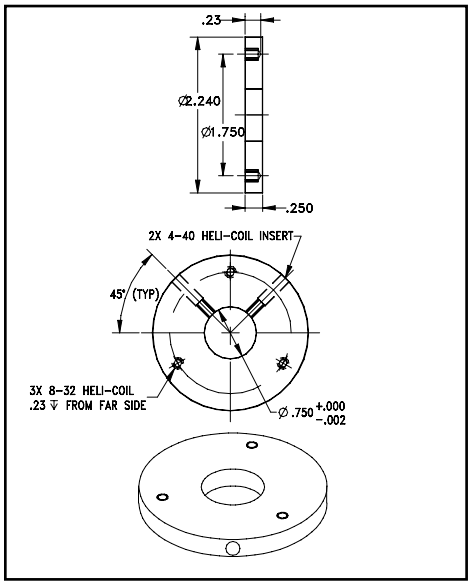
POSITION Measurement & Control

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

New Mounting Disc Available for Series 160, 161, and 162 products

Smaller Profile, More Affordable

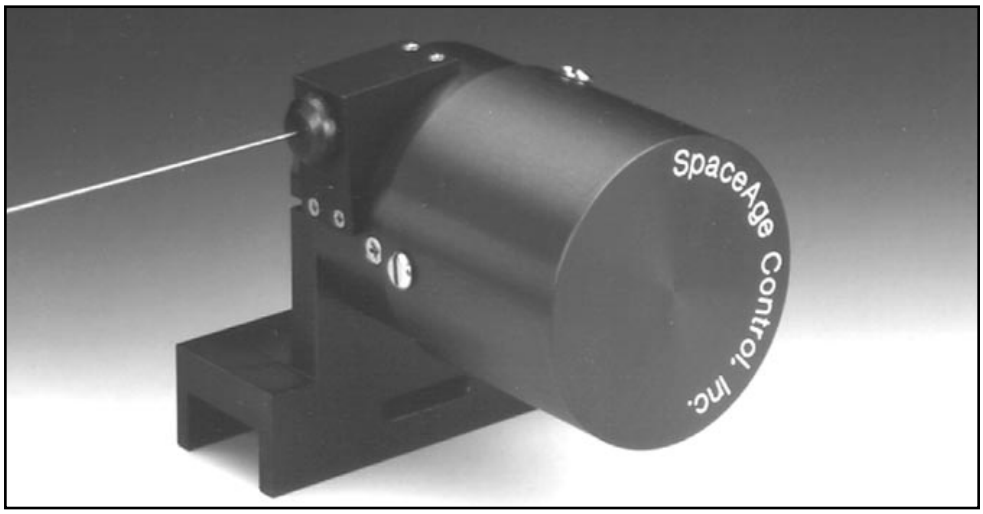
Developed from customer feedback, the 160040-1 mounting disc is now available for the Series 160, 161, and 162 product lines. As the figure below shows, this base is smaller than the other bases available for these product lines. The mounting disc allows the position transducer to be mounted such that the cable exits in the plane of the mounting surface. Once mounted, the position transducer may be rotated 360° to finetune the displacement cable alignment.



The 160040-L mounting disc.

In addition to smaller size, the mounting disc allows the displacement cable to travel along the same plane as the base itself and is more affordable. For more information on the mounting disc, please complete the reply card on page 3 and return it or contact us by phone, fax, or e-mail. ❑

Flight Data Recorder-Compatible Position Transducers



SpaceAge Control position transducers offer reliability, quick installation, flexible mounting, and varied electrical outputs for flight data recorder use.

Responding to an FAA mandate requiring that increased flight data parameters be monitored on commercial aircraft, SpaceAge Control, Inc. now offers position transducers compatible with commercial aircraft flight data recorders. The products have size, weight, and installation advantages over traditional rod-and-cylinder transducers such as LVDTs and linear potentiometers. In addition, they offer easier mounting than rotary synchro and RVDT sensors.

SpaceAge Control position transducers were first developed in the late 1960's to monitor aircraft flight control surfaces for NASA. Since that time, these products have been used in a broad range of aircraft/aerospace applications for control, acquisition, test, and measurement purposes. Most recently, they have been used with military aircraft flight data recorders by Aerospace Technical Services.

