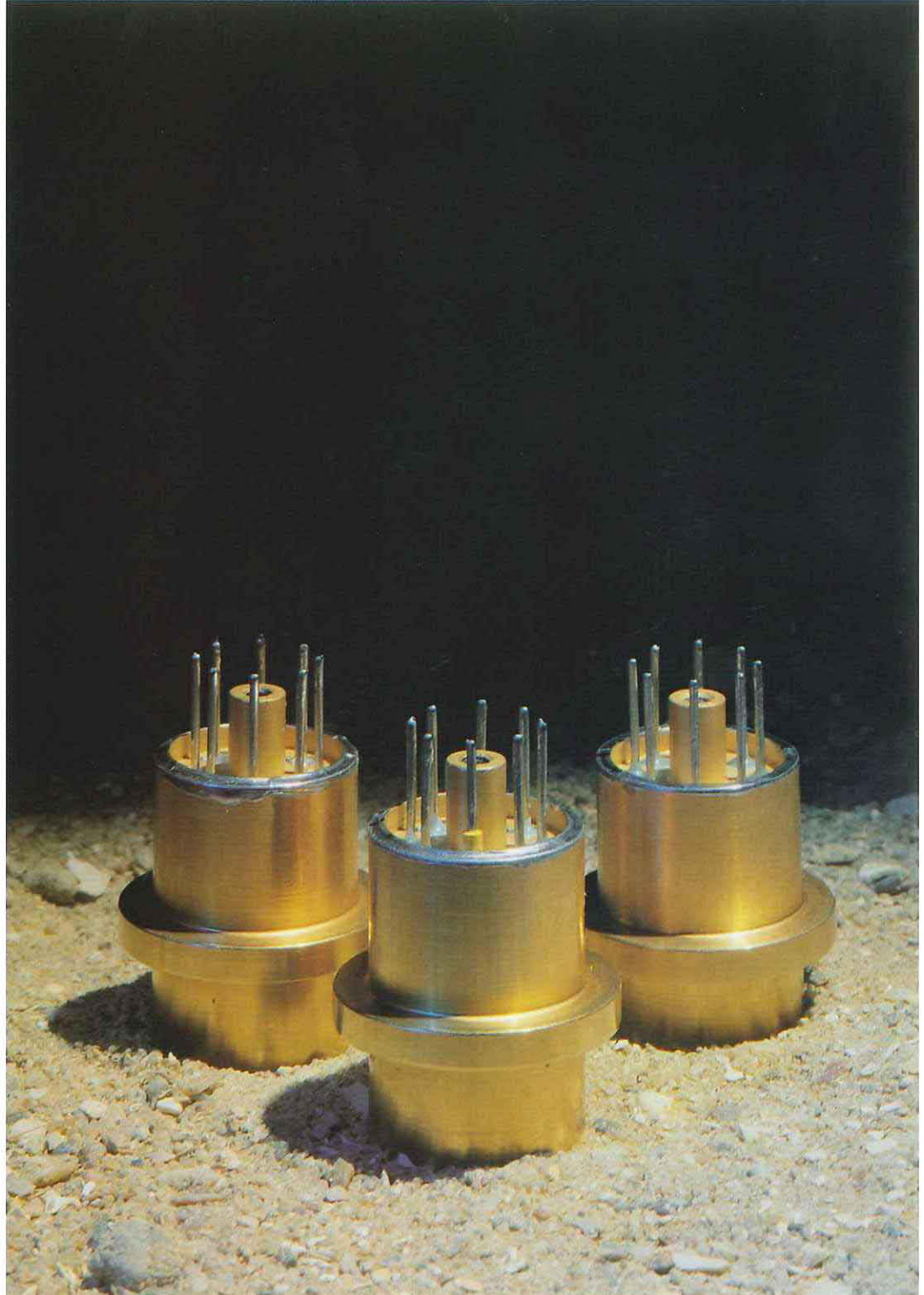


S T A R T

GEC AVIONICS

SOLID STATE ANGULAR RATE TRANSDUCER



ADVANCED ENGINEERING FOR DEMANDING ENVIRONMENTS

www.rochesteravionicarchives.co.uk

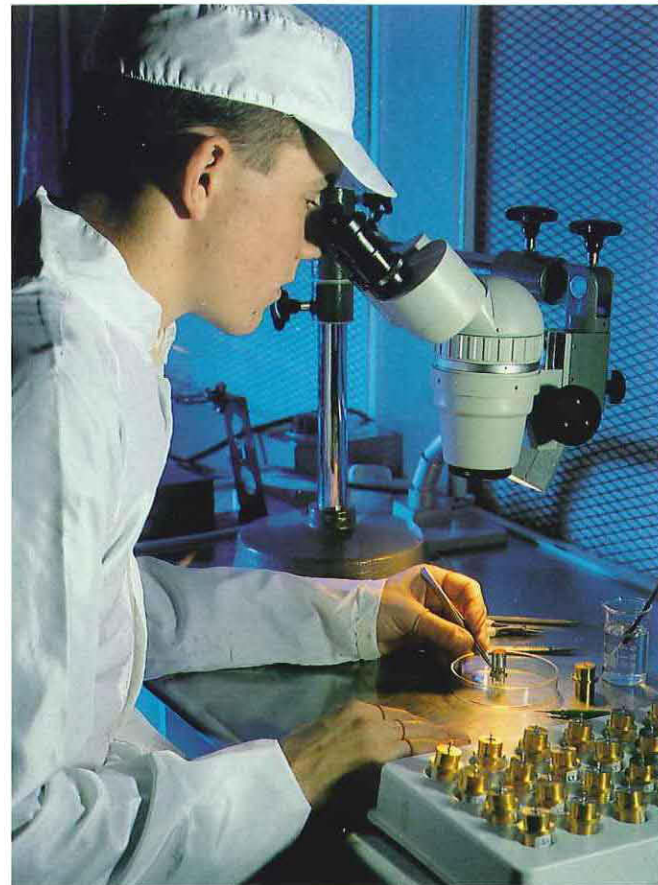
START

SOLID STATE ANGULAR RATE TRANSDUCER

Using advances in material technology and micro-electronics GEC Avionics has further refined the established principle of the vibrating element angular rate gyroscope to produce a new generation Solid State Angular Rate Transducer (START). The unit price is estimated to be less than one tenth of that for conventional rate gyroscopes of similar performance.

Compared with the traditional wheeled gyroscope START has no moving parts and suffers none of the problems associated with bearing wear and lubrication. With no mechanism that will wear out START yields long life (active and shelf) without the need for any maintenance.

