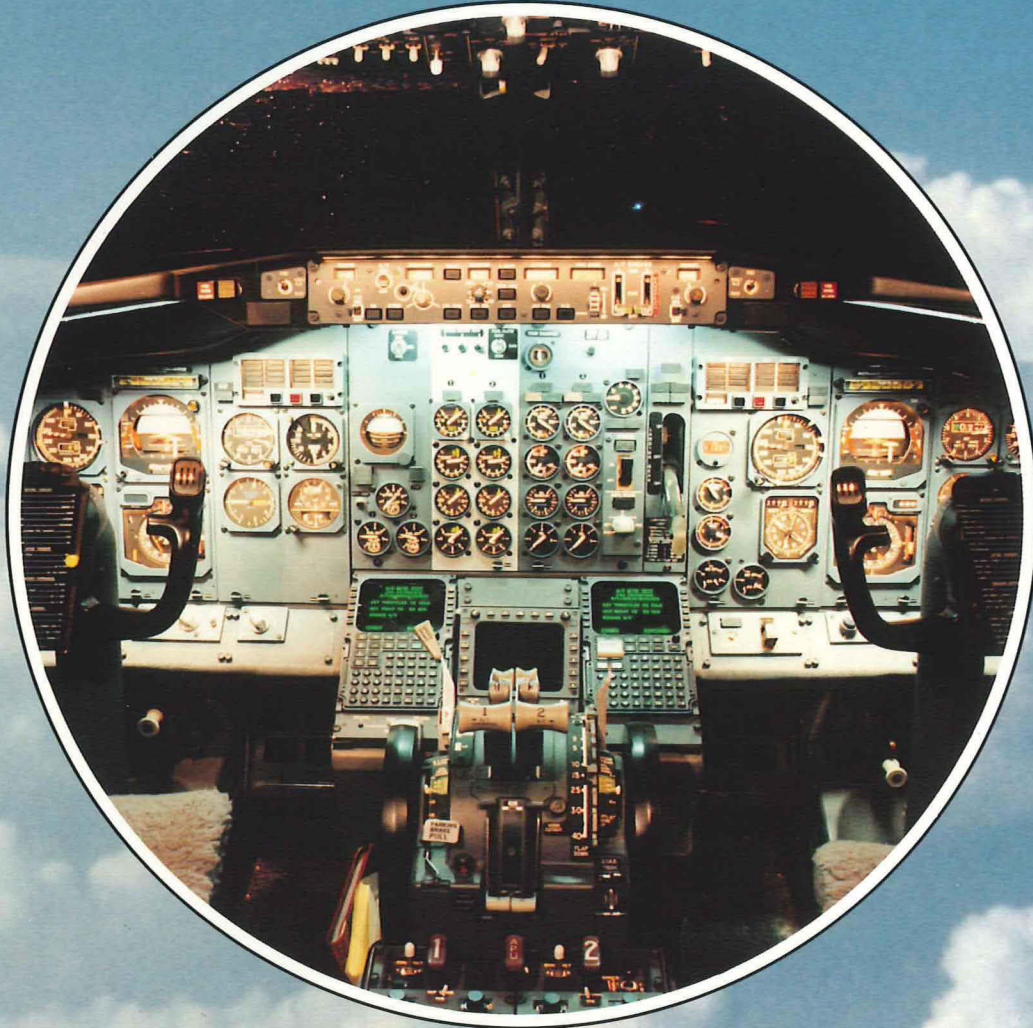
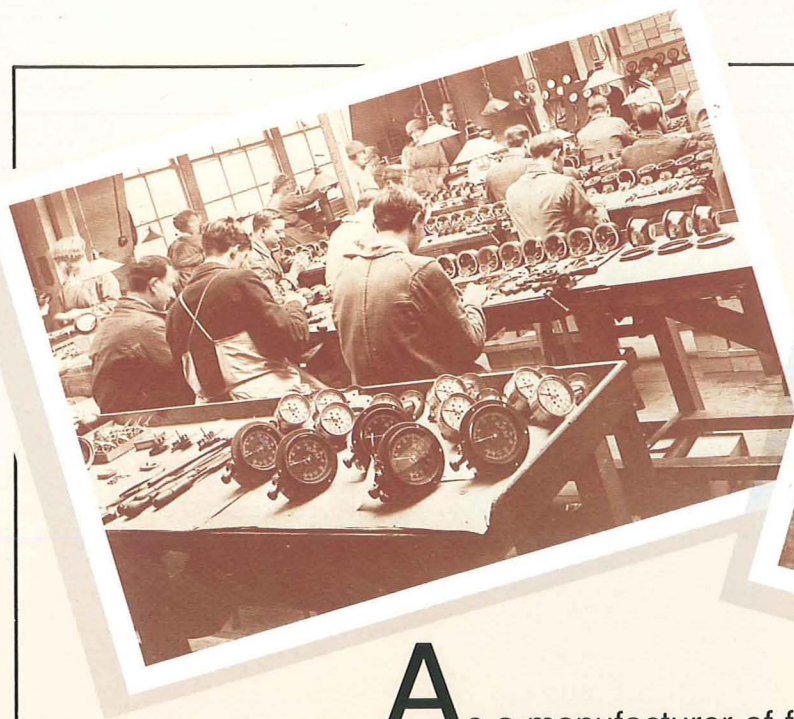


