team. They have found that they jump higher, and they end up with fewer leg problems, muscle pulls, etc. as a result of landing on their feet after a jump. Basketball players are experimenting with them, along with runners.

The design is of a regular nylon-bodied running shoe, with the rubberized rippled or cleated sole.

But the inside has another rippled rubberized insert running the entire length of the shoe. In the outside of the heel of the shoe is a small air intake valve.

A rubber-bulb pump is inserted into the valve and the insert is filled with air, like filling an auto or bicycle tire or a football or basketball.

Then the shoe is put on, laced and tied. And when one walks on it, he or she is literally and actually walking on air.

**Air forced out**  
Each step forces the air from one spot in the insert into another by use of computer-designed valves, and the result is a cushioned step whether walking or running or jumping, and a rolling effect when one walks or runs.

"They should end problems with leg muscles, shin splints, bone spurs, etc. And they should cut foot fatigue for runners," Ariel said.

Right now the design has been acquired by the Pony Shoe Company, which makes footwear for all kinds of sporting activities.

Ariel figures that the shoe will be used in Olympic and other national and international competition. He believes it will find a place in sports, particularly basketball, and perhaps football as well.

But it also should result in use in regular shoes worn by the general public, and could have the nation, if not the world, walking on air, and being healthier for it, if Ariel and his computers are correct.

"Imagine how great this would be for paratroopers or others jumping from considerable heights," enthused Ariel.

The graying but husky University of Massachusetts doctoral graduate also is enthusiastic about the exercise machine he has designed.

**Originally used weights**  
Originally he designed one for the Universal firm, one of the top such companies in the U.S., using the established method of actual weights attached to pulleys and handles.

It was different and easier to operate than others on the market at the time, but still quite bulky and space-consuming.

The latest design, made possible by the omniscient and omnipresent computer, is a simple large cylinder connected to a variety of bars or pedals or overhead handles.

The computer is hooked up on a shelf as part of the system. You press a button, and the computer asks if you want to exercise.

You press buttons that indicate that you want to do weight lifting, and how much force or poundage you want to lift.

The computer then sets the valve that controls the hydraulic fluid in the cylinder and thus the amount of force necessary to lift the piston in the cylinder.

It eliminates the need for the actual weights to be there.

One of the people involved with Ariel in his enterprises is former U.S. Treasury secretary William Simon. He is interested in forming their own manufacturing firm to turn out the new tennis rackets that CBA has designed.

Doing research on tennis racket efficiency and how the ailment, "tennis elbow," occurs, CBA and Dr. Ariel found that the impact of a ball on the racket, sends a jarring force through the racket handle up the arm and against the elbow joint.

The computer suggested a rotating handle that would use that force to twist the handle, making it so the face of the racket is directly against the ball each time it hits the racket.

This not only eliminated the jarring force going into the elbow, it also made possible the opportunity for a perfect return shot.

Using that racket, which Ariel says will be produced by someone within a year, either their own firm or one of the regular sporting goods manufacturers, with the tennis ball CBA designed for Spalding, could make for much improved tennis.

## —'Walking on air'

(Continued from page 1)

**Take the air shoe.**  
Originally the U.S. Bureau of Standards contracted with CBA several years ago to do a survey on the efficiency of design of the common shoe.

The study, including filming of people walking and then slowing the film down to analyze frame-by-frame what happens when a person takes a step, showed that the common shoe is not an efficient design.

The protruding heel causes a person to step onto the heel of the foot first, putting the strain of each step on it, and then expanding that strain up through the leg into the lower back.

"It showed that the way we walk and the kind of shoes we walk with can be a cause of lower back trouble as well as the cause of foot and leg problems.

"The computer showed that the most efficient way to walk is the way we walk barefoot, with a rolling motion so that the force we generate as our foot hits the ground will cause a rolling motion, pushing the body forward on the foot, instead of jarring the force up the leg."

**How to utilize that knowledge?**  
After the report was sent to the federal agency, Gideon and his compatriots at CBA worked on putting theory into reality.

One shoe was designed, aimed at providing the rolling motion, but still sending some of the jarring motion up the legs. Then came the idea of using that jarring action to provide forward motion.