

GEC SENSORS



## Night Attack FLIR Systems

[www.rochesteravionicarchives.co.uk](http://www.rochesteravionicarchives.co.uk)



## The Requirement

To gain surprise and avoid enemy defenses, low level high speed attack has become an essential feature of the ground attack scenario. By day this is a demanding task for the pilot. At night and in poor weather it has been impossible – with aircraft grounded and opportunities lost.

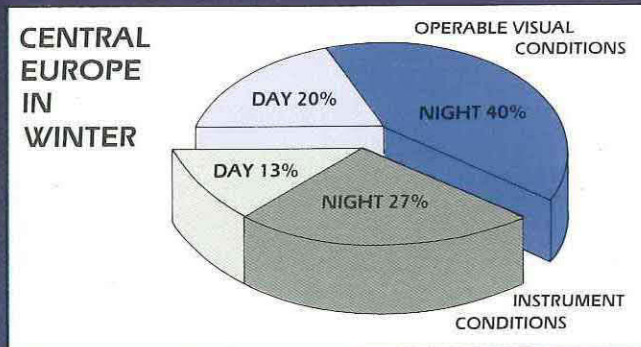
But a night attack capability is vital since, as the chart shows, clear daylight conditions are not normal, particularly in Europe, and ground forces increasingly use the cover of darkness for attack, movement and resupply.

What is needed to meet the requirement is a cost effective passive sensor which will allow pilots to use

## The Concept

Full benefit of FLIR performance is gained only when the FLIR forms part of an integrated system, comprising FLIR, displays and Night Vision Goggles.

The FLIR image is projected with 1:1 registration of the real world on the pilot's Head Up Display (HUD) and may be repeated on the Head Down Displays.



visual flying techniques even in the dark. A high performance Forward Looking Infra Red (FLIR) imager provides the answer.

Potential targets appearing in the HUD field of view are highlighted by a thermal cue. Using Night Vision Goggles to provide a 'look around' capability and complement FLIR detail, the pilot can look into turns and maneuver his aircraft aggressively. GEC Sensors which manufactures FLIR, and its sister company GEC Avionics which produces Night Vision Goggles and Head up Displays, have together acquired unique experience in their operation in combined sensor and display systems.

## The Experience

From the mid 1970's, GEC Sensors has been closely associated with the pioneering work on passive pilot night vision systems carried out by the Royal Aircraft Establishment at Farnborough on the 'Nightbird' program.

Hundreds of hours of experience were gained using a TICM II FLIR in the Farnborough Hunter aircraft,

demonstrating the FLIR and Night Vision Goggles concept, and the vital role of the thermal cue.

Further trials with GEC Sensors FLIR pod fits on Harrier and Tornado aircraft produced equally impressive results. A FLIR pod installation, flown extensively for the United States Marine Corps on an A-7 aircraft in the Mojave desert in California, showed just how well the FLIR could cope with the low contrast terrain conditions of the desert.

A GEC Sensors supersonic FLIR pod is flying with great success on an F-16 aircraft in the United States, and further trials are taking place worldwide.

Another supersonic FLIR pod is flying with the US Navy on an A-6E Intruder aircraft in an extensive trials program.





