

# Q-HUD™ head-up display system

## Fly with confidence in all conditions

Based on a breakthrough in optical design technology, BAE Systems has developed the Q-HUD™ system — a low-cost, high-performance head-up display solution for commercial aircraft that is significantly smaller, lighter, and less expensive than systems available to date.

Like a conventional head-up display, the Q-HUD system displays essential information such as airspeed, altitude, heading, pitch attitude, flight director, and flight path marker in the pilot's forward field of view, superimposed on the pilot's view of the outside world.

However, thanks to a superior method of image generation, the Q-HUD system does not require the heavy and expensive optics used in conventional HUDs. This dramatically reduces size, weight, and cost without sacrificing reliability and performance.

BAE Systems' revolutionary, patented technology manipulates light using holographic waveguides, effectively generating the symbology within the glass, rather than projecting an image onto its surface, as conventional HUDs do. Thus, unlike current systems, the Q-HUD does not require cumbersome projection systems above the pilot's head, thereby maximizing headroom, and making the system easy and inexpensive to manufacture.

## Improved pilot comfort

The Q-HUD system's low-profile pilot display unit can in some instances be mounted above the cockpit's closeouts so that the combiner is the only visible part of the system. This allows the pilot to move as freely with the HUD fitted as without, an especially significant advantage in smaller cabins.

## Benefits

Lower-cost solution compared to conventional HUDs.

Reduced weight, volume, and complexity.

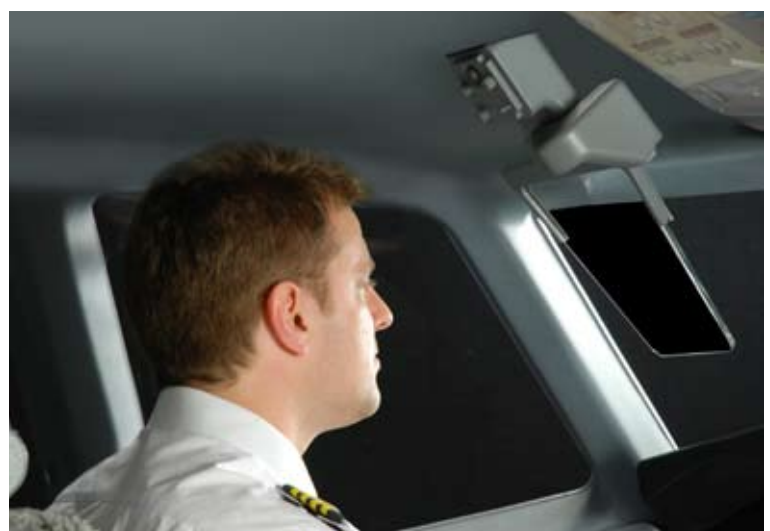
Large head motion box, enhancing pilot comfort.

Universal fit with minimal cockpit intrusion.

Increased safety and reliability.

Significantly increased room for pilot head movement while viewing the display.

No obstruction of display image, regardless of head position.



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## Features of Q-HUD technology

- Compatible with enhanced and synthetic vision systems.
- Precise flight-path guidance (for ILS and non-ILS approaches).
- Take-off and roll-out guidance.
- Warning alerts.
- ARINC 818 and RS170 video interface.
- High-integrity solution supporting CAT IIIa approaches and lower-minima takeoffs.
- Compliance with AS8055, ARP5288, and ARINC 764.

## Q-HUD system details

Field of view, H x V	>34 x 25 degrees
Head motion box	x15 current-generation HUDs
Head vertical clearance	To lining
Symbology brightness	3,000 foot-lamberts
Raster brightness	>1,500 foot-lamberts
Combiner transmission	>80 percent
System mean time between failure	>20,000 hours
Weight	<10 Kg
OHU power dissipation	<100 watts

## Increased operational performance

Because of its novel architecture, the Q-HUD system offers greater reliability and operational performance compared to conventional head-up displays. Its inherent accuracy enables takeoff in a 300-foot runway visual range. It also reduces the probability of runway excursions while enhancing the pilot's ability to "spot-land" the aircraft. The Q-HUD system provides approach guidance and deceleration cues that give pilots an additional safety margin at non-ILS runways, making overrun landings less likely. Designed to accept enhanced or synthetic vision interfaces, the Q-HUD system's flexible display interface allows it to be integrated with existing flight deck computational resources, in many cases saving the cost of a separate display computer.



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