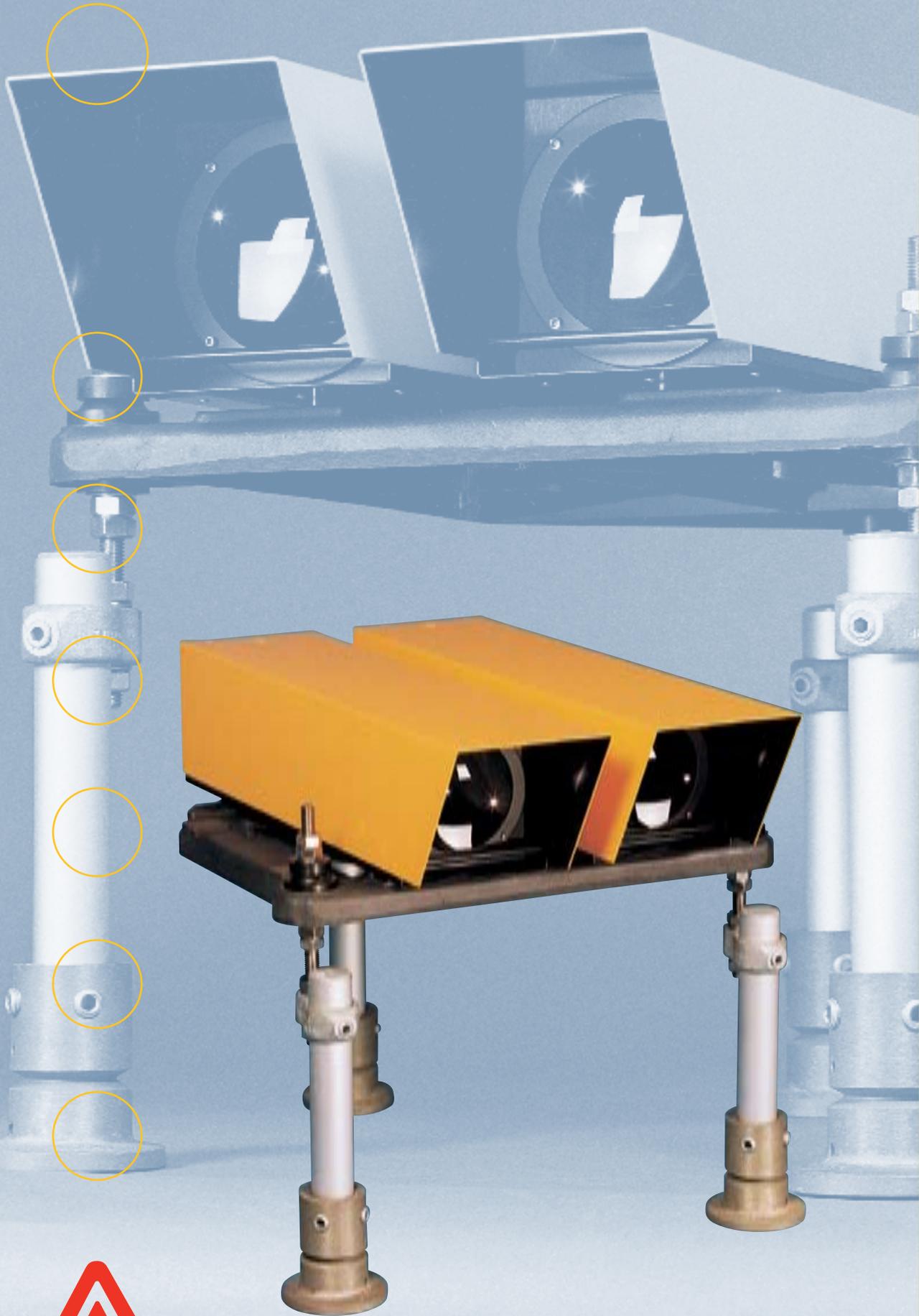




RESEARCH ENGINEERS LIMITED

Precision Approach Path Indicator



The PAPI (Precision Approach Path Indicator) system is a simple and efficient, positive visual aid to the pilot on final approach. The PAPI system consists of a line of four units at 90° to the runway centre line which are typically spaced at 9 metres apart. Units are identical, producing a beam of light with the upper portion white and the lower red. A pilot sees the four individual lights in a combination of red and white, depending on his vertical position. Typically the elevation settings of each unit vary by 20 minutes of arc, the nominal 3° glideslope angles being midway between the centre pair. The system is easily set for other

glideslope angles. Using a PAPI system it is possible to follow the glideslope to less than 300 metres from touchdown (approximately 15 metres height).