START offers a new dimension to applications where cost and delicate nature of conventional gyroscopes has limited their use.



Pre-production manufacture



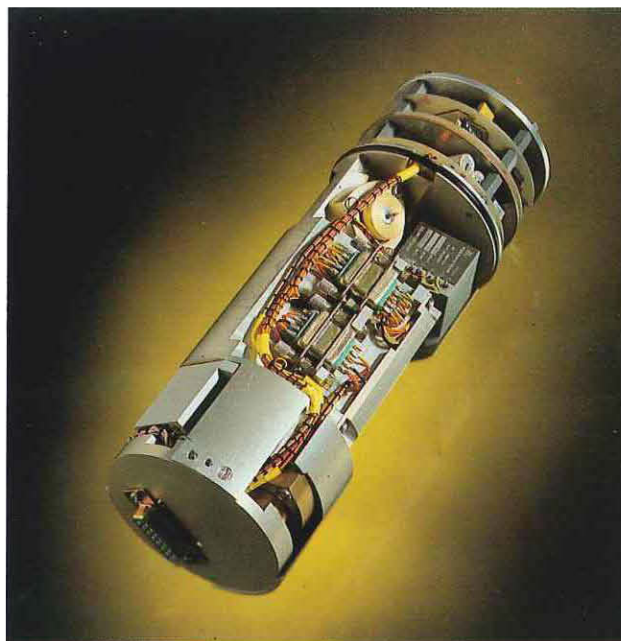
In recognition of its innovative design and the considerable potential benefit offered to a wide spectrum of commercial and military uses, START has been awarded one of the United Kingdom's most prestigious technology accolades. From an entry exceeding 500 new products, START was selected as an award winner for the innovation stage of the 1990 Prince of Wales Award for Innovation and Production



Above and sub-surface stabilisation
Photograph courtesy of Total Oil Marine p.l.c.



