

# Laser Harmonisation Device For Automated Alignment of Hardpoints in Aircraft

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## ABSTRACT

The invention relates to a laser harmonization device (102) for automated alignment of hardpoints in aircrafts. The device (102) includes a laser diode mounted on a shaft attachable to an aircraft hardpoint of one or more hardpoints, configured to project a laser beam onto a harmonisation board (108), a camera (106), and an onboard PCB control unit (114) configured to acquire and process a plurality of real-time image frames from the camera (106) through YOLO model to detect a targeted crosshair and the laser beam in each frame, and compute a displacement vector between the laser beam and the targeted crosshair. The control unit (114) further generates one or more alignment instructions based on the displacement vector to detect temperature changes induced by the laser beam, monitors resistance of the thermistor sensor (112) and transmit a confirmation signal to user interface (116) upon achieving optimal alignment.

## KEY APPLICATION AREAS

1. Aircraft Maintenance, Repair & Overhaul (MRO).
2. Military and Defense Aviation.
3. Aircraft Hardpoint/Pylon Alignment.
4. Aerospace Inspection & Calibration Systems.
5. Automated Precision Alignment and Verification.

## POTENTIAL USE

1. Automated harmonization of aircraft weapon hardpoints and pylons.
2. Alignment verification of external stores such as missiles, sensor pods, and fuel tanks.
3. Real-time laser-guided alignment during aircraft maintenance.
4. AI-based detection and correction of alignment errors using YOLO computer vision.
5. Maintenance logging, audit trails, and alignment quality verification.
6. Precision alignment in field, hangar, carrier-deck, and remote deployment environments.