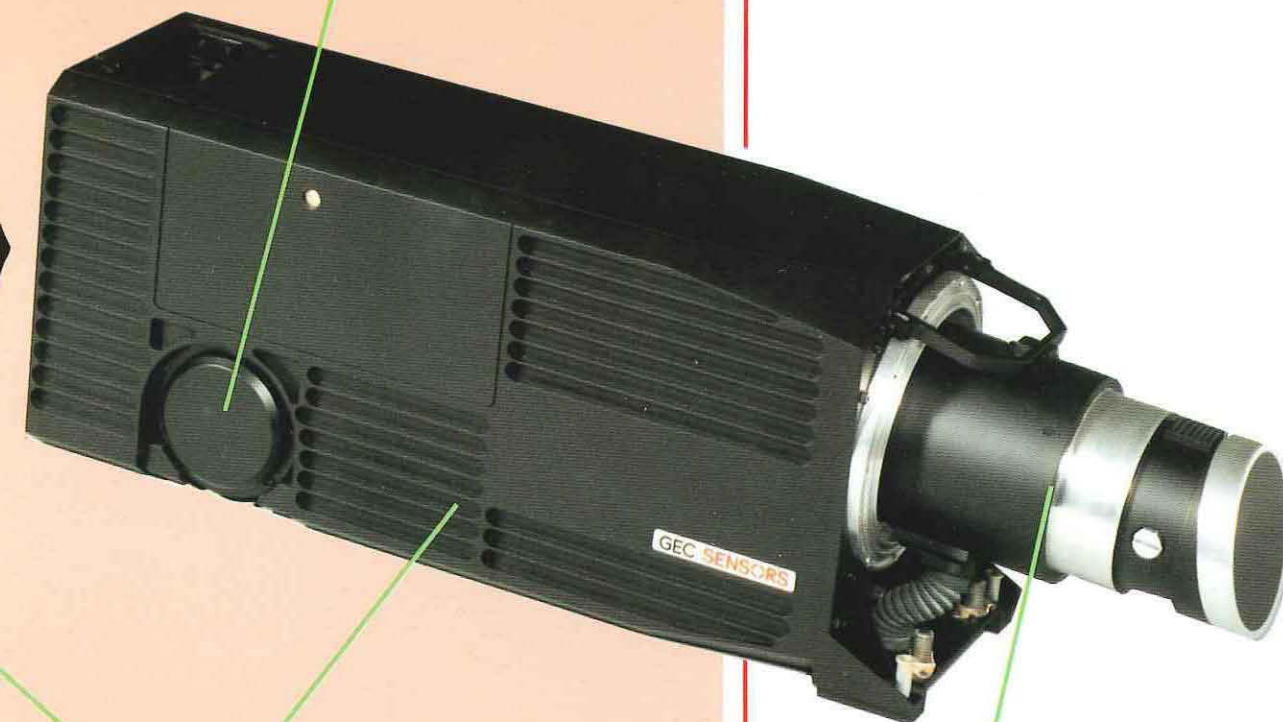
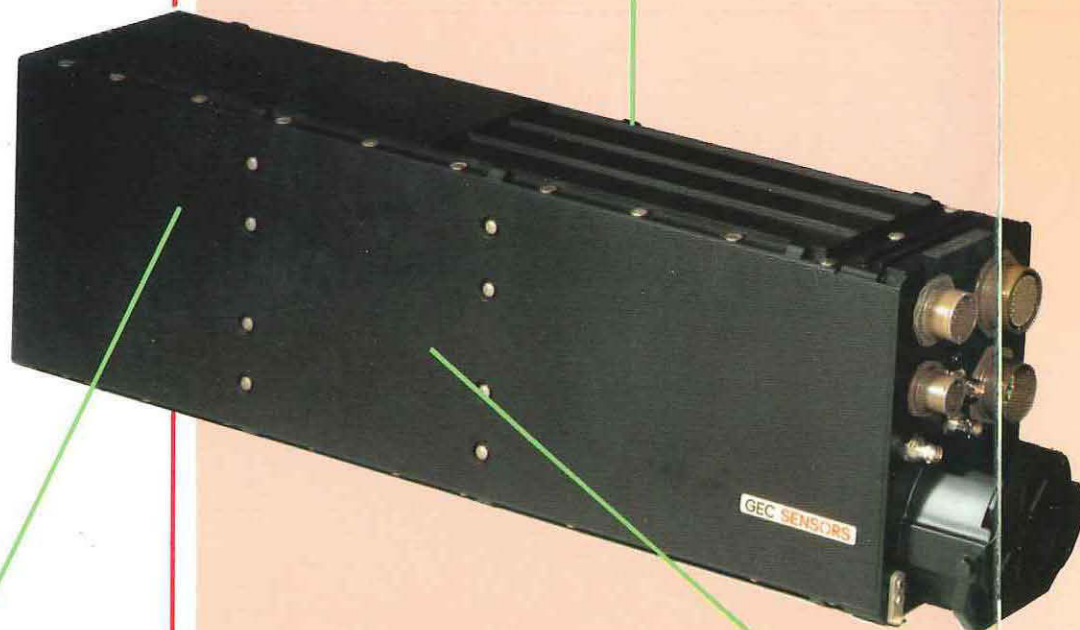
## Modular FLIR

FLIR trials experience and intimate knowledge of thermal imaging applications have been combined by GEC Sensors to produce a modular FLIR system which encompasses the latest infra-red technology together with operational enhancements vital to the ground attack role.

