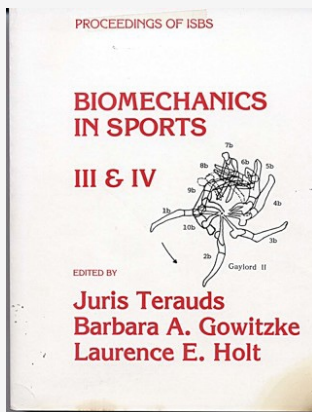




# The Ariel Computerized Exercise System (CES)

Ariel CES is the only system available that automatically monitors, controls, and modifies resistance and velocity while the person is exercising



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<b>Author</b>	Gideon Ariel
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<b>Privacy</b>	Public

## Ariel Computerized Exercise System: A New Era in Physical Rehabilitation and Conditioning

The Ariel Computerized Exercise System (CES), developed by Dr. Gideon Ariel, is a revolutionary system in the field of physical rehabilitation, research, and conditioning. The system automatically monitors, controls, and modifies resistance and velocity during exercise, adjusting to each individual's unique capabilities or limitations.

Ariel CES provides extensive and accurate measurements of movement, strength, and endurance, with the capability for storage and subsequent comparison and analysis of the individual's performance. It is referred to as the "Intelligent System" for rehabilitation and fitness as it senses and responds directly to an individual's performance in real time, providing immediate visual and audio feedback during exercise.

The system offers flexibility in terms of exercise modes, including isotonic, isokinetic, or isometric exercise, or any combination of these. It can control and measure velocity, resistance, power, work output, fatigue level, duration of exercise, or combinations of all five.

Ariel CES also allows for manual and preprogrammed sequences of exercises as well as customized individual exercise sequences. It encourages innovation and creativity in physical therapy and fitness routines.

The Ariel CES performs many critical functions, including rehabilitation and conditioning, measurement and diagnosis, recording and evaluating results, controlling and monitoring velocity and resistance, programming the range of motion, accommodating resistance until the individual reaches a prescribed level of fatigue during endurance training, displaying performance goal target as an incentive during exercise, storing and retrieving performance data, comparing current and previous performance data, and generating performance profile of average and maximum exercise results.

Ariel Dynamics, Inc., founded by Dr. Gideon Ariel, manufactures, sells, and services the Ariel Computerized Exercise System worldwide while continuing the development of new features and models.

