# Appendix 6 – How Data General Computers Are Helping Our Athletes Level Mt. Olympus



**Data General**

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Competition . . . Computers . . . Champions!

"This is a tremendous boost to our effort," said Colonel F. Don Miller, executive director of the United States Olympic Committee, in announcing at a New York Press conference Data General's donation of the first computer designed to help U.S. athletes perform better.

The ECLIPSE S/250 computer and its peripherals – valued at more than $200,000 – and a Whizzard 7000 digital screen – donated by Megatek Corp. of San Diego, will be housed in the Committee's new specially-designed Bio-Mechanics Laboratory in Colorado Springs. It will use special software produced by Computerized Biomechanical Analysis of Amherst, MA. The system will be used by athletes training for all future international competition, starting with the Winter and Summer Olympic Games to be held in Lake Placid, N.Y. and Moscow in 1980.

"Other countries, principally those in eastern Europe, have been using technology which is similar to this, although not as advanced, for several years. And they have been very successful. Now we shall be able to do the same," said Miller.

Success is measured in millimeters.

## The Objective:
## Help The Best Do Better

"This will be a great tool for our Olympic coaches and athletes," noted Dr. Irving Dardik, chairman of the Sports Medicine Committee, who is in charge of the Bio-Mechanics Laboratory.

There is no such thing as the perfect athlete, Dr. Dardik said, "but the computer will help our athletes get much closer to their full potential."

Dr. Gideon Ariel, a member of the Sports Medicine Committee and developer of the programming that allows the computer to analyze and improve athletic performance, will direct the effort.

## The USOC, Mining New Fields . . . For Gold

Data General's contribution is part of a great increase in corporate support for the U.S. Olympic Committee (USOC).

For the 1980 games, the Committee expects about 50 sponsoring companies compared with 35 for the Montreal Olympics in 1976. And corporate cash donations are expected to rise to $9 million from the $4 million last time.

Such largess has helped the Olympic Committee reach its budgetary requirements for the 1980 quadri-period. $26 million . . . double that of the previous Olympiad.

The U.S. Olympic Committee's preparations for the 1980 Olympic Games in Lake Placid and Moscow are well underway. The Committee's first year-round training centers at Squaw Valley and Colorado Springs have already trained thousands of athletes in both winter and summer sports. New programs have been established, including the Sports Medicine Committee, which held the first-ever Sports Medicine Conference at Squaw Valley, and a job opportunities program that has received enthusiastic support of both athletes and the American business community.

The U.S. Olympic Committee's first National Sports Festival, held at Colorado Springs for more than 2,000 of our most gifted amateur athletes, is now an annual event in non-Olympic years.

But of all the new programs and contributions, few have stirred up the interest, that Data General's contribution of a computer has caused.

And for good reason.

"Biomechanics is the future not only for the Olympic movement, not only for athletes, but for studying the human movement as it relates to physics," says Doug Dunlop, the U.S. Olympic Committee's director of planning.

## CBA: A Scientific Analyzer
## of Man and Motion

Computerized Biomechanical Analysis CBA Inc. is the world's first research company created specifically to scientifically analyze and evaluate the dynamics of improving athletic performance. Founded early in 1971, CBA initiated its work in the area of improving athletic performance. By mid-1974, CBA was also involved in the development and improvement of sports equipment and industrial products, as well as, in research supporting governmental agencies concerned with industrial and consumer safety.

As director of research, Dr. Gideon Ariel's chief business is testing and designing athletic equipment to maximize effective force. But since 1972, he has also been photographing athletes and feeding this visual data into a Nova computer, which produces a graphic report in terms of force, direction of force, and acceleration and velocity of body parts. The computer readouts give a quantitative measure of motion. From these, CBA determines what is necessary to perfect an athletic performance, the only limitations being those of muscles and ligaments. Using data from medical science, CBA knows at what point the forces exerted begin to tear human tissue.

CBA's methods fall in the realm of biomechanics.

CBA does not claim to be true pioneers in biomechanical analysis, however. Sweden's Ingvar Fredricson has been studying the motion patterns of standard-bred horses with a computer for 10 years, predicting lameness from minute stride irregularities, and discovering that most trotting tracks are banked too much on the straightways and too little on the turns, placing dangerous stress on delicate forelegs. At Penn State, Peter Cavanagh is well along in a study of human stride patterns.

## The Problem:
## The Eye Cannot See . . .

"The human eye cannot quantify human movement," says CBA Research Director Gideon Ariel. "Exterior movements happen too fast to follow. How can the eye tell if an athlete has turned his shoulder a degree too far to the left or stepped a centimeter short when releasing the ball? In fact, it can't. A coach can maybe guess right, but that is all." According to Ariel, the answers are to be found only in the laws of Newtonian physics.

CBA's system is based on Newtonian physics. "Every type of movement or stress, whether it be human or mechanical, is based on these laws, which are hundreds of years old. What we have done is add modern computer technology."

