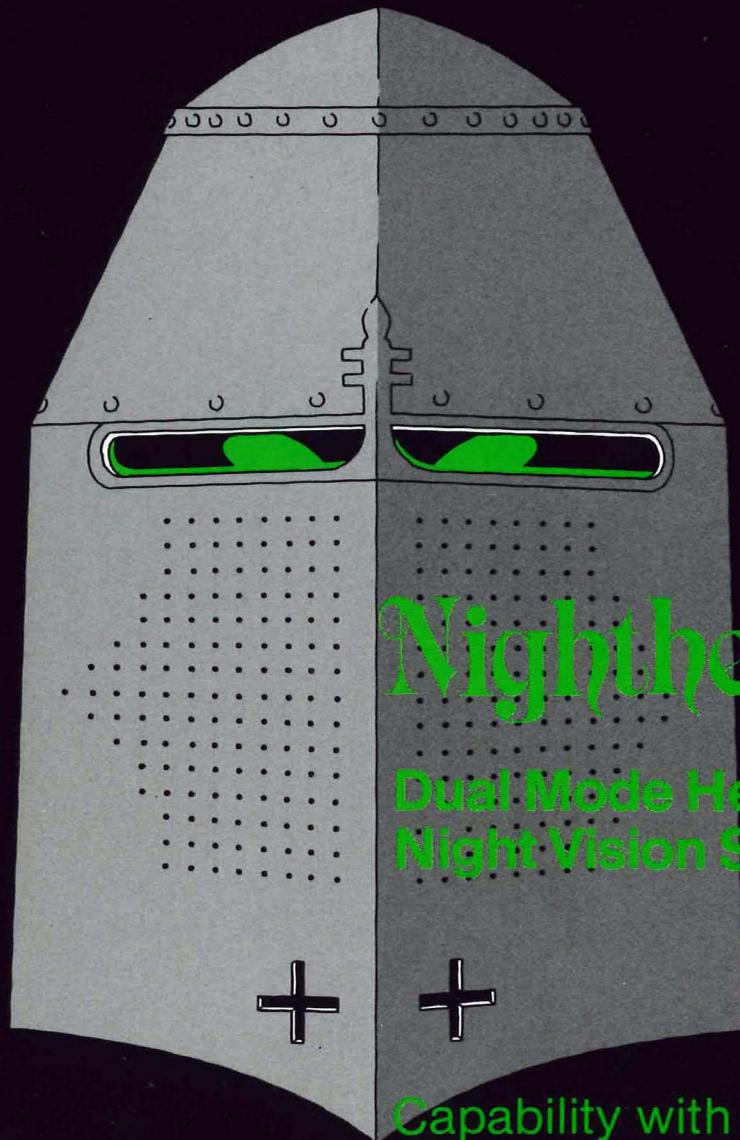


MARCONI  
AVIONICS



# Nighthelm

Dual Mode Helmet  
Night Vision System

Capability with Flexibility

Nighthelm...