Flight Deck Instruments & Flight Deck Display Systems



SMITHS INDUSTRIES
The logical choice

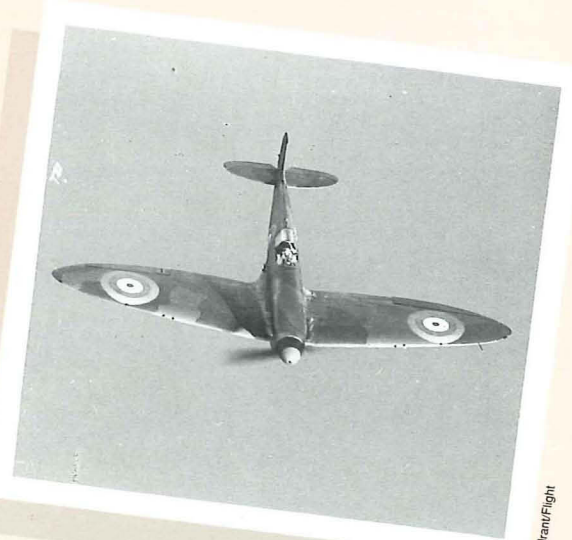
www.rochesteravionicarchives.co.uk



QuadrantFlight

As a manufacturer of flight deck displays, Smiths Industries pedigree goes back almost 80 years. In 1912 we designed and built the airspeed indicator for the Blackburn Monoplane – now part of the Shuttleworth collection and still capable of flying. And in 1919 Alcock and Brown made their historic flight across the Atlantic in a Vickers Vimy equipped with our engine speed and airspeed indicators.

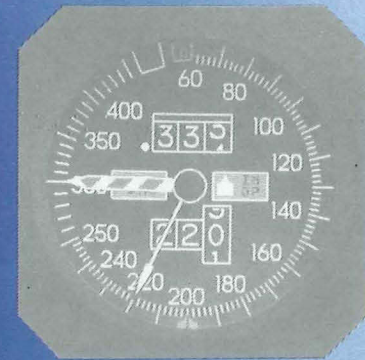
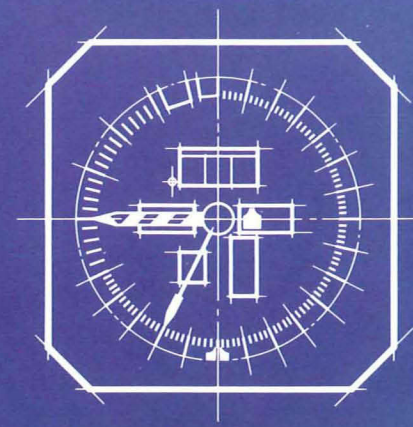
Since those early days instruments from Smiths Industries have featured prominently both in military and civil cockpits and today, our indicators and display systems are specified by airline operators, airforces and airframe manufacturers all round the world. Among our customers we are proud to number the best-known names in the aerospace industry. Names such as Airbus Industrie, Boeing, British Aerospace, Embraer, Fokker, McDonnell-Douglas, Panavia, Shorts and Westland. These are the names against which our success can be gauged, and on which our reputation stands.



