

## Notes by Michael Callaham on RTCA SC186WG4B Meeting #15

5/15/07

### Attendees:

Robert Burns (Engility Corp. / FAA Technical Center)  
Mike Callaham (Mitre / CAASD)  
Robert Eftekari (Mitre / CAASD)  
Jonathan Hammer (Mitre / CAASD)  
Paul Lipski (FAA AIR)  
Dennis Miller (Boeing)  
Paul Prizasnuk (ARINC)  
Rick Shay (NASA Contractor)  
Bernald Smith (Soaring Society of America)  
Dave Thomas (Engility Corp. / FAA Technical Center)  
Don Walker (Honeywell)

AI#1 review sec. 2.1 with CDTI subgroup.

DW: Alan [Branch?] and Rick Shay (UAL Technical Captain and consultant to NASA LaRC) arrived.

DM: where did unnumbered table in 2.2.2 of ASSAP-WP-13-06\_ASAS MOPS\_03-29-07.pdf go?

RE: In telecon, TE said he was going to completely rewrite that [section].

DW: We should document traceability.

JH: In the past we've used an appendix to document traceability to MASPS.

CM arrived.

\_\_ arrived.

[Review of Surveillance Processing section]

[Discussion of LB suggestion to "delete /ADS-R."]

JH: Disposition: Paul takes action (AI#2) to ask program office (about probability).

[Discussion of Figure 2-1: Surveillance Processing Architecture]

Should clock be on left of Common Time Track Extrapolation Function block?

Should connecting line be dashed?

[Discussion of "rationale for this architecture"]

Consensus: Add "as a minimum requirement. However, these requirements do not preclude the use of sensor fusion techniques" after "avoiding the complexity of a fusion tracker."

Issue (I#1) raised by Paul: Is ADS-B or anything else influence how TCAS tracks are displayed?

Consensus: Change "does not warrant" to "does not necessitate requiring."

Discussion of Comment #5 of LB: Need to include what information goes into a "track" or "source file."

Consensus: Added an assumption (new sec. 1.5.1) that the ADS-B reports are already subject to ...

Ron Harris and Woody Bode of Freestate Electronics arrived (to demo).

Subparagraphs a, b, and c in "Source Level Track Generation" section (formerly 2.2.2.2.1, now 2.2.3.1.1) was edited.

Subparagraph d in "" deleted.

Subparagraph (formerly "e," now "d") in \_\_\_ should be edited to be consistent with Table 2-105 of DO-260A-V1. (Continued after lunch).

[Break, during which Freestate Electronics ADS-B Test Set demo is set up]

Ron Harris, President, and Woody Bode, Chief Engineer, of Freestate Electronics (fse-inc.com) demonstrate ADS-B Test Set. On the market; delivered to Garmin.

Q (DW): time resolution?

A (RH): 1 microsecond timestamps.

ADS-B Test Set is connected to an Agilent Technologies MSO6104A Mixed Signal Oscilloscope and also to a laptop PC running software (LabView, with .DLL, displaying "ADS-B Test System Control" window).

Each channel can be ATCRBS, Mode S 112 bit, Mode S 56 bit, or Squitter.

Two totally independent RF channels, and isolators after those.

Lots of capabilities to generate noncompliant signals, if desired.

DM: Do you have capability to meet European standards for elementary, enhanced, and ADS-B?

RH: This box, no. But our Beacon Test Set ...

DW: DM, you want a ramp tester. This is not a ramp tester. This is a lab tester, for TSO.

WB: Computer is doing monitoring, not any real-time control.

DM: Max transmit level?

RH: 0 dBm. Can go down to -90 dBm.

DW: Needed: way to simulate interacting TCAS systems, with changing propagation delay.

[Lunch break. RH and WB depart.]

DW: Before Paul left, he got a response from the program office--hence action (AI#2) is closed--saying problem could occur. It needs to be fixed.

DW: Copied Table 2-105 of DO-260A-V1 into subparagraph (formerly “e,” now “d”) of "Source Level Track Generation" section (formerly 2.2.2.2.1, now 2.2.3.1.1), and changed paragraph text to "ASSAP shall be capable of maintaining at least the number of tracks in table <insert crossref>." [Table 2-105 of DO-260A]

Discussion of subparagraph (formerly “f,” now “e”):

JH: I think it's a good requirement; the only question is, what should the distance be?