Yaw rate sensing proven in F1 racing



Customised 3 axis configuration

APPLICATIONS

START is a major advancement providing robust and cost effective solutions for numerous applications in a diverse range of user environments.

Oil and Gas Industry:

positioning and handling systems

Vehicle Motion Sensing:

vehicle dynamic control

Remotely Operated Vehicles:

stability control systems

Precision Guided Munitions:

inertial control systems

Oceanographic Instrumentation:

sea surface motion,

heave compensation

Process Control:

flexible manufacturing techniques

Flight Instrumentation:

flight data recording

Robotic Engineering:

stabilisation and control of tools

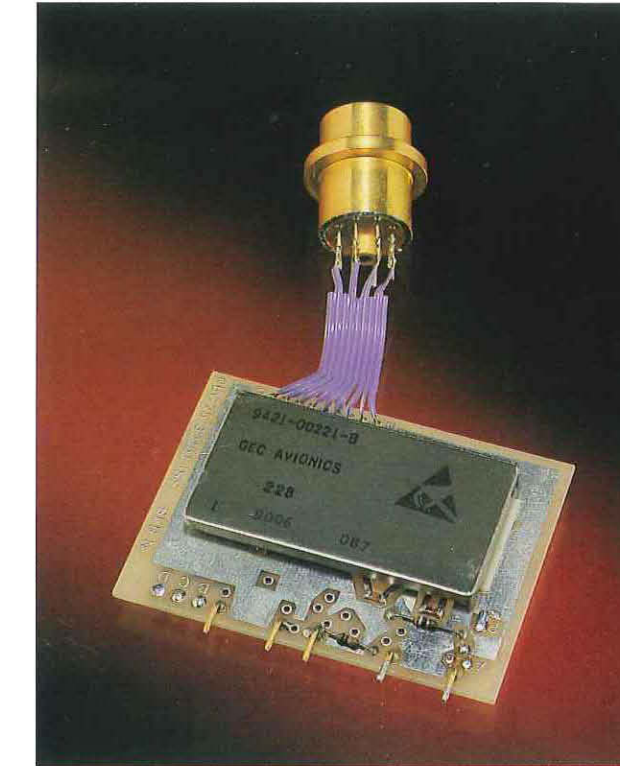
Human Factors Assessment:

measurement of body movement

STATUS

START sensors and associated hybrid electronic modules have been procured by a number of customers for a range of applications including Precision Guided Munitions, Active Vehicle Control Systems and Sea Heave Compensation. In the automotive industry START is already being incorporated into developmental electronic systems which will improve the safety and performance of a wide range of vehicles from the family car to the heavy goods vehicle. During tests for these applications START has successfully completed trials in arctic conditions and has been subjected to 25,000g accelerations.

START is available in single or three axis form and GEC Avionics is prepared to offer its long established inertial system engineering capabilities to customise configurations for particular user requirements.



START sensor and control electronics



Preparation for high volume production

DESIGN BENEFITS

The design of START includes the following benefits:

Wide Operating Range: With a resolution of $<0.03^\circ/\text{sec}$ it measures angular rate from $0.03^\circ/\text{sec}$ to $1600^\circ/\text{sec}$. The scale factor can be adjusted by using two external resistors.

Overranging Survivability: Being solid state it recovers immediately and cannot be damaged in the same way as conventional gyroscopes.

Readiness Time: It is fully operational within 0.25 secs of applying power, unlike a spinning wheel gyroscope.

Good Temperature Tolerance: Full operational performance is provided between -20°C and $+60^\circ\text{C}$. This will increase to -40°C and $+80^\circ\text{C}$ with the introduction of a custom chip. It will withstand storage within the range -50°C to $+120^\circ\text{C}$.

Resistance Against Shock: It is inherently rugged having survived a shock of 25,000g, equivalent to being fired from a large calibre gun. It cannot be damaged by handling.

Small Size and Light Weight: The simplicity of design provides a sensor significantly smaller and lighter than existing gyroscopes.