QuadrantFlight

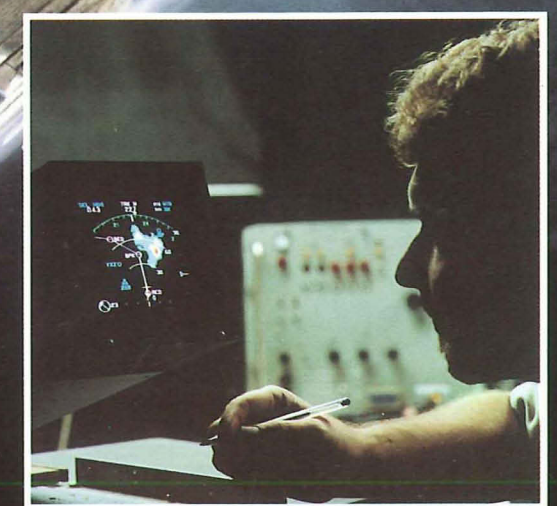
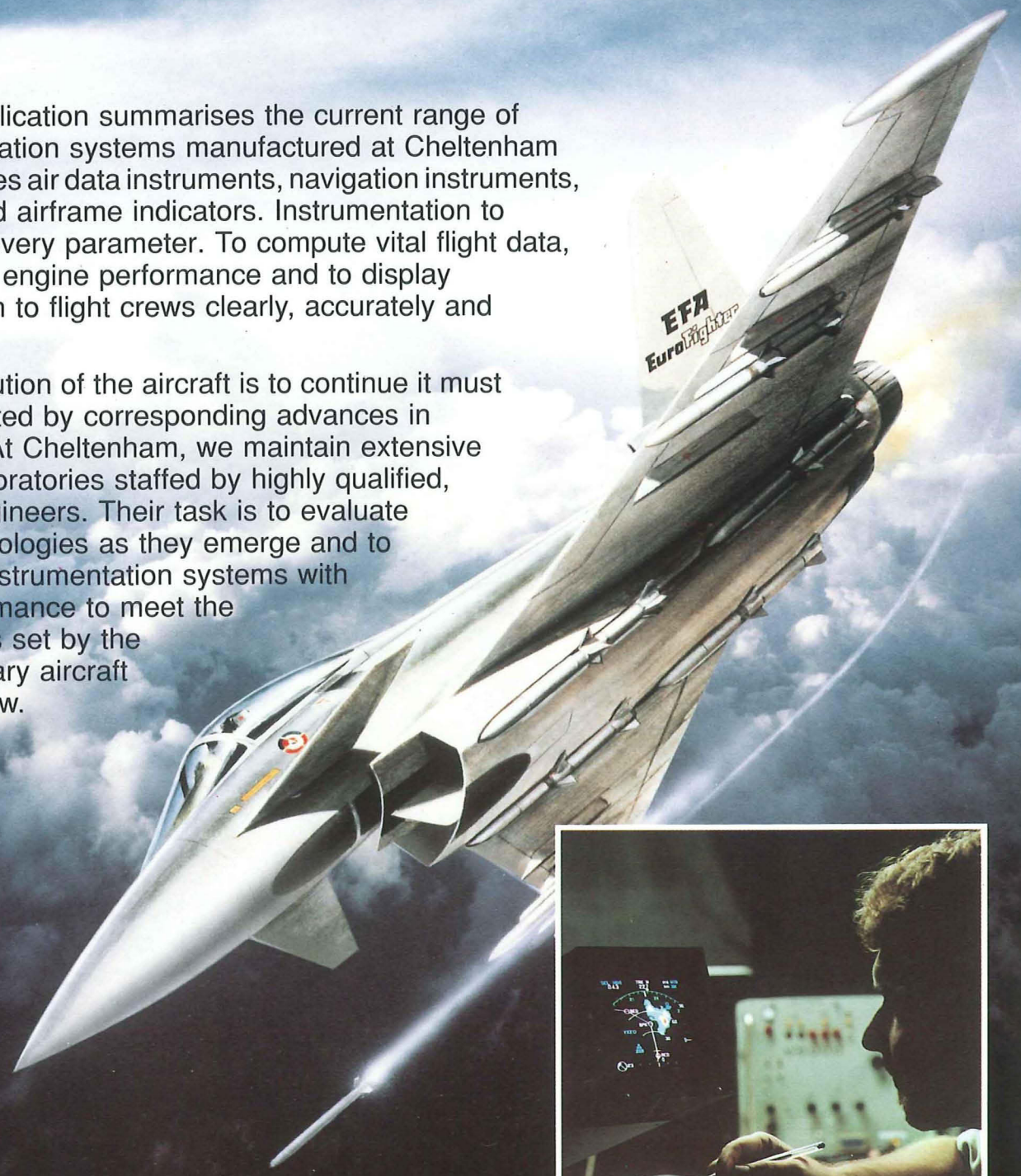