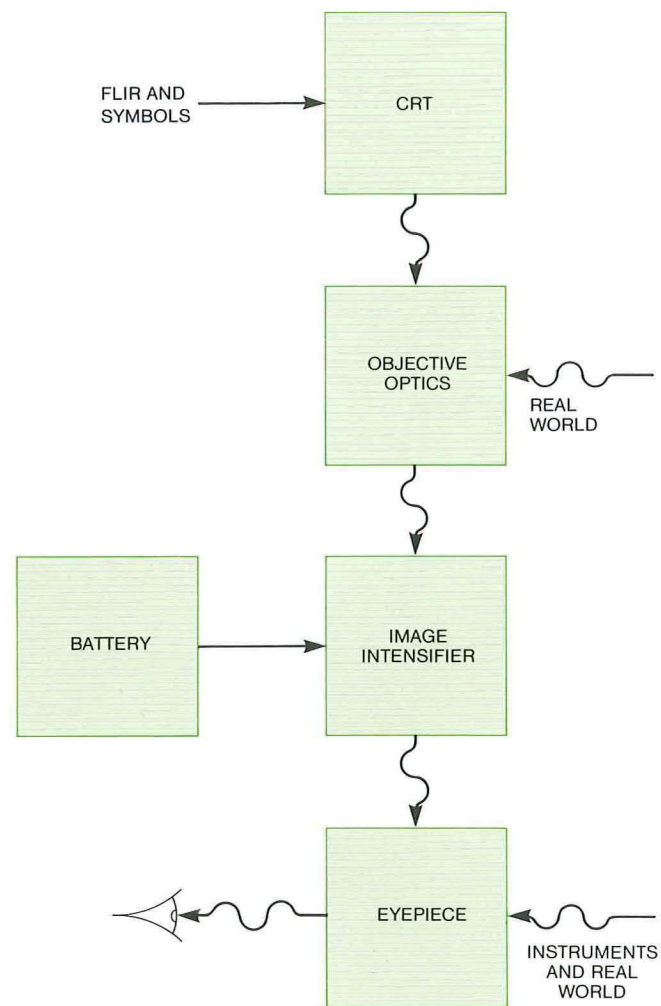
# Innovation

Recent operations have clearly demonstrated the need to operate safely and flexibly by night as well as by day. Modern attack helicopters now use a steerable Forward Looking Infra Red (FLIR) sensor to provide night flying imagery together with a target sensing capability. The critical factor in such a system is the display of the imagery. Experience has shown that, for full operational effectiveness, the display system must be:

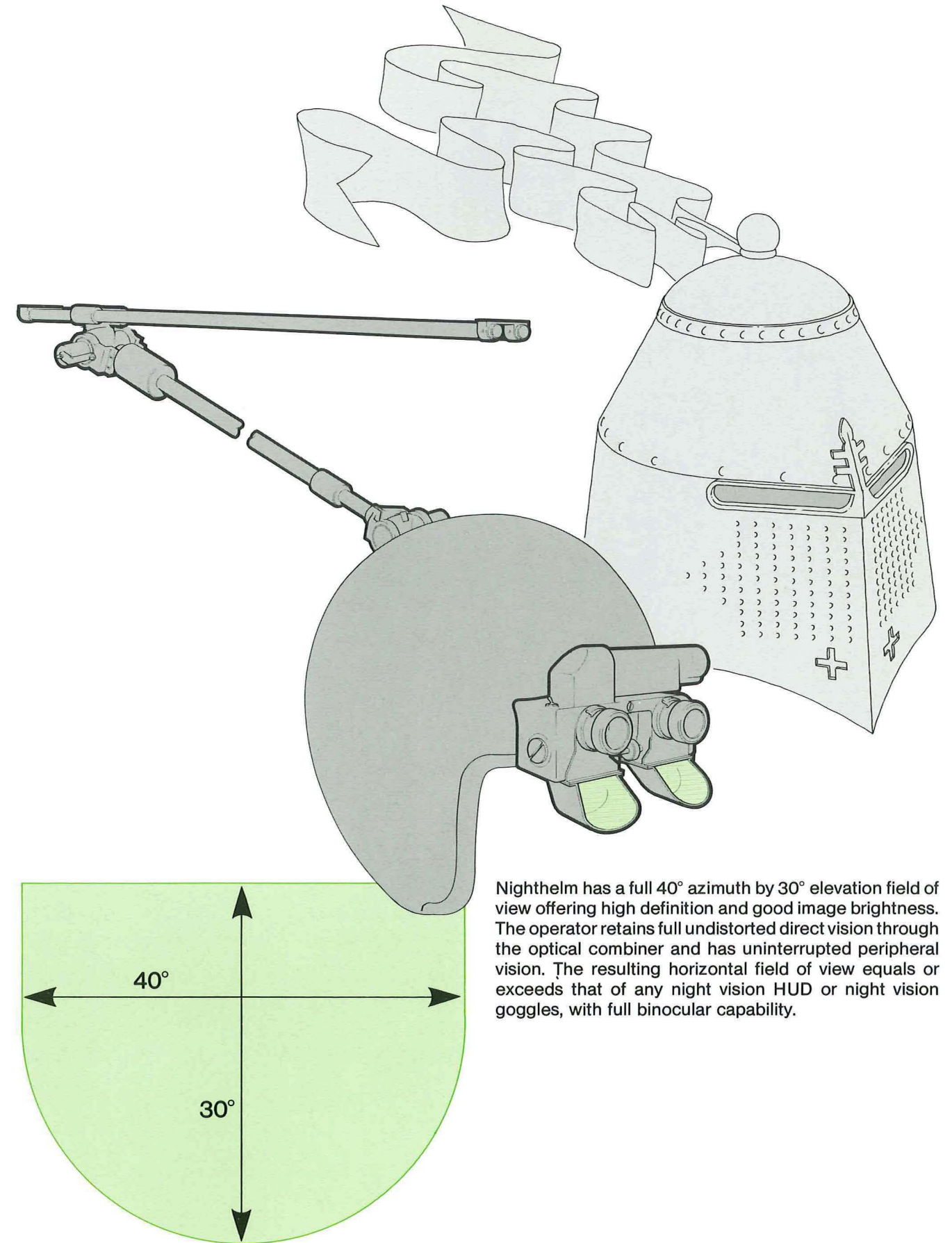
- Mounted on the helmet
- Scaled 1 to 1 with the real world
- Fully redundant for fail-safe operation
- Capable of operation in a wide range of thermal and visual conditions
- Fully compatible with human factors requirements
- Lightweight and low cost

