

Summary of Meeting #4, of RTCA SC-186, Working Group 5 For the Development of a MOPS for UAT

The meeting was held on 1 – 3 May 2001, at the Headquarters of UPS Aviation Technologies, hosted by James Maynard. The meeting was called to order at 9 a.m. on May 1, 2001 by Co-Chairman George Ligler. George provided introductory remarks, welcomed all attendees and asked that each one introduce themselves and their organization. The attendees included:

Jerry Anderson – FAA (AIR-130)	Greg Kuehl – UPS Airlines	Robert Seach – NTIA – Dept of Commerce
Larry Bachman – JHU – APL	Ian Levitt – Titan Corp - FAATC – ACT-350	Bernald Smith – SSA/FAI
Mike Biggs – FAA (ASR-200)	George Ligler – PMEI	Ken Staub – Trios Assoc.(supporting FAA)
George Cooley – UPS Aviation Technologies	James Maynard – UPS Aviation Technologies	Terry Stubblefield – FAA (AFS-430)
Tom Elledge – FAA Alaska Region	Chris Moody – Mitre CAASD	Tom Teetor – Defense Concepts Assoc.
Gary Furr – Titan Corp - FAATC – ACT-350	Tom Mosher – UPS Aviation Technologies	Bill Thedford – Titan Corp, Hanscom AFB
Richard Jennings FAA (AIR-130)	Al Muaddi – JHU – APL	Ed Valovage – Sensis Corp.
Stan Jones – Mitre CAASD	Ei Mon Phyu – Titan Corp -FAATC-ATC-350	Warren Wilson – Mitre Corp.

1. Following introductions, known regrets were announced as follows:
 - Brent Phillips is attending the AMCP WG-C meeting and presenting the UAT MOPS Status
 - James Higbie
 - Tom Pagano is attending the data analysis meeting in Frankfurt
 - Ronnie Jones is attending the data analysis meeting in Frankfurt
 - Rich Weathers
 - R.H. “Bob” Saffell was working high priority items at Rockwell-Collins
 - Bob Prill and Andrew Comba from BAE Systems are working on other company projects
 - Hartmut Uhr has been asked by his sponsor to attend Ad Hoc MASPS revision meetings
 - Bill Flathers
2. The Working Group was asked to review and approve the Minutes to Meeting #3. Stan Jones asked that changes be made in Item #5 related to his presentation. Chris Moody additionally pointed out a change that needed to be made in Item #10 as well as several editorial corrections. Modifications were made to the Summary of Meeting #3 and the revised Minutes will be posted on the UAT web site after the end of this meeting.
3. Gary Furr and Rich Jennings then reviewed Working Paper WP-4-02, which was the initial listing of Un-Resolved or “Orphaned” Issues in support of Action Item 3-24. It was noted that there are several Working Papers being presented at this meeting that address issues on the initial list in WP-4-02. This list was updated at the end of Meeting #4 and follows here for future tracking of Issues which have not been turned into Action Items, or which the Working Group simply wishes to remember for future reference.

Un-resolved Issues or Questions not tracked specifically by Action Items

Issue #	Issue/Question Description	Raised by	Date Raised	Status
1	What is the best approach to determining the length of the ADS-B message for proper R/S decoding? If a separate 8 bit length ID field is used outside the R/S block – as is the current Capstone approach – could a half rate code supporting 4 information bits be supported to identify payload type? If the length ID is only 2-state, could it be shortened from 8 bits?	Chris Moody UAT-WP-2-06	20 Feb 01	Addressed by WP-4-15 (Not formally reviewed)

