

RTCA/DO-253C Maintenance/Development Matrix (Version: 2014.02)

Item coloring indicates action required at this meeting.

Green = review implementation in MOPS;

Yellow = none; awaiting input from actionee;

Rose = subject of action or discussion required to move forward

White or Gray = none

Item	Section(s)	Issue	Discussion	Resolution
1	2.3.9.5	Remove the term “ $c\Delta t$ ” from the equation in the differential correction magnitude check. POC: John Warburton	Feb 2009 - John Warburton’s presentation from the February 2009 WG-4 meeting identified this as a possible error. Confirmed by manufacturers present at the meeting.	Feb 2009 - Change agreed by WG-4 for incorporation into maintenance matrix. Mar 12 – Implemented in WG-4 Draft MOPS Update
2	2.1	Editorial clarification of allowed receiver standards for the PVT output. POC: Hamza Abduselam	Any PVT output standardized by other relevant RTCA GNSS receiver standard is allowed by this MOPS. A class of equipment that does not output PVT does not satisfy the requirement for the PVT output. Clarify that Delta class SBAS receivers can not be used as the basis for the PVT output. Delta can include Beta sensor (b3/d4). Delta only by itself cannot be used – doesn’t output PVT. None are under production (ILS look alike only). June 2009 – Can add clarifying note. March 2012 – Accepted Hamza’s proposal	.March 2012: Accepted Hamza’s proposal. See working paper 11. Mar 13 – Implemented in Draft MOPS Update
3	2.3.11.5.2.3	Editorial clean-up of notation. (1) Missing reference and notation inconsistent. A lower case “s” should replace the upper case “S” in the following equations and section reference:	Section 2.3.11.5.2.1.4 and 2.3.11.5.2.1.5 uses lower case in multiple places. Should read:	June 2009 – Update the text. Mar 12 – Implemented in WG-4 Draft MOPS Update

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		$\sigma_{B_vert}^2 = \sum_{i=1}^N \frac{S_{Apr_vert,i}^2 \sigma_{pr_gnd_100,i}^2}{U[i]}$ $\sigma_{B_lat}^2 = \sum_{i=1}^N \frac{S_{Apr_lat,i}^2 \sigma_{pr_gnd_100,i}^2}{U[i]}$ <p>S_{Apr_vert} and S_{Apr_lat} are as defined in Section 2.3.11.5.2.1.4 Add U[i] to the above section reference.</p> <p>(2) Remove underscores between product terms in the summations.</p> <p>POC: Barbara Clark</p>	<p>Need to update with compatible equation editor !</p> $\sigma_{B_vert}^2 = \sum_{i=1}^N \frac{S_{Apr_vert,i}^2 \sigma_{pr_gnd_100,i}^2}{U[i]}$ $\sigma_{B_lat}^2 = \sum_{i=1}^N \frac{S_{Apr_lat,i}^2 \sigma_{pr_gnd_100,i}^2}{U[i]}$ <p>S_{Apr_vert}, S_{Apr_lat}, and $U[i]$ are as defined in Section 2.3.11.5.2.1.4</p>	
4	2.3.11.5.2.1.4	<p>Editorial clarification. GPA parameter used without reference to its source.</p> <p>POC: Barbara Clark</p>	<p>Append text as illustrated: θ_{GPA} = glide path angle for the <u>selected</u> final approach path <u>from the Type 4 message</u></p>	<p>June 2009 – Update the text. Mar 12 – Implemented in WG-4 Draft MOPS Update</p>
5	None	<p>The MOPS doesn't have a minimum required use for the broadcast APD parameter. Some equipment was developed to filter CAT I approaches based on this parameter (and is now removing this feature); other equipment ignores the value of this parameter.</p> <p>It is desired that equipment supporting Cat I approaches (AEC C) function at least when the APD has the values of 1, 2, 3, or 4.</p> <p>POC: Jason Burns (for ICAO NSP CSG)</p>	<p>Don't want to put a shall in the MOPS because it isn't a requirement, yet comes with a cost.</p> <p>We need to be backwards compatible with receivers that do not use this field already. Feedback to CSG – We will add a note that AEC C doesn't have to look at this field (if we don't already have one).</p>	<p>June 2009 – No change.</p>
6	2.3.11.5.2.2	<p>Clarification of the BAM requirements has been</p>	<p>Two clarifications should be considered:</p>	<p>October 1009 – Exact</p>