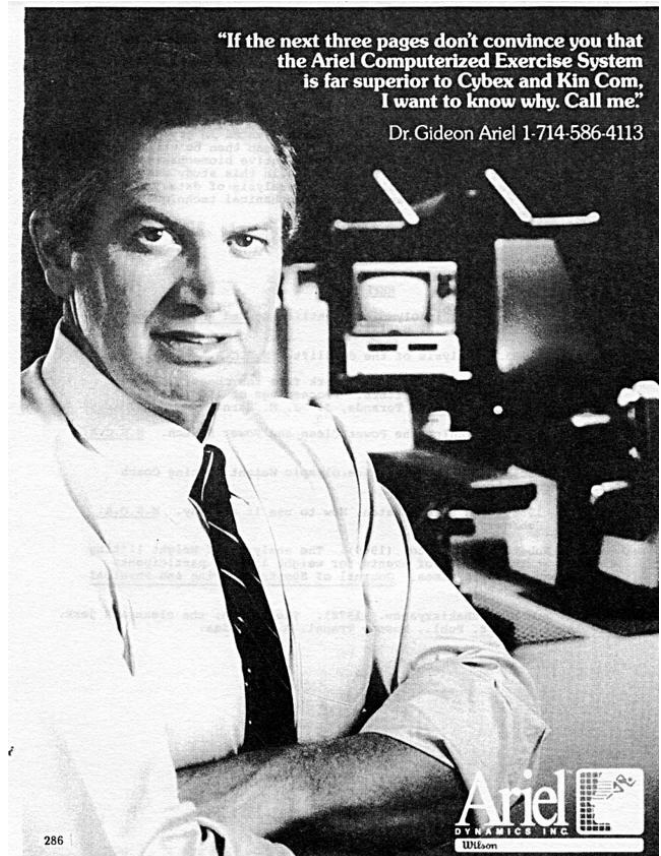
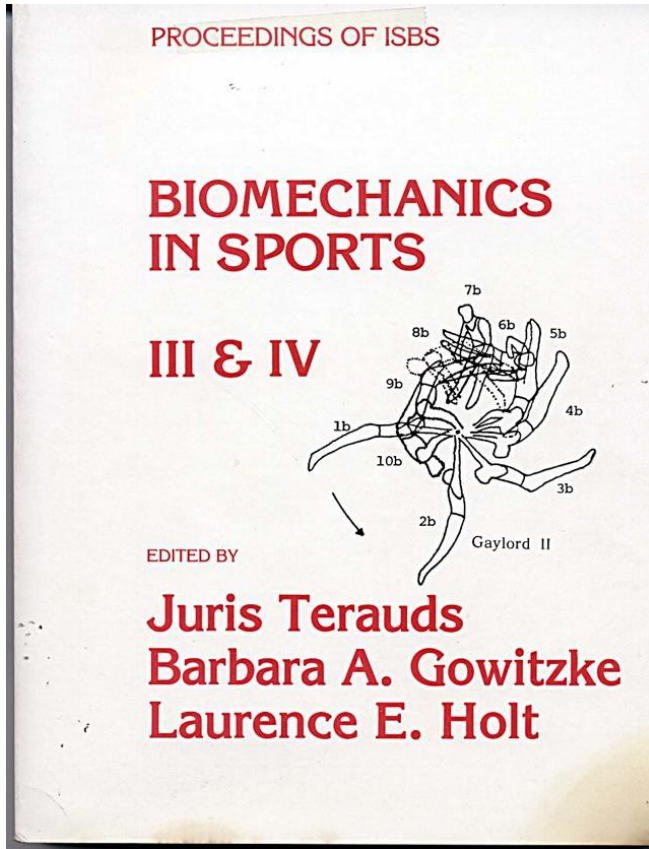
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Below find a reprint of the 9 relevant pages of the article "The Ariel Computerized Exercise System (CES)" in "Biomechanics in Sports":



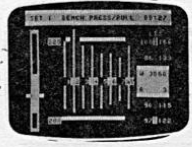
The Ariel Computerized Exercise System (CES), invented by Dr. Gideon Ariel, heralds a new era in physical rehabilitation, research, and conditioning. **Ariel CES is the only system available that automatically monitors, controls, and modifies resistance and velocity while the person is exercising. It does this safely and efficiently, constantly adjusting itself to accommodate each person's unique capabilities or limitations.** Ariel CES also provides extensive and accurate measurements of movement, strength, and endurance with the capability for storage and subsequent comparison and analysis of the individual's performance.

	Upper Body Strength	Lower Body Strength
Ariel CES	1000	1000
Cybox	300	360
Kin Com	210	270

### The Intelligent System

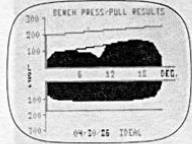
That's why we call it the "Intelligent System" for rehabilitation and fitness. Ariel CES senses and responds directly to an individual's performance in real time. In other words, the computer is able to control your movement and adjusts to your effort while you exercise. Not only does the Ariel CES sense and respond to specific motions, it also interacts with the individual, providing immediate visual and audio feedback during exercise.

At the heart of Ariel CES's "intelligence" is a state of the art microcomputer system. The computer and its unique software assume the responsibility for controlling the precise force level, speed of movement, and temporal sequence to achieve a specific pattern of exercise. Unlike other systems, Ariel CES has the ability to adjust and modify its assignment throughout the entire exercise session.



The monitor provides complete performance information on a continuous basis during exercise. Remaining totals of work, repetitions, and elapsed time are maintained.

The "user-friendly" screen instructions permit anyone to operate the system, even individuals who have never used a computer.



The average curve plot (solid graph) shows the average exercise values measured for both the up and down strokes. Optional comparisons to previous performance (red line), or to an "ideal" performance goal (green line), may also be included.