QuadrantFlight



This publication summarises the current range of instrumentation systems manufactured at Cheltenham and includes air data instruments, navigation instruments, engine and airframe indicators. Instrumentation to measure every parameter. To compute vital flight data, to monitor engine performance and to display information to flight crews clearly, accurately and reliably.

If the evolution of the aircraft is to continue it must be supported by corresponding advances in avionics. At Cheltenham, we maintain extensive R & D laboratories staffed by highly qualified, skilled engineers. Their task is to evaluate new technologies as they emerge and to develop instrumentation systems with the performance to meet the challenges set by the revolutionary aircraft of tomorrow.



Hybrid Display Engine Instruments

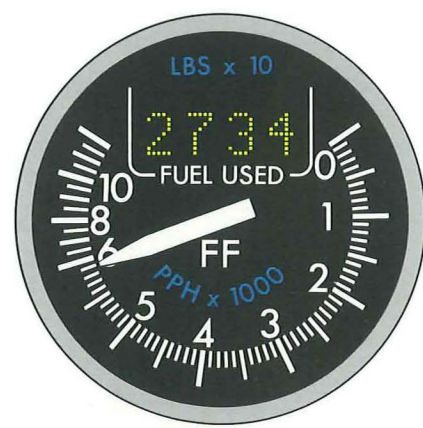
Hybrid engine indicators feature an analogue pointer and a LED, dot matrix display. The pointer is driven by an electro-mechanical servo loop and the LED display is programmed to show sense and rate information just like a conventional mechanical counter. A powerful microprocessor is incorporated to enhance performance and provide greater flexibility.



- Available in 2" round or 2ATI cases
- Standard fit on Boeing 737-300
- Standard option on Airbus A310 and A300-600
- More than 6,000 instruments supplied to date



