Head Up Display HUD Mk1: LCA Air Force

Introduction

Head-Up Display (HUD) is an essential aid to the pilot of aircraft, especially fighter aircraft. It is a transparent display that presents data without requiring the pilot to look away from his usual viewpoint. The information is projected on to semi-reflective transparent glass through a combination of special projection technology, optical assembly and display source.

CSIO built Head UP Display Mk1 in LCA-AF Cockpit

HUD displays flight information such as altitude, airspeed, angle of attack, navigation, weapon aiming and other flight information in collimated form so that the pilot is able to view the information with his/her head "up" and looking forward, instead of looking down on other instruments mounted in the cockpit. It can also be used to adequately overlay imagery that has a physical relation to the real environment, which makes the information easier to apprehend, such as the runway symbology under poor weather conditions.

A head-up display gives pilots access to the critical flight information needed to safely fly the aircraft while allowing them to focus their attention outside the cockpit for potential conflicts or threats. The combiner glass is provided unique coating with material or combination of materials so as to reflect green wavelength, to which human eyes are most sensitive, while allowing everything else seen through in the forward direction.

Flight Symbology viewed through HUD Mk1 in LCA-AF

The HUD Mk1 interface electrically with Open Architecture Computer of the aircraft and displays flight symbology as well as Forward Looking Infrared Camera (FLIR) captured IR video of the outside environment.

The HUD MK1 technology possess multiple operational modes, high display brightness upto8200cd/m², which is essential in high ambient day mode flights, high contrast ratio with maximum display luminance, wide field of view of more than 25°, no forced air cooling or internal fan to remove the heat generated in the system which results in reduction in cockpit noise and increases pilot's comfort level.

Specifications

- Field of View (FOV), FOV (AZ), IFOV (EL) : 25°; 20°x 18°(15° Below+3°above FRL)
- Brightness : Normal cursive line luminance at a writing speed of 25°/ms:2400fL, Stroke in raster line luminance at a writing speed of 190°/ms:1000fL; Peakraster luminance: 260fL
- Modes of Operation :Stroke, Stroke in Raster Mode
- Power Consumption : <120W
- MTBF : >12000 hours
- Built in Test : Comprehensive
- Writing speeds :25°/ms, 70°/ms, 190°/ms
- Image Recording : Present
- Multifunctional Up-Front Control Panel : Interface between OAC and Pilot
- Thermal Management: : Convection cooling Without fan
- Compliance :MIL-STD 704D, 810D, 704C
- Weight : 18.5kg
- Parallax error : 0°-6°: 1.3mR; 6°-12.5°: 2.3mR

- Symbol positioning accuracies limits :0°-5°:<1.5mR;
  5°-10°: <2.0mR
  10°-12.5°: < 3.6mR
- Binocular disparity :0°-6°:<1.0mR;
  6°-12.5:<1.7mR
- Contrast ratio : ≥1.2
- Brightness non-uniformity : 1.5:1
- Bore sighting error: :< 1.0mR
- Line width : ≤ 1.0±0.5mR
- Linearity :> 1.3% of FSD
- Jitter : < 0.5mR

Status

- DGAQA and CEMILAC approved full qualification testing performed conforming to MIL standard 810D, 461C and 704D.
- Airworthy certification and successful flight trials.
- Under regular production by Bharat Electronics, Panchkula.

Head Up Display Mk1: Cursive and Raster Variants