The result is a compact and reliable system housed in two line replaceable units: a Sensor Head and an Electronics Unit. This design allows maximum flexibility and adaptability through varying the shape of the enclosures to meet the space constraints of most modern aircraft, whilst retaining commonality of sub-assemblies within the FLIR units.

The design also provides excellent accessibility for repair and maintenance, together with the ability to accommodate updated sub-systems when required.

The Sensor Head and Electronics Unit configuration illustrated were designed for the Harrier GR5 and AV-8B. Their narrow shape makes them suitable for many aircraft types.



### Interface Unit

Consists of a group of electronic processing cards which provide control and operation functions for the FLIR sensor through the aircraft data bus or through discrete signals. The design of the unit is sufficiently flexible to permit interfacing to most aircraft types.

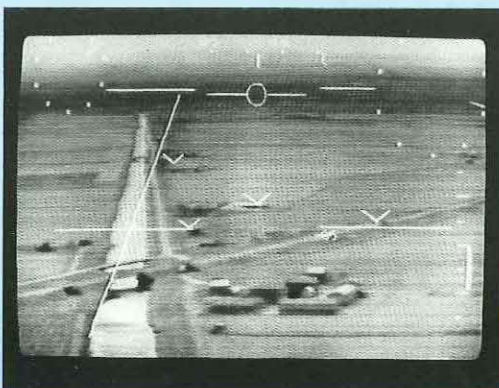


### Cryogenic Cooler

Provides effective and reliable cooling for the infra-red detector using latest Stirling split-cycle design. The cooler fits neatly into the Sensor Head, to give thousands of hours of maintenance-free operation.

### Thermal Cues

Alerts the pilot to potential targets in his field of view by marking them on the HUD. Accurate target coordinates are also produced for hand-off to weapon systems if required. The cueing capability is provided by processing cards in the FLIR Electronics Unit.



### FLIR Scanner and Processing Electronics

Based on Thermal Imaging Common Modules Class II (TICM II) currently in large scale production. The unique high resolution SPRITE detector and automatic 'hands off' electronics processing guarantee imagery of the highest quality.



### Infra-red Telescope

Inside protective cover gathers radiation from the scene ahead of the aircraft. A range of athermalised telescopes is available to match most HUD fields of view and provide the necessary 1:1 registration between the HUD and the FLIR image.



## Integral Systems

Where internal aircraft space is available, an integral FLIR is an ideal solution since it causes virtually no drag and does not involve the loss of a weapon station.

The GEC Sensors modular FLIR, integral configuration has been selected by the UK Ministry of Defence to provide the Royal Air Force Harrier GR5 and Tornado GR1 aircraft with a night flying and attack capability to meet Air Staff Requirement 1010. The FLIR has also been selected by the United States Marine Corps for the AV-8B aircraft.

Following the successful work on this program a contract was awarded to the Company by the Grumman Corporation for the development of a Navigation FLIR to be installed in the United States Navy A-6 Intruder aircraft.

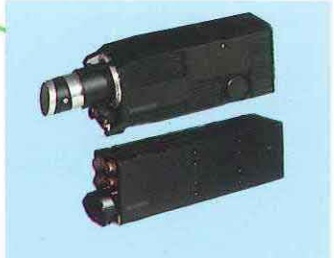
## Tornado

The GR1 Tornado aircraft is packed with mission and system electronics. Finding space in such an aircraft is not easy, but the flexibility of the GEC Sensors modular FLIR design allowed small and awkwardly shaped spaces to be designated for both the Sensor Head and Electronic Unit. In the Tornado, the Sensor Head is located in the lower fuselage with the electronics in an avionics bay above.



## AV-8B and GR5

For the AV-8B and Harrier GR5 aircraft an 'in-line' configuration has been selected to fit the relatively slim nose structures of these aircraft. The Sensor Head is mounted forward of the canopy with the Electronics Unit immediately below. This installation provides excellent forward visibility with only a small external protrusion, which has minimal effect on aerodynamics.