Typical 2ATI indicators supplied for A310 and A300-600



Typical 2" Round indicators on Boeing 737 aircraft

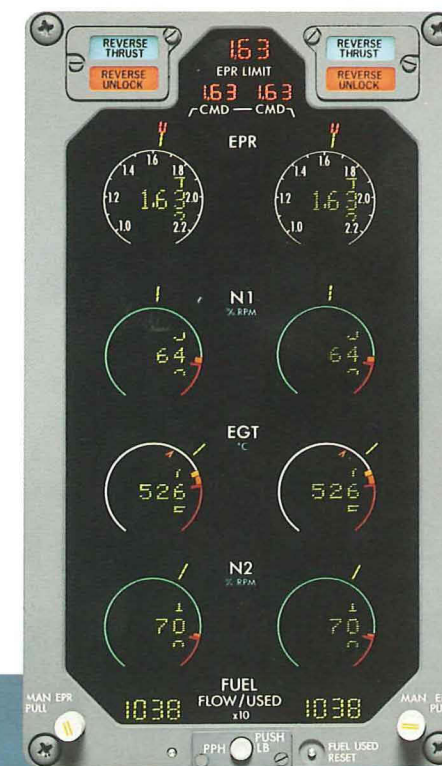


Solid State Engine and Systems Displays

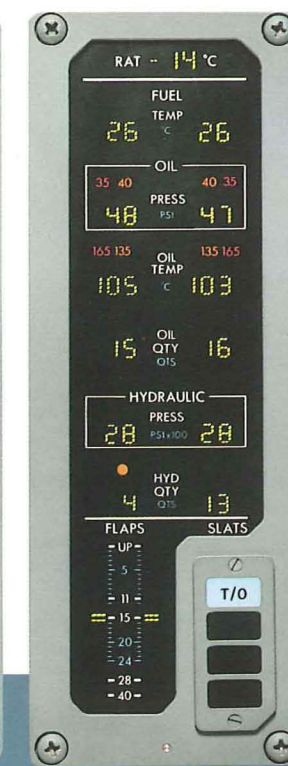
Selected by major airframe manufacturers for commercial and military aircraft, Smiths Industries LED-based instrumentation has won total acceptance by flight crews and certification authorities.

The presentations use LEDs for the active display elements which are formatted to be direct replacements for existing electro-mechanical instruments. Information is therefore presented in a form already familiar to the aircrew. The all solid-state design brings significant benefits to operators in terms of weight reduction, power savings, increased reliability and lower cost-of ownership. No cooling air is required, no major wire changes are necessary and there are no changes to airplane sensors. The versatility of the LED display technique makes these instruments ideal for many applications in today's aircraft and Smiths Industries equipment is currently specified for primary engine display panels, systems display panels, overhead annunciator panels, message displays and for standby engine and air data displays.

Suitable for all MD-80 Series airplanes, Smiths Industries solid-state instrumentation systems have initially been selected by McDonnell-Douglas as Primary Engine Displays, System Displays and Annunciator Panels for the MD-88.