A Research Engineers PAPI may have either two or three projectors. The two projector PAPI meets both ICAO and FAA performance specifications. The three projector PAPI is used to comply with specific local regulations and military applications. The three projector PAPI maintains its performance, exceeding international specifications even if one lamp fails.

The Projector

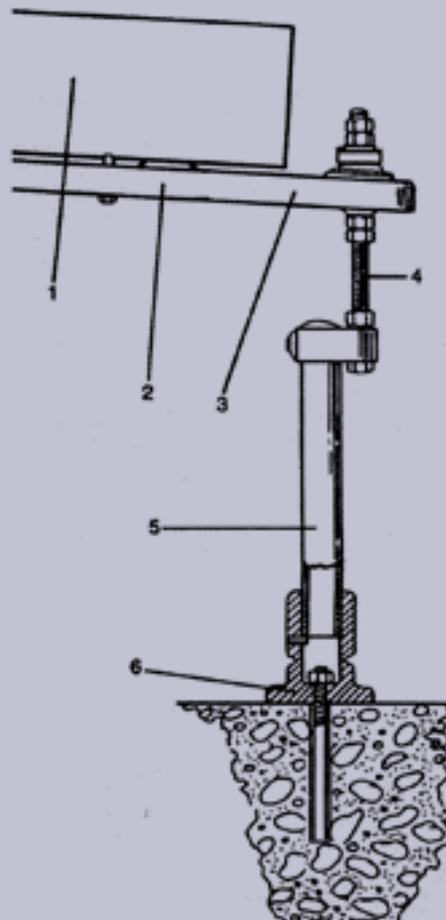
Projector design is fundamental to PAPI performance and Research Engineers have developed an outstandingly efficient single lens optical system. The Research Engineers projector has been specifically designed for the PAPI and has not been merely adapted from existing light units.

By using a purpose made parabolic reflector Research Engineers projectors require only a single lens, an elegant design solution that minimises internal components and realises maximum optical efficiency.

- **High Intensity Output** – Achieved with the minimum number of optical elements. Every element in an optical system will absorb some of the light passing through it and reduce effective range and contrast.
- **Positive Signal** – The most technologically advanced double coated dichroic filters are used, which transmit 25% compared with only 16% for the normally used mass coloured glass absorption filters. The signal from the Research Engineers PAPI is bright and clear for maximum effective range.
- **Fewer Components** – Fewer things to go wrong, easier installation and lower spares stocking.
- **Uniform Colour** – With its parallel light beam through the dichroic filter, the Research Engineers PAPI projects clear consistent signal colours to the extreme of azimuth.
- **Reduced Maintenance and Spares** – Resulting from the effective optical design.
- **Sharp Transition** – Rapid colour change is achieved with the use of dichroic filters and parabolic reflectors.
- **Azimuth Range** – The units exceed all international standards. With effective ranges $\pm 8^\circ$ (ICAO), $\pm 10^\circ$ (FAA) or $\pm 15^\circ$ (CAP 168). There is no sudden loss of signal at the beam edge.
- **No Heater** – Due to the compact size and single lens optical system, rapid demisting can be achieved without the need for heating circuits.



Two Projector PAPI Exceeds ICAO requirements

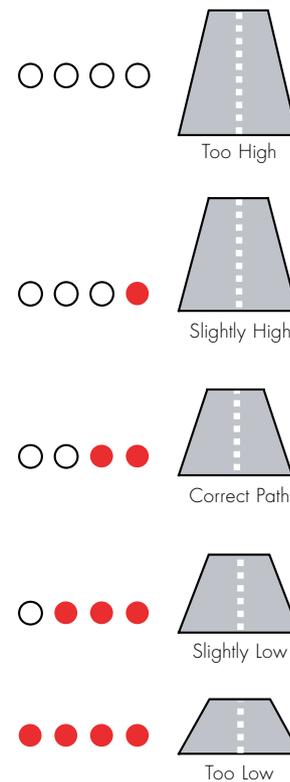


- 1. Efficient Optics**
High output
Simple maintenance
- 2. Modular Projectors**
Minimal system downtime
Improved Maintenance
- 3. Rigid Base**
Interchangeable projectors Stable optical reference
- 4. Level Screw Assembly**
Quick adjustment
Precise setting
- 5. Three Leg Support**
Inherently rigid
No induced stress or fatigue
- 6. Frangible Feet**
Minimal ground hazard Certified performance

The Modular Concept

The Research Engineers PAPI with its modular design is unique. Interchangeable pre-aligned projectors can be easily fitted onto a variety of bases for both fixed and portable applications.

