



Unmanned Aircraft System (UAS) Standards Development

RTCA SC-228 Status

ICAO RPAS Symposium 2015

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Date: March 12, 2015





Overview

- RTCA Process
- Special Committee (SC)-228 Leadership
- Terms of Reference
- White Papers
- Architectures Overview
- Detect and Avoid Status
- Command and Control Status



RTCA Process

- Radio Technical Commission for Aeronautics (RTCA) established 1935 as a non-profit
- Federal Advisory Committee
- Enables government to convene private sector participants consistent with U.S. antitrust laws to develop policy recommendations
- www.rtca.org



SC-228 Leadership

Co-Chairs - George Ligler, Project Management Enterprises , Inc. (PMEI)
Paul McDufee, Insitu, Inc.

Designated Federal Official - Steve Van Trees, FAA Aircraft Certification
Secretary - Gary Furr, Engility Corporation

Detect and Avoid (DAA) Working Group, WG-1

- Co-Lead - Paul Schaeffer, Air Force Life Cycle Management Center
- Co-Lead - Don Walker, FAA Aircraft Certification
- Secretary – Kathy Ciaramella, FAA Tech Center

Command and Control (C2) Working Group, WG-2

- Co-Lead - John Moore, Rockwell Collins
- Co-Lead - Steve Van Trees, FAA Aircraft Certification
- Secretary – Gary Furr, [Engility Corporation](#)

Total Membership = 451 Members as of January 21, 2015



Terms of Reference (TOR) Timeline

TOR written to support FAA UAS ConOps v2.0, Sept 28, 2012

Phases Steps	Phase One		Phase Two	
	DAA	C2	DAA	C2
White Papers	Dec 2013		TBD	
Verification & Validation	July 2015		TBD	
Final MOPS	July 2016		TBD	

- White Papers - Defines assumptions, envisioned approach, initial requirements, and method for developing additional requirements
- Verification and Validation of initial MOPS - Develop preliminary MOPS and V&V Testing Program
- Final MOPS - Deliverable based on results of V&V activities



Terms of Reference

● DAA Scope

- Phase I
 - UA operated under IFR, Transit operations through Class D, E, G airspace to Class A or Special Use Airspace, Class A operation to be handled outside of RTCA, Ground Taxi is out of scope
- Phase II
 - Extend operation in all airspace classes

● C2 Scope

- Phase I
 - Terrestrial* only for L & C Bands
- Phase II
 - SATCOM (multiple bands)

* (Potentially 1) direct Line of Sight UA to control station, 2) terrestrial based cellular network, 3) both)



White Papers - DAA

- Class D, E, and G operations except for pattern ops
- Class A evaluation
- Self-Separation Function performance
 - Sample algorithm developed for validation
- Collision Avoidance Function performance
 - TCAS II algorithm used for validation
- Airborne Sense and Avoid Architecture
 - ADS-B, transponder surveillance, and radar sensors
 - Track information downlinked over C2
 - UA may include ability to automatically perform collision avoidance if C2 fails or PIC fails to act



White Papers – C2

- Develop system architectures / performance allocations with particular focus on differing DAA allocations requirements
 - What are the differing performance levels for different DAA architectures?
 - Specification of the performance levels to support the DAA Architecture of the Phase I DAA MOPS will be the top priority here.
- Evaluate / determine point-to-point and network C2 architectures that must be supported.
- Evaluate potential for sharing waveform structure between L and C band solutions to reduce certification.
- Evaluate potential / value of simultaneous operation and physical integration of L band and C band to improve system performance.
- Determine and document
 - frequency allocation scheme that is adequate to support anticipated system capacity and performance
 - physical layer waveform requirements
 - network waveform requirements
 - upper level services that need to be co-located in the C2 LRU
 - external interfaces



DAA Status

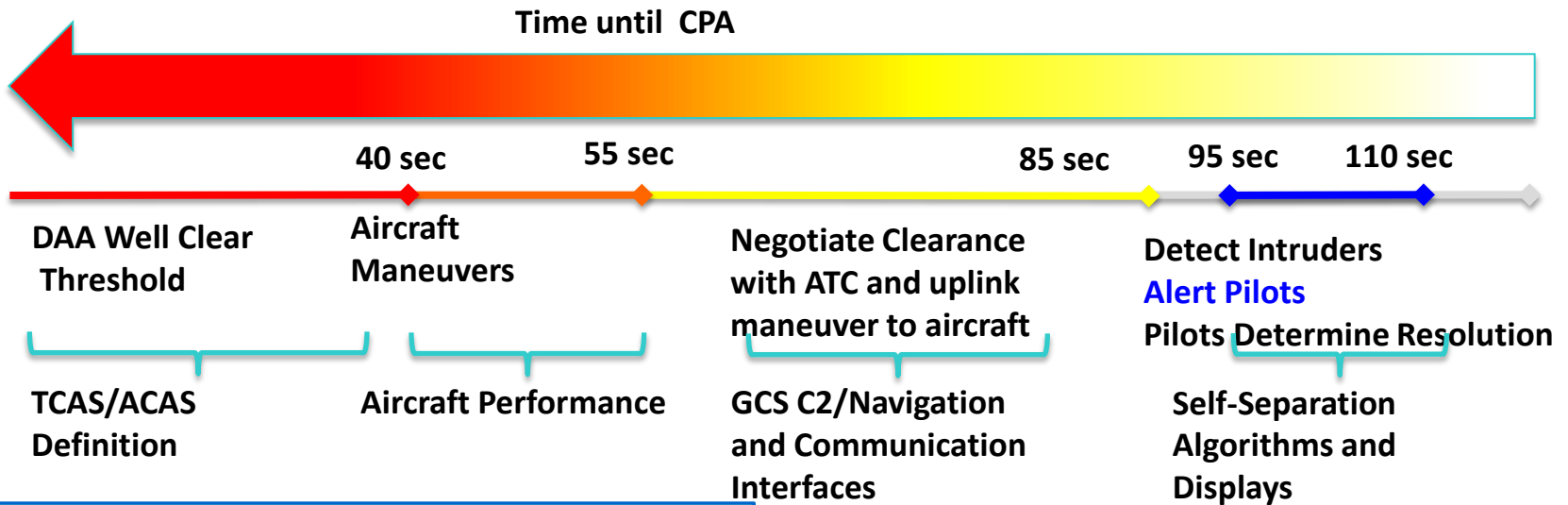
- Modeling and Simulation (M&S) (in progress)
- Human in the Loop Studies (in progress)
- SC-228 Inter-Special Committee Requirements Agreement with SC-147 – Interoperability with TCAS (Draft went out for review and completed disposition of comments)
- MOPS draft - in development
 - Operations (almost complete) – HITL, Alerting, Scenarios
 - Definitions (background task) – Well-Clear, SS Thresholds
 - Requirements (in progress) – Performance Limitations
 - C2 coordination (in progress) – RCP10 – 60 targets/sec (30 up/down)
 - Right of Way (parallel effort) – Maneuvering options
 - Safety (in progress) – TLS, RR and OSA
 - Validation and Verification (planning stages) – Grd & Flt Testing



