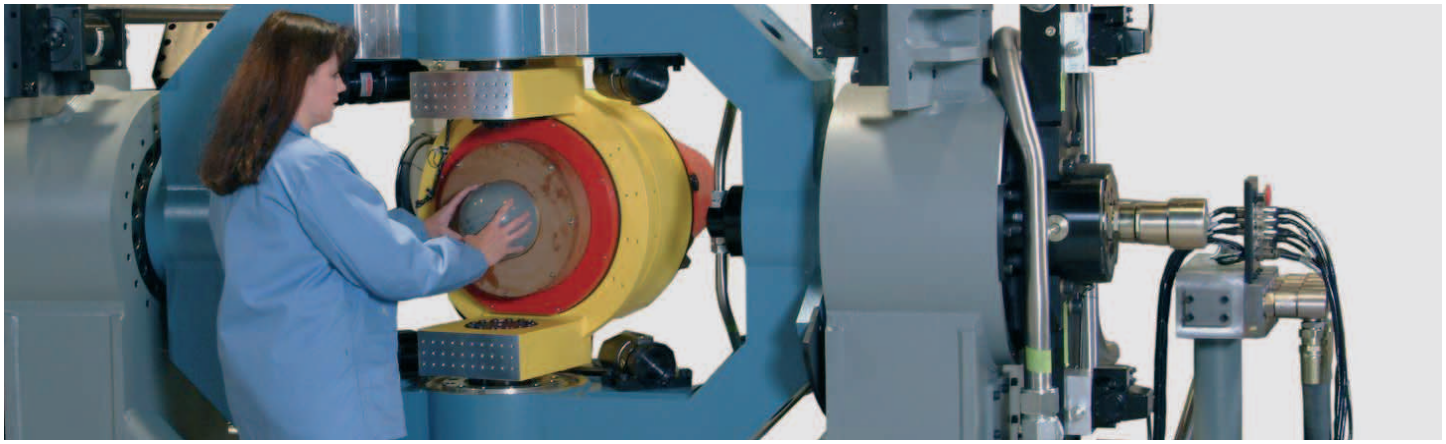
Issue 7_November 2004

Newsletter



Model HD756-1 Three-Axis Flight Motion Simulator with seven inch diameter seeker installed on the roll axis.

Editorial

Dear Reader

Welcome to the second 2004 edition of the ACUTRONIC Newsletter.

This edition focuses on the successful rollout of the ACUTROL® 3000. In various articles you will find interesting notes describing ACUTRONIC and customer perspectives.

The year 2004 was another milestone in our corporate history. Both operations, the US and Swiss offices, reinforced their leading positions as key suppliers of Flight Motion Simulators in the HWIL community. In addition to this achievement, we haven't forgotten our original market partners, namely the gyro and inertial navigation test customers. We continue to focus on both customer areas and endeavor to act as a "systems supplier" for the motion simulation world.

Sincerely Yours, Thomas W. Jung, CEO

ACUTRONIC USA delivers HD756-1 Three-Axis Flight Motion Simulator

Keith Andrew, ACUTRONIC USA

Successful installation of Model HD756-1 Three-Axis Flight Motion Simulator.

ACUTRONIC USA has delivered a Model HD756-1 three-axis flight motion table for use in Hardware-in-the-loop (HWIL) simulation of Radio Frequency (RF) and Infra Red (IR) missile seekers. The units under test may be as large as 7 inches in diameter, weigh as much as 26 pounds and have an aft dimension as long as 26 inches. A temperature chamber integrated into the roll axis permits thermal testing of the unit under test. High dynamic performance (20,000 deg/sec^2 axis acceleration) is achieved with an electric motor on the roll axis and hydraulic actuators on the yaw and pitch axes.

The Model HD756-1 Three-Axis Flight Motion Simulator includes the most advanced motion control system available for HWIL simulation, the ACUTROL3000 Digital Motion Controller. SCRAMNet+ or VMIC shared memory interfaces are available.]

