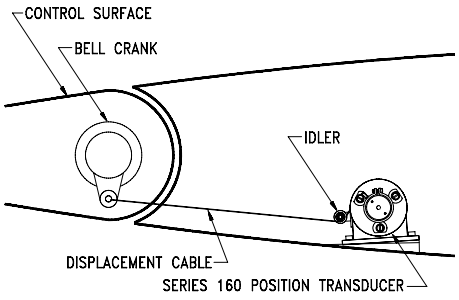
POSITION Measurement & Control

Winter 1998 *Practical Information on SpaceAge Control, Inc. Position Transducers*

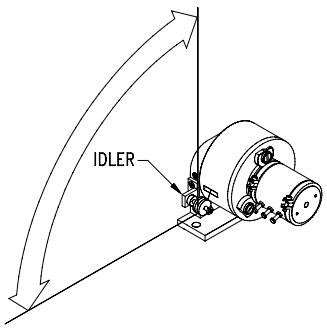
Application Corner

Use of the Idler in Cable Re-Direction

Idlers were developed to allow the displacement cable on SpaceAge Control position transducers to more effectively track the rotational movement of flight control surfaces. The idler allows the cable to sweep approximately 90° through a geometric plane, tracking the flight control surface as the surface rotates.



The idler has also been used as a stand-alone cable re-direction device. An example is an X-Y-Z positioning system for a scissors table. The product design requirements required the position transducer to fit within a specific footprint. This limitation did not allow for the cable to exit the transducer in the direction of the motion to be monitored. To solve this problem, an idler was mounted



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Gymnastics in the Sky

Acrobatic Aircraft Instrumentation Increases Precision

If test pilots need to have the "right stuff," then acrobatic pilots need to have the "right stuff" plus the precision of a surgeon and the timing of an orchestra. Acrobatic flying competition is a demanding suite of compulsory, freestyle, and unknown components. All flying must be performed in an imaginary 1000-meter per side cube that is 100 meters off the ground. Performance in competition is based on how well the pilot can generate crisp vertical, horizontal, and 45° lines; circular loops; and 90°, 180°, and 360° rolls.

The Akrotech Unlimited G300 prototype unlimited class acrobatic aircraft.

Developing and finetuning the skills for acrobatic flying typically involves a feedback process with the pilot and ground-based observer. The ground-based observer watches the acrobatic routine and provides a real-time or post-flight audio critique of the flying. While valuable, such a critique is limited in the information it can provide and often results in disagreements between the observer and the pilot.

Frustrated with the lack of objective data to quantify their training, world-class acrobatic pilots Bob Meyer and Marta Bohn-Meyer decided to instrument their aircraft, the Akrotech Unlimited G300, to provide flight details that could be used to enhance their flying performance. The G300 is an ultralightweight prototype acrobatic aircraft with a six-cylinder engine that generates 350+ HP and 210 knots maximum speed. The aircraft is made entirely of composite materials and features a pilot seat inclined at 45° to improve the pilot's ability to handle g-loads. In competition, g loads of +8 g and -6 g are commonly experienced.

To obtain the required flight data, the Meyers and some friends outfitted the prototype aircraft with over 40 sensors and a datalogger. The datalogger was a Tattletale from Onset Computer Corporation. Sensors included three rate gyros for inertial measurement, pressure transducers for air data acquisition, strain gages for wing and stick force measurement, and three SpaceAge Control Model 173-0241 position transducers for stick, rudder, and aileron position measurement. During flight, the Tattletale datalogger can capture up to 12 minutes of flight data from 32 channels at a rate of 25 samples per second per channel. After the flight, the data is downloaded to a notebook PC for graphing, analysis, and evaluation using MatLab.

To date, the data acquisition system and sensors have been invaluable in providing feedback to the aircraft manufacturer and in enhancing the Meyers' acrobatic skills. For example, the execution of a particular snap roll was performed inconsistently by both of the Meyers. Analysis on the ground of stick

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SpaceAge Control, Inc.

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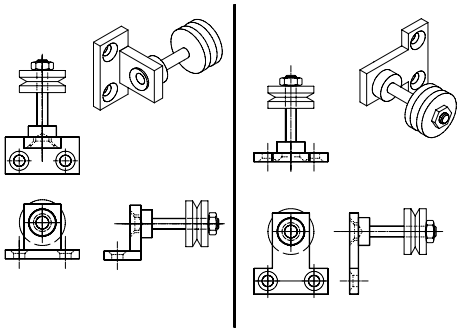
Application Corner (continued from page 1)

to the scissors table to re-direct the cable 90° from the direction the cable exited the transducer.

