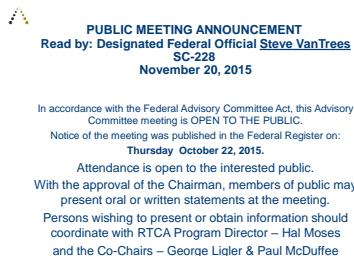


**RTCA SC-228**  
**Summary of Plenary 9 – RTCA Paper No. 010-16/SC228-030**  
**NASA Ames, CA**  
**9:00am to 12:00pm, Friday, November 20, 2015**

The ninth Plenary of RTCA Special Committee 228 was called to order by SC-228 Co-Chair, George Ligler at about 9:00am on 20 November 2015, from within the NASA Ames Research Center in Mountain View, CA. George welcomed all attendees to NASA Ames and those participating in the proceedings via the phone and WebEx.

1. Agenda Item #1 - Welcome/Introductions/Administrative Remarks

- 1.1 The session started off with George Ligler announcing himself and Paul McDuffee as the Co-Chairs for SC-228. He also introduced Kristina Carr as SC-228 Secretary. After the introductions, Confesor Santiago provided remarks from our host, NASA Ames, followed by facilities and safety announcements. George continued with asking each attendee to introduce himself or herself. Steve VanTrees, John Moore and Don Walker co-chairs of WG-2 and WG-1 respectively introduced themselves, as well. The complete list of session participants is listed in Appendix A.
- 1.2 George introduced Steve Van Trees, who read the Public Meeting Announcement from the Designated Federal Official.



- 1.3 Hal Moses read the proprietary information policy and discussed the new process and requirements for continuing membership as an RTCA member. It becomes effective January 2016. Membership allows access and discounts to documents, training and other RTCA activities. If there are any questions, go to the RTCA website for any further details on membership. Perla is working to cross reference people and active membership dues.



### RTCA Proprietary References Policy

- RTCA Proprietary Reference Policy covers any patented technology and copyrighted material required to comply with a RTCA Standard.
  - The policy allows RTCA to consider proprietary technology for inclusion in an RTCA Standard -- if it provides significant technical or economic benefit over non-proprietary technology.
- The policy has distinct requirements:
  - A bona fide, public interest basis for the reference and/or usage.
  - Evidence that private pecuniary interests have not driven any decision to either include or exclude a system from the market.
  - A participant must disclose if the use of any patented, patent pending, or copyrighted technology is proposed and/or required to comply with a RTCA Standard being developed.
  - The Chairman of a Special Committee proposing to use Proprietary information will coordinate with the committee's Program Director to provide a White Paper for approval in the Special Committee's Plenary session.
  - When approved for inclusion in a RTCA document, the proponent must sign a Commitment to License the technology under reasonable and non-discriminatory terms.
- By signing the attendance book or by submitting material for consideration at the meeting, you confirm that you understand the RTCA policies and agree to comply with them.
- RTCA policies available at: [www.rta.org](http://www.rta.org)

#### RTCA Guidelines Participation/Nonparticipation Policy

Effective January 1, 2010, agreements with a representative participating in RTCA Committee are required to be members of RTCA. Participants who do not meet the requirements for membership in RTCA are not eligible to participate in RTCA activities, attend and attend interactive, and staff activities in the presence of other attendees who have not signed a similar agreement.