CM: It should be a function of NAC.

DW: Reworded requirement to: "When two targets/tracks are reporting the same address, ASSAP shall identify them as separate when the second track initiates at a distance at least three times the sum of the two target accuracies (as reported in the NAC) apart from the first."

Discussion of comment by LB on subparagraph (formerly “g,” now “f”):

Changed requirement to "ASSAP shall attempt to identify TIS-B report streams with different addresses on the same detected target as a single track." and deleted Note 2 thereof.

This solution was debated, and it was decided that JH will take an action (AI#3) to draft candidate text for this requirement.

Inserted the following subparagraphs after “c:”

d. Report to track correlation logic shall take into consideration all of the following criteria: address, altitude, velocity, position, and quality.

e. The correlation algorithm shall perform at least as well as the example given in Appendix TBD with respect to distinguishing ...

[Break]

Subparagraph “a” edited.: ...

DW: Edits Inter-source Correlation section (now 2.2.3.1.2).

DW: Revisits table <insert crossref>.

RS: Where do these numbers come from?

DW: Adds note explaining req number is sum of TCAS tracks specified in DO-185() and ADS-B tracks specified in DO-260() for the category of equipment.

Further discussion of required numbers of tracks, with some sentiment that they are too high.

DW: Recommends 130 for class A0.

CM: Source track does not include TCAS.

DW: Adds note explaining that source tracks do not include TCAS, and changed "tracks" to "source tracks" in (new) 2.2.3.1.1.f: "The correlation algorithm shall perform at least as well as the example given in Appendix TBD with respect to distinguishing unique tracks and miscorrelating tracks. .... is met by passing the correlation test scenarios given in section 2.TBD."

Regarding comment 11 by LB ("at least put in one probability"): edited section.

Changed title of section (formerly 2.2.2.2.2?, now 2.2.3.2.3) from "Correlate TCAS with Source-Level Tracks" to "Correlate TCAS with ADS-B, ADS-R, and TIS-B Tracks" and changed requirement to:

"The inter-source correlation algorithm shall perform at least as well as the example given in Appendix TBD with respect to distinguishing unique tracks and miscorrelating tracks between TCAS and ADSB, ADS-R, or TIS-B sources. This intent is met by passing the correlation test scenarios given in section 2.TBD."

DW: Action (AI#4): replace data in 2.2.3.3 with information in Joel Wichgers's paper, ASSAP-WP-03-06 (Gary Furr misattributed authorship on web site), which says [paraphrased, and forgetting ACL]: Look at SIL, then, depending on Horizontal Position Integrity, ...

DW: RE, what does your algorithm implement?

RE: SIL, then NIC, then  $NAC_P$ , then  $NAC_V$ .

DW: performs action (AI#4) by inserting note to insert Joel's SIL, NIC,  $NAC_P$ ,  $NAC_V$ , and adds If  $NAC_P < 5$ , then drop back to TCAS track.

DW: Takes action (AI#5) to revise outline (because of realtime editing in Word).

Action (AI#6) for MC: define "coast interval."

Bernald \_ arrived.

Discussed "Track Termination" section (now 2.2.3.4).

DW: Revised it to read: "ASSAP shall terminate a track when the maximum coast interval has been exceeded for all of the applications for which the track is potentially being used. The coast interval is the elapsed time since a report from \_an\_ source has been correlated with the track"

Discussion of "Track Estimation" section (now 2.2.3.5).

1645 Adjourned

[Text above this line\* transferred to DW]

[Except original, mis-numbered "Action (AI#5) for MC" was subsequently changed to "Action (AI#6) for MC."]

:::::: 2007-05-16 :::::

JH: I'll have to be in a phone call...

DW: call to order

DW: projects agenda

DW: Shows his draft of 2.2.3.3, Best Source Selection

Discussion

[JH returns]

DW: This draft text will allow [in some cases] a TIS-B target to be shown over TCAS. Is that OK with you.

JH: Yes. I like what you've done with the text here. Deciding whether TIS-B or TCAS is better is hard.

Discussion

DW: OK, so I agree for now. We'll leave it [my draft] as it is.

DM: Are you checking the comments?

DW: Good call. [Projects consolidated comments doc]

Discussion of comments by LB.