If your application requires re-direction of the cable, consider the use of idlers. SpaceAge Control idlers can be ordered as part numbers 160022 and 161022. If these products do not meet your requirements, please feel free to contact us for sources of wheel and pulley components.

Material on the idler usage and scissors table application was provided by Test Interface Systems, Inc., a company focused on the crash test and automotive industries.

SpaceAge Control, Inc. Idlers



P/N 160022 **P/N 161022**

Test Interface Systems, Inc. offers design and fabrication of test fixtures, instrumentation cabling/paneling, and data acquisition systems. For more information on Test Interface Systems, please contact:

John Cheyne
Test Interface Systems, Inc.
8198 Boardwalk Street
Brighton, MI 48116 USA
248-437-5287
248-437-5386 (fax)

Gymnastics (continued from page 1)

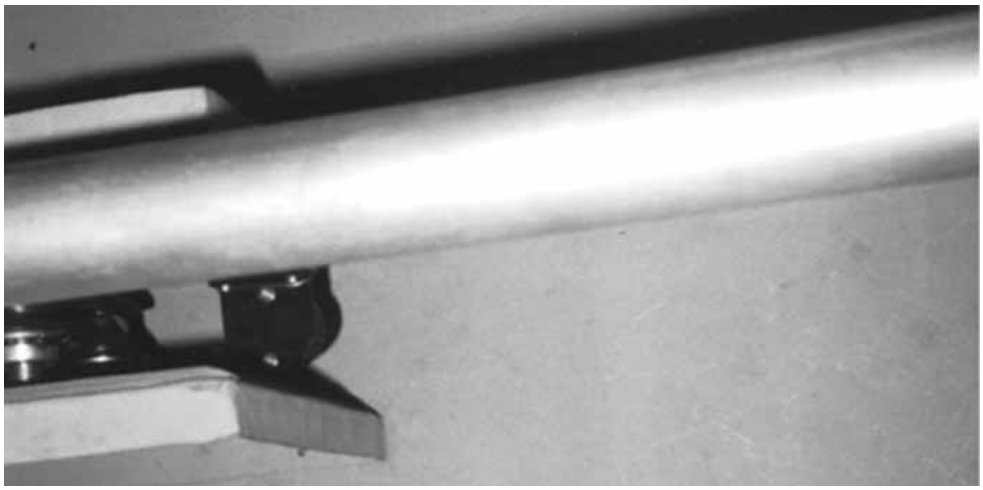
force versus stick position showed that the stick force required was nonlinear throughout the range of motion making it difficult for smooth stick actuation. This data was useful in verifying the nonlinearity and compensating for it once it was verified.

The system is also useful for enhancing the repeatability of the pilot's procedures. Maneuvers can be compared against each other from flight to flight and from pilot to pilot. Variances in performance can be monitored and, with analysis, explained.

Commenting on the selection of SpaceAge Control position transducers for the instrumented aircraft, the Meyers stated, "We have an extremely lightweight aircraft with minimal space available. With those environmental limitations and the need for a highly accurate, reliable, and robust solution, the SpaceAge Control product met our needs."

Bob Meyer and Marta Bohn-Meyer have been building and flying acrobatic aircraft for over 20 years and are active competitors in the unlimited acrobatic category. Bob was a member of the 1994 US Acrobatic Team. Marta was the US Advanced National Champion in 1993.

When they are not finetuning their acrobatic techniques, the Meyers pursue careers in aerospace at the NASA Dryden Flight Research Center where Bob is Director of Engineering and Marta is Deputy Director of Flight Operations. The Meyers also have collateral flight test engineering duties at NASA Dryden where they serve on aircraft such as the SR-71, F-18, F-15, and F-16. Marta has the distinction of being the only woman to serve in a flight crew role on the Mach 3+ SR-71 Blackbird.



Position transducer mounted in confined area to monitor aileron displacement. SpaceAge Control's Model 173-0241 position transducers were selected to monitor stick, aileron, and rudder travel on the G300.

For more information on acrobatic flying and products mentioned in this article, please contact:

Bob Meyer and Marta Bohn-Meyer
5019 West Avenue K-14
Quartz Hill, CA 93536 USA

Akrotech Aviation Inc.
53774 Airport Road
Scappoose, OR 97056 USA
503-543-7960

Lycon Aircraft Engines
8231 West Doe Avenue
Visalia, CA 93291 USA

Onset Computer Corporation
536 MacArthur Blvd.
P.O. Box 3450
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First Technology Safety Systems Has New Test Fixture Underfoot

Crash Dummy Manufacturer Automates Testing Process

First Technology Safety Systems, a leading supplier of crash test dummies, has developed a test fixture to measure the Hybrid III 50th-percentile dummy tibia and foot response. Developed to meet European crash testing requirements, the test fixture, when combined with a data acquisition system, determines if the dummy tibia, upper foot, and lower foot are providing a biofidelic response.