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		<p>requested.</p> <p>By evaluating the projection of error, the “bias approach monitor” provides high confidence that once an approach is initiated the NSE does not prevent it from being completed. The BAM check is intended to be done both prior to the final stage of the precision approach and when changes in geometry occur which change the projection of error.</p> <p>POC: Barbara Clark</p>	<p>(1) Once the aircraft is no longer on the approach, the BAM evaluation is no longer relevant. It must be performed again, however, whenever the aircraft begins any subsequent approach, whether the approach was retuned or not. One potential way to clarify this would be to add a “recovery” note: A faulted BAM check may be “cleared” after the aircraft leaves the PAR.</p> <p>(2) The definition of the terms used in the BAM evaluation were intended to allow re-use of the projection matrix “s” from the differentially corrected position solution. Add a note to clarify this, in close proximity to the “exception” language for σ_i.</p> <p>October 2009. October 1009 – Intention is correct. Could redraft with sigma having BAM subscript. Re-use the S (requirement). Propose something.</p> <p>February 2011 – Barbara and John S</p>	<p>proposal needed.</p> <p>Mar 12 – Implemented in WG-4 Draft MOPS Update</p>
7	2.3.6.4.1	<p>Annex 10 Amendment 83 has two minor differences compared with DO-253B. Annex 10 has < in the first row of Regions 1 and 2 and DO-253B has ≤. I believe the MOPS was what was intended. If the MOPS is correct, you are allowed to have a 7 MHz bandwidth with correlator spacings less than 0.2. If you use the SARPs method and delete the "or equal to", than the constraint regions do not "touch" and you are not allowed to have for example a 7 MHz BW and correlator spacing of 0.15. (You would have to have 7+epsilon MHz and decrease your differential group delay.)</p>	<p>October 2009 – MOPS is as intended.</p>	<p>October 2009 – No change.</p>

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		<p>ICAO and RTCA correctly captured what they were given by the same technical members. Verify intent.</p> <p>POC: Barbara Clark</p>		
8	2.3.6.4.1	<p>(1) DD constraint region boundaries. For Region 2 we have less than 14 MHz in Row 2 and less than or equals in Row 1 and 3. I think this means that there is a discontinuity within the constraint region, i.e. you are not allowed a BW of exactly 14 MHz for average correlator spacings from 0.085 - 0.1.</p> <p>(2) Definition of “x”. Table 2-7 uses the parameter “x” but never defines it. It should be the average correlator spacing (corresponding to the third column of the table).</p> <p>Ed Note (a): Editorial corrections should also be made to Table 2-7 to avoid the “breaks” in a numerical value (2.667) and units (MHz).</p> <p>POC: Bob Jeans</p>	<p>October 2009 – The discontinuity is not intended. The definition of “x” should be the average. The MOPS should be updated to reflect these points.</p> <p>February – The WG agreed that we should also add a note that the DD range is different that DO-229().</p> <p>February – Barbara to propose.</p> <p>March 2012 – Reviewed.</p>	<p>October 1009 – Exact proposal needed.</p> <p>Mar 12 – Implemented in WG-4 Draft MOPS Update</p>
9	2.3.8.1.1	<p>Currently Annex 10 has notes “allowing” (Appendix B 3.6.8.3.3.2 and 3.6.8.3.3.3.1) a satellite to be incorporated into the position solution prior to validating the ephemeris CRC during the initial acquisition of the VHF data broadcast.</p> <p>The MOPS does not make such allowances.</p>	<p>October – 2009 Discussed. No thoughts yet.</p> <p>February 2011 – Mats, Joel, Jason and Barb to propose something: group is fine with retaining ICAO allowance or imposing our requirement</p> <p>March 2012 – Propose a paper be written by Barbara Clark / Jason Burns (TBV) for ICAO to see if their allowance is being used by anyone.</p>	