### Flexibility of Use and Function

Key to the Ariel Computerized Exercise System is the flexibility it offers. Isometric, isokinetic, or isometric exercise, or any combination of these exercise modes can be performed. In addition, the Ariel CES can control and measure velocity, resistance, power, work output, fatigue level, duration of exercise, or combinations of all five.

Another major value of the Ariel CES is its ability to run manual and pre-programmed sequences of exercises as well as customized individual exercise sequences. A physical therapist can follow prescribed testing or training protocols for patients or can

create and program unique procedures for specifically desired routines.

In fact, Ariel Computerized Exercise System encourages innovation and creativity...because the Ariel CES can adjust the speed or the resistance of an exercise throughout its range of motion...because the Ariel CES allows the application of an isometric contraction at a selected point within a movement...because the Ariel CES response can be controlled throughout the entire range of motion...the possibilities are endless.



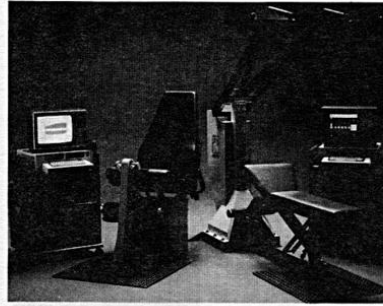
Rehabilitation statistics report, in numerical format, the average measured values for a number of parameters of exercise and motion.

The Ariel CES is comprised of these basic components:

- The Multi-Function Exercise Station
- The Arm, Leg, Back Exercise Station
- The Computer Console
- The Monitor
- The System Software
- The Printer (Optional)

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Function	✓	✗
Control and monitor velocity in each direction independently	•	
Control and monitor resistance in each direction independently	•	
Program the pyramiding of resistance or speed in each direction	•	
Program the range of motion in each direction	•	
Accommodate resistance until the individual reaches a prescribed level of fatigue during endurance training	•	
Display performance goal target as an incentive during exercise	•	
Store and retrieve performance data	•	
Compare current and previous performance data in color graph, chart or tabular form	•	
Generate performance profile of average and maximum exercise results for each repetition and for both up and down directions	•	
Illustrate in graphic format the force, work, power, and fatigue in relation to time, bar position, and lifting pace	•	
Calibrate dynamically force and velocity through the entire range of motion and verify results	•	



- Accommodate resistance until the individual reaches a prescribed level of fatigue during endurance training
- Display performance goal target as an incentive during exercise
- Store and retrieve performance data
- Compare current and previous performance data in color graph, chart or tabular form
- Generate performance profile of average and maximum exercise results for each repetition and for both up and down directions
- Illustrate in graphic format the force, work, power, and fatigue in relation to time, bar position, and lifting pace
- Calibrate dynamically force and velocity through the entire range of motion and verify results

### What the CES Can Do

For the operator the Ariel Computerized Exercise System performs many critical functions, including the ability to:

- Rehabilitate and condition
- Measure and diagnose
- Record and evaluate results
- Control and monitor velocity in each direction independently
- Control and monitor resistance in each direction independently
- Program the pyramiding of resistance or speed in each direction
- Program the range of motion in each direction

For more information about the Ariel CES, fill in your name, address and phone number and mail in this card or to sign up for our next conference call.

1-714-586-4113 Dr. Gideon Ariel / Ariel Dynamics, Inc.  
1-312-456-6100 Mr. David Lumley / Wilson Sporting Goods Co.  
2233 West Street, River Grove, IL 60717

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_  
Zip \_\_\_\_\_ Telephone \_\_\_\_\_

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### Ariel Dynamics, Inc.

Ariel Dynamics, Inc. was founded in 1968 by Dr. Gideon Ariel, a world renowned authority in bio-mechanics. He has been the driving force behind 18 years of research and development leading to the Ariel CES.

Ariel completed his graduate and post-doctoral work at the University of Massachusetts. He holds a Ph.D in Exercise and Computer Science, has published many scientific papers, holds patents on several devices, founded and chaired the Biomechanics Committee of the U.S. Olympic Committee, and has served as consultant to many of the country's leading companies and organizations including IBM and NASA.

### Wilson Sporting Goods Co.

Wilson Sporting Goods Co. is a worldwide leader in the manufacture of equipment for golf, racket sports and team sports.