ACUTRONIC

Dual Target Motion Simulator for Hardware-in-the-Loop Test Facility

Colin Stevens, ACUTRONIC Switzerland

With this Four-Axis Simulator ACUTRONIC met the challenge to provide a system that is accurate for static and dynamic motion.

ACUTRONIC has successfully installed a complete HWIL missile test facility comprising a Dual Target Motion Simulator (DTMS), two three-axis Flight Motion Simulators (FMS), one of which also has a two-axis Target Motion Simulator (TMS).

Major components of the DTMS are: the steel frame, the two-axis azimuth and elevation carriages that hold the targets, the two rail systems for x and y motion, z-axis rails, the ACUTROL digital controller, the host computer and the large AC drive Power Cabinet.

Each carriage on the DTMS supports either an Infra Red (IR) source or a Radio Frequency (RF) horn that is used to transmit the signature of a target to the missile seeker. The carriages can be positioned over a range of 7 meters horizontally and 6.5 meters vertically.

It is very important that the horns point to the missile seeker within a sphere of 25mm. The challenge was to provide a system that was accurate over the entire range for both static and dynamic motion.

The DTMS has two target platforms which move linearly in both x-direction (horizontal) and y-direction (vertical). Synchronous to the linear movement the target platform has to rotate the target horns to keep them pointing back to the axis intersection of the three-axis FMS. These coordinated movements are accurate at low as well as high dynamic movements.

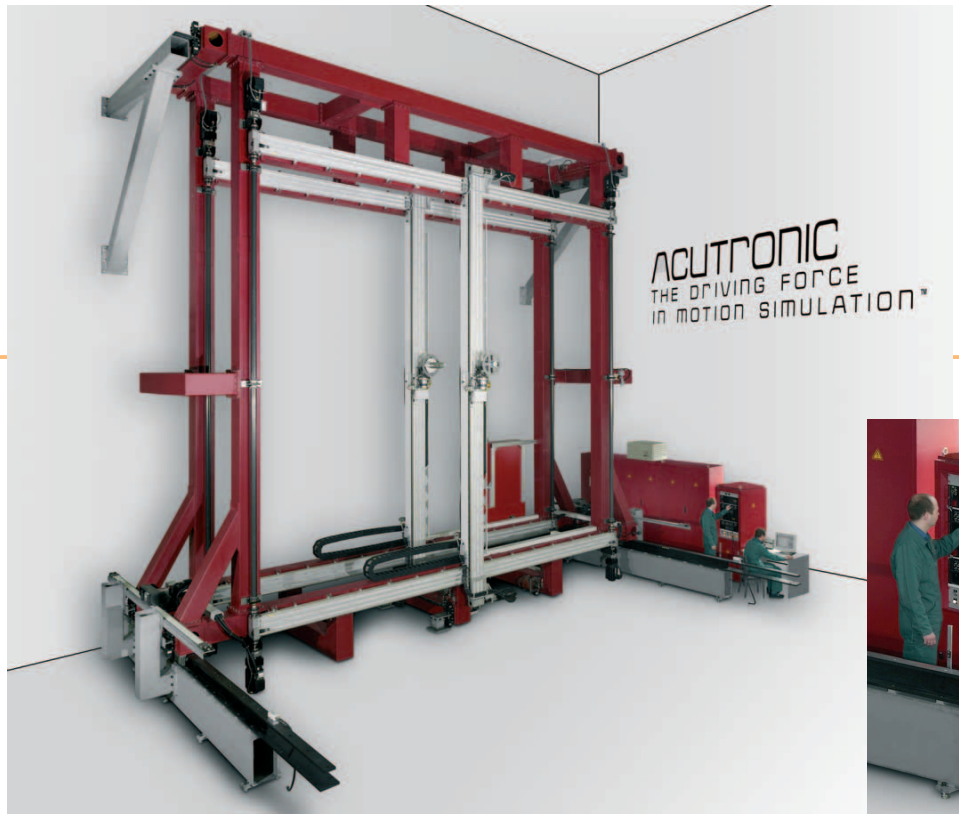
In order to accomplish these movements the DTMS has a total of six motors for the linear and two motors for the rotational movement of each target. Two additional motors move the complete frame in the z-direction. The x and y movement use four motors which are linked together either by a torsion beam (top – bottom) or a belt (left – right) on which the vertical slide is mounted. This combination assures that the vertical slide is always moving parallel and does not become skewed. In the vertical direction, two motors (top – bottom) drive the belt on which the target platform is sliding. The rotation in azimuth and elevation direction of the target platform is done by two Harmonic Drives.