## Other Aircraft

For many aircraft an existing configuration of the modular FLIR will provide a cost effective night attack capability. If necessary GEC Sensors designers and engineers can meet the challenge to establish new configurations for the vast majority of airframes.





## FLIR pods

A FLIR pod provides a cost-effective and flexible answer to the night attack requirement when an integral fit is not feasible.

The GEC Sensors ATLANTIC (Airborne Targeting, Low Altitude Navigation, Thermal Imaging and Cueing) FLIR pod is designed to provide this flexibility for supersonic aircraft. The pod houses the two modular FLIR units, the Sensor Head and Electronics Unit, together with an Environmental Conditioning System to dissipate the heat generated in supersonic flight.

Due to its slim shape, the ATLANTIC pod can be carried on fuselage and wing stations of a number of aircraft with minimal drag effect.

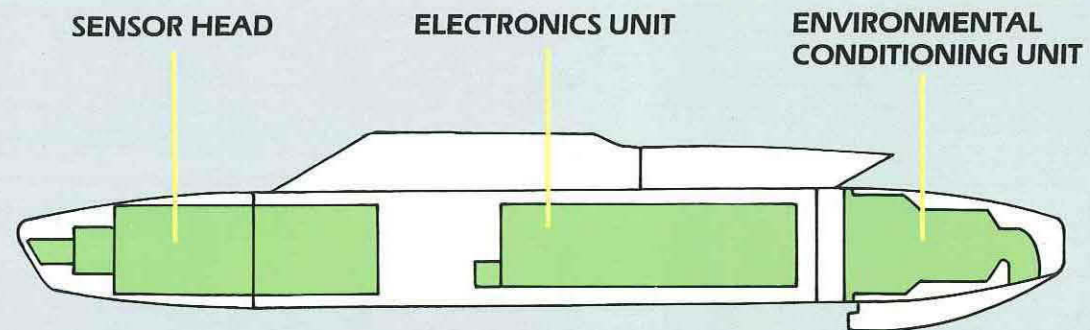


### F-16

The ATLANTIC FLIR pod is an ideal partner for the F-16 aircraft. In flight trials the pod has been carried under the wing and on the engine air intake. For operational use the engine air intake position is preferred, because there is minimal impact on the F-16's unique flying capabilities and it permits full use of all wing weapon stations.

### Other Aircraft

The advanced yet simple design of the ATLANTIC pod makes it suitable for operation on most strike aircraft using a suitable adaptor.





## Logistics and Support

GEC Sensors is committed to comprehensive reliability and through life support programs for all its products. Major areas include:

### Reliability

High reliability is a feature of all the GEC Sensors FLIR systems. It is achieved through stringent control of the entire design, development and manufacturing process from parts selection and procurement to final inspection and test on advanced automatic test equipment. Comprehensive quality control procedures and reliability growth demonstrations ensure that every production system meets the Company's exacting standards.