Issue #	Issue/Question Description	Raised by	Date Raised	Status
2	What is the best combination of CRC and FEC for meeting integrity requirements most efficiently	Chris Moody UAT-WP-2-06	20 Feb 01	
3	Quantify the benefits for “preamble re-trigger” and specify if necessary <ul style="list-style-type: none"> How many parallel decode paths are needed? How to deal with sync pattern in the data? 	Chris Moody UAT-WP-2-06	20 Feb 01	
4	What is the optimum sync threshold “score” that is best matched to the overall message decoding success while minimizing false alarm for re-trigger? Should the threshold be specified? If so, how is it tested?	Chris Moody UAT-WP-2-06	20 Feb 01	Addressed by WP-4-12 WP-4-18 (Not formally reviewed)
5	Can a minimal installation without an “On Ground” indication continue alternating top and bottom antennas for transmit without significantly sacrificing performance?	Chris Moody UAT-WP-2-06	20 Feb 01	
6	What is the minimum isolation required for antenna switching (20 dB in 1090 MOPS)?	Chris Moody UAT-WP-2-06	20 Feb 01	
7	Is an explicit specification needed to describe the filtration on the transmitted signal? If so, how to specify? If not, what implementation loss are we allowing?	Chris Moody UAT-WP-2-06	20 Feb 01	
8	What kind of receive filtration specification is required?	Chris Moody UAT-WP-2-06	20 Feb 01	
9	What minimum specification is required on baud rate timing to allow reception of the entire uplink using a single sync sequence? Is it practical to require this minimum?	Chris Moody UAT-WP-2-06	20 Feb 01	Addressed by WP-4-11 (Not formally reviewed)
10	Whether or not to require an algorithm to determine On-the-Ground status	Section 2.2 discussion	2 May 01	
11	Given that the agreed-upon solution to Coding Selected Altitude appears to add 2 bits, we will remember that we can revisit this issue later if we need to recover those bits.	Discussion on Coding Selected Altitude in WP-4-03	3 May 01	

4. Moving to Agenda Item 4a, the Working Group began the review of Action Items 3-1 through 3-3, 3-14 and the UAT/DME Interference Modeling issues. First, Ian Levitt reported on Action Item 3-1 and the status of the testing of UAT/DME at the FAA Technical Center (FAATC). He indicated that FAATC personnel had validated measurements and verified the CW level going to the receiver. The sensitivity of the DME receiver was also validated, and in order to synch UAT interference, they modified the test set-up by triggering the interrogation through DATAS. Initial measurements are being made on the Bendix KD7000 DME. During discussion of Action Item 3-1, Mike Biggs requested that tests be run on off-tune CW and it was agreed that the FAATC will include these tests in data presented at Meeting #5 in Lexington.

During discussion of Action Item 3-2, it was agreed that the FAATC will provide one complete set of data on a minimum of one DME unit to JHU-APL prior to 06/01/2001. This will allow JHU-APL to run simulations and prepare reports prior to Meeting #5. Action Item 3-2 was updated to reflect this agreement.

With discussion of Action Item 3-3, WG-5 was informed that Nikos Fistas had provided the names and models of the DMEs used in Europe and that they would request testing be performed on. Those two units were the Rockwell-Collins DME-900 and the Bendix-King KDM706A. Rich Jennings has already been in contact with Rockwell-Collins and Honeywell and prior to the end of this Meeting, arrangements were in process to send one unit of each model to the FAATC for testing. If testing can be completed prior to Meeting #5 on one or both units, the FAATC will report on that testing at Meeting #5 in Lexington.

Action Item 3-14 was declared done and was closed.

Ian Levitt reported that the FAATC has begun to review resource and schedule requirements necessary to implement an RF UAT Message Generator to simulate high density scenarios as identified in Action Item 3-25. A further report on this effort will be given at Meeting #5.