In 1985, as an extension of their involvement in athletic performance, Wilson entered into a licensing agreement with Ariel Dynamics, Inc. Wilson provides marketing, financial, manufacturing/quality assurance and consulting support. Ariel Dynamics, Inc. manufactures, sells, and services the Ariel Computerized Exercise System worldwide while continuing the development of new features and models.



The Arm, Leg, Back Exercise Station



The Multi-Function Exercise Station



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Trabuco Canyon, CA 92679

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### ARIEL PERFORMANCE ANALYSIS SYSTEM, INC.

22000 Plano Trabuco Road  
Trabuco Canyon, California 92678  
714-586-4113

The ARIEL PERFORMANCE ANALYSIS SYSTEM represents the latest enhancement to the proprietary biomechanical analysis system developed through more than a decade of research, software engineering, and hardware development/integration by Computerized Biomechanical Analysis (CBA) Inc., the acknowledged world leader in human performance analysis.

Now, for the first time, this proprietary system is being made available to professionals in the fields of biomechanics, sports medicine, athletics, rehabilitation, forensics, and basic research. Over the course of years and through literally hundreds of analyses, this system has proven successful in the following areas of application:

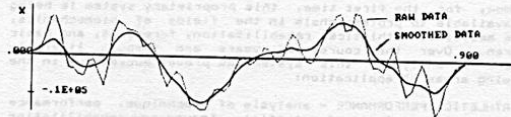
- ATHLETIC PERFORMANCE** - analysis of technique, performance limits and analysis of potential, injury and rehabilitation analysis, comparative analysis to world class and "elite" athlete performance. Analysis of "non-human" athletes such as race horses and dogs for selection and training.
- EQUIPMENT PERFORMANCE** - analysis of the following types of equipment under "actual use" conditions: shoes, gymnastic equipment, tennis rackets, golf clubs, bicycles, strollers, prosthetic devices, protective pads and helmets, and various types of exercise equipment.
- FORENSIC BIOMECHANICS** - determination of causes of injury through analysis of forces resulting from impact, falls, or being struck by objects. Determination of potential for injury from various types of activity and through the use and misuse of various equipment. Quantification of extent of injury, loss of use, or degree of recovery for individuals in relation to liability/compensation issues.
- COACHING AND PROFESSIONAL SPORTS** - assessment of individual performance level and technique. Measurement of progress over time or through variations in technique. Evaluation of performance loss due to injury, and determination of extent of recovery and "fitness to compete". Talent recognition and evaluation of potential performance. Team formation analysis.
- MEDICINE AND PHYSICAL THERAPY** - evaluation of extent and type of motor dysfunction and/or injury. Monitor progress in program of rehabilitation. Quantify loss of use for workman's compensation or insurance claims. Analyze effectiveness of prosthesis and isolate problems encountered in use of prosthetic devices.

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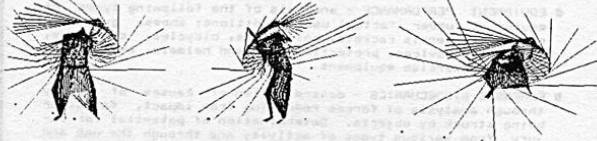
### ARIEL PERFORMANCE ANALYSIS SYSTEM, INC.

The ARIEL PERFORMANCE ANALYSIS SYSTEM is a fully integrated system of hardware and software for biomechanics and the analysis of human performance and generalized motion analysis featuring:

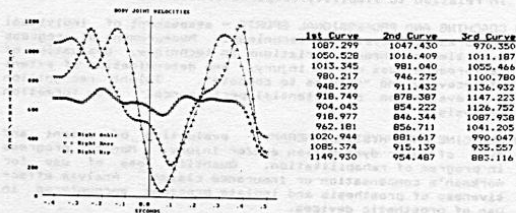
- Performance analysis through digitized film and/or video recordings of any type of activity. Interactive computer-assisted digitizing process for enhanced data collection.
- Full three-dimensional analysis using two or more cameras. Two-dimensional (planar) analysis using a single camera.
- Sophisticated smoothing and filtering options to provide exceptional accuracy in the determination of true performance parameters.