A Four-Axis ACUTROL is being used to control the four Axes of each target frame making a total of eight axes of control.

Z-Axis

As well as the movement of the target platform in linear and rotation direction, the whole target frame is movable in z-direction by up to 20 meters. This movement

The Ukraine-made Cargo Aircraft "Antonov 124" on its short guest stay at the Zurich International Airport.



Engineers operate the DTMS with the Power Cabinet and Control Console.

is not done during target simulation, but merely to allow the facility to be used with seeker heads of various radio frequencies.

Pointing

As the customer commands the target platform in x and y, a real-time transformation into linear and rotational motion has to be done. This transformation is done in a NI PXI Computer running LabVIEW RealTime. The commanding can be done either via SCRAMNet+ in Track Mode using position, rate and acceleration or with an analog signal, representing Position and Rate demand. Both the SCRAMNet+ data as well as the analog demands are inputted to the PXI Computer, where a full state vector is generated then converted into linear and rotational vectors and finally sent to each ACUTROL via the SCRAMNet+ link.

A Graphical User Interface computer provides the operator the ability to initialise the system, control, start and stop simulations, move the frame in the z-direction and shut the system down.

Transportation

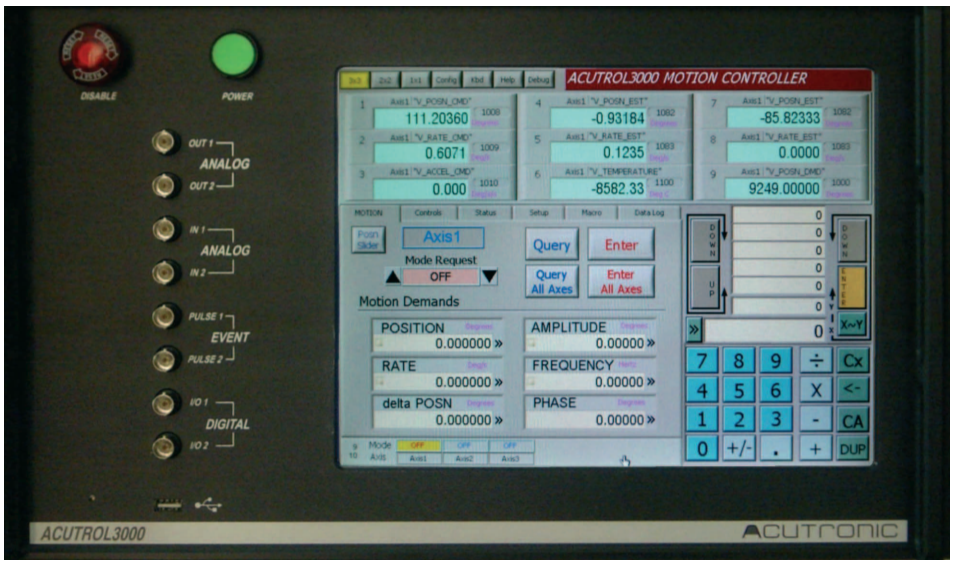
Due to the enormous dimensions of the entire system, the DTMS had to be shipped with one of the world's largest Cargo Airplanes. An "Antonov 124" was chartered solely for the airfreight of the simulation system. Only this giant airplane was big enough to "swallow" the huge wooden boxes of the DTMS.]