5. With Agenda Item 4b, Mike Biggs indicated that Action Item 3-6 was not yet completed and it was agreed to extend reporting on this Action until Meeting #5. Mike Biggs additionally reported on Action Item 3-9 by showing several slides that indicate where in Europe there are DMEs at 978 MHz and 979 MHz. Mike will share this information with Nikos Fistas and further report on this Action Item at Meeting #5.
6. In conjunction with Agenda Item 4c, George Cooley presented Working Paper WP-4-13 on UAT Receiver Adjacent Channel Rejection, addressing and closing Action Items 3-8 and 3-16. George concluded that a 750 kHz IF yields the best adjacent channel rejection and will bode well with DME stations 1 MHz away. A 1 MHz IF may require the adjacent DME channels (stations 1 MHz away from either side of the UAT channel) to be cleared away. Local Oscillator stability of 20 – 30 PPM is recommended with 750 kHz IF. A 750 kHz filter appears to yield a lower noise floor and gives greater receiver sensitivity. Initial measurements indicate that data does not appear to be degraded by the narrower filter, however this has not been fully investigated. The narrower filter should be used to solve adjacent channel problems and not for the sole purpose of increasing sensitivity at the expense of greater inter symbol interference.
7. Action Item 3-15 was discussed in conjunction with Agenda Item 4d. Warren Wilson presented Working Paper WP-4-06 supporting Action Item 3-15. The Working Paper considers Red Solomon codes for UAT that can provide undetected burst error rates of less than 10^{-8} without additional CRC coding. The Working Paper shows that to meet this requirement, it would be necessary to use RS(29,17) and RS(47,33) codes for the short and long ADS-B Messages, respectively. If, instead, the requirement were 10^{-7} , then codes RS(27,17) and RS(45,33) would be sufficient. During discussion on Working Paper WP-4-06, JHU-APL agreed to accept **Action Item 4-1** to take the 1×10^{-8} per message undetected error rate in transmission and do a sensitivity analysis on the UAT system capacity arising from the longer RS Code implementations on LA2020 and Core Europe scenarios and report at Meeting #5.
8. In conjunction with Agenda Item 4e, Mike Biggs reviewed Working Paper WP-4-04 in response to Action Item 3-12. The Working Paper presented three Link-16 interference environments against which to evaluate UAT (modified) performance. The scenarios included: (1) The previously presented “Baseline” scenario (for evaluation in all UAT self-interference environments), (2) A “Heavy” scenario simulating major exercise activity (for evaluation in the “Low-Density” UAT self-interference environments), and (3) A “Light” scenario simulating a carefully controlled operation (for evaluation in the “High-Density” UAT self-interference environment).
9. Addressing Agenda Item 4f, Warren Wilson presented Working Paper WP-4-05 in a partial response to Action Item 3-13. The Working Paper addressed the performance of the various UAT burst types in the presence of the Link-16 interference environments described in Working Paper WP-3-08. It

was agreed that Warren would be studying the remaining 2 scenarios described in WP-4-04 and reporting in Meeting #5.

Also, at this time, Al Muaddi presented Working Paper WP-4-16 entitled the “Generation of JTIDS Interference,” and Working Paper WP-4-17, entitled “Modifications to UAT Receiver Model Used in UAT Network Model.”

Additionally, Larry Bachman presented Working Paper WP-4-14 entitled “The Analysis of Modifications Proposed to UAT.” This Working Paper presented some preliminary analysis of the changes that have been proposed to UAT as they relate to the LA2020 scenario and to the UAT model evaluated by the TLAT.

10. In conjunction with Agenda Item 4g, Ed Valovage presented Working Paper WP-4-10 in reply to Action Item 2-18. In this Working Paper thoughts were explored for anti-spoofing, division of uplink labor, TIS-B/ADS-B function, and time slot dithering. The conclusion was to use five (5) bits for ground station ID and tie the assignment to the assignment of transmit time slots. After Working Group discussion, it was agreed to have a separate off-line discussion with a smaller group because there was confusion over the recommendation suggested in WP-4-10. Later in the meeting, Ed Valovage reported on the decision of the smaller group. Their agreement was to recommend five (5) bits and it need not be the same as the slot ID. So, it could also be reduced to 4 bits if necessary.
11. Al Muaddi reported on Action Item 3-19 in conjunction with Agenda Item 4h. Al reported that he had run some analysis on UAT performance in the presence of DME adjacent channel interference only. More information will be gathered on Core Europe DME scenarios and Al will report on this at Meeting #5, as well as the LA Basin data. Al will use both 750 KHz and 1 MHz filters until the Working Group has made a decision to use one or the other.
12. For Agenda Item 4i, Warren Wilson presented Working Paper WP-4-12 in partial reply to Action Item 2-23. This Working Paper was a preliminary report on UAT synchronization issues.
13. The Working Group then addressed Agenda Item 5b with the presentation of Working Paper WP-4-07 by James Maynard. This Working paper represents the 2nd draft of Section 2.2 focusing specifically on Message Formats. During the discussion of the Address Qualifier, the Working Group agreed to require an algorithm to generate the anonymous address. Chris Moody agreed to accept **Action Item 4-5** and head a group of WG-5 members to specify the algorithm.