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		Should/Could this difference remain for GAEC C equipment? Should/Could this difference remain for GAEC D equipment? POC: Barbara Clark		
10	-	Harmonize airborne equipment classification terminology with Annex 10. AEC becomes GAEC (G for GBAS). POC: Barbara Clark	October – 2009 Discussed and agreed.	Mar 12 – Implemented in WG-4 Draft MOPS Update
11		Ed note: Type 11 parameter name harmonization with SARPs		
12		Ed note: Tom Z's question on accuracy test		
13	2.3.11.5.2.1.2	DO-253C section 2.3.11.5.2.1.2 indicates that the GAST D Approach Service Type is downgraded when either the Vertical or Lateral Alert Limit is exceeded. So it appears the MOPS does not make an allowance for continuing to use the Lateral only. We should probably look at this issue to see if some changes should be made. POC: Rick Cassell	<p>October 2010: Primary issue identified was defining at what point to separate the alerting between lateral and vertical.</p> <p>February 2011: The WG-4 discussed Rick's briefing <i>GAST D Vertical and Lateral Alerting</i>. Because the GAST C and GAST D position solutions are different GAST D lateral solution may be preferable.</p> <p>Discussed assumption of radar altimeter transition and retention of this is the standard. Unless someone envisions an implementation, retaining reliance on radalt.</p> <p>Agreed that to support multiple aircraft integrations, the avionics should be allowed to flag (both or only vertical), look for another geometry, or revert to C independent of altitude. This allows the OEM to decide. Rick and Matt to propose text.</p> <p>November 2011: Our solution set didn't consider the pilot presentation. The pilots polled aren't happy with the display that could result (don't want</p>	Mar 12 – Implemented in WG-4 Draft MOPS Update (may need to be revisited based on AIRBUS results)

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			vertical devs to go away or be flagged). Want all xLS to look the same. AIRBUS will be conducting a simulation study to investigate.	
14		ICAO NSP Nov 09/WP-22 provided preliminary monitor performance predictions for the Honeywell GBAS ground system with necessary upgrades to meet GAST D requirements. The analysis noted that acceptable performance for some monitors required that new satellites would not be used in the position solution until at least 25 seconds after the carrier smoothing of the code pseudoranges (CSC) was initiated in the airborne equipment. Nov 09/WP 22 assumed this requirement would be met based on the RTCA airborne MOPS requirement to verify the ephemeris CRC.	<p>February 2010: RTCA discussed the relevant MOPS requirements and formulated the note below to be added to the carrier smoothing section of the MOPS:</p> <p><i>Note: The GAST D ground station has 25 sec allocated to detect and exclude any ranging source fault present at filter startup or occurring during the first 30 seconds since filter startup. This means that the carrier-smoothed corrected pseudorange used in GAST D is not protected by ground monitoring until 25 sec has passed from airborne filter startup. The CRC condition in 2.3.8.1.1 typically prevents the ranging source from being used in the position solution for the first 30 [TBC] seconds. However, if due to the specifics of the implementation, the time from filter start up to incorporation in position solution is less than 25 sec, the receiver manufacturer should account for the unmonitored period by providing comparable protection through other means. One possible means of protection is the continued use of the satellite additional fault detection defined in 2.3.9.6.1 throughout this interval accompanied by an assessment of the likelihood of</i></p>	Mar 12 – Implemented in WG-4 Draft MOPS Update