The ACUTRONIC assembly team in action on-site.

ACUTRONIC announces the ACUTROL®3000 Digital Motion Controller

Michael H. Swamp, ACUTRONIC USA

With the ACUTROL3000 ACUTRONIC presents the next generation motion controller for inertial guidance test tables and flight motion simulators.



ACUTROL3000
Digital Motion Controller
Front Panel Graphical Interface.

ACUTRONIC is pleased to announce the availability of the ACUTROL3000 Digital Motion Controller. The ACUTROL3000 represents the next generation motion controller for inertial guidance test tables and flight motion simulators. The ACUTROL3000 is software compatible with and replaces the ACUTROL2000 and ACUTROL1000 family of motion controllers.

The ACUTROL3000 is available in a single chassis version to support 1, 2, or 3 axes. It is also available with an internal power amplifier (ACUTROL3000PA) for supporting 1 or 2 axes. Available interfaces include GPIB and TCP/IP for low speed communication and SCRAMNet+, VMIC, and DRV11J parallel interfaces for high speed asynchronous communication.

The ACUTROL3000 provides digital loop rates up to 5 kHz/axis and has built in data logging to capture controller internal variables. Both analog and digital I/O are accessible through the front panel of the controller. Axis frequency response data may be recorded and then displayed on the front panel graphical display.

The ACUTROL3000 may be integrated with a variety of position feedback devices such as resolvers, inductosyns or optical encoders. State estimators are incorporated to provide full motion state feedback to the servo controller. It directly interfaces to DC Brush, DC Brushless, and hydraulic actuation systems to control precision rotary or linear motions. As such, it is available for upgrade of existing ACUTRONIC motion simulators as well as motion simulators built by other manufacturers.

An overview of the ACUTROL3000 features is described in the “Innovation” section on page 6.]

MBDA UK to get Europe's first ACUTROL®3000

Kevin Fisher, Group Head HWIL, MBDA UK

Hardware-in-the-Loop simulation requires enhanced phase and bandwidth response, which ACUTROL3000 is providing with its highly flexible, state of the art digital control capability.

MBDA UK Limited, in Stevenage, recently became the first ever customer of the eagerly awaited ACUTROL3000 digital controller for Flight Motion Simulators.

Installed as a direct replacement for the original obsolete controller fitted to a Carco S458R-3BD three-axis FMS, the ACUTROL3000 provides the enhanced phase and bandwidth response that is necessary for the demanding Hardware-in-the-Loop simulation requirements on MBDA's Meteor missile programme.

Installed in the Radio Frequency (RF) Laboratory in the recently completed "Simulation Centre", the ACUTROL3000 has been specified with a VMIC Reflective Memory interface. This interface makes the motion controller an integral component of the Reflective Memory network, which allows for the high speed deterministic transport of real-time simulation data to all subsystem nodes making up the overall simulation system.

The ACUTROL3000 was delivered to MBDA in July 2004 and has recently completed successful acceptance testing. Kevin Fisher, Group Head of Hardware-in-the-Loop, commented, "The ACUTRONIC ACUTROL3000 provides MBDA with a highly flexible, state of the art digital control capability for our RF Flight Motion Simulator that will enable us to satisfy the demanding simulation needs of our current and future missile development programmes. This recent acquisition further strengthens the professional working relationship that MBDA has experienced with the ACUTRONIC team."]

ACUTROL3000 installed
Foreground: Re-instrumented cabinet with ACUTROL3000 installed.
Background: Carco Model S458R-3BD 3-axis Flight Motion Simulator with dummy load.

Dual Target Motion Simulator
Dual Target Motion Simulator with two, double curved tracks. Radar absorbing material installed.

Front Panel of ACUTROL3000
The single chassis digital ACUTROL3000 replaced two 19˝ racks of analogue electronics.