Marconi Avionics has recently produced Cats Eyes, a radical new helmet-mounted night vision system which is totally self-contained, using image intensifier tubes to operate in very low light levels. We have now developed Nighthelm, a dual mode night vision display system, based on the same optical technique which is used in Cats Eyes. Nighthelm is the first system to meet fully all the night vision requirements of applications requiring the use of a steerable FLIR, such as attack helicopters, gunships and advanced anti-aircraft systems.

The Nighthelm system uses revolutionary new optical techniques to present an electro-optical image on a clear 'see-through' combiner in front of each eye. Two alternative electro optical sources can be used, either a steerable FLIR or a pair of image intensifier tubes. The image is projected onto a plastic combiner in front of the operator's eye, giving a clear image scaled 1 : 1 with the outside world and superimposed on it. The result is that the operator is presented with alternative low light or thermal imagery on a clear bright display, permitting full night operations in a wide range of conditions without obstruction of his vision. This combination of capabilities is unique to Marconi Avionics Nighthelm.



Nighthelm Visual System



Nighthelm has a full 40° azimuth by 30° elevation field of view offering high definition and good image brightness. The operator retains full undistorted direct vision through the optical combiner and has uninterrupted peripheral vision. The resulting horizontal field of view equals or exceeds that of any night vision HUD or night vision goggles, with full binocular capability.

# Two Operating Modes

Nighthelm has a unique capability, in that it can be used in either of two operating modes, one operating in visual conditions, the other in thermal conditions. In addition, the system can be operated using image intensifiers with symbology overlaid on the low light image.