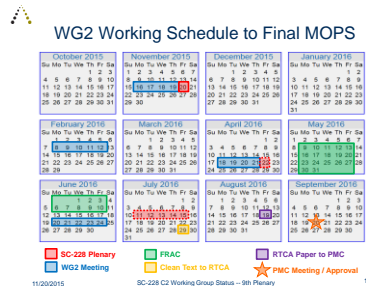
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2. Agenda Item #2 – Agenda Overview. George went over the agenda and proposed that agenda item #11 be moved up to accommodate early travelers. Agenda item #11 will follow agenda item #3 ( Review and Approval of Plenary #8 Minutes)
3. Agenda Item #3 - Review/Approval of Minutes from Plenary #8 (RTCA Paper No. 132-15/SC228-021 held Friday, May 22, 2015 at RTCA). George referenced the Meeting Minutes and indicated that it was posted on workspace. The minutes were approved after no comments from the floor.
4. Agenda item # 11 - Date, Place and Time of Next Meeting(s)
  - 4.1 Paul Campbell brought up the WG-1 DAA schedule. Don Walker showed the timeline of the DAA MOPS and requested a September 16, 2016 to support the FRAC process and dispositioning comments schedule. The plenary will be one day. It may be a long day, but it will be done. Hal confirmed. September 16<sup>th</sup>, 2016 was nominated as the date for a Plenary in Washington, D.C.- RTCA site. Mark Reed (ALPA) raised the issue regarding previous agreements. The agreements were that the rotation of the Plenaries would be after every other WG meeting. George Ligler clarified that we are going away from this routine and will be meeting when necessary and for WG-1 their needs for the Plenary is for September. WG-1 - DAA schedule is attached.
    - PMC Approval (December 2016)
    - Final Version to PMC (Mid-October)
    - All Comments Adjudicated (Sept 9<sup>th</sup>)
    - September 12 - 16 (FRAC Review)
    - Enter FRAC (August 12)
    - Face-Face (May 23-27)
    - Face-Face (Feb 29 – Mar 4)
  - 4.2 John Moore, C-2 co-chair, proposed a July 29, 2016 Plenary to support the C2 FRAC process. They proposed a week long Plenary - July 11-15, 2016.. Their vetting of comments is proposed for June 20-24, 2016 for C2, prior to Plenary. George Ligler was not in agreement for a week long Plenary in July. All agreed that a Plenary starting on July 14<sup>th</sup>, (Thursday) 8:30am and continuing to July 15<sup>th</sup> (Friday), as necessary would be

adequate. Don Walker emphasized that the WG-1 would have limited involvement in the Plenary. John Moore, Steve Van Trees and Chairs were in agreement and that only those in WG-1 supporting C2 would need to be present at the this Plenary. This would be the last opportunity for anyone to make any changes or bring up issues before the C2 document is published for final. C2 proposal briefing is attached.



4.3 Plenary schedule was agreed upon. They are as follows:

- Plenary #10 – July 14-15, 2016
- Plenary #11 – September 16, 2016.

**Note:** There is no Agenda Item #4 on the schedule.

5. Agenda Item # 5 – EUROCAE WG-73 on their progress. There was no update.

6. Agenda Item #6 - Review of RTCA Steering Committee Activity

6.1 Paul McDuffee presented. The Phase Two SC-228 TOR Development Team consists of 14 people, including individuals from the FAA, MITRE, NASA, General Atomics, Insitu, and ALPA. Kelly Markin from MITRE chairs the team.

6.2 The phase 2 TOR and its contents will be briefed to the Steering Committee on December 2, 2015 and be sent to the PMC in December 2015 (or March 2016 if not able to meet in December timeline). It will be published no later than March 16, 2016.

6.3 Greg Loegring (NGC) asked about BLOS with and without C2 SATCOM. Phase II TOR is considering both options. It will elaborate on the UTM concept. Discussion has begun with NASA and RTCA to look at UTM – operations below 500’ and BVLOS. RTCA and leadership have been asked to add inputs in what it would entail. Things have not been defined. Eric Euteneuer asked for elaboration on interoperability with UTM. Need interoperability platforms, because of the shared airspace between the equipment. But need partitioning between SC-228 and this activity. NASA and FAA discussing setting up “operations exclusively below 500 BVLOS.” Information will be shared soon. The TOR Phase II will mention it, but may not address. Will there be OSED discussion. George Ligler asked Hal Mose to add UTM into the TOR Phase II item. George realizes there is something is needed, but not quite defined. UTM is research, but is not operational at this time.