ACUTRONIC Technology and Innovation

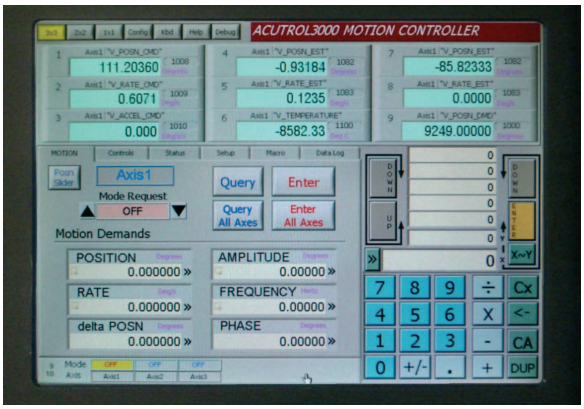
Howard S. Havlicsek, CTO

This new section of the newsletter will be included in future issues to highlight the technically significant activities and accomplishments of ACUTRONIC.

This issue provides an overview of the new/advanced features of the ACUTROL3000 and future articles will elaborate on specific key features that illustrate the exceptional performance and customer acceptance.

The ACUTROL3000 motion controller is now being used on all new ACUTRONIC motion systems/programs and is also being used for refurbishment of vintage motion systems as a cost effective approach to upgrading motion simulation facilities. The ACUTROL3000 has been designed to replace and provide enhanced functionality over the ACUTROL® Act2000 and all other controllers currently in use in the motion simulation industry. Flexible configuration options and embedded integration tools make the controller especially suited for fast turn-around upgrade of motion systems in the field.

The 1-3 axis controller is built in a single 10.5″ rack mount chassis using two embedded Pentium computers; one for the graphical user interface (GUI) and the other for real-time (RT) control. An Acutronic designed Axis Interface Board (AIM) is used for each axis to provide custom interface hardware between the RT computer and the transducers of the physical motion system. The RT algorithms for position encoding, motion state estimation, servo control, data logging, and external computer interfacing are under the control of the LynxOS real-time operating system. The GUI is implemented as a LabView application and runs under Embedded Windows XP. The communication between the two computers is via an Ethernet connection using the Acutronic Command Language (ACL). ACL is used to configure and control the Acutrol3000 over any of the non-real-time computer interfaces (TCP/IP, IEEE-488, or reflective memory).



ACUTROL3000
Front Panel Graphical Interface of the Digital Motion Controller.

The control structure is implemented using summer-filter blocks that are programmatically connected/configured to permit a diversity of digital servo topologies. The servo loops are unity-scaled and a gain block provides normalization of the servo loops relative to the actual scaling of the motion system plant. Plant model scaling is done in one place in the controller and can easily be adjusted in the field to accommodate payload changes.

Data logging is used to collect data produced in the ACUTROL3000 controller. Using the built-in logarithmic sweep capability of the sine wave synthesizer (Synthesis mode), time response data is collected and saved for FFT post processing in the GUI. The servo engineer can easily generate a frequency response plot of an axis and output a plot or raw data file for system documentation.]

Additional features are summarized below:

1. SCRAMNet+ or VMIC Reflective memory real-time interface with auxiliary ACL support.
2. Asynchronous communication of real-time host demand data.
3. Error model calibration tables to cancel position and torque disturbances.
4. Full digital control including inner pressure or torque loop.
5. Direct 3-phase motor commutation.
6. Data logging, plotting and frequency response generation.
7. Macro programming using ACL scripts.

New Management at ACUTRONIC USA, Inc.

Thomas W. Jung, Chairman

With Michael H. Swamp and Carl N. Hockenberry two experienced Managers with strong know-how are the new leaders of ACUTRONIC USA, Inc.

ACUTRONIC is proud to announce the promotion of Michael H. Swamp to President and Chief Operating Officer of ACUTRONIC USA, Inc. Mr. Swamp has been with ACUTRONIC USA, Inc. for seven years serving as Engineering Manager.

