Air Vehicle Operator Head-Up Display (AVO HUD)

AVO HUD

- CSC Name: Air Vehicle Operator Head-Up Display (AVO HUD)
- Function: Provides timely, graphical display of critical flight status data allowing the UAV operator or pilot maximal situational awareness.
- Note: Displays presented here may change depending upon the findings of the Joint Cockpit Display Working Group

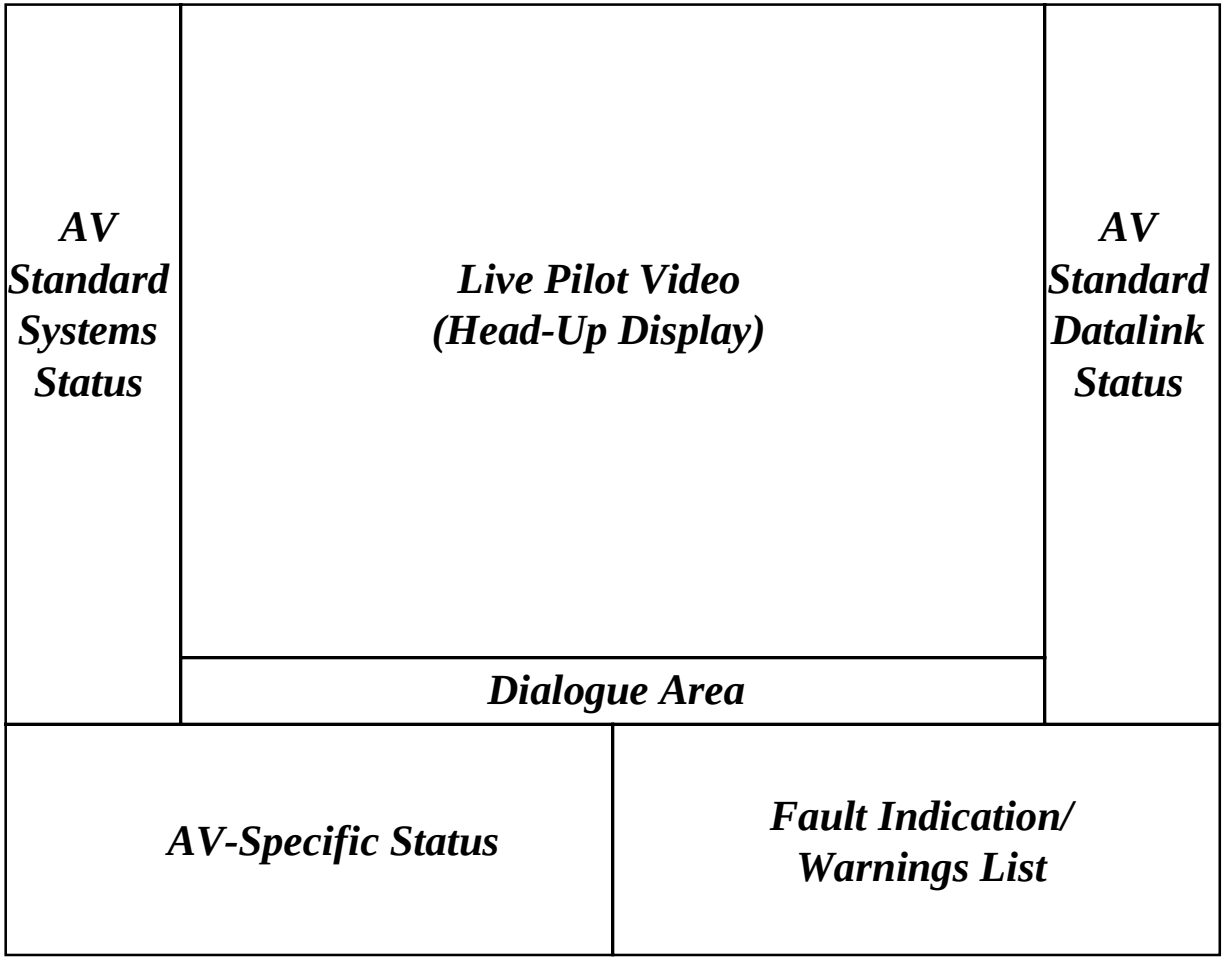
Design Drivers

- FAA Findings: Unusual Attitude Recovery
- Situational Awareness
- Pilot Ergonomics
- Compact Data Display
- Special Flight Characteristics of UAVs

Approach

- AFI 11-206 Instrumentation Requirements:
  - Continuous display of Attitude, Altitude, and Airspeed.
  - Ability to recognize, confirm, and recover from unusual attitudes *(cited by FAA as missing from Predator® GCS).*
  - Pitch, Vertical Velocity, Bank Angle, Horizon Reference, and Complete Fault Indications
- Arc Segment Attitude Reference (ASAR)
- F-18 Helmet-Mounted Display (HMD)

Window Layout



Data Use

- The AVO HUD is a status-only application. Information flows only one direction: from the Data Server to the Display.
- Processes Data Server objects as they are received from the AV Standard Interface (1 to 10 Hertz).
- Updates graphical display at 1 Hertz. Optimal rate is still TBD.