- Powerful full-color computer display facility for digitized activities. Still frame, multiple frame, and full animation modes with complete three-dimensional image transformation capabilities.



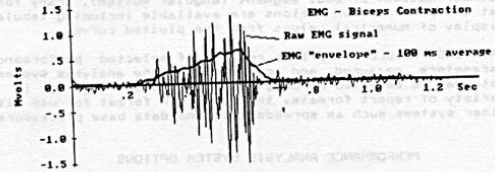
- Flexible data reporting through fully annotated graphs, stick-figures, and tabular display of information.



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### ARIEL PERFORMANCE ANALYSIS SYSTEM, INC.

- Direct measurement of performance utilizing force platforms, EMG (electromyogram), or motion sensing devices.



- Remarkable ease of use provided through simple menu selection of commands and options. On-line "help" system is available at all times through a single keystroke. On-line tutorial system to train new users.

#### HARDWARE AND SOFTWARE SPECIFICATIONS

Main Processor: Enhanced IBM PC compatible processor w/640K memory, 30 Megabyte hard disk, 360K byte diskette drive, tape backup system, monochrome display and adapter, high resolution color graphic display and adapter, monochrome printer and color graphic printer with parallel interfaces, joystick, and serial interface.

Performance Analysis System Basic Integrated Software Package:

- DIGITIZING MODULE - provides computer aided digitizing of video or film sequences. Optional video analyzer or film analyzer with rear-projection digitizer required for full digitizing capability.
- TRANSFORMATION MODULE - produces true three-dimensional image coordinates from two or more digitized camera views or two-dimensional coordinates from one or more camera views.
- SMOOTHING MODULE - removes random digitizing errors from analysis sequences. Provides choice of smoothing algorithm, automatic or user-controlled smoothing, and special smoothing for high-frequency data such as occurs during impact.
- VIEWING MODULE - displays digitized analysis sequence images in a variety of modes. Single frame, multiple frame, animation, and multiple sequences can all be selected. Full three-dimensional image transformation can be performed to view activities from any desired perspective.

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### ARIEL PERFORMANCE ANALYSIS SYSTEM, INC.

- GRAPHING MODULE - produces annotated graphs of selected kinematic, kinetic, and analog values measured and computed by the analysis system. Data may be selected by body joint (linear motion) or body segment (angular motion). Many format and presentation options are available including tabular display of numerical values from the plotted curves.
- PRINTING MODULE - prints reports of selected performance parameters measured and computed by the analysis system. Data may be selected by body joint or body segment in a variety of report formats, including DJF format for use with other systems such as spreadsheets and data base processors.

#### PERFORMANCE ANALYSIS SYSTEM OPTIONS

- VIDEO RECORDING AND PLAYBACK OPTION -- includes video analyzer with single frame advance/reverse, slow motion and search capabilities, computer interface, and color video monitor. Also includes two portable, professional quality video camera systems with recorders, monitors, AC adapter-rechargers, battery packs, and a dual camera timing control center for external control of digital camera timers using switches or photocells.
- FILM ANALYSIS OPTION - for the digitizing of cinematographic sequences. Includes 16mm film analyzer with single frame forward/reverse, slow motion, and remote control. Also includes high-precision rear-projection digitizer with interface to Performance Analysis System.
- ANALOG/EMG PROCESSING OPTION - subsystem for general purpose laboratory analog signal processing using devices such as force platforms, motion detectors, sensors, and other types of transducers. Includes specialized support for EMG (electromyogram) measurement and analysis, including options such as spike analysis, envelope processing, signal integration analysis, waveform analysis, and spectral analysis. This option includes an advanced analog hardware interface and an analog sampling unit with program-selectable gain, 16 channels of analog input, and sampling rates up to 40,000 samples/second.

The ANALOG/EMG option is also available as a complete analog processing system (including computer) for those who do not require the Performance Analysis package.

For additional information, or to arrange for a demonstration of this unique analysis system, please contact our sales office:

Ariel Performance Analysis System, Inc.  
22000 Plano Trabuco Road  
Trabuco Canyon, CA 92679  
(714) 586-4113

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