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			<p style="text-align: center;"><i>occurrence of a fault in this time frame versus the missed detection probability of 10^{-3} used in the satellite additional fault detection.</i></p> <p>RTCA must evaluate the text of the note (for clarity, completeness, etc.), whether a note is sufficient (vice a requirement) and whether the possible means provided is adequate. Note that the additional satellite fault detection referenced is essentially a RAIM requirement (using the 30-second smoothing solution) and was originally intended as an additional means for detection of rare ionosphere gradient anomalies and position errors that may go undetected by other methods required by the MOPS.</p> <p>April 2010 telecon: Discussed the note. A number of criticisms were made including:</p> <ol style="list-style-type: none"> (1) The first sentence is confusing. It requires the ground station to exclude satellites that could have posed a problem for only a limited number of users. It appears to duplicate the integrity responsibility given to the airborne receiver later in the note for the same period. (2) The note does not separate acquisition of a new satellite and re-acquisition of a satellite momentarily lost. (3) More time was needed to assess the “one possible means” method. <p>The working group agreed in principal to ensure that the MOPS supports an allocation of integrity responsibility to the avionics for satellites used in the position solution during the first 25 seconds</p>	

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			<p>after smoothing filter initialization. After this time, the ground subsystem is responsible in accordance with the proposed GAST D ranging source monitoring standards.</p> <p>A team of three RTCA SC-159 WG-4 participants (two from different avionics vendors and one from an aircraft manufacturer) took an action to re-draft the MOPS text to accomplish this. The text is expected at the next meeting in June 2010.</p> <p>June 2010: Action team proposed a new requirement to capture the “waiting period”, deleting the note above, and revisions to the satellite acquisition and re-acquisition requirement (LAAS-096). Confusion of whether we need SV ac/re-acq requirements and what they are doing in augmented modes. WG-4 agreed in principle to adding the waiting period and deleting the note, but we need to work the ac/re-acq. Specific proposal to be developed by John and Mahesh.</p> <p>February 2011: WG agreed in principle – see file. Matt updating proposal.</p> <p>The newly acquired GPS satellite signal shall [LAAS-XXX] not be incorporated into the GAST D precision approach solution earlier than 25s after acquisition.</p> <p>March 2012: CCD filter settle time obviates the need for this requirement. Replaced requirement with a note in the CCD filter section. John S to writeup a description that can be used to respond to ICAO at a later date.</p>	

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15	2.2.10	<p>There appear to be inconsistencies in the analysis of the VDB link budget, in particular for the estimation of the Aircraft Implementation Loss (AIL; also called Aircraft Implementation Factor) and of the mismatch losses. Alternative computation methods are suggested. The primary issue is the method for estimating the RF load and source impedance mismatch losses.</p>	<p>April 2010 – Discussed in WG-4 telecon. JC Lanoue and Daniel Domey took action to define issue.</p> <p>June 2010 – Discussed. See Meeting References P11 and P12. Proposed resolution assigned to Orville’s adhoc group. See action 16.</p>	
16	Multiple VDB sections	<p>Changes to the VDB link budget are proposed specifically as it relates to the minimum aircraft implementation loss budget. This change would be used to aid in three areas:</p> <ol style="list-style-type: none"> 1) Increase Maximum Field Strength – The current field strength requirements form severe restrictions on VDB siting at airport installations compounded by other system installation constraints. 2) Relax VDB Co-Channel Rejection – The current requirement to meet the message failure rate when an undesired VDB signal (+15dBm) is received at the receiver input and a desired VDB signal (-87dBm) is received in the next adjacent TDMA slot is constraining on the VDB receiver design. 3) Receiver Dynamic Range - The current requirement to meet the message failure rate with VDB signal levels ranging from -87 dBm to -1 dBm is unnecessarily constraining on the VDB receiver design. 	<p>April 2010 – Discussed in WG-4 telecon. Al Malaga and Kim Class took actions to define issues. See June Meeting Paper <insert reference – paper name in archive>.</p> <p>June 2010 – Discussed. See reference <>. Orville’s adhoc group to review the link budget, clarify assumptions (for example aircraft implementation loss/gain for various antennas), and document test procedures assumptions (for example the 50 ohm load assumption), clarify test language (“in the same manner” for replacing standard dipole with aircraft), etc. See also Issue 15 for scope of adhoc work.</p> <p>October 2010 – The WG discussed multiple AIRBUS papers and a Honeywell proposal. Actions from the WG:</p> <ol style="list-style-type: none"> 1) To provide the background and summarize the assumptions previously made in arriving at the VDB receiver specification of Co-Channel rejection of Undesired VDB signals in DO-253C paragraph 2.2.7.1 part b [1]. The current requirement for rejection of co-channel Undesired VDB signals is to meet the specified message failure rate when an Undesired VDB 	Feb 14 – Implemented in WG-4 Draft MOPS Update