DAA System Timeline

DAA Well-Clear definition:

35 sec Tau with 4000' HMD and 450' VMD

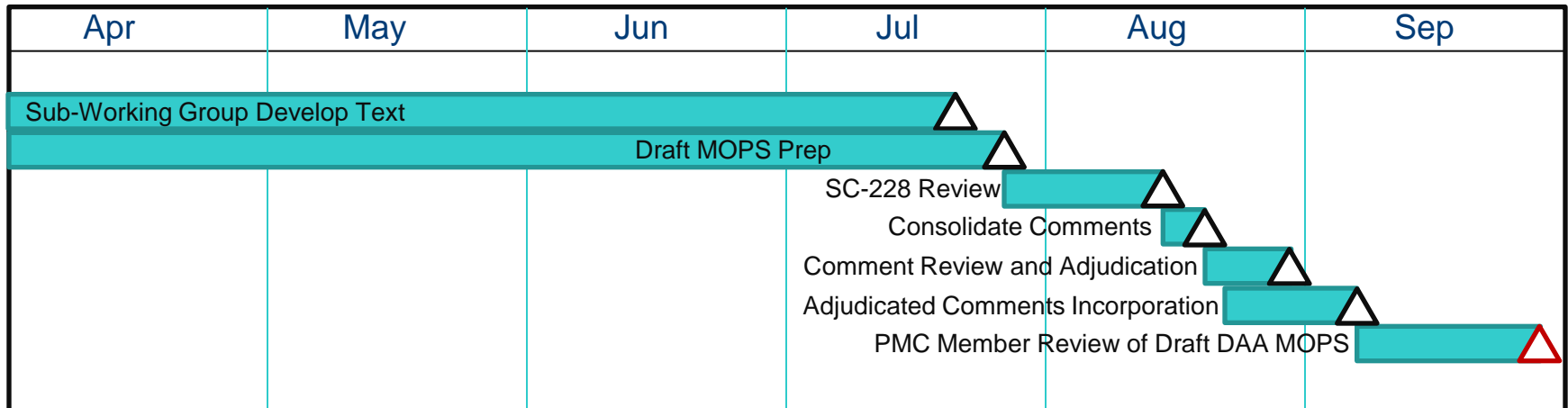


HITL study results will help develop alerting and guidance requirements



DAA WG Draft MOPS Schedule

- 20 July: Last Major Section (Safety) delivered for MOPS consolidation
- 7 Days for final draft MOPS Preparation
- 27 July: Draft MOPS released for comment
- 17 August: Comments due to DAA WG for consolidation
- 4 Days for comments to be consolidated
- 21 August: Consolidated comments distributed
- 24-28 August: Face-to-Face Comment Review and Adjudication
- 7 Days for incorporation of adjudicated comments
- 9 September: Clean copy of Draft DAA MOPS released to PMC
- PMC Review of Draft MOPS





C2 Status

- MOPS draft - in development
 - Section 2.2 draft by February 2015
 - Signal in Space
 - Dynamic Allocation
 - Security
 - Levels of Automation
 - Human Factors
 - Ground Environment
 - Safety
- NASA Flight Test of MOPS
 - Beginning Spring 2015 continuing through the year
- SC-228, WG-1 Coordination
 - Ensuring C2 MOPS meets DAA needs



C2 WG Path to V&V MOPS

Dates	Function/Deadline
18 – 22 May 2015	SC-228 Plenary, WG2 F2F, full week
22 May to 12 June 2015	Finalize draft CNPC V&V MOPS text / format for distribution
12 June 2015	Distribute draft CNPC MOPS for review by full SC-228
10 July 2015	Comments due to WG-2 Secretary
21 – 23 July 2015	WG-2 F2F for review / resolution of comments
7 August 2015	WG-2 provides draft CNPC V&V MOPS to the PMC
22 September 2015	RTCA PMC Meeting, review and comment to SC-228