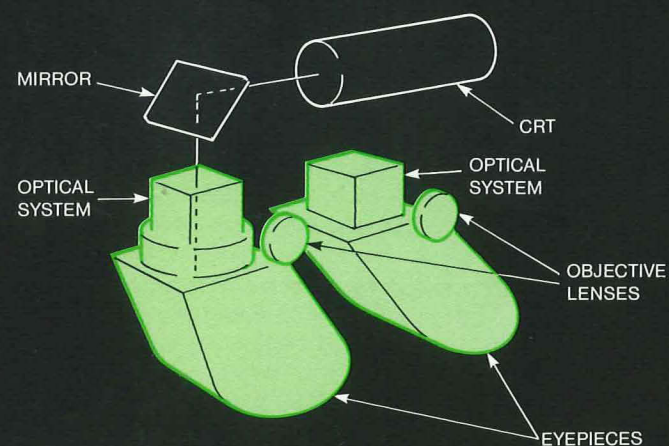
## FLIR Mode

The second mode, which can be selected by a remote switch, displays monocular FLIR imagery from a remote steerable sensor system. In this mode, the left image intensifier is switched off, so that the left eye looks directly through its see-through combiner optic at the outside world. The right objective lens is blanked off by a shutter, and the FLIR imagery is displayed on a miniature CRT. This is viewed by the right eye on its combiner optic.

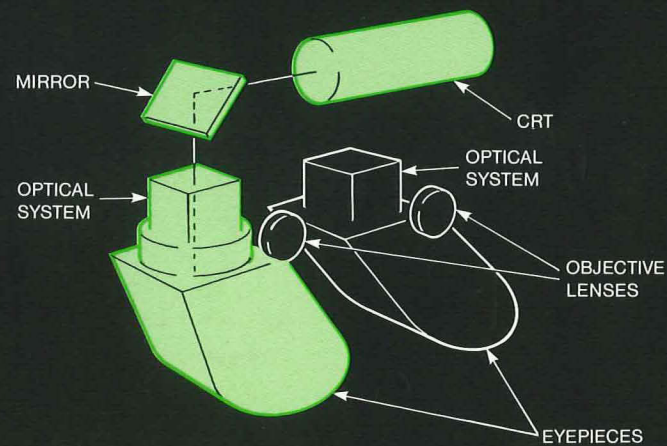
The resulting system operates in a full range of low light and thermal conditions, offering maximum flexibility and giving the operator freedom to select the optimum sensor at will.

## Low Light Mode

The first mode operates in low light conditions, using image intensifiers to provide binocular imagery. In this mode Nighthelm offers a similar capability to Cats Eyes, with two parallel optical and electrical paths.



Optical Schematic



Optical Schematic

# Flexibility

The combination of low light image intensification with FLIR imagery ensures maximum operational flexibility and effectiveness. System features include:

- Effective in a wide range of thermal conditions, using the FLIR
- Effective in low light levels, using either Generation 2 or Generation 3 image intensifier tubes
- Both pilots retain a full night vision capability at all times. When one pilot uses the FLIR the other can use his low light capability
- Full symbology overlay available in both low light and FLIR modes