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			<p>signal of up to +15 dBm is received at the receiver input and a Desired VDB signal ranging from -87dBm to -1 dBm is received in the next adjacent TDMA slot.</p> <p>2) To explain why the recommendation made at the October 27-28, 2010 meeting of RTCA SC-159 Working Group 4 [2] to change the minimum aircraft implementation loss assumed in the VDB Link Budgets from -6 dB (i.e. from a net gain) to + 2 dB (i.e. to a net loss) should also result in a recommended change to the maximum co-channel Undesired VDB signal level at the receiver input from +15 dBm to +7 dBm. The maximum co-channel Undesired VDB signal level at the output of an ideal lossless VDB antenna with 0 dBi gain shall remain unchanged at +9 dBm.</p> <p>3) To explain why and recommend that the maximum ratio of Undesired VDB to Desired VDB co-channel signals in adjacent slots should also be specified in DO-253C paragraph 2.2.7.1 part b. The verification test procedure in DO-253C paragraph 2.5.2.2.7.1 part B [1] has “derived” the ratio of Undesired to Desired VDB from the vaguely worded requirements in DO-253C paragraph 2.2.7.1 and specifies a test where this ratio is 102 dB. The intent of this paper is to show that the 102 dB ratio exceeds the actual maximum ratio of Undesired to Desired VDB signals that can be expected within the coverage volume.</p> <p>February 2011: Refer to <i>Nyhus-Malaga_Undesired-VDB-Signal-Spec-Paper_Final_2011-02-07.doc</i> which answered the actions above. Refer to <i>Nyhus_Summary-of-Changes-to-VDB-</i></p>	

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			<p><i>Specifications-in-DO-253C_2011-02-10.doc</i> for the current changes proposed by the adhoc group. Group needs to define the “X” in their budget. Need to define what happens when aircraft within defined implementation loss and guidance for when the implementation loss is outside of that range, what does the rx have to do to make up the difference (includes more “loss-y” aircraft; rx more sensitive). The group will consider creating classes based on the compatible range of aircraft implementation loss. The adhoc group will draft material to add to the installation advisory circular to address the whole scope of changes. The group will also have to discuss the antenna variation difference and consider drafting something for NSP.</p> <p>June 2011: Refer to Nyhus presentation (Paper 11) made during the meeting. Seems to be general consensus that two classes of VDB receivers is desirable for future revision of the MOPS. One class of VDB receiver (Class A) accommodates all AILs from 2 to 15 dB, and a second class of receiver (Class B) accommodates different AIL limits as specified by the receiver manufacturer. For the second class, AIL limits may be higher and/or lower, and the AIL range may be larger or smaller. The AIL limits (and hence range) for the second class of receiver need to be specified in the installation guidance (i.e., the manufacturer will specify the upper and lower AIL limits supported by the receiver).</p> <p>LAAS-063 is a problematic requirement, and should be removed. It is trying to be an antenna</p>	

