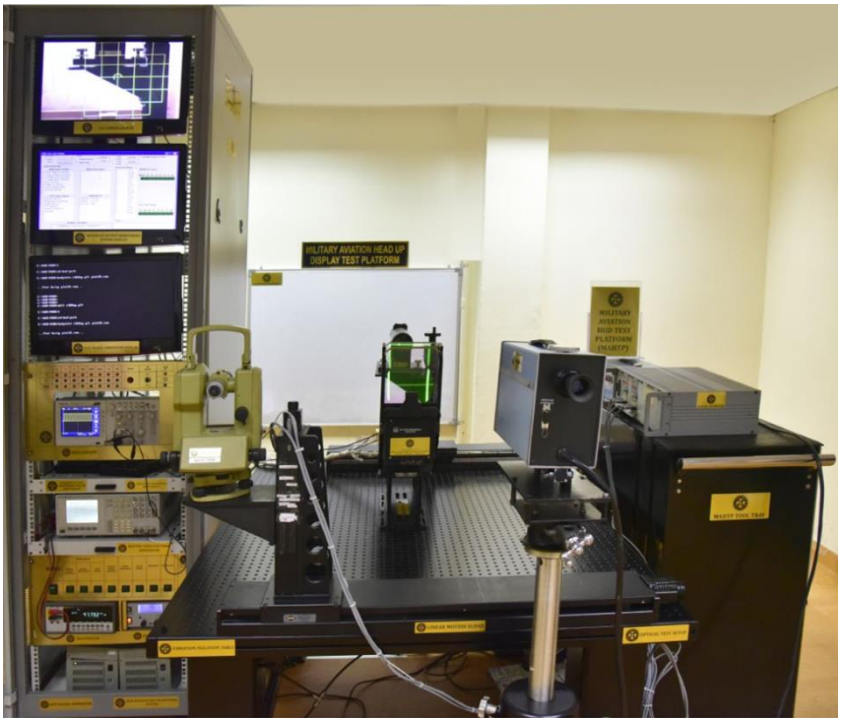
Military Aviation Head Up Display Test Platform

Introduction



Military Aviation Head Up Display Test Platform (MAHTP)is used to evaluate the electronic, optical and mechanical interface functionality of the cockpit displays and optronic systems which includes verification of performance and design parameters. This platform makes the process of automated testing & debugging less time consuming for Ground Staff and Maintenance Personnel using Intermediate Level (I-Level) & Operator Level (O Level) MAHTP at Defence Base Station, while system and subsystem level automated testing, fault rectification and maintenance is done using Depot Level MAHTP at Manufacturing Agency. The test platform provides following operations:

- Intermediate Level (I-Level) - Intermediate Level for automated testing in standalone mode at Defence Base Station: It is meant to test functionality of cockpit display and optronic systems in stand-alone mode which include: a) visual inspection b) health monitoring and communication and c) verification of display image quality.
- Operation Level (O-level) - Operation Level for automated testing of cockpit display and optronic systems, fault debugging at system level and repair at Electronics Module and Sub-module level at Manufacturing Agency's Site: It is meant for functionality test as listed above for I-Level apart from semi-automated evaluation of optical parameters like parallax error, binocular disparity, photometric characteristics, field of view, camera, etc. In addition to these functions, it is also used for automated identification and rectification of faults at Electronics Module and Sub-module level.

- Depot Level (D-Level)- For automated and semi-automated testing of cockpit display and optronic systems, fault debugging and repair at system and subsystem level at design or Manufacturing Unit: This involves rigorous testing of faults not rectifiable at Defence Station or Manufacturing Site. Hence, it involves automated and semi-automated component level analysis in addition to the tasks carried out at I-Level and O-Level testing as well as optical fault rectification.

Features

- Accurate and repeatable parallax measurements within 6" for horizontal movement of 200 mm and 100 mm of vertical movement.
- Positional accuracy measurements in single setup within 6" for entire design eye position of a simulated aircraft cockpit.
- Brightness measurements from 2fL to 20000fL for background varying from 0fL to 12000fL.
- Measurement of ghost images.
- Simulation of ambient brightness fluctuations.
- Symbology writing speeds upto 25°/ms, 70°/ms& 190°/ms.
- Correction of geometric errors within the specified limits.
- Real time reporting of fault.
- Measurement of electrical parameters.
- Customized test patterns for cursive & raster mode testing and measurements.
- User friendly graphical user interface.
- Video quality assessment.
- System level, sub-system, module and component level fault debugging.
- Measurement of optical parameters like parallax, binocular disparity, positional accuracy, brightness uniformity, line-width, field of view etc.
- Software level interface and fault finding.
- Endurance testing, calibration, report generation.