### Spares

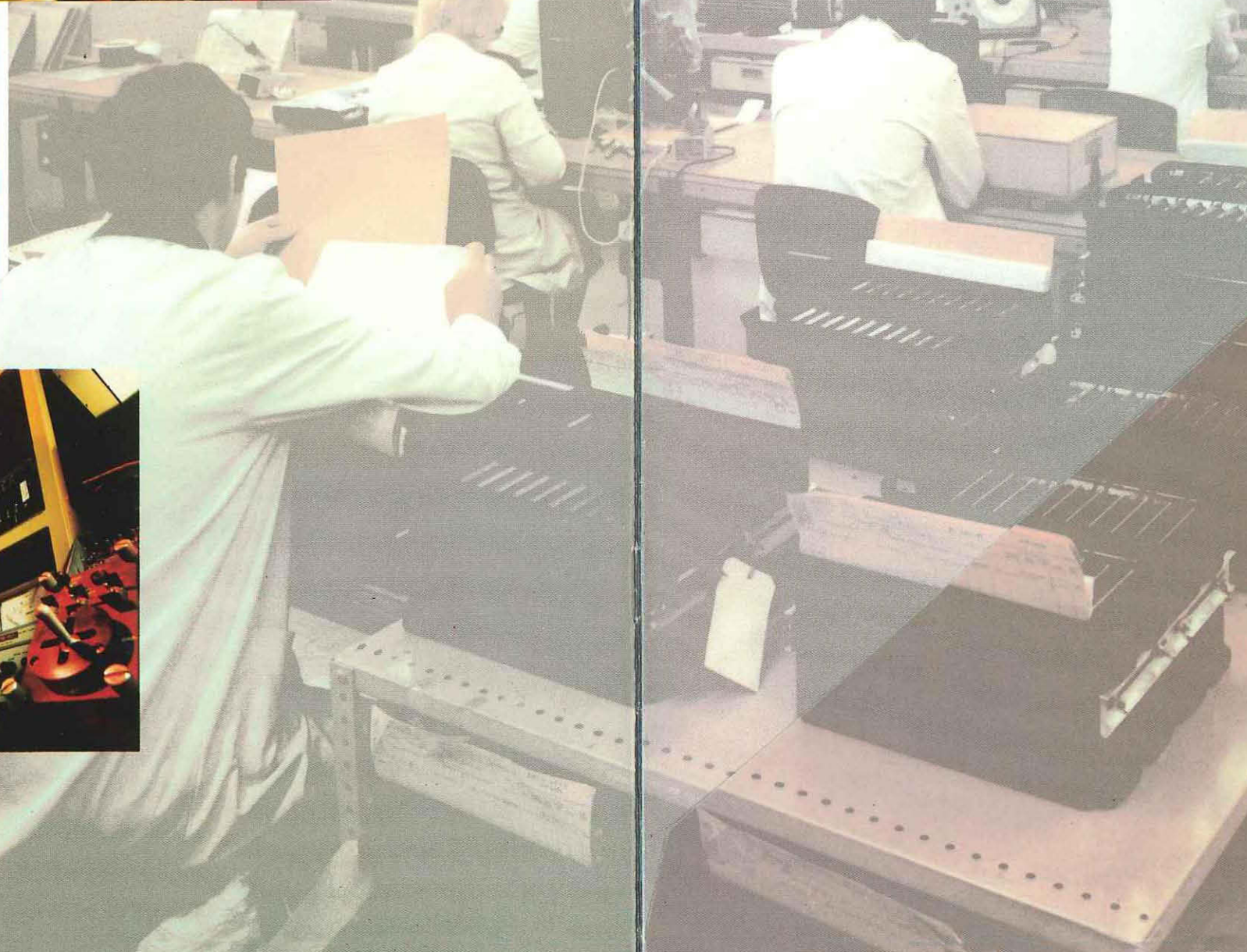
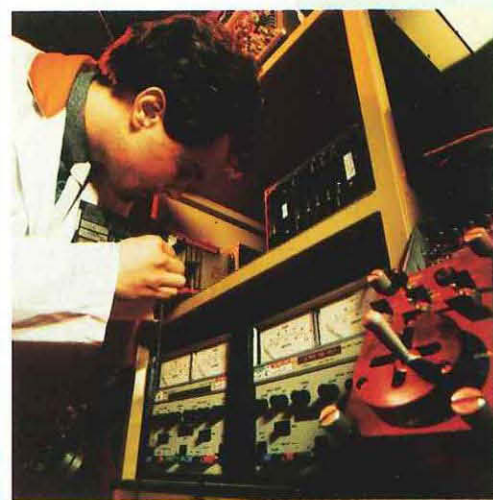
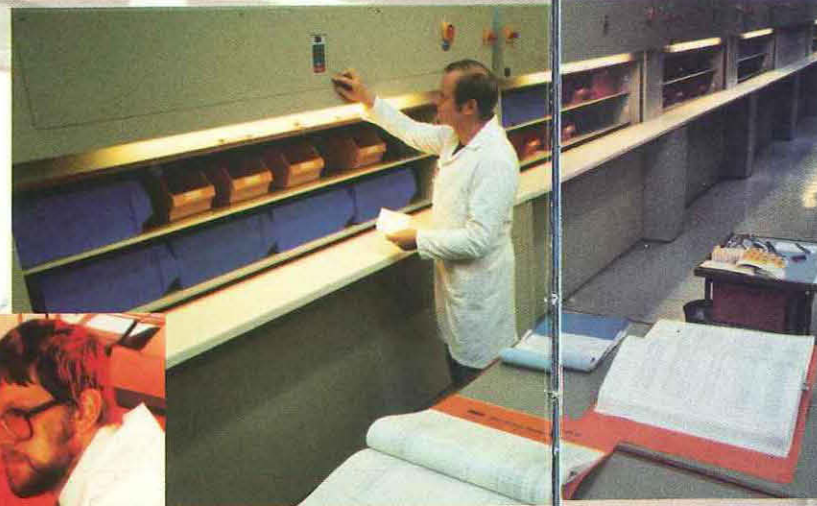
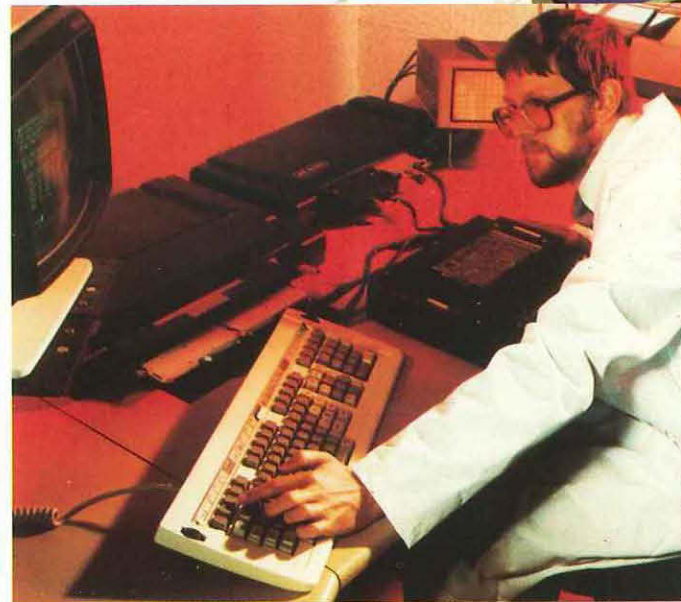
The modular FLIR systems now being produced by GEC Sensors have already been ordered in large quantities by the UK Ministry of Defence. These contracts provide an assurance that spares will be available throughout the anticipated lifetime of the equipments concerned.