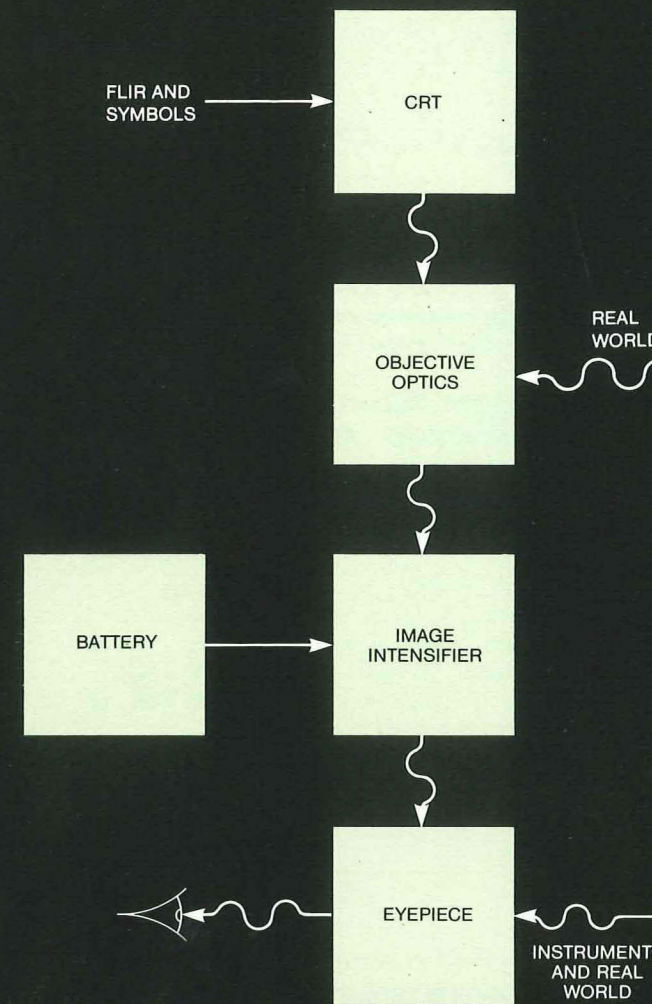
# With Safety

Previous helmet night vision systems have included vulnerable components, failure of which can instantly deprive the pilot of his night vision capability. In a critical low flying situation, the night vision display is an essential flight safety system. FLIR display systems have been particularly vulnerable, as they have always had a long series of critical components, from the helmet position sensor through the FLIR turret to the display. Now Nighthelm incorporates full redundancy for complete safety. No matter which component fails, the pilot will still retain at least a monocular night vision capability.

# Based on Experience

Marconi Avionics offer the widest range of night vision equipment and the most advanced optics in the world. These include:

- The only full production night vision head up display, for the A-7 Corsair.
- The LANTIRN HUD, the world's most advanced holographic night vision head up display, for the F-16 and A-10 aircraft.
- Advanced helmet-mounted displays, supplied to US and UK Defence Forces.
- The Cats Eyes night vision display system