During the discussion on the lengths of the Latitude and Longitude fields, the Working Group agreed to hold in reserve the possibility of splitting the State Vector, and sending some bits of the Latitude and Longitude in the long message in order to save bits in the short message. James Maynard agreed to produce a Working Paper to describe how this would be implemented, if the Working Group decides that it is needed in the future.

During discussion of the proposed NIC and NAC fields, the Working Group agreed to state that there are bits “reserved” for NAC since this has not been totally agreed to by RTCA SC-186 Plenary.

Open Issue 10 was entered into the “Orphan Issue” list in order to help the Working Group to remember whether or not to require an algorithm to determine the On-the-Ground Status.

During the discussion on encoding N-S, E-W Velocity, and the number of bits required, **Action Item 4-7** was accepted by James Maynard to report to the Ad Hoc MASPS Working Group that there appears to be an error in the last row of Table 3-4, page 84 of DO-242, where the standard deviation of horizontal velocity error for both the Airborne and Surface columns is stated at 0.25m/s. During post meeting discussions between Gary Furr, Chris Moody, Jonathon Hammer and James Maynard, it

was agreed that there was no error in Table 3-4 of DO-242. Further email exchanges led to the following explanation from James Maynard of the resolution required for Velocity:

Using the “multiply by SQRT(12)” rule to determine LSB resolution, we can see that:

$$\text{SQRT}(12) * \text{Sigma}_{\text{HV}} = \text{SQRT}(12) * (0.25\text{m/s}) * 1 \text{ knot} / (1852\text{m}/3600\text{s}) = 1.68 \text{ knots}$$

So, 1-knot resolution does seem to be more than adequate. If we encode horizontal velocity rounded to the nearest knot, regardless of whether you are airborne or on the ground. If you don’t know whether you are airborne or on the ground, or if you are on the ground, or if you are airborne and are moving less than 1000 knots, you could encode the velocity to 1 knot resolution. For velocities less than 1000 knots, 10 bits plus a sign bit should be OK. That is, however, exactly what we have proposed now for the N-S and E-W Velocity fields. So, we cannot reduce the N-S and E-W Velocity fields by one bit. We still have the problem of encoding velocities up to 4000 knots. To encode up to 4000 knots with 1-knot resolution would require 12 bits, plus a sign bit, or 13-bit fields for N-S and E-W Velocity. The present proposed compromise is to encode to 4-knot resolution for speeds between 1000 and 4000 knots.