Primary Engine Display

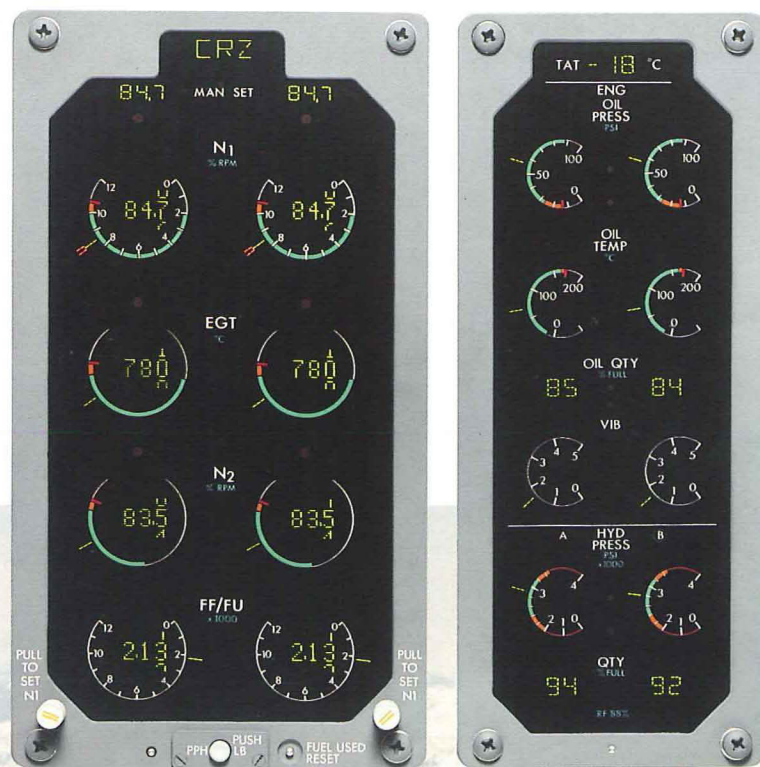


System Display



Overhead Annunciator Panel





Primary Engine Display

Secondary Engine/Hydraulic Display

Solid State Displays

Boeing has selected Smiths Industries solid-state Engine Instrument Systems for CFM56 powered B737 Series airplanes as direct replacements for existing electro-mechanical instruments.

They are ideal not only for new-build aircraft but also for existing 737 Series aircraft where they can be retrofitted without significant mechanical or electrical modifications.



Designed for use with all engine types installed on Boeing 757 and 767 aircraft, Smiths Industries Light Emitting Diode (LED) Standby Indicators automatically display the primary parameters of both engines if the EICAS should fail. They are suitable both for new-build and retrofit applications and can be installed as direct replacements for existing instrumentation.



Standby Solid State Displays

Aircraft with sophisticated instruments and systems involving CRTs, must be fitted with standby instrumentation so that essential flight data will still be available if the main power supply or computers should fail.



Solid state barometric reversionary instruments



Navigation reversionary instruments

Smiths Industries is developing a range of self-standing instruments which can be powered from the aircraft's 28V battery power supply. The use of new techniques, such as LED displays, allows these instruments to be grouped together and housed in cases which can be custom-made to suit the available cockpit space.

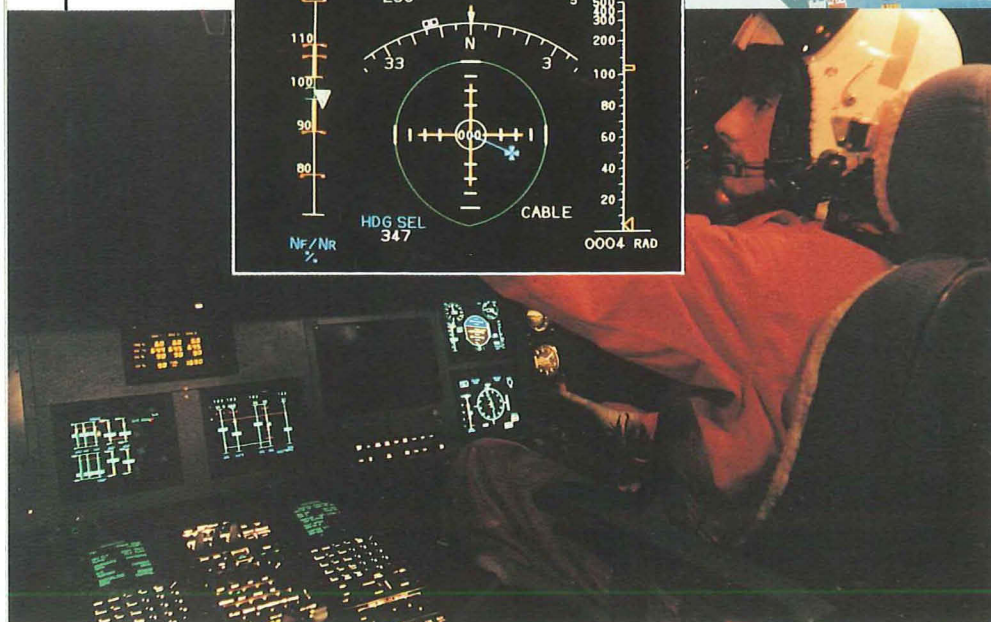


CRT Electronic Instrument Systems

EIS is an integrated cockpit information system which presents flight, navigation and aircraft system data on full-colour CRT displays. Smiths Industries EIS is noted for its advanced symbology, operational flexibility and enhanced system integrity. Already it has proved its superiority in fixed and rotary wing applications both for military and civil markets.