Gideon Ariel likes to compare training an athlete with the building of a bridge.

"No engineer would construct a bridge without calculating all the stresses and forces involved. Coaches should essentially do the same thing in the training of their athletes. The human eye cannot tell whether an athlete is reaching his fullest potential. For, when competing, athletes generate tremendous forces. These can only be calculated by computers."

The Megatek system automatically registers the coordinates of any point touched by the tracing pen.

At the same time the tracings appear on the screen, information from them is being collected by the Data General ECLIPSE S/250 computer.

The computer then calculates the velocity, acceleration, direction, angle and forces generated by the body's segments.

A computer readout is then provided which outlines the athlete's strengths, weaknesses and possible ways he or she might improve.

## The Athlete's Advantage:
### Predicting Performance Beforehand

The computer can gauge exactly how moving just a bit faster or turning more to the left or right might affect an athlete's performance.

This is a game Dr. Ariel likes to call, "what if" and it lets coaches calculate the impact of these changes on the computer without the athlete actually having to make the adjustments.

"That way we know beforehand whether a change would help or not," says Ariel. "This makes it much easier for a coach to suggest something new to the athlete since he already knows it will work."

## The System's Advantage:
### Avoiding Software Obsolescence

It has taken almost 10 years to complete CBA's programming and development.

Dr. Ariel estimates that it took some 10,000 hours over 7 years to create the programs that now instruct the computers. He wants to maintain, utilize and build upon that base. Data General computers make that possible.

When Computerized Biomechanical Analysis, Inc. was founded in 1971, it soon had contracts from two major sports manufacturers to test their equipment: basketballs for Spaulding and shoes for Uniroyal. This allowed CBA to purchase its own equipment. They selected a Data General NOVA® computer because of its ease of programming and upward compatibility.

Today, Computerized Biomechanical Analysis has a staff of 12, six full-time. In the back room of its unassuming headquarters is more than $300,000 worth of equipment, soon to be augmented by Data General's latest NOVA offering, the extended-memory NOVA 4/X system. As well as, Data General's newest and most powerful microNOVA™ computer, the MP/200, which is being incorporated in a computer-oriented exercise machine, that may cause a revolution of its own.

All of the programs developed by CBA on the NOVA 3/D can be run on their new NOVA 4/X system.

## A Bright Future

CBA is already a busy operation. And from a look at some of the action underway at CBA—computerized health system for weight control, the study of degenerative locomotor patterns in muscular dystrophy, research and design of children's toys for prevention of injury, analysis of human performance in industry—Dr. Ariel and his associates are going to be even busier in the future.

Regarding the marriage of technology and sports Gideon feels that the true benefits will be seen with the 1984 Olympics.

This despite the fact that U.S. athletes won an unprecedented 351 Gold, Silver and Bronze Medals in the 1975 Pan American and 1976 Olympic Games.

To help bring this about he says specialized training schools should be developed for youngsters who have athletic potential.

"Until 1964 talent alone was good enough to win," he concludes. "Since then, however, sports has become a science, not an art." Col. Miller adds, "we always have had the greatest technology in the world in the United States. Now we shall use it."

*Analyzing* – At the same time the tracings appear on the screen, information from them is being collected by a Data General ECLIPSE S/250 computer. The computer then calculates the velocity, acceleration, direction, angle and forces generated by the body's segments.
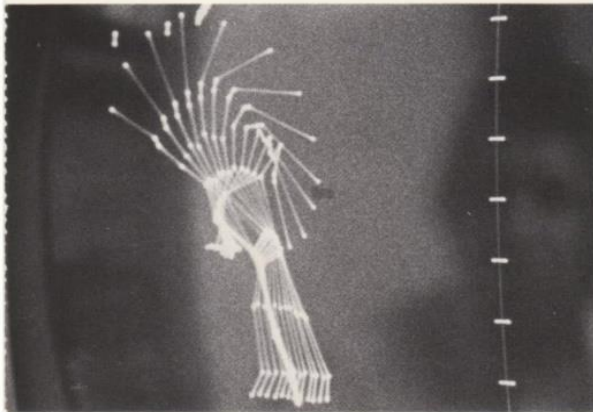


*Digitizing* – After high-speed movies are taken of Oerter's every move, Dr. Gideon Ariel breaks down the film to show the body in segments. The Megatek system automatically registers the coordinates of any point touched by the tracing pen.



*Discussing* – A computer readout is provided which outlines the athlete's strengths, weaknesses and possible ways to improve. The computer can gauge exactly how moving just a bit faster or turning more to the left or right might affect performance.



*Performing* – Al Oerter was an Olympic Discus' Gold Medalist in 1956, 1960, 1964 and 1968. Retired, until recently, Al is now attempting a computer-aided comeback at age 43. His current throws are the longest in his career.