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			<p>spec, and not a receiver spec. The AIL including the gain variations of the antenna need to be part of the maximum and minimum AIL for the aircraft installation.</p> <p>March 2012: Proposal reviewed. Action for AdHoc VDB group (lead Orville Nyhus) to address FM immunity requirements changes and test procedures associated for Class B equipment with a non-zero "Y" parameter.</p> <p>Mar 2013: Current baseline of changes contained in P09 from this meeting. Note the appropriate version was updated post meeting and is the one included in the meeting documents.</p> <p>Jan 2014: WG agreed to put baseline changes into the MOPS as the issues with the VDB link budget and receiver sensitivity are worked out.</p>	
17	Table 2-21 PAN Environmental Performance Requirements	<p>Row on the "Explosion Proofness Test": The "X" should be in the "System Operating" column, not the "Sensitivity and Dynamic Range" column.</p> <p>POC: Daniel Domey</p>	February 2011 – WG agreed with proposal.	<p>Accept change.</p> <p>Mar 12 – Implemented in WG-4 Draft MOPS Update</p>
18		<p>Newark flight inspection anomaly (unavailability and loss of continuity) has resulted in interest in confirming the expected availability of the system and reconsidering the effectiveness and robustness of the fault hypotheses.</p> <p>POC: Barbara</p>	<p>June 2010: Discussed the I-GWG presentation. Reference <insert presentation>. WG-4 agreed to assist in defining the appropriate avionics functional/performance assumptions for predicting the system availability and continuity (wrt the availability of guidance given existing designs). Recommend that the prediction tool be capable of analyzing the sensitivity to changes of the VAL splay.</p> <p>OBE – Barbara and Jason to verify with Newark AA</p> <p>No action. Availability prediction tool is operating</p>	No action needed.

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			adequately and periods of unavailability are being addressed by the service provider.	
19	2.3.9.6.1	Revisit all requirements (357, 358, 397, 398, and 359) to clarify if RAIM is required all the time. Consider removing the negative “shall not”. Consider re-organizing with LAAS-359 starting the section. Convey idea is to have credit for the 20 mins. POC: John, Mahesh, and Matt	February 2011 – Agreed in principle. File P06 contains Matt’s updated text changing only the lead in text to LAAS-357.	Mar 12 – Implemented in WG-4 Draft MOPS Update
20	2.3.8.1.3 Appendix A	Dmax in the MOPS is inconsistent with Annex 10 and the current FAA TSO-C161a. Differential corrections cannot be used outside of Dmax (regardless of the service). POC: Barbara	Two changes are required: 1. Add item (g) to 2.3.8.1.3 The distance (slant range) between the aircraft and the GBAS reference point is less than the maximum GBAS usable distance, if the maximum GBAS usable distance (D_{max}) is provided in the Type 2 message being used [LAAS-281]. 2. Add definition of Dmax back into Appendix A.	Mar 12 – Implemented in WG-4 Draft MOPS Update (body)
21	Multiple POC: Laurent	Reversion to lower service type In case GAST D cannot be ensured, automatic reversion to GAST C is required. However, according to operational conditions, in some cases it may be preferred to set deviations to NCD.	October 2010: Refer to presentation <i>Airbus inputs to DO253C maintenance matrix</i> . Review “shall change the active approach service type to C” requirements and: - Either set conditions for which reversion is required, - Or re-write them as a “should” requirement. February 2011 – Laurent to verify. Want to avoid toggling between service levels (C and D) during final stages of precision approach.	