The flexible and space-efficient products use a stainless steel cable wound around a precision-machined drum. The bearing-mounted drum is mated to a precision sensor based on potentiometric, synchro, RVDT, or encoder technology that translates linear position information to an electrical signal. This transducer technology gives high precision, easy installation, and fast calibration. The products are quickly mounted using high-flexibility mounting bases or custom installation plates.

For more information on aviation-related uses, request our Application Note for Aircraft/Aerospace using the reply card on page 3 of this newsletter. For more information on the FAA ruling requiring expanded parameter monitoring, please visit:

http://www.faa.gov/avr/arm/dfdr24.txt

This Web page gives background information on the subject, why the requirement was made, and what the requirement is.

For more information on the use of SpaceAge Control products by Aerospace Technical Services for flight data recorder use, visit:

http://www.aerospace.com.au/aerospace/Whatsnew.htm

SpaceAge Control, Inc. designs and manufactures position transducers and air data products for virtually every commercial, military, and general aviation company in the world. ❑

SpaceAge Control, Inc.

PLEASE ROUTE TO: ❑_____ ❑_____ ❑_____ ❑_____

Rib Cage Intrusion Measured By Position Transducers

MGA Research Corporation Component Testing

Editor's Note: Thank you to Jessica Cronkhite, Lab Manager for MGA Research's Sled/Dynamic Test Lab for providing background information.

MGA Research Corporation, an independent test and research laboratory specializing in transportation safety, was recently contracted by an automotive manufacturer to determine the intrusion into a vehicle passenger compartment during a side-impact vehicle collision. Side-impact collisions can be a source of tremendous passenger injuries due to the relatively weaker structures found in the door areas of vehicles.

To perform the test, MGA Research used a Biofidelic Side Impact Dummy, or BioSID. This dummy is instrumented with six SpaceAge Control Model 160-0321L position transducers having maximum ranges of 4 inches (101.6 mm). These products are modified Model 160-0321 position transducers and have 56 ounces (16 N) of cable tension compared to 16 ounces (4 N) found on the standard model. The Model 160-0321L products also have an application-specific mounting base and use a crimped ball for displacement cable connection.

The six position transducers in the BioSID are mounted along the spine with the displacement cable attached to ribs. The purpose of the transducers is to measure thorax and abdominal rib deflectionfsfp. With the increased cable tension, these transducers can monitor cable accelerations in excess of 50 g's.

Side-impact simulation tests can either be performed using a side-impact sled ora pneumatic impactor on a component-level basis. In both cases, the component being evaluated impacts the BioSID at a specified velocity. The six position transducers sense the displacement of the rib cage as it is impacted. The results can then be compared to an acceptable reference number, typically either a minimum or maximum value.

Side-impact simulation tests normally require a week to set up using two test technicians and a test engineer. Individual tests last just a few seconds. Test results are immediately available using custom MGA Research data acquisition software.

MGA Research was founded in 1977 and has six facilities located in New York, Michigan, and Wisconsin. The company performs full-scale crash, sled, and component-level testing. In addition, computer modeling and simulation, test equipment design and fabrication, and environmental testing services are offered. For more information on MGA Research, please contact:

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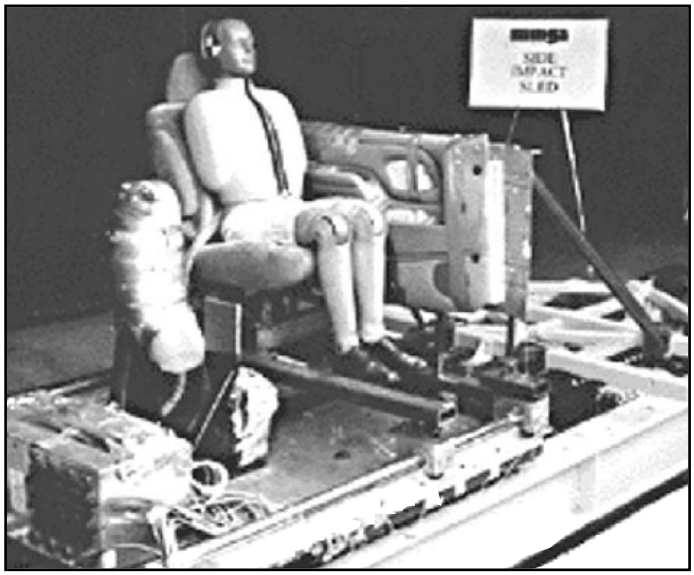

The calm before the storm: BioSID crash impact dummy awaits side impact outfitted with six SpaceAge Control Model 160-0321L position transducers.