Constant Low Power: START has no spin motor or heaters and the power consumption remains constant at less than 1.2 watts throughout the rate range.

Low Noise Level: There is no source of mechanical noise and good design practices have been employed to minimise the electrical noise level.

Shelf Life: There are no lifed items and no requirement for periodic exercising or other maintenance actions

CONTINUING DEVELOPMENT

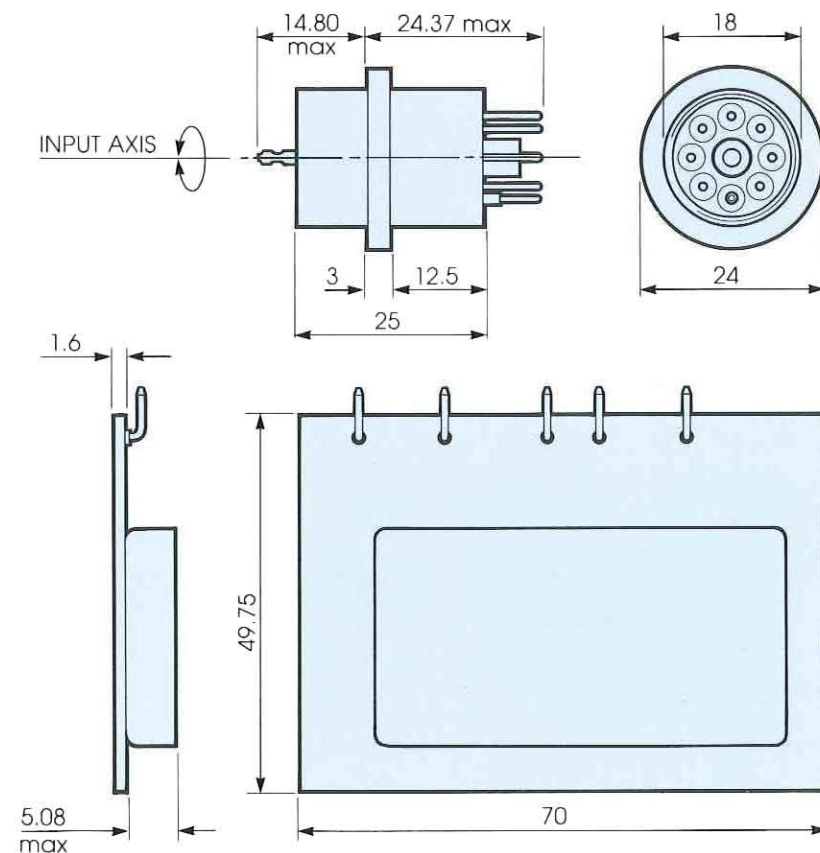
Refinement of START continues to realise the price objective for high volume production. This will be achieved by replacing the present hybrid electronics with a custom designed integrated analogue chip packaged on the sensor cylinder and by further automating the manufacturing techniques.

OUTLINE SPECIFICATION

Range.....	Adjustable up to 2000°/sec
Overrange characteristic	25000°/sec
Saturation characteristic	Constant output
Weight	40gms (inc hybrid)
Excitation	±15Vdc
Power	1.2 watt
Full scale output	±10Vdc
Bias stability	±4°/sec
Switch on repeatability	Bias ±1°/sec, Scale ±2%
Scale factor (20°C)	±2%
Scale factor variation with temperature	±3.5%
Linearity	<0.25% full scale
Hysteresis	<0.1% full scale
Resolution/threshold.....	<0.03°/sec
Start up time	<200msec
Bandwidth	>50Hz
Noise	<0.1°/sec RMS
Bias (offset at 20°C)	±1°/sec
Operating temperature	-40° to +80°C
Shock survival	>25000g 5msecs
Vibration	1.5mm DA 10Hz to 57Hz 10g peak 57Hz to 9KHz
Maintenance.....	No lifed items No preventative maintenance required

DIMENSIONS IN MILLIMETRES

ACTUAL SIZE SHOWN



**THE PRINCE OF WALES
AWARD**
For Innovation and Production
Finalist 1990

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