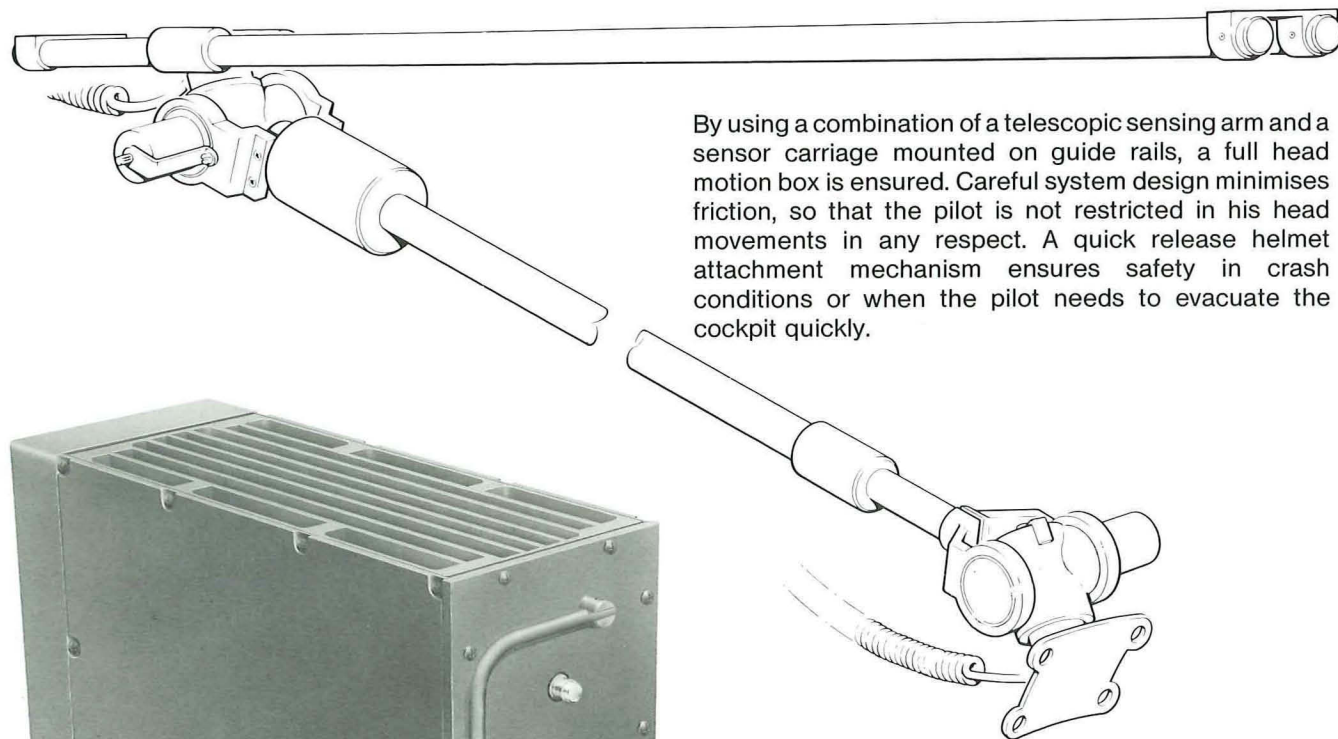
Nighthelm Visual System

# Advanced Technology

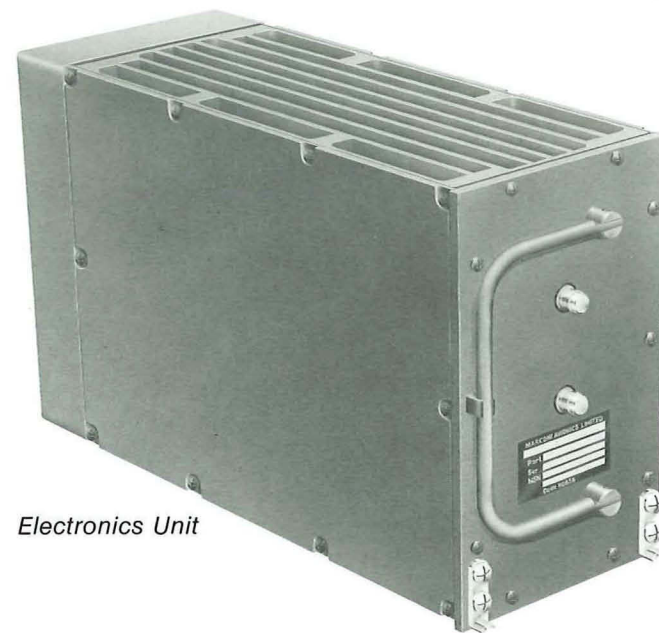
By the use of the latest position sensing and electronic techniques, the Nighthelm system ensures high reliability with a low overall system weight.

The use of a mechanical head position sensor ensures maximum reliability and accuracy. Movement of the pilot's head in any direction generates an output from one or more of the five synchros fitted on either end of the telescopic arm. These synchro outputs can be used to compute precise head angle in all axes.

Position Sensor Mechanism



By using a combination of a telescopic sensing arm and a sensor carriage mounted on guide rails, a full head motion box is ensured. Careful system design minimises friction, so that the pilot is not restricted in his head movements in any respect. A quick release helmet attachment mechanism ensures safety in crash conditions or when the pilot needs to evacuate the cockpit quickly.