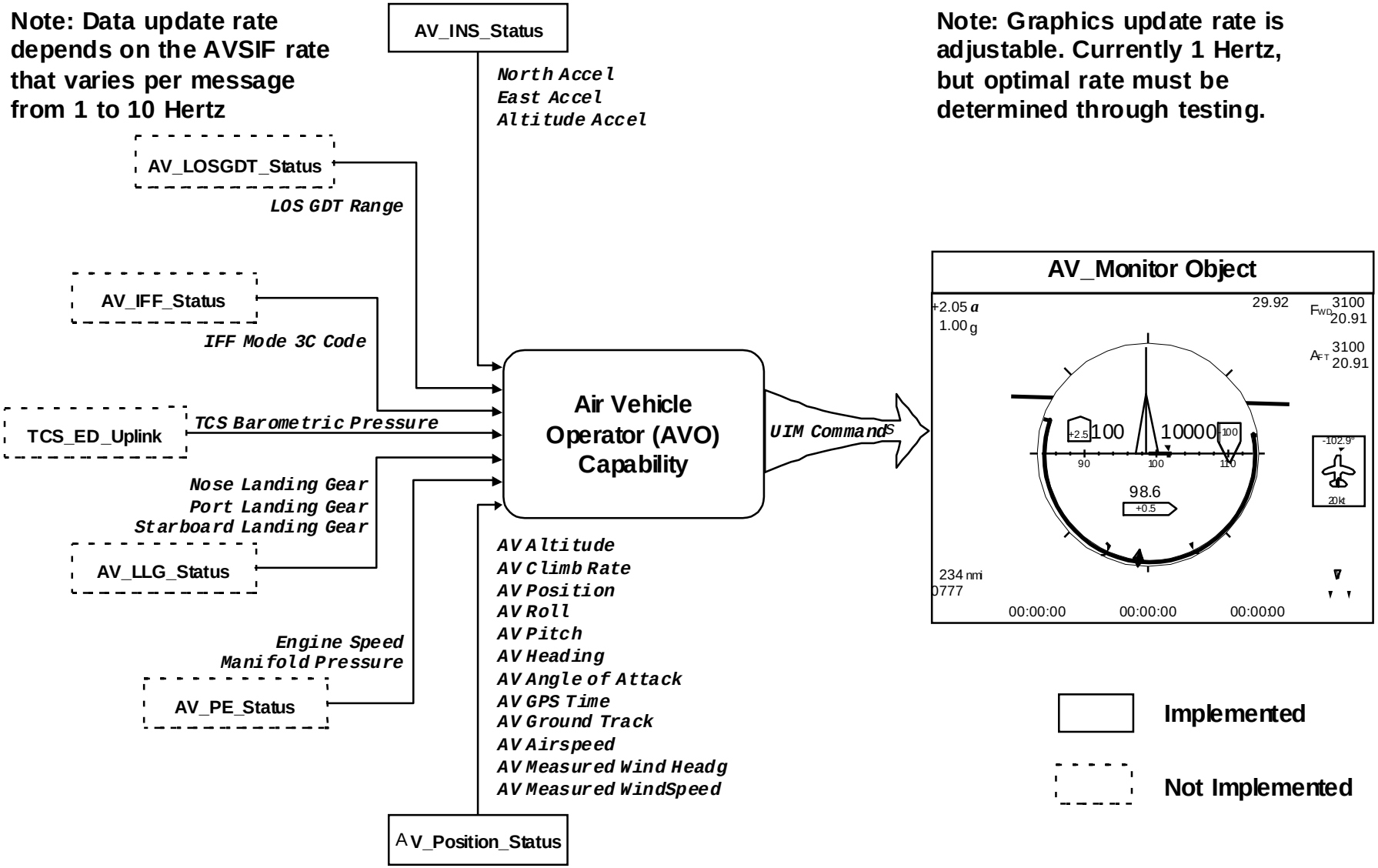
Operation

- Store status data as it arrives.
- Set internal flags that tell which AV status data items have changed since last refresh.
- At each graphical refresh cycle recalculate and redraw only those graphics that must change because of status changes.