RE: I hate to backtrack, but the gapfiller function?

DW: I promised to write that...and failed miserably.

DW: I'm going to take an action to get rid of these (list) letters and replace them with sub-paragraphs.

DW, JH, ...: Discussion of merits of numbering lines.

DW: I've changed this, so extrapolation of tracks is done once, at source level. Now we need to rewrite Best Source Selection priorities to refer to extrapolated  $NAC_P$  and extrapolated  $NAC_V$ .

Does this address gap, RE?

RE: I'll have to check.

DW, JH (0957): Let's take a 5-minute break and then Paul [P.] can make his presentation.

[Break]

DW, RE, JH, et al.: discuss source-selection "hysteresis" etc.

Paul Prisaznuk of ARINC, presents "AEEC Project Paper 735B, Traffic Computer Standards Development Activity"

Title slide: AEEC Project Paper 735B, Traffic Computer Standards Development Activity

[AEEC: Airlines Electronic Engineering Committee]

Paul: We were hoping that ACSS would be making the presentation, they're the lead industry drafter, incorporating other inputs. But ACSS isn't here today.

Slide: AEEC activity: Traffic Computer

- o Initiated September 2006

- o ARINC 735B, "TCAS with ADS-B Capability"

...

This is a draft, out for comment until May 30. ACSS will roll it again in June, with the goal of having a mature draft in August. I want to stress that between now and August is a golden opportunity [to influence draft characteristic]. BTW, these slides are on a silver USB stick being passed around the room.

DW: We'll give it a name and put it on the web site.

Paul:

Slide: Retrofit and Current Production

Not all pins will be assigned by characteristic. Some are at manufacturers option. [To support UAT or VDL-4.]

Slide: ARINC 429 Interfaces

\_: Can you go back to slide [Retrofit and Current Production]? What is ASP?

Paul: Isn't that in DO-289?

JH: What we're interested in is ACL, in DO-289.

DM: ...auxiliary display...discussion of ADS-B ON/OFF, Euro and Australian positions, Airbus flight deck philosophy etc.

Slide: Traffic Selector Discrete Inputs

A735B Alt(DO-289) Definition  
Highlight Select Target for which ...  
Select Couple Target upon which ...  
Couple No equivalent term Target upon which ...

Slide: A-380 and B-787 Considerations  
ARINC 768

[WG4A invited and arrives]

PP: Back to:

Slide: Traffic Selector Discrete Inputs

SR: ...

DW: PP, is Highlight info fed back to the traffic computer?

...

PP: It is bidirectional...

...

SR: My opinion is we can converge on definitions in the time frame you mention.

DW: SR, will you take an action to...

SR: Yes. The CDTI group will take the one action on this, and the broader group will comment to ACSS.

PP (to all): Do you see DO-289 being revised?

JH: DO-289 won't be revised for some time. But we have an issue paper process. We have issues with DO-289 every 5 minutes.

PP: Send comments to me: [pjp@arinc.com](mailto:pjp@arinc.com). Zach Reynolds at ACSS is the industry editor.

Slide: Future Activity

o Mature ARINC 735B will provide near-term support for airline retrofit programs in 2007

- Focus on operational efficiency

o RTCA and EUROCAE participant comments are invited

- Comments to ACSS before May 30

o Beyond 2007 - ADS-B Program in the United States

- Support SC-186/WG51 MASPS and MOPS

o Beyond 2007 - Single European Sky Initiative

- Global solutions and common equipment standards

o Future revision to ARINC 735B as required

[1135: PP and WG4A members depart]

DW: CM will present his "Essential Spec." Any other material to present? This is the time to speak.

[No response.]

CM: Presents excerpts of TIS-B/FIS-B Essential Services Specification

JH: I don't think we want to glean this for particular scenarios.

CM: But the general philosophy is interesting.

DW: DM's up next.

DM: Presents "Response to SC-186 ASSAP WG4 Action Item #73," May 11, 2007

DW: Noted his "very public" email exchange w/Ken Carpenter.

JH: Let's back up -- 11 years. I recommend everyone read App. J of DO-242. Evidence is we can do CD much better with geo than with baro. That has no implication for \_navigation\_.

PL: I'll go back and get an FAA position...