Specifications

Display Simulator	
Symbology generation	Vector scan method
Interfacing	ISA/PCI/USB port
Resolution	1024*1024
Flicker free images, Double buffer for display	

Differential drive 0 to ±20V for controlling X & Y deflection	
Writing speeds	25°/ms, 70°/ms& 190°/ms
Maximum pixel drawing speed	10 million pixels/sec
Symbology comprises of alphanumeric characters, line segment and circle	
Programmability entering any shape of display	
Support for multimode operations	Pure Stroke mode and the mixed mode, i.e., raster in Stroke mode
Raster Video Pattern Generation	
Signal Generator type	Video and TV
RF Output	(32-900) MHz
Standard	PAL, NTSC, SECAM
Signal	RGB + YC + YcrCb
Input Supply Voltage	210-240 V
System	625 lines (50 Hz)
Line frequency	15.625 kHz for 625 lines
CVBS Video	1 V PP
Impedance for video Output	75Ω
Port	IEEE, RS-232
Power Supply 230V AC ± 10%, 50Hz; Up to 30V (nominal 28V DC), 10A (Max)	
Industrial PAL Video Output Monitor LCD Screen Size: 19”(81 cm); Standard: PAL,NTSC,SECAM	
Optical Test Setup	
X-axis slide	885 x 150 x 66 mm, Travel: 650 mm
Z-axis slide	577.5 x 150 x 75 mm, Travel: 200 mm
Motion Controller	Software controlled
X axis travel	200mm
Z axis travel	100mm
Y axis	Fix
Theodolite	Accuracy ±3 sec, Least count 1 sec
Photometer	Pritchard; Photometer Tripod: Manual height adjustment ~ 300 mm
Test Setup Fixture	480 x 160 x 170.9 mm
Vibration Proof Table Top	48”X72” & 8” thick, Water proof & Acid Resistant, Honey comb structure
Built-In-Test Monitoring System	

Following checks performed with Offline testing:

- Bit and Key Switch Status
- UFCP switch status
- Equipment Id
- Software Checksum
- Errors if occur or through simulations

Applications

- It provides complete end-to-end solution to perform testing, validation and error correction on Line Replacement Units (LRUs) such as Head Up Display & Multifunction Displays for error correction, testing, pre-flight clearance and post flight analytics and Testing, validation, calibration and pre-installation checks on Gun Sights, Bore Sighting Tool for Laser Ranger & Marked Target Seeker (LRMTS), SPA Payloads, Bore Sight Harmonization Tool, Gun Sights, Optical Sights and Holographic Optical Sights employed in Aircraft, Tanks, Ships, Helicopters & Military Surface Vehicles.
- Scope of optical evaluation also include measurements of parallax error, binocular disparity, symbol positioning accuracy, linearity, field of view, photometric, line width and ghost images measurements, etc.
- Functional testing at LRU Level, module and sub-module levels as well as component Level.
- Pre-Flight & Installation checks.
- Calibration of Optronic Equipment for Target Delivery at infinity.
- The system takes care of the optical and electronic accuracy within 1.3 mR. This accuracy can be calibrated in range of ~5 seconds in lab at a measuring distance of 3 m which translates to an accuracy of 10ft diameter when the aircraft/helicopter is flying at a height of 20km. The calibration is capable of tackling the effects of flight and battle field dynamics as well.
- Post-flight and post-field operation analytics and diagnostics (module/component level).
- Simulation of head motion box enables testing of most of the Military Optronic Equipment.
- Simulation of true horizon at a distance of 3m thus helps in avoiding the need of large empty spaces as the aircraft/military/navy instruments

earlier used to be calibrated at a distance of 25.4 meter or more as per the end requirement.

- Brightness measurements from 2fL to 20000fL for background varying from 0fL to 12000fL to manage contrast ratio measurements as in actual flight, operation and field conditions.
- Correction of geometric, positional accuracy, linearity, parallax and binocular disparity errors within the specified limits are achieved through customized test patterns, measurement methodology, precision optical equipment used and the precision mechanical movements and assembly.
- Real time reporting of faults for isolation of faults in real time at component level.
- User-friendly graphical user interface for programmable symbology and test pattern generation at three writing speeds with handshake provides flexibility for comprehensive functional operations for multitude of Optronic Equipment.

Status

- DGAQA and CEMILAC approved.
- Under licensed production at Bharat Electronics, Panchkula.

MAHTP and Test Modes of ACDVP