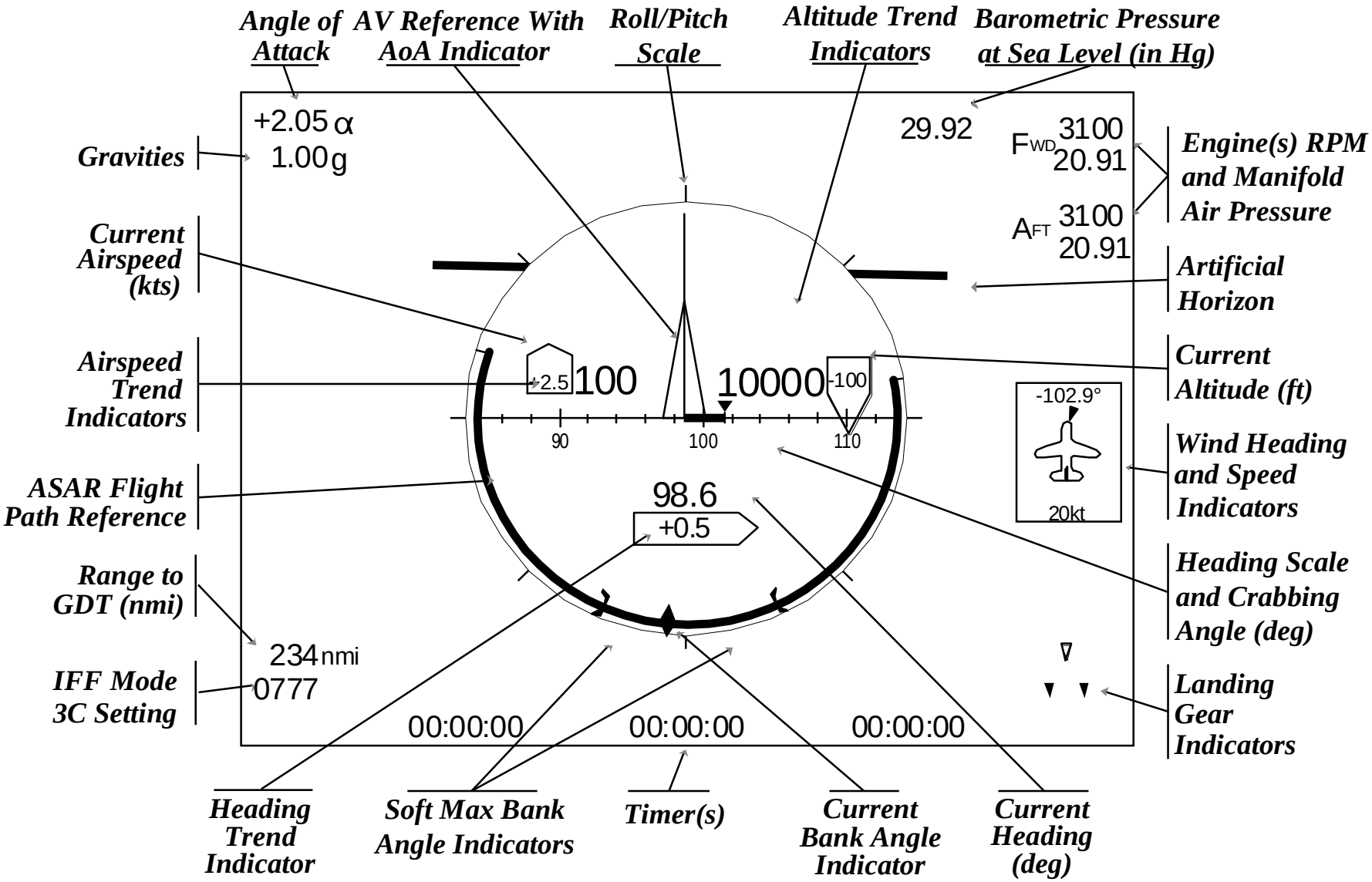
AVO HUD Data Flow

Note: Data update rate depends on the AVSIF rate that varies per message from 1 to 10 Hertz

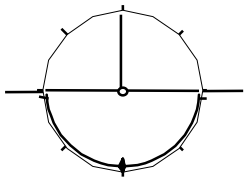
Note: Graphics update rate is adjustable. Currently 1 Hertz, but optimal rate must be determined through testing.