DW: But that all has to do with operation of the aircraft; this has nothing to do with operation of the aircraft.

JH: Our job is to make recommendations to FAA. FAA can toss them out.

PL: My job is to make sure that if you're going against an FAA regulatory position, you \_know\_ you're going against an FAA regulatory position.

...

JH: Projects do-242a.pdf; esp. plot of Pr(CD) v. lead time, for perfect info v. geo v. baro, etc.

...

We'll take the action (AI#7) to write up (betw. PL, I, and Bill Petruzel) to write up characteristics of geo alt performance to share with Bruce McQueen at FAA.

PL: And Barbara...?

JH: We'll revisit after lunch.

[Lunch break 1236]

DW (1347) resume. DM will present next AI.

DM: Presents "Response to SC-186 ASSAP WG4 Action Item #74," May 10, 2007.

".... It is not recommended to use GNSS vertical velocity in any ASSAP and/or CDTI processing and/or application. ...."

[Discussion...]

DW: Shows DO-302.pdf .

DM: In interest of keeping discussion short, I'll leave it to you and JH do decide what to do with this. I have it on a stick.

DW: We'll get it on the web site.

...

DM: The ADS-B message structure has a baro/geo flag [bit] for vertical position, and another one for vertical rate.

DW: Thank you, Dean, for your presentation. We'll get it on the web site. Really.

JH: Thank you for your interest in aviation safety.

DW: [Reviewing MOPS draft:] There is a General Requirements section of Application Processing, but I don't know whose name is assigned to it.

RE: Tom Eich.

DW: I've broken this section into two: 2.2.4.2.1.1 Own Aircraft Requirements for EVAcq, and 2.2.4.2.1.2 Target Vehicle Requirements for EVAcq.

DM: We don't have a definition of "uncompensated latency" in our definitions.

DW: MC, take an action (AI#8) to define "uncompensated latency" in our definitions.

DW: Per DM's suggestion, moved the following up to 2.2.4.1 General Requirements:

"...uncompensated latency...200 ms...."

DW: More comments?

DW: On to ASSA/FAROA....

DM: DO-272, Airport Mapping Database MOPS, quoted confidence as 90%. [Should have been 95%.]

JH, DW: recalculate error budget, correcting 90% to 95%, and find it makes negligible difference in error budget.

DM: You can note in Comments page that you updated text.

DW: Does so.

DW: Any more discussion of Own Aircraft Requirements for ASSA/FAROA? [None.]

DW: On to Target Vehicle Requirements for ASSA/FAROA....

JH, DW: We need to reference DO-260 and DO-282....done.

...

[Discussion of rationales for coast.rates]

DW: Issue is with table [3.2] of DO[189?]. I think 15 s in terminal area is too long.

I'm proposing to drop coast time from 3 en route sweeps to 2 sweeps, and to change \_\_\_ coast times to 11, 15, and 24.2 s.

[Group consents to general approach.]

DW: Takes action (AI#9) to write Issue Paper on this topic.

DW: Next topic: Conflict Detection (CD)

PL: We're deferring discussion of geo/baro altitudes until after discussion w/FAA.

DW: Displays 2.2.4.2.2.3 Conflict Detection (CD)

...

PL: Suggest changing "Avoidance maneuvers are not suggested ..." to "Avoidance maneuvers are not provided ..."

DW: Is this all there is to CD?

RE: The algorithms are in the appendix.

DW: We need to define what CD is.

JH: Should be like Surveillance Processing.

DM: EVAcq and ASSA/FAROA are pretty light.

DW: But they don't require processing; CD does.

DW: Edits section, adding text suggested by JH.

JH: OK, we'll take the comments back to GW.

DM: (Referring to Surveillance Processing diagram): there's no Application Processing.

RE: I could add a block.

[Discussion of where Common Time Track Extrapolation block should go.]

DM: Propagate TIS-B and TIS-R to Inter-Source Correlation?

...

MC: Alternative to adding Application Processing block is to label arrows at right "to Application Processing."

DM: Then I'd like to see comparable figures for "Application Processing" and "CDTI."

JH: Can we take an action, MC to feed comments back to GW? (AI#10)

1610: JH: reconvenes. We'll adjourn at 1640.

JH: Mike, did you get names of all attendees?