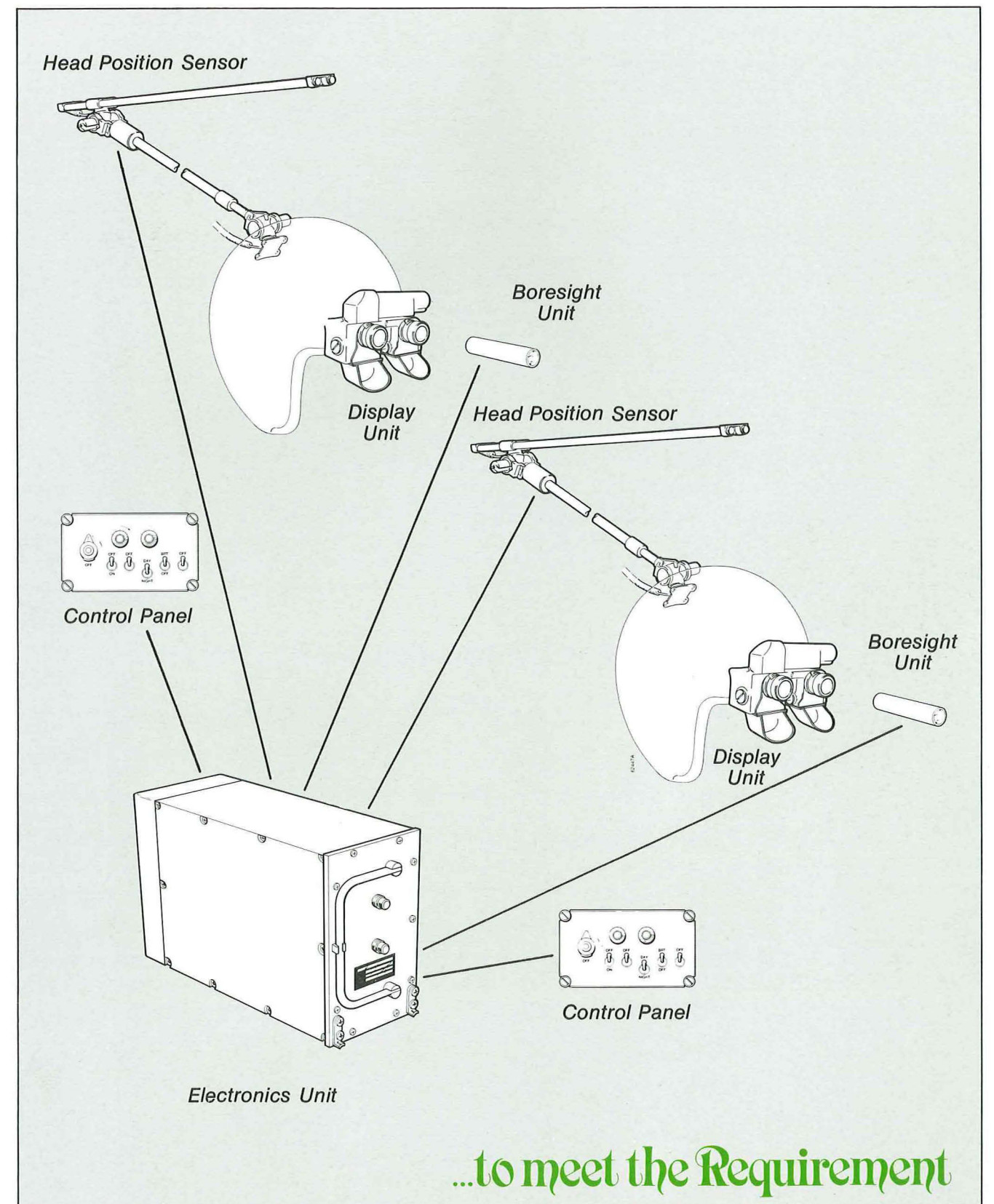
Electronics Unit

Allied to the helmet position sensor, Marconi Avionics lightweight electronics unit process the synchro outputs to compute head look angle. This microprocessor-based unit has been especially developed for this system to ensure high capability with low weight. It combines the following features:

- Head position sensing computations
- Symbology generation
- Light weight - 13lbs
- Low power - 50 watts approximately
- Small size - 1/2 ATR short
- No cooling air required
- 1553 bus compatible