14. The Working Group then began a review of Working paper WP-4-03 presented by James Maynard, which indicates a proposed method for “Coding Selected Altitude.” In the final hour of Meeting #3 in Melbourne FL, there was a discussion on Coding Selected Altitude which ended with the Working Group agreeing with Bob Saffell to encode selected altitude as a binary numeral in which the LSB has a weight of 64 feet. In WP-4-03, James Maynard discusses his disagreement with this method of encoding selected altitude, and proposes that the Working Group adapt the method originally proposed by Chris Moody in which the selected altitude is encoded as a binary numeral in which the LSB has a weight of 100 feet. Although Bob Saffell was not able to be at Meeting #4, the Working Group considered his objection to WP-4-03 via the reading of emails, which he has exchanged with James Maynard. After further discussion, the Working Group agreed to output a binary number that has an LSB of 16 feet. Ground systems will receive the data the same way as specified in the 1090 MHz system. Additionally, since this solution will add 2 bits, the Working Group will post an item on the “Orphan Issues List” in order to remind us that we can revisit this issue at a later date if necessary, if we need those bits.
15. The Working Group then began a review of those sections of Section 2.2 that had not been previously covered during the Review by James Maynard. During this review, **Action Items 4-8** through **4-15** were assigned and accepted for further review, analysis and writing.
16. Since there were a number of Agenda Items that were not covered because of availability of time during Meeting #4, it was agreed by the Working Group that those sections not reviewed completely in Section 2.2, and Sections 1 and 4, would be given high priority for review at the beginning of Meeting #5 in Lexington MA, June 19 – 22.
17. During the 1st meeting of WG-5, December 18, 2000, the Working Group reviewed the sections of the proposed UAT MOPS and worked through the identification of individuals and organizations that would be responsible for writing drafts of those sections. The following table is the result of the assignments of those writing actions. The asterisk (*) beside a name indicates the lead person or organization.

UAT MOPS Writing Assignments

Section	Version / Filename	Date / Due	Primary Author(s)	Status/Comments

Section	Version / Filename	Date / Due	Primary Author(s)	Status/Comments
1.0 Introduction	Sec_1a.pdf	3/27/01	Bill Flathers * Jerry Anderson	
2.1 General Requirements	Sec_2-1b.pdf	3/27/01	Tom Mosher	
2.2 Equipment Performance Requirements	Sec_2-2b.pdf	04/27/01	Chris Moody * Bob Saffell Rich Weathers Jim Maynard JHU-APL (?)	
2.3 Environmental		Due after 2.4	Small 2.4 group	
2.4 Equipment Test Procedures			Tom Pagano * Bob Saffell UPS-AT Chuck LaBerge JHU-APL (?)	
3.0 Installed Equipment Performance				
4.0 Equipment Performance Characteristics	Sec_4b.pdf	04/24/01	Greg Kuehl	
A. Glossary & Acronyms	App_A2.pdf	03/27/01	Rich Jennings	
B. MASPS Cross Reference Matrix	App_B1.pdf	01/03/01	Greg Kuehl Jim Maynard Nikos Fistas JHU-APL (?)	
C. Example ADS-B Message Encoding			Chris Moody + 2.2 writers	
D. UAT Ground Infrastructure	App_D1.pdf	02/14/01	Ed Valovage * Paul Gross	
E. Aircraft Antenna Characteristics				
F. Link Budgets & Scenario Dependent Ranges			Larry Bachman	
G. Standard Interference Environments			Mike Biggs	

18. The following table indicates the currently agreed upon meeting dates and places for meetings of RTCA SC-186 Working Group #5.

Proposed dates and places for future meetings of the UAT MOPS Working Group 5:

Dates/Time	Meeting Place
June 19, 9:00 through noon June 22	MIT Lincoln Labs facility at Hanscom AFB, Lexington, MA Travel info and lodging details are available on the ADS-B/UAT web site

Dates/Time	Meeting Place
July 31, 9:00 through noon August 3	FAA WJH Technical Center, Atlantic City Airport, NJ Travel info and lodging details are available on the ADS-B/UAT web site
Week of Sept 24, 2001 Specific days TBD	George Ligler and Nikos Fistas to agree on European location and specific days for the meeting during the week of Sept 24, 2001

19. The following **Action Items** were identified during the course of this and previous meetings. The asterisk (*) beside a name or organization indicates that they are the lead for the resolution of that Action Item. Actions shown here are those Action Items which remain OPEN, and/or were just closed in this meeting as a result of Working Papers or other actions being reported on in these Meeting Minutes.