- **Proven Design** – Over fifteen thousand projectors installed around the world in over thirty countries for both civil and military use.
- **Interchangeable Projectors** – Individual projectors are fully interchangeable, simplifying maintenance and spares management.
- **Field Maintenance** – With no need for realignment, lamps and filters can be replaced and optics cleaned. A defective projector can be quickly replaced with a spare and then serviced in the ideal conditions of the workshop.
- **Stable Reference** – Projectors are mounted on a rigid aluminium casting which has integral clinometer reference pads. This casting is the optical base that is adjusted for cross level and elevation. Subsequent replacement of pre-aligned projectors does not require base readjustment, the unit retaining its correct settings.
- **Compact Size** – Large enough to provide optical precision but small enough to minimise the effect of jet blast. Easy storage and handling.
- **Instant Projector Change** – Quick release fasteners are used. No need for any special tools or realignment.
- **Corrosion Resistance** – All projectors are manufactured from anodised light alloy. All fasteners are stainless steel.



PAPI System Visual Indications

Installation and Maintenance

The Research Engineers PAPI unit has an inherently rigid frame with a genuine kinematic support system. The modular concept has proved itself repeatedly in terms of minimum runway shut-down time and economic maintenance.

- **Controlled Positioning** – Simply and quickly achieved with three legs. The front legs level the unit laterally whilst the rear leg provides the elevation adjustment.
- **No Induced Stressing** – The Research Engineers three leg support system does not force the unit into place. PAPI units that use four legs introduce internal stress which causes signal distortions and which may then lead to fatigue failure.

ICAO recommends that major overhauls of PAPI systems should be undertaken in the workshop. The quality of service will be higher in workshops rather than out of doors. This procedure is practical only with the Research Engineers modular PAPI.

The Research Engineers PAPI system is supplied as a complete system, including the following elements.

- **Frangible feet** – Batch tested to specific frangibility performance.
- **Support Legs** – Supplied in standard lengths 1.16m or 0.58m, cut to required length on site.
- **Levelling Assembly** – Stainless steel with locking nuts.
- **Lamp Leads** – Complete with FAA two pin plug.
- **Installation Manual** – All units are supplied with a comprehensive, illustrated, installation and servicing manual. The 17 page manual includes practical notes on site preparation, installation, electrical connection, setting up and maintenance.
- **Clinometer** – A precision clinometer is available for accurate and reliable setting up.

Clinometer

A precision Clinometer has been specifically designed by Research Engineers. It has a longitudinal spirit level with a micrometer type screw calibrated in degrees and minutes. Overall accuracy is better than one minute of arc.

The Clinometer has a broad temperature operating range (-50°C to +70°C), being constructed in aluminium and stainless steel, and is FAA approved. Needing no electrical supply, the Clinometer is supplied in a fitted protective case.



Clinometer - Supplied in a fitted protective case.



Clinometer - No need to remove cover to fit clinometer.



Three Projector PAPI - Available in ICAO or UK CAP168 beam performance.



Interchangeable PAPI Projectors - Research Engineers PAPI projectors are secured to the base frame by three, quarter turn DZUS quickly detachable fasteners. Workshop service and maintenance in accordance with ICAO RSM-9 is practicable.



Portable Tactical PAPI - A portable tactical PAPI (NATO stock number 6695-90-0112120) is available where rapid deployment is required.

PAPI technical Data

Optical characteristics comply with ICAO, FAA and CAP168 requirements. Additional certified authorisation is available from many national authorities.

Photometric data of various configurations of projectors and lamps are available on request.

Lamps: Pk30d, 200 W is standard for ICAO, FAA and CAP168 performance. Other lamp options, PG16, Gy9.5, G6.35, must be specified at time of ordering.

Shipping	4 x 2 Projector Unit	4 x 3 Projector Unit	Clinometer
Dimensions	56 x 65 x 75cm	56 x 65 x 90cm	36 x 29 x 10cm
Weight	52kg	66kg	1kg

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