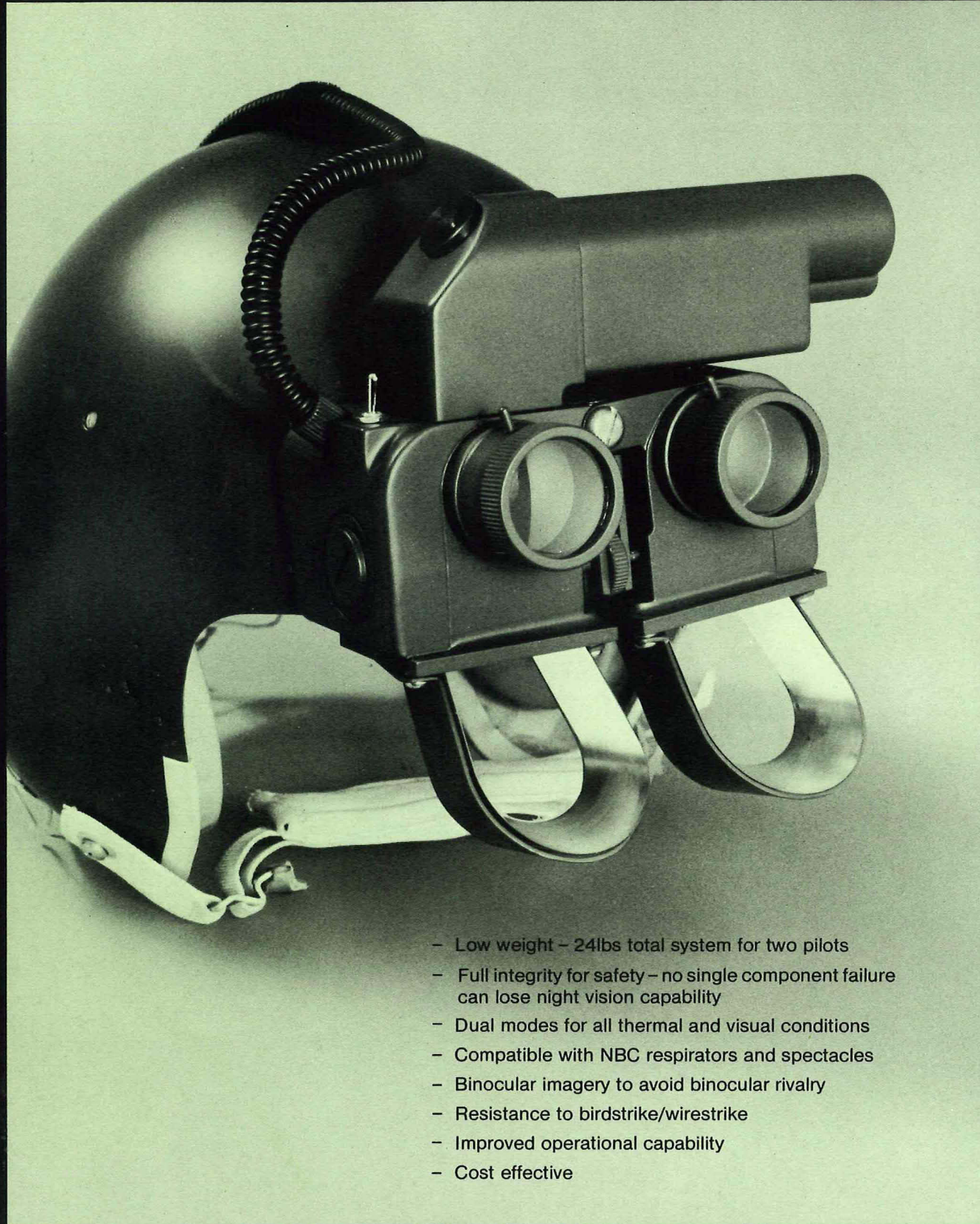
Two individual control panels and two boresight units complete a highly cost-effective system. Total weight of the system for two pilots is 24lbs.

# A Cost Effective System Design...



...to meet the Requirement

# Features



- Low weight - 24lbs total system for two pilots
- Full integrity for safety - no single component failure can lose night vision capability
- Dual modes for all thermal and visual conditions
- Compatible with NBC respirators and spectacles
- Binocular imagery to avoid binocular rivalry
- Resistance to birdstrike/wirestrike
- Improved operational capability
- Cost effective

Nighthelm Equipment

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# Nighthelm

round the clock capability

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