Action Number	Action Description	Assigned to	Status
2-15	Derive to the degree possible, performance requirements for UAT delivery of FIS-B products, from the FIS-B MASPS.	George Ligler Bill Flathers Stan Jones	Provide at Mtg #5
2-19	All members of WG-5 - provide comments to Greg Kuehl on Appendix D prior to Meeting #5.	All WG-5 members	
3-1	Validate bench test results taken at FAATC. Verify the previous measurements taken prior to additional testing to be made for model development of DME operation with UAT overlaps.	Ian Levitt	Mike requests some off-tune CW tests. Will be included in data at Mtg 5
3-2	Interchange of FAATC work product into APL simulations. Addition of ground uplinks into APL full-scale simulation. Preliminary data on the first DME by Mtg. #4. Larry with a status report at same meeting.	Larry Bachman Tom Pagano	FAATC will have data to APL by 1 June for APL to run simulations for presenting at Mtg 5
3-3	Additional data collection on DME equipment: Honeywell, General aviation unit, and additional equipment as has been specified by Eurocontrol. Presentation on data from FAATC from original Bendix and Narco units at Meeting #5.	Tom Pagano Ian Levitt	Rich Jennings has contacted Rockwell about supplying a unit to the FAATC
3-4	Ian to supply Nikos and Gondo with model numbers of DME equipment available at FAATC for testing	Ian Levitt (ASAP)	Done-4/16/01 CLOSED
3-5	Larry to provide UAT power distributions for refinement of UAT-DME bench testing to FAATC and Mike Biggs by 13 April.	Larry Bachman	Done. CLOSED
3-6	Mike and Gondo to determine criteria for acceptable DME performance in the presence of UAT interference	Mike Biggs Gondo Gulean	Report for Mtg. #5
3-7	Mike to determine what is meant by "Emergency Use" in relation to DME channel 978. Supports Action 3-9.	Mike Biggs	Report for Mtg. #5
3-8	George to discuss results of measurements on the narrower filter being tested at UPS AT for Mtg. #4	George Cooley	Addressed by WP-4-13 CLOSED
3-9	Nikos to investigate the DME usage of 978 MHz in Europe, with results to present if possible in the May or, alternatively, the June meeting.	Nikos Fistas Gondo Gulean	
3-10	Bob to focus on necessity of database, frequency selection to avoid DMEs, and cost feasibility (using single channel implementation as baseline cost) of BAE proposal for the June meeting	Bob Prill	Mtg #5
3-11	Larry to send a copy of LA 2020 scenario and low density scenario to Warren by 13 April for use in simulation.	Larry Bachman	Done. CLOSED

Action Number	Action Description	Assigned to	Status
3-12	Mike and Rich will agree on a low density JTIDS scenario for incorporation into LA 2020 self-interference model, and a high density JTIDS scenario for incorporation into the low density self-interference scenario. To be provided to Larry and Warren by April 20.	Mike Biggs Rich Weathers	Addressed by WP-4-04 CLOSED
3-13	Warren and Larry will provide preliminary simulation results of the following scenarios: -Baseline JTIDS and each UAT self-interference scenario (LA 2020 and low-density) (Mtg #4) -High density JTIDS and low-density UAT self-interference (Mtg #5) -Low density JTIDS and LA 2020 (Mtg #5)	Warren Wilson Larry Bachman	Partially addressed by WP-4-05 WP-4-14 WP-4-16 WP-4-17 Additional Scenarios at Mtg 5
3-14	Larry to coordinate with Mike to ensure that the model of DME antenna being used by APL is correct. To be done by Mtg. #4	Larry Bachman Mike Biggs	Done CLOSED
3-15	Warren et. al will calculate the integrity on various encoding schemes (for both long and short ADS-B messages) and will provide at least those encodings that meet 10^{-8} PUME. An agreed-upon code will be provided by early in the week of April 9 th .	Warren Wilson (*) James Higbie John Barrows Tom Mosher	Sent out for review 4/10/01 Addressed by WP-4-06 CLOSED
3-16	George Cooley will provide code/no code sensitivity measurements over temperature for 1MHz and 700 KHz IF filters, evaluate oscillator requirements measure adjacent channel rejection for those filters, minimizing ISI.	George Cooley	Report on Mtg. #4 Addressed by WP-4-13 CLOSED
3-17	George Ligler and Nikos to decide on a location in Europe, and specific dates for the meeting during the week of September 24th	George Ligler Nikos Fistas	
3-18	Mike, in coordination with Nikos and Chris, will provide core Europe DME scenario(s), including DME location, frequency, and power data to AI.	Mike Biggs Nikos Fistas Chris Moody	
3-19	AI will run the scenarios provided from Action 3-18 (if available), and from LA Basin, and do additional analysis on UAT performance in the presence of DME adjacent channel interference only. For Mtg 5	AI Muaddi	
3-20	Tom to re-run the Mode-S transponder ATRBS reply scenarios on the 981 MHz/new FEC UAT receivers. Additionally to present data reported to TLAT on ATRBS co-site testing.	Tom Pagano	Mtg. #5
3-21	Ian and Ei-Mon to continue analysis of independent range validation, with new information from Costas. Possibly provide input to timing requirements.	Ian Levitt Ei-Mon Phyu	Mtg. #4
3-22	Stan to examine impacts of compensated and uncompensated latencies of up to 1.5 seconds	Stan Jones (*) Chris Moody George Ligler Ian Levitt	Mtg. #4