### Maintenance

Comprehensive Built In Test Equipment (BITE) is a major feature of all GEC Sensors FLIR systems, enabling front-line crews to check out the complete system, isolate and replace faulty Line Replaceable Units (LRU's) and recheck the system as part of a normal preflight inspection, without the use of specialised ground equipment. The high reliability of the FLIRs permits an 'on condition' maintenance philosophy. Intermediate workshop and depot level maintenance procedures are carried out with the aid of BITE and Automatic Test Equipment developed under U.K. Ministry of Defence programs.

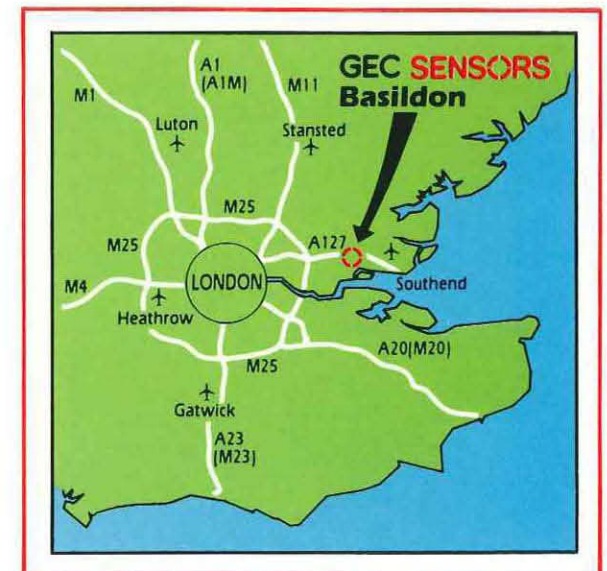
### Training

The Company runs its own customer training facility, staffed by qualified instructors who are familiar both with the equipment and with Service needs. Operator and maintenance personnel courses are tailored to meet customer requirements, either at the Company's training school or at the customer's preferred location.



**Electro-Optical  
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**GEC Sensors Ltd  
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GEC Sensors Limited is a management company for GEC-Marconi Limited

Printed in England

Produced by UniGraphics, Chelmsford

EOSD-NAFS-3000