Developed over a three-month period, the test fixture incorporates 1.25-kg or 5-kg probes that impact the test component at speeds as high as 6.7 m/s. An accelerometer is attached to the probe and measures the deceleration of the probe as it impacts the test component. Load cells are mounted and monitored in the lower tibia. The test data can be used to calculate the test component's resistive force to determine if the test component is biofidelic.

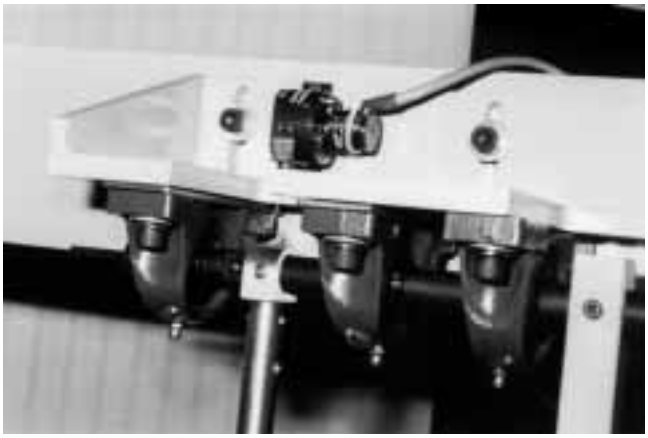
The probes are attached to a pendulum that swings about a shaft mounted on a frame. A SpaceAge Control Model 160-0643 position transducer is attached to the shaft via a set screw and serves to measure the pendulum's angle of rotation. The angle of rotation at which the pendulum is released determines the probe's impact speed. The angle of rotation is displayed on a digital meter.

Why did the company select a SpaceAge Control product for the angle measurement? Gordon Morgan, FTSS Director of Technical Support noted, "We have used the product successfully before in our Hybrid III and BioSID dummies and knew the products were easy to set up, reliable, and provide an absolute position signal."

The FTSS Foot Fixture can be used with the FTSS Data Acquisition System or with customer-supplied data acquisition systems. A turnkey foot testing system will be available from FTSS in the first quarter of 1998.

For more information on FTSS and foot testing, please contact:

Gordon Morgan
First Technology Safety Systems, Inc.
47460 Galleon Drive
Plymouth, MI 48170-0319 USA
313-451-7878
313-454-4784 (fax)
info@ftss.com
http://www.ftss.com



The Model 160-0643 position transducer is used to measure shaft rotation on First Technology's Foot Fixture.

30th Year Open House

On October 16, 1997, SpaceAge Control held an Open House in celebration of its 30th year in operation. Over 200 people attended the event and were treated to a deep-pit barbeque feast. Thank you to all who stopped by to enjoy this fun evening. We hope to see all of you who could not attend this event at the 60th Year Open House!

Door prize winners at the Open House were:

Ron Mahlum	Air Force Flight Test Center
Alan Fisher	Bazz-Houston Co.
David Balian	David Balian Photography
Ron Hart	Instrumentation Consultant
Ruth Lehnhoff	Lockheed Martin Corp.
Chris Patrizio	Media City Machining
Gene Hayden	Palmdale Precision
Dianne Van Norman	The Society of Flight Test Engineers
Col. James Doolittle III	USAF Flight Test Center
Jeff Kuhn	USAF Instrumentation Lab

New Manufacturing System Implemented

SpaceAge Control has recently implemented a new manufacturing system that will result in faster response, better communications, and improved manufacturing accuracy.

With the new manufacturing system, prospects, customers, and vendors will see new formats for a number of forms including quotes, order acknowledgments, invoices, and certificates of conformance.

In addition, changes in our product ordering scheme were implemented with the new manufacturing software to make ordering easier. Product options will now be printed in full on all relevant forms.

Please contact us if you have any questions or comments about our new manufacturing system. ❑

Upcoming Events

We invite you to visit us at these upcoming events:

February 23 - 26, 1998
1998 SAE International Congress and Exhibition

sponsored by the Society of Automotive Engineers
Booth # 834
Cobo Center
Detroit, Michigan USA
412-772-7131
412-776-0210 (fax)
http://www.sae.org

May 19 - 21, 1998
Sensors Expo San Jose

Booth # 1036
San Jose Convention Center
San Jose, California USA
203-256-4700
203-332-4569 (fax)
http://www.expocon.com

September 14 - 18, 1998
Society of Flight Test Engineers

30th Annual Symposium
Silver Legacy Hotel
Reno, Nevada USA
805-538-9715

See us at SAE '98 in booth #834
February 23-26, 1998, Cobo Center
Detroit, Michigan USA

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