Action Number	Action Description	Assigned to	Status
3-23	Warren will present initial cut at items 3 and 4 from WP-2-06	Warren Wilson	Partially addressed by WP-4-12 WP-4-15 WP-4-18 CLOSED
3-24	Establish a bin item for orphan actions, i.e. issues raised in WP-2-06. Possible repository for similar unresolved issues.	Rich Jennings George Ligler Gary Furr	Addressed by WP-4-02 CLOSED
3-25	Perform an initial investigation to define and develop an RF UAT message generator to simulate high density scenarios. Determine the schedule and resource requirements to complete.	Ian Levitt Tom Pagano (*)	Status report at Mtg #5
4-1	We will take the 1×10^{-8} per message undetected error rate in transmission, and JHU-APL will do a sensitivity analysis on UAT system capacity analysis arising from the longer RS Code implementations on LA2020 and core Europe scenarios. Report at Meeting #5	Larry Bachman	
4-2	Continue analysis on UAT Synchronization Issues raised in UAT-WP-4-12 for the purpose of possibly creating an Appendix for the UAT MOPS.	Warren Wilson	
4-3	Run his models on all JTIDS scenarios (9), two 1 MHz offset DME scenarios, and self interference, as appropriate to the JTIDS scenarios, with power levels agreed to at Meeting #3 -- with labeled axes (and no yellow lines) -- for Meeting 5.	Stan Jones	
4-4	Rerun data originally shown in UAT-WP-4-14 with A3 power reduced by 3dB, for sensitivity analysis	Larry Bachman	
4-5	Algorithm for anonymous address.	Warren Wilson Tom Mosher Tom Elledge Chris Moody (*) Bill Thedford	
4-6	Prepare a presentation of experiences in the Capstone Project.	Tom Elledge (*) Chris Moody	
4-7	Take information to the Ad Hoc MASPS Group that there is an apparent error in Table 3-4 of DO-242. In the last row, the Standard Deviation of Horizontal Velocity Error is 0.25 m/s for both Airborne and Surface.	James Maynard	
4-8	In sections 2.2.2.4.3 and 2.2.3.1.1, recommend a requirement for Mtg #5	Tom Mosher	
4-9	Provide a spectral mask for section 2.2.2.5 for Mtg #5	Warren Wilson Chris Moody	
4-10	Research spurious emissions regulations and come up with a recommendation for the UAT MOPS for Mtg #5	Mike Biggs Chris Moody	
4-11	Document the Ground UpLink message in Section 2.2.3.2 for Mtg #5	Chris Moody Warren Wilson (*)	
4-12	Study worst case UAT uplink performance in JYIDS environment	Warren Wilson	
4-13	Stability requirement on section 2.2.5.1.a	Ian Levitt	