MC: Not all. [Introduces himself to Steve Ramdeen]

JH: Discusses EVApp; shows draft sections. I assume these numbers are straight of of the MASPS?  
RE: Yes, except I did not use the degraded values.

#### 2.4.2.2.4.1 Own Aircraft Requirements for ASSA/FAROA

#### 2.4.2.2.4.2 Target Vehicle Requirements for ASSA/FAROA

TBD versions of existing ADS-B links are eligible to be EVApp targets (e.g. DO-260 Version 0)

...

JH: Now we come to a fork in the road: Continue reviewing document, or review open action items? I feel some of the other sections are mostly boilerplate.

[Concurrence]

JH: OK, let's go over to the action items.

JH: AI3: RS

DM: We reviewed WP08-12. Closed.

JH: AI5, TE. I'm going to call it OBE.

JH: AI9, LB. Let's leave it open.

JH: AI16: anyone recall what this is about?

JH: AI18...

RE: I think we closed that....

JH: OK. Let's close that.

JH: AI46, availability. ... I guess that stays open.

JH: AI52: Closed

JH: AI54: OBE...I guess I'll say closed. Req'ts have been agreed ....

JH: AI58: Closed. (It's an ongoing activity.)

JH: AI59: OBE by Don Walker's presentation WP12-05 to ASSAP and CDTI ...

DM: ...which maybe should become an appendix.

JH: AI61, Dave Thomas. Closed. Not a real action.

JH: AI65: still open.

JH: AI66: DW did this today, will write an Issue Paper. Still open.

JH: AI68: Closed.

JH: AI69.

DM: This is similar to AI74.

JH: AI69 OBE by AI74.

JH: AI73 and AI74 both closed.

JH: Plenary is tomorrow; we'll continue our deliberations on Friday. Who will not be here?

[Some.] We'll re-poll group tomorrow.

JH: Adjourns 643.

..... 2007-05-17 .....

JH (1410, after Plenary): Reconvene

DM: I gather AI70 is now closed, based on Gary's comment in Plenary?

JH: Yes.

DM: But will that hurt safety case?

(discussion)

JH: AI70? Leave open.  
JH: AI72? ... Closed  
JH: AI75? Open, for now.  
JH: AI76? Closed: DW did at Mar mtg  
AI77: closed  
AI78: "quantization" means availability.  
DM: AI46 is still open...  
Steve Ramdeen: rule will address this.  
JH: AI78: closed  
JH: AI79: closed

JH: Done with AIs. Next agenda item: flight test prep. I think we should then talk about next steps: drafting assignments, test reqts.

JH can someone get MP out of CDTI meeting?

CM: I will.

DM: Would there be value in collecting data on the ground, too.

CM: That's the easy part. I think they're going to do that. Right, Dave?

DT: right.

JH: RE?

RE: Vendors will loan hybrid ADS-B+TCAS boxes. Data release issue. DW wrote that Honeywell will provide TPA-100A TCAS/ADS-B unit.

(Discussion of need to sync or calibrate TCAS and ADS-B times. How to get TCAS times?)

DM: TE said ACSS box records on flash cards.

JH: What happens next?

MP: I'm waiting on ...someone...to sign authorization...

(Need to allay perception that test will delay doc.)

MP, ...: what transponders will be used? RE will ask.

...

RE: some scenarios require 3 A/C.

MP: 3d A/C may have just regular 1090 xpdr....

I've been contacted by Paul Purcell, ...

RE: Presents Questions/Thoughts for ASSAP Data Collection Flight Tests

JH: RE, CM, MC, work on scenarios, then summarize plans to group, and (RE) go up to Tech Center to talk to test pilots...

[Done with flt test discussion; MP leaves]

[Break]

[Resume]

JH: Plan is to be done with complete draft by Oct. If we could knock out test reqts by Jul, that would be great. How do we construct tests, Dave?

RE: RC had a lot of meat in older section...

JH: Show us.

RE: ...

DW: Section structure parallels requirements section structure, with "Verification of" in section titles.

...

JH: 2 actions:

1) DT to start poring through sections, to identify tests that don't require scenario

2) RE to identify tests that do require scenario, and develop scenarios

Let's distribute these and discuss at June 20 (2pm) telecon.

JH: Mike, I want to take an action to call Bob Saffell.

JH: Adjourned 1614.