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			<p>June 2011 – Refer to P09. Discussed the reversion between service types, concern expressed about “flickering” between GAST C and GAST D. If we restrict reversion between GAST C and GAST D (and vice versa), what is the criteria? Agreed that inside the PAR, leave the transition between GAST C and D as an integration issue. Outside the PAR, continuously try to recover GAST D. Action for Laurent to define the proposal.</p> <p>November 2011: Refer to P10 for updated status.</p>	
22	<p>Multiple</p> <p>POC: Laurent</p>	<p>Reversion to lower service type</p> <p>RTCA/DO-253C defines monitoring so as to check if GAST D requirements are met. In case GAST D cannot be ensured, automatic reversion to GAST C is required. Besides, [LAAS-367] requirement of RTCA/DO-253C requires that approach service type output reflects the change (if any) within 2 seconds, but does not deal with deviations. Therefore, the status of deviations, when conditions for reversion to GAST C are met (e.g. always NO, or NCD during a limited time...), are not specified.</p>	<p>October 2010: Refer to presentation <i>Airbus inputs to DO253C maintenance matrix</i>. <u>Proposed evolution / discussions:</u></p> <p>To specify status of deviations during the time the airborne receiver reverts from GAST D to GAST C</p> <p>February 2011 – Need to maintain deviations and not have a break in providing them. It may not be a good thing to go back to GAST D. Action for Matt, Laurent, and Hamza to define proposal.</p>	
23	<p>Multiple</p> <p>POC: Laurent</p>	<p>Geometry Screening</p> <p>Two methods of geometry screening are required in RTCA/DO-253C:</p> <ul style="list-style-type: none"> - The first one is the use of more stringent Alert Level, dependent from the aircraft and its guidance performance, - The second one is a check on S values of the Projection matrix: <ul style="list-style-type: none"> . By performing a test on the highest S value 	<p>October 2010: Refer to presentation <i>Airbus inputs to DO253C maintenance matrix</i>.</p> <p>February 2011 – Since large numbers can be used, the WG doesn’t see this as an issue.</p>	No change needed.

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		<p>among each ranging source, . By performing a test on the sum of the two highest S values.</p> <p>Both methods may not be necessary to fulfil the requirements. So a selection between them may be done, or a “or” may be added between to methods.</p>		
24	Multiple POC: Laurent	<p>Timing Requirements</p> <p>RTCA/DO-253C does not provide explicit timing requirements to invalidate GAST D service type when any monitoring on geometry screening, RRFM, ionospheric gradient or Fault Detection detects an error. A value of 400 msec is provided in requirement [LAAS-144] for time between inputs change and output of data coherent with the inputs, and is coherent with RTCA/DO-253C’s timing of other monitoring like those on protection levels.</p> <p>Does this timing also apply to GAST D invalidation after geometry screening, RRFM, ionospheric gradient or Fault Detection monitorings?</p> <p>Besides, timing regarding invalidation of vertical outputs after Bias Approach Monitor has detected an error is not provided too.</p>	<p>October 2010: Refer to presentation <i>Airbus inputs to DO253C maintenance matrix</i>.</p> <p>February 2011 – The working group agreed there is a missed requirement. Matt has the action to investigate.</p>	
25	Multiple	<p>Fault Detection for Satellite Addition</p> <p>RTCA/DO-253C states that « satellite measurement shall [LAAS-359] not be added to</p>	<p>October 2010: Refer to presentation <i>Airbus inputs to DO253C maintenance matrix</i>.</p> <p>The satellite measurement shall [LAAS-359] be</p>	

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	POC: Laurent	<p>the precision approach position solution until the 20-minute observation period required by the airborne Code Carrier Divergence monitor has elapsed, <u>or</u> until the VPLFD is less than VAL, LPLFD is less than LAL [...] ».</p> <p>Shouldn't it be a « and », i.e. the satellite is added when both tests are OK?</p> <p>Current requirement is ambiguous and use a negative sentence which is undesirable</p>	<p>added to the precision approach position solution once “true” condition is met in following logic table:</p> <p style="text-align: center;">< see table in presentation ></p> <p>The working group agreed that the wording may be improved.</p> <p>February 2011 - Matt and Laurent to review.</p>	
26	2.3.9.4	Introduce a s_lat_2 check in.	February 2011: Matt to update text. See item 13.	Mar 12 – Implemented in WG-4 Draft MOPS Update
27	2.3.9.6.1	Introduce lateral checks in vertical flagged.	February 2011: Matt to update text. See item 13.	Mar 12 – Implemented in WG-4 Draft MOPS Update
28	New Appendix POC: Mats	WG-2C is developing an appendix for inertial integration that should be incorporated into the MOPS.		
29	Appendix C POC: John S and Daniel D.	Need to handle GPA and TCH zero cases. Need to review the FPAP and LTP combinations as well. Review all corner cases you can think of.	<p>February 2011: Bring a proposal for the next meeting that would accompany the change proposal for the ICD. (This is being coordinated with WG-2 and with Flight Standards.)</p> <p>November 2011: Note developed by WG-2 for DO-229 was reviewed. Some messaging of the note required for WG-4 because note doesn't provide rationale (backwards compatibility) for recommendation and should be adapted for MOPS and ICD (and Annex 10). Also need to add a note in the deviation calculation example to alert manufacturers to adapt calculations. Need to define to establish PAR anyway – so need to code the angle.</p>	