Action Number	Action Description	Assigned to	Status
4-14	Establish subparagraphs to section 2.2.5.2.2, and/or notes to the table in section 2.2.5.2.2	Stan Jones Chris Moody (*) Larry Bachman	
4-15	Tolerance of time of applicability.	George Ligler Chris Moody	

20. The **Working Papers** shown in the following table are specifically for the Meeting being reported in these Meeting Minutes. Working Papers for all WG-5 Meetings, as well as the Meeting Agendas, Meeting Minutes, Meeting Schedules and files leading to the production of a UAT MOPS are posted on the ADS-B UAT web site at: <http://adsb.tc.faa.gov>

SC-186 Working Group 5 – MOPS for UAT – Working Papers

Working Paper	Size	Description	Introduced At:
UAT-WP-4-01	12KB	UAT MOPS Considerations for WG-5 discussion as forwarded by Ronnie Jones, FAA	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-02	12KB	Report on un-resolved Issues or Questions that have not been tracked specifically by Action Items, presented by Gary Furr in response to Action Item 3-24	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-03	17KB	A proposal for Coding Selected Altitude, presented by James Maynard.	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-04	12KB	Link 16 Interference Environment, presented by Mike Biggs and Richard Weathers, in support of Action Item 3-12	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-05	39KB	In partial fulfillment of Action Item 3-13, this paper addresses the performance of the various UAT burst types in the presence of the Link 16 interference environments described in working paper UAT-WP-3-08, presented by Warren Wilson and Myron Leiter	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-06	26KB	This paper addresses Action Item 3-15 to consider Reed Solomon codes for UAT that can provide undetected burst error rates of less than 10^{-8} without additional CRC coding, presented by Warren Wilson	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-07	171KB	The 2 nd Draft of Section 2.2 with additional text added to describe some of the ADS-B Message Payloads in more detail, presented by James Maynard	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-08	25KB	This paper presents the status and schedule for the development of the RTCA MOPS for UAT, prepared by Chris Moody for presentation by Brent Phillips at the AMCP WG-C Meeting to be held 7-11 May 2001. This completes Action Item 2-2	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-09	28KB	The 2 nd draft of Section 4 of the UAT MOPS with added text in blue font, presented for review by Greg Kuehl	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-10	14KB	This paper addresses Action Item 2-18 and presents a recommendation for the number of bits for Ground Station ID, presented by Ed Valovage.	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-11A	9KB	Analysis of Uplink Data Rate Tolerance, presented by Tom Mosher, addressing UAT-WP-4-02 Open Issue #9	Meeting 4, 05/01/01 UPS-AT, Salem OR

Working Paper	Size	Description	Introduced At:
UAT-WP-4-12	36KB	A preliminary report on UAT Synchronization Issues raised by Item #4 on UAT-WP-2-06 and UAT-WP-4-02 (the new UnResolved Issues List) in response to Action Item 3-23, presented by Warren Wilson	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-13	98KB	The Adjacent Channel Rejection of the UAT was characterized for CW interferes at various power levels, presented by George Cooley	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-14	317KB	Preliminary analysis on the changes that have been proposed to UAT as they relate to the LA-2020 scenario and to the UAT model evaluated by the TLAT, presented by Larry Bachman	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-15	14KB	Use of FEC Decoder for Message Length Determination, presented by Tom Mosher, addressing UAT-WP-4-02 Open Issue #1	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-16	148KB	Generation of JTIDS Interference, presented by Al Muaddi	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-17	131KB	Modifications to UAT Receiver Model Used in UAT Network Model, presented by Al Muaddi	Meeting 4, 05/01/01 UPS-AT, Salem OR
UAT-WP-4-18	13KB	This paper presents results of bench tests of false sync detection rates using UAT prototype hardware. This paper is presented by Tom Mosher in support of UAT-WP-4-12 Section 3 and Open Issue #4 from UAT-WP-4-02	Meeting 4, 05/01/01 UPS-AT, Salem OR