## 6.4 Briefing is attached.

SC-228 TOR Development  
Team Status  
20 November 2015

## 7. Agenda Item #7 - Report from WG-1 for DAA progress on the DAA MOPS

- 7.1 Don briefed WG-1 Progress. Don Walker expressed confidence that DAA MOPS development is reaching the “final stretch” and that Workgroup 1 is coming together to complete their work. NASA presented their HITL work – TCAS II integration, Flight Test 4 activity planning, definitions group updated terminology, equipment classification, requirements – critical issue on vertical rate velocity for integrating with TCAS II. TCAS program office helped in the evaluations. DAA vertical maneuver issues when transitioning into TCAS II RA alerts and ACAS alerts. Greg asked TCAS II use performance limitation and asked for FAA policy? Don responded that the Program office has just received results. There is no FAA policy issue at this time. Don identified that installation of TCAS II on UAS is making headway, and that recent research undertaken by the TCAS Program Office does indicate some UAS may have the technical performance to carry TCAS II. The DAA will need to be published, TSO needs to be published, and AC will need to published and then policy will be released to discuss performance issue.
- 7.2 Don shared some of the DAA MOPS Validation elements currently in final development. All aspects of end-to-end system performance are being considered, from encounters, through system detection and tracking, to alerting/guidance and display, including pilot and aircraft response modeling. Different organizations have identified resources, model development, and data collection efforts. And in most cases multiple efforts will contribute to MOPS performance assessments.
- 7.3 Slide 2 represents the DAA chain design development of the system - encounter models, detection, tracker, alerting, guidance, display, pilot, and aircraft model. Each block had assigned groups. There is coverage for all these pieces. Don then opened it up for questions. George wanted to complement Don and the group. Paul McDuffee asked what the aircraft performance limitations would be. Don said the aircraft performance information will be in the introduction and appendix. The AC will provide guidelines for types of ac installations, performance limitations, and applicability. Briefing is attached.

**SC-228 Detect and Avoid Status Brief**

Brandon Suarez &amp; Don Walker

November 20, 2015

SC-228 DAA WG

NASA Ames Research Center – Mountain View, CA

**8. Agenda item #8 - Report from WG-2, C2**

8.1 Comments on the C2 MOPS have been adjudicated and MOPS presented to the PMC in September.

8.1.1 Outstanding work items include

- Further development of “Quantum” concept
- Active power control
- Careful attention to calling out all “Normative” material in the body of MOPS; “Informative” material held in the appendices.
- Working out all V&V test cases

8.2 Spectrum Considerations

8.2.1 Formal coordination of 960-975 MHz band with DoD

- Ongoing “Sharing Study” led by Mark Hammond
- Draft report September 2015
- Final report in coordination and expected in January
- To be posted to RTCA website upon release

8.3 C2 V&V testing and test cases is underway

8.3.1 Leveraging NASA’s UAS in the NAS project. Operation at various power levels. Characterizing basic waveform. Industry involvement under CRDA. Feasibility demonstration on ScanEagle. Don Walker asked if V&V is looking at C2 range performance/interference given small antenna design (Answer: still in research, includes designs with small ground plane... but antenna design and interference is seen as an installed performance issue and work to be addressed)

8.3.2 NASA is conducting waveform and interference testing including

- comprehensive bench testing,
- electrometric compatibility

- UAT compatibility @ 987 MHz
- CNPC interference with Navy TACAN
- Co-site installation with existing systems
- CNPC-CNPC near-far compatibility

8.4 Briefing is attached.



#### **SC-228 C2 Working Group Status**

*John R. Moore, Steve Van Trees*

SC228P09-WP02-C2 WG Briefing  
20 November 2015

9. Agenda Item #9 for Action Item Review

9.1 No outstanding business

10. Agenda Item #10 for Other Business

10.1 Chris Swider presented a short brief of two FAA international efforts with JARUS (Joint Authorities for Rulemaking on UAS) and ICAO (International Civil Aviation Organization). Briefing is attached.

10.1.1 ICAO UAS Study Group started back in 2008; publishing circular 328 (RPAS Manual). In 2014, the Study Group stood up as an ICAO Panel with Randy Willis (FAA) as chairman. ICAO UAS Panel has 6 workgroups; including WG2 for C2 and WG3 for DAA. Panel's objective is to interact with other ICAO Panels to

- Develop regulatory guidance and concepts
- Review and recommend changes to SARPs
- Coordinate with ITU WRC

10.1.2 JARUS is made up of 43 member countries and includes Eurocontrol and EASA. JARUS has 7 workgroups; including WG4 for DAA and WG5 for C2. JARUS WG7 is developing CONOPS, which has developed UAS operations categories for "Open", "Specific", and "Regulated"

- “Open” corresponds to operations similar to FAA NPRM Part 107; requiring light regulation
- “Specific” corresponds to operations expanded beyond “Open”, which would be approved based on the scope of a given operation; often requiring operation specific safety considerations; requiring moderate regulation
- “Regulated” corresponds to the most “integrated” operations operating with few restrictions; requiring the most rigorous regulation comparable to regulations found in 14CFR parts 23-29.