Application Corner

Q. I need to acquire position information into a data acquisition system that accepts digital or analog signals. Should I choose an incremental encoder- or nonwirewound potentiometer-based position transducer?

A. Without knowing more about the application, it is difficult to make a firm recommendation. However, Table 1 on page 3 shows some differences between the two sensor types.

In general, if you need absolute position information that includes knowing where the object being monitored is at time of power up, then a potentiometer is the preferred sensor. If you need relative position information or can live with moving to a reset position at time of power up, then an incremental encoder might better suit your needs. For a given application, there in not an inherent price advantage in using one type or the other.

For certain applications, other rotary sensors such as a absolute encoders, synchros, resolvers, and RVDTs offer benefits not found in potentiometers and incremental encoders. If you would like assistance in selecting the proper sensor for your application, please contact us or request the *Selecting Position Transducers* reprint via the reply card on page 3.

(continued on page 3)

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Application Corner *(continued from page 2)*

Table 1

ENCODER

Advantages

- non-contact sensor with lifetimes often in the 100 millions of shaft revolutions
- not typically affected by noisy circuits
- accuracy can ultimately be higher (for a price)

Disadvantages

- relative output that requires resetting to a zero point at power on
- interfacing and programming can be trickier

POTENTIOMETER

Advantages

- absolute signal (power cycling does affect output at power on)
- easy setup with a usually little programming involved

Disadvantages

- limited range without gear reduction
- contact sensor with lifetime often limited to 5 million shaft revolutions on multi-turn units
- circuit noise can affect measurement accuracy

Frequency Response

If you need to translate sinusoidal motion parameters of displacement (D), velocity (V), acceleration (A), and frequency (F), you might find the equations below handy.

$$D = V/(\pi F) = (GA)/(2\pi^2F^2) = (2V^2)/(GA)$$

$$V = \pi FD = (GA)/(2\pi F) = ((GAD)/2)^{1/2}$$

$$A = (2\pi^2F^2D)/G = (2\pi FV)/G = (2V^2)/(GD)$$

$$F = ((GA)/2\pi^2D))^{1/2} = V/(\pi D) = (GA)/(2\pi V)$$

Metric	Imperial	SI
D = mm peak-to-peak	D = in peak-to-peak	D = mm peak-to-peak
V = mm/s peak	V = in/s peak	V = mm/s peak
A = g_n peak	A = g_n peak	A = m/s^2 peak
F = Hz	F = Hz	F = Hz
G = 9806.65 mm/s^2	G = 386.0885827 in/s^2	G = 1000 mm/s^2
π = 3.141592654	π = 3.141592654	π = 3.141592654

Reference: An Introduction to Vibration by Richard Baker, Ling Dynamic Systems, Inc., 60 Church Street, Yalesville, CT 06492 USA, +203-265-7966, +203-284-9399, 1995. ❑

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New CNC Machining Center

Our new state-of-the-art CNC machining center is now in full operation.

This facility is fully integrated with our design process and allows us to improve on our delivery times for standard and custom products. This facility incorporates a complete inspection area, CNC and conventional machines, and is able to meet the most rigorous quality system requirements.

Machines added to our capabilities include a Hass VF-2 vertical CNC mill, FEMCO CNC lathe, Sharpe conventional mill, and other metal cutting machines and tooling.

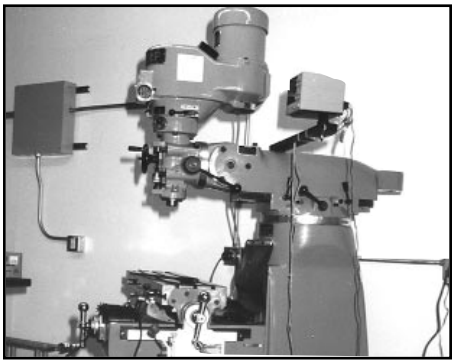
CAD/CAM-capable, the center is focused on rapid turnarounds from receipt of work order to final inspection. AutoCAD Release 14 and MasterCAM are used in-house with the capability to work with industry-standard formats as required.

For more information on the capabilities of this operation, please contact Robert Dodes of SpaceAge Control, Inc. at 805-947-2100 or cnc@spaceagecontrol.com. ❑

New CNC lathe First article!

Verticle CNC lathe

CNC lathe



Conventional mill

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