

Federal Aviation Administration

# **UAS DAA HITL**

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## Detect And Avoid Traffic Display Minimum Information Requirements

- WJH Technical Center study is looking at the following independent variables
  - Display Symbology (Basic Information display, CPA display, Avoidance Areas display, Banding display)
  - Control Station Interface (Predator B, ICOMC2 – Integrator)
  - Pilot Experience
    - UAS experience (Pred, other) 16
    - Instrument-rated manned aircraft experience only - 16

## **Basic Traffic Display**





## **CPA Traffic Display**





## **Avoidance Area Display**





## **Banding Display**





# **Banding Information**



- Alerts and banding information are generated using NASA Langley DAIDALUS algorithms
- Yellow banding only for DAA alerts no green banding except for recovery bands
- Banding display includes heading, altitude, and airspeed bands
- Alerts use latest timing and distance parameters from SC-228





## **Traffic Alerts**





# **Alerting Parameters**

		Preventive Alert	Corrective Alert	Warning Alert
Alert Level		Caution	Caution	Warning
Must Alert Threshold	Within Time	55 sec	55 sec	25 sec
	тmod*	35 sec	35 sec	35 sec
	DMOD and HMD*	0.66 nm	0.66 nm	0.66 nm
	h*	700 ft	450 ft	450 ft
Must Not Alert Threshold Threshold	More than time	75 sec	75 sec	35 sec
	HMDp	> 2.0 nm	> 1.5 nm	> 1.0 nm
	dh_p	> 800 ft	> 450 ft	> 450 ft



### **Encounter Complexity Factors**

- From Rantanen et al. (2004) Developing and validating human factors certification criteria for cockpit displays of traffic information avionics
- Traffic that is climbing or descending is more difficult to handle
- Different relative speeds between ownship and traffic make detection and understanding more difficult
- Non-orthogonal approach angles are more difficult (not 0, 180, or 90)
- Pilot tendencies
  - Pilots increase preference for vertical maneuvers under increased time pressure
  - Pilots tend to avoid airspeed adjustments
  - Pilots tend to avoid simultaneous multi-axis maneuvers



### **Preliminary Observations**

- Pilots rarely use change of airspeed as an avoidance maneuver.
- Pilots appear to have individual preferences for altitude changes or heading changes when executing maneuvers.
- Banding has been rated most favorably overall thus far, but many pilots have reported that the Baseline display was sufficient for enabling them to execute necessary maneuvers. The Avoidance Area display has generated more extreme responses. Some pilots find that format very useful, others not at all.





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### **Questions?**



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