Civil EIS installation for the ATP



Military EIS installed in the EH101



3B ALTIMETER

- Self-contained, servo-operated
- Internal altitude encoder
- PE correction inputs
- Input for altitude alert

ALTITUDE ALERT UNIT

- Audio/visual warnings
- Alerting signal sequences for both capture and deviation
- Automatic reset

Flight Instruments

We manufacture a wide range of instruments to meet a continuing demand for air data, capsule-operated instrumentation. Housed in 2ATI or 3ATI cases and suitable for primary and standby roles they are ideal for aircraft without sophisticated computers or CRT displays.

The need for self-contained instruments capable of operating from the aircraft's 28V battery supply has prompted the introduction of solid-state technology eliminating many mechanical parts and increasing reliability still further.



SPEED COMPUTING DISPLAY

- 3ATI
- 0.4 to 0.9 Mach
- 60 to 450 knots
- Command airspeed 100 to 450 knots
- Altitude range -2000 ft to +50,000 ft



CURRENT DEVELOPMENTS

SOLID STATE ALTIMETER

- 3ATI or MIL spec case
- Fully solid state
- High efficiency, sunlight-readable LEDs
- NVG compatible
- Dual mode: Primary mode from DADC; Secondary mode internal self-sensing transducer
- 28V DC power supply
- High MTBF (12000 hours)
- Modular construction
- Full MIL specification



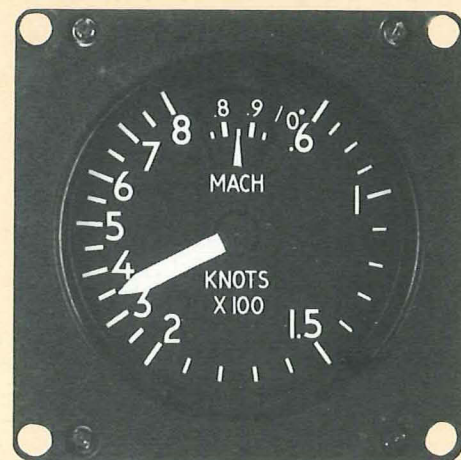
COUNTER-POINTER ALTIMETER

- Range -1000 ft to +50,000 ft
- Potentiometer outputs
- Metric versions



2" VERTICAL SPEED INDICATOR

- Range 0 to $\pm 6,000$ ft/min
- Withstands overloads up to 50,000 ft/min



2" MACH/ASI

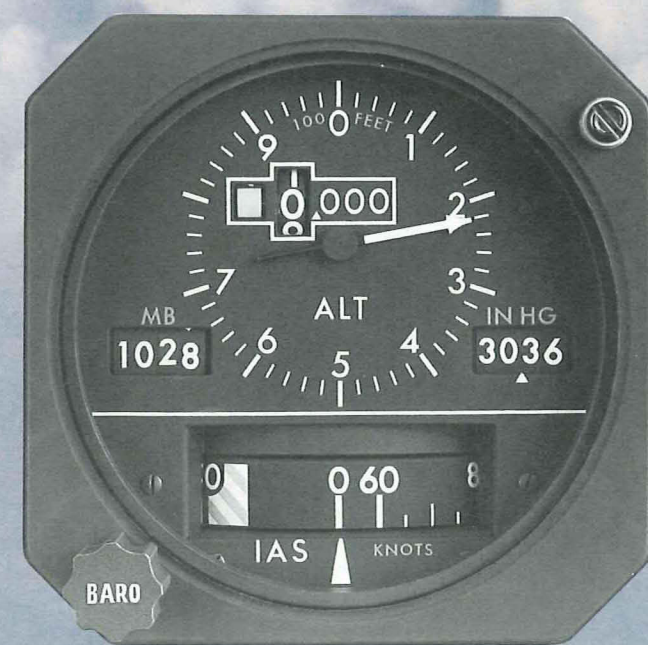
- Up to 800 knots, 2.4 Mach
- Fixed Mach aperture