ACUTRONIC is also pleased to announce the promotion of Carl N. Hockenberry, CPA to Vice President and Chief Financial Officer. Carl Hockenberry has worked with ACUTRONIC USA as its financial advisor for seven years and has been on the staff for the past year and a half as Manager of Financial Reporting. Messrs. Swamp and Hockenberry succeed Dr. Louis A. DeMore who remains on the Board of Directors of ACUTRONIC USA, Inc. and will support the ACUTRONIC Group strategic marketing efforts.

Together, Messrs. Swamp and Hockenberry look forward to continuing the growth of ACUTRONIC USA, Inc. and furthering the tradition of excellence in the field of motion simulation. ACUTRONIC thanks Louis DeMore for his exceptional efforts and the huge success of his work.]

Michael H. Swamp, President and COO
Carl N. Hockenberry, Vice President and CFO

"Hurricane Ivan" Adds Adventure to ACUTRONIC Group Meeting in West Virginia

Carl N. Hockenberry, ACUTRONIC USA

ACUTRONIC Group Meeting – an adventure trip into the force of nature.

Between September 15 and 18, 2004, ACUTRONIC USA, Inc. hosted the biennial ACUTRONIC Group Meeting. The meeting was attended by the management of ACUTRONIC companies operating in Germany, Switzerland, and the USA.

The meeting was held near Chester, West Virginia. The management of the ACUTRONIC Group of companies reviewed the strategic and financial results of the past two years. In addition, management conducted strategic planning workshops over two days.

An afternoon and evening excursion from West Virginia to Pittsburgh, PA was planned, including a boat ride on Pittsburgh's three rivers. However, the excursion coincided with the rainy remnants of Hurricane Ivan. The ACUTRONIC management left for Pittsburgh in two cars. One car was forced to return, the other, piloted by Dennis Whitehead, forged ahead into Ivan, fording roads covered by as much as one foot of flooding streams. After three hours, the intrepid Mr. Whitehead turned back to the hotel, passing flooded towns and a mudslide that covered half of the highway.

While the trip into Pittsburgh was a bust, the people in the second car, including three Swiss nationals, got their river tour and an excursion into "Ivan" to remember!]

Linking with New Generation Female Engineers

Paul A. Hollinger, ACUTRONIC USA

ACUTRONIC USA hosted fourteen local female students from the FIRSTE program.

On May 11, 2004, ACUTRONIC USA hosted a visit from the FIRSTE program. The FIRSTE program is a local initiative that helps promote and foster interest in technology and engineering careers for female high school students. FIRSTE stands for "Females Involved from Regional Schools in Technology and Engineering".

During the visit, fourteen students heard a talk by Dr. Louis DeMore about the type of work that ACUTRONIC does and videos were presented of some significant projects. During the plant tour, the group saw demonstrations of several systems, including a three-axis inertial test table and a hexapod produced for a thermal vacuum chamber. The students visited the engineering area and were given a demonstration of our engineering design software and viewed a solid model of a hydraulic simulator. ACUTRONIC hopes that their efforts may inspire some future engineers.]

High School students from FIRSTE program visiting ACUTRONIC USA.

High-Tech Business Support

Larry Zana, ACUTRONIC USA

ACUTRONIC USA Joins the Pittsburgh Digital Greenhouse (PDG).

The PDG is a strategic economic development initiative established to foster growth for companies in the Western Pennsylvania region that are developing System On Chip (SoC) technologies, embedded systems technologies, and related technologies. Founded in 1999, the PDG has helped to create an ideal environment for business expansion by leveraging the Pittsburgh region's existing high-tech base, and combining it with resources and support from local universities, private foundations, regional development organizations, as well as state and local government, and industry. Membership in the PDG will help ACUTRONIC to develop synergy with other PDG member companies, allowing early access to related technologies as well as commercialization partnership opportunities.]

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