## FAA UAS Integration Efforts

### International Update

**Presented To:** RTCA Plenary

**Presented By:** Christopher Swider,  
FAA UAS Integration Office,  
JARUS Vice-Chairman

**Date:** November 20, 2015



10.2 Mike Janus asked to make a comment and a request; he was granted permission to speak briefly to the Plenary. Comment: Mike thanked our gracious host, NASA, and additionally Confesor Santiago for being a valuable asset to the community. Mike compared him to Sloan and others from GM... this work is like herding cats... Confesor, Marcos, Scott – thank you. Mike commented that accommodations at NASA lodge were great. Mike expressed that he is disheartened how this part of the NASA campus has run down... dilapidated...Request: Mike indicated he would like to request to stay here to renovate to develop the truck depot of the future. To employ recent retirees of the UA Army to run a new air traffic organization and facility in support small UAS operating under 500’.

10.3 George yielded to Paul. Paul reflected on, and recognized with praise, this organization within the UAS community. He expressed nervousness of new Phase 2 TOR, but he is looking forward to the challenges ahead.

George adjourned the meeting at about 12:00. With no further questions or comments from the Plenary participants, George thanked everyone for their participation and the meeting was adjourned at about 12:00 PM, Friday, 20 November 2015.

**Appendix A – List of SC-228 Plenary Participants**

George Ligler	SC-228 Plenary Co-Chair	Consultant to PMEI
Paul McDuffee	SC-228 Plenary Co-Chair	Insitu Group Inc.
Sheila Mariano	SC-228 Plenary, Acting Co-Secretary	FAA.
Paul Campbell	SC-228 Plenary, Acting Co-Secretary and WG1 Secretary	FAA
Kristina Carr	SC-228 Plenary, Incoming Secretary	FAA
Don Walker	SC-228 WG1 for DAA, Co-Chair	FAA, AIR-130
John Moore	SC-228 WG2 for C2, Co-Chair	Rockwell Collins
Steve Van Trees	SC-228 WG2 for C2, Co-Chair	FAA, AIR-130
Lee Nguyen	SC-228 WG2 for C2, Secretary	FAA

<b>Name</b>	<b>Company</b>	<b>Name</b>	<b>Company</b>
Arnstein, Donald	The MITRE Corporation	Kim, Heewook	Electronics and Telecommunications Researc...
Bajwa, Anupa	NASA Ames	King, Lance	Northrop Grumman Corporation
Chae, Jong-Suk	Electronics and Telecommunications Researc...	Kunzi, Fabrice	Aurora Flight Sciences
Chauhan, Deepak	FAA	Lester, Ted	The MITRE Corporation
Connolly, Jack	NASA	Loeering, Greg	Northrop Grumman Corporation
Cowles, Lawrence	FAA	Long, Anthony	FAA
DeMott, Ed	Wendie L. Kellington, Attorney at Law PC	Lowry, Michael	NASA
Euteneuer, Eric	Honeywell International, Inc.	Martin, Terrence	Queensland University
Farrier, Thomas	ClancyJG International	Moses, Harold	RTCA, Inc.
Fern, Lisa	NASA	Newman, Bridger	Air Line Pilots Association
Foina, Aislan	University of California, Berkeley	O'Leary, Michelle	Regulus Group
Grindle, Laurie	NASA	Olsen, Doug	University of North Dakota
Griner, Jim	NASA	Pagano, Thomas	Regulus Group
Hammer, Jonathan	Noblis Inc.	Reed, Mark	Air Line Pilots Association
Hayes, Peggy	NASA Armstrong	Santiago, Confesor	NASA



<b>Name</b>	<b>Company</b>	<b>Name</b>	<b>Company</b>
Hirt, Ruth	FAA	Scheff, Scott	HF Designworks, Inc.
Hoang, Ty	NASA	Simon, Joanna	Morrison Foerster
Hobbs, Alan	San Jose State University Foundation	Sperry, Mike	Northrop Grumman Corporation
Jackson, Barry	Cahon Systems Inc	Swider, Christopher	FAA
Janus, Michael	ECBB Holdings, LLC	Vian, John	The Boeing Company
Jeziarski, Carl	FAA	Vogl, Tom	Rockwell Collins, Inc.
Kay, Jacob	Bihrl Applied Research, Inc.	Wilkening, Christopher	Bihrl Applied Research, Inc.
Kelley, Mark	Esterline AVISTA	Young, Ray	Northeast UAS Airspace Integration Researc...
Kellington, Wendie	Wendie L. Kellington, Attorney at Law PC		

– S –

Sheila I. Mariano  
Acting Secretary, RTCA SC-228

CERTIFIED as a true and accurate summary of the Meeting.

– S –

George Ligler  
Co-Chair, RTCA SC-228

– S –

Paul McDuffee  
Co-Chair, RTCA SC-228