Standby Flight Instruments

Essential today on even the most advanced commercial and military aircraft in current production, standby flight instruments are likely to be required for the next generation.

These mechanical flight instruments can be used on less sophisticated aircraft as primary indicators for displaying height, airspeed, vertical speed etc. and Smiths Industries continues to manufacture large quantities of air data, capsule-operated indicators in 2ATI and 3ATI sizes.

Lighting is to MIL specifications or NVG compatible and glass surfaces are anti-reflection coated. Current applications include the F18, BAe 125, AV-8B, Hawk, Tornado, Boeing 737, MD-80 Series, ATP and C17.



STANDBY ALTIMETER/ASI

- Two instruments in a 3ATI case
- Military and commercial variants
- Optional baro-correction electrical outputs

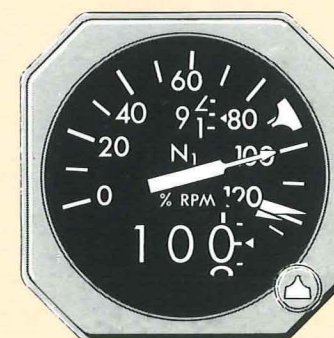


Servoed Counter/Pointer Engine Instruments

The servoed, counter-pointer engine instrument was designed during the development of Concorde to meet a requirement for higher accuracy and greater reliability in single-pointer mechanical engine indicators. During the past decade, these very successful indicators have been installed on Tornado, the Boeing 747, the BAe 146, and the BAe 125. Still in volume production, they are ideal for retrofitting to older aircraft as part of major updating programmes to extend engine and airframe life.

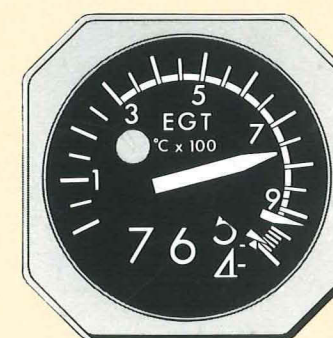
- 2ATI case
- Reliability proved in service — MTBF exceeds 40,000 hours

- Output functions can be provided for Airborne Integrated Data Systems (AIDS) and etc.
- More than 16,000 instruments supplied to date



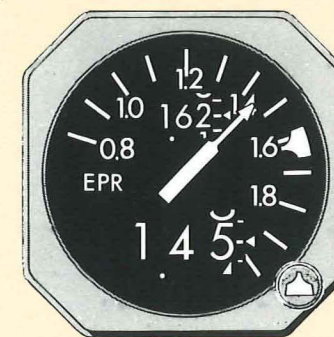
Engine Speed

Percentage RPM, N₁ (with or without limit setting), N₂, N₃



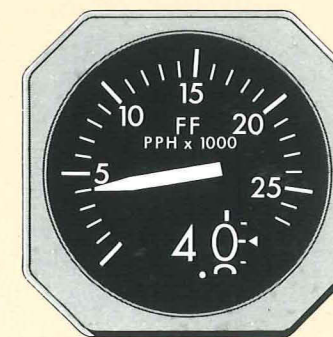
Engine Temperature

Exhaust gas or Inter-turbine temperature



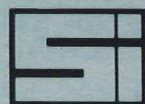
Engine Pressure Ratio

Pressure Ratio (with limit setting)



Fuel Flow

Fuel flow (pounds per hour)



SMITHS INDUSTRIES

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