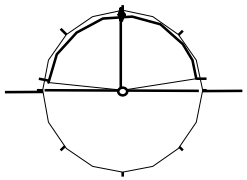
HUD Graphics



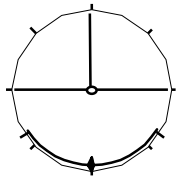
ASAR Symbology



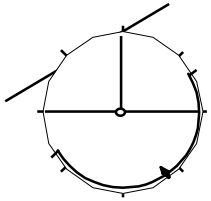
1. Level flight
($\gamma \approx 0°$, $\phi \approx 0°$)



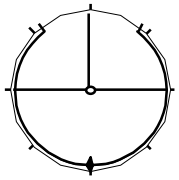
4. Inverted flight
($\gamma \approx -1°$, $\phi \approx 180°$)



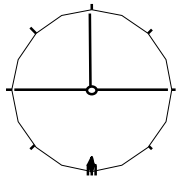
2. Steep Climb
($\gamma \approx 30°$, $\phi \approx 0°$)



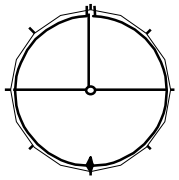
7. Right Bank
($\gamma \approx -2°$, $\phi \approx 35°$)

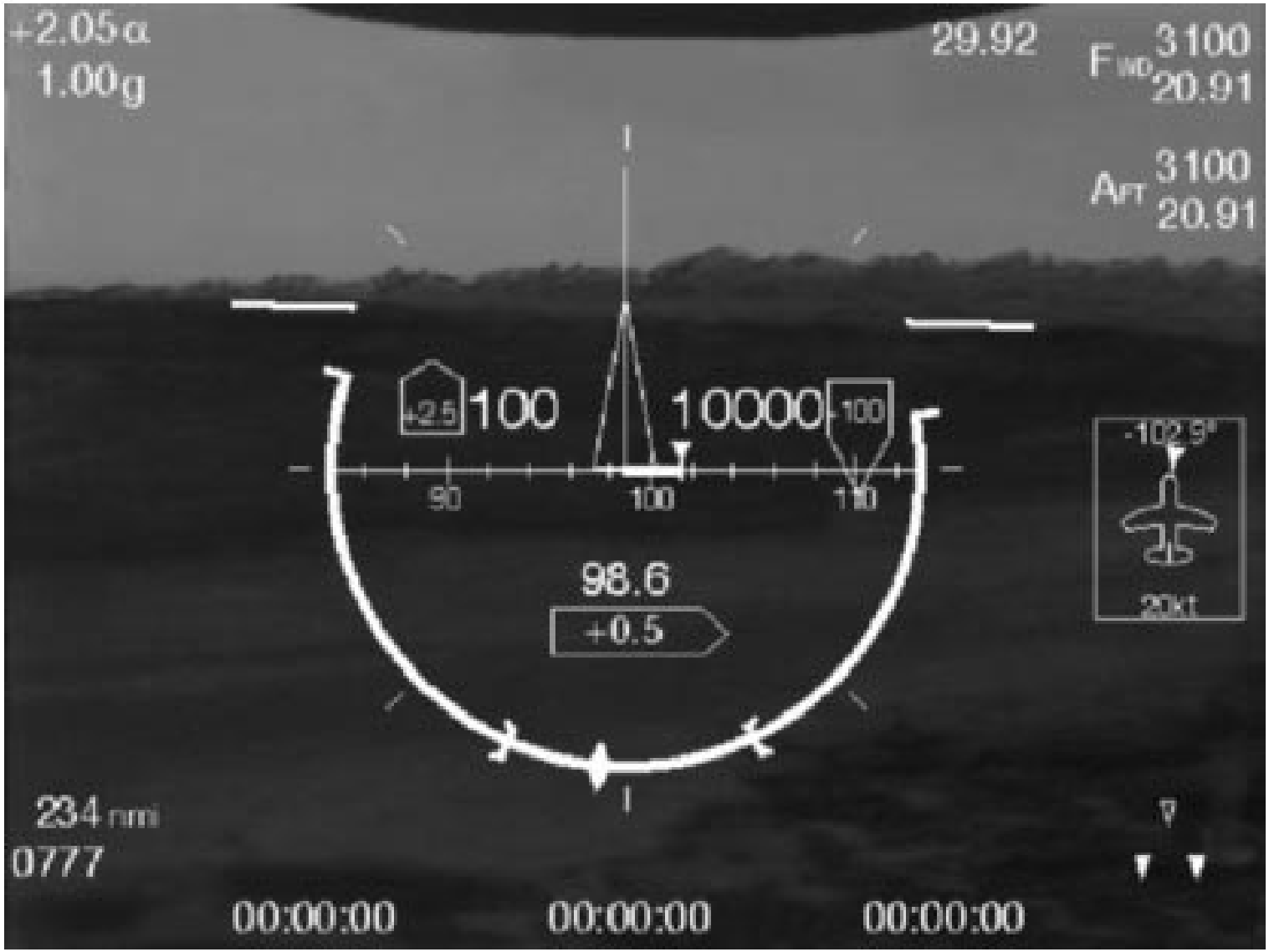


5. Steep Dive
($\gamma \approx -50°$, $\phi \approx 180°$)



3. Straight Up
($\gamma \approx 90°$, $\phi \approx 0°$)



6. Straight Down
($\gamma \approx -90°$, $\phi \approx 0°$)

Implementation