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			<p>No FPAP and LTP limitations worth noting found. No null value for loc only.</p> <p>March 2012: John to propose text to be added to the MOPS appendix to note that approaches can be coded with a TCH and/or GPA of zero. Appendix algorithms fail on this condition, so manufacturer needs to know that they have to deal with these conditions.</p>	
30	VDB Link Budget – Appendix K	Consider including as an appendix to the MOPS since we are not updating the MASPS.	<p>February 2011: WG agreed we do not want to lose the material and motivations for VDB changes. VDB adhoc will address.</p> <p>Mar 2013: P10 contains the draft appendix.</p>	
31	LAAS-179 POC: Daniel	Should this trigger on MT11?	February 2011: OK because MT 11's are forced to coincide with MT 1's. No changes.	
32	SARPs Compatibility	Annex 10 requires exclusion of a satellite based on He whereas the MOPS does not require this.	<p>Barbara, John S, and Mahesh to propose.</p> <p>November 2011: See P14. The WG-4 agreed that we should only pursue further harmonization of the SARPs and MOPS language on this requirement in the context of a broader effort to revisit the “at-distance” GBAS precision approach requirements.</p> <p>It was also noted that a ground station should set its service volume (and D_{max}) to correspond to the region where a useful service can be reliably expected (where H_0 dominates). This would reduce if not eliminate the apparent performance differences from satellite exclusion.</p>	
33	2.3.9.6	RAIM for satellite changes. Clarify that it is done only with the most recent set. You don't need to keep up with changes that occur as you are in the 2 sec period of calculating RAIM – drop and move on to current set.	<p>February 2011 - Matt to propose text. Change “within 2 seconds of a SV geometry change” to “within 2 secs of the most recent SV geometry change”. WG agreed.</p> <p>March 2012: Matt to review if the proposed times</p>	Mar 12 – Implemented in WG-4 Draft MOPS Update

Item	Section(s)	Issue	Discussion	Resolution
			can be consolidated and simplified.	
34	2.3.6.4.5 Table 2-22 (2.3.6.4.3-5)	Clarification of GPS acquisition and re-acquisition requirements for the various “modes” (GPS, GAST C, GAST D, etc.)	<p>Daniel to review and propose. See Matt Harris’ presentation from Feb 2011 as launching off point.</p> <p>March 2012: Protect against how acquisition is done during GAST D or assume independent of mode? Have agreement to specify requirement and allow test to be a separate subject (that handles the modes).</p> <p>October 2012: Editorial clean-up discussion: Standard testing is a given because DO-208 is no longer an option. The references may be able to just refer to the latest version of DO-229(). Need to check the interference masks and ensure they are the same (Appendix D in DO-253 and Appendix C in DO-229D Change 1.) Larger issue because also in Table 2-8. Daniel to look at all references to DO-229. Style: “229 with appendix replacement” and a note for equivalency of current drafts.</p> <p>Can the tests be just passed in one mode? DO-229 ends with “position solution”, but we have other requirements that need to be satisfied to incorporate into the differential position solution(s). Add a note – unaugmented for all for x.x.4.5</p>	
35	2.5.2.2.5.2	<p>Working Paper 12 from June 2011 meeting identified an inconsistency in the second sentence of the following note:</p> <p>“The test is designed to verify the performance of the AGC of the VDB receiver subsystem over a 10-second interval. This scenario can be encountered if the LAAS ground facility transmits Type 4 messages at the minimum specified rate.”</p>	<p>June 2011: It was agreed during the WG-4 meeting on June 16, 2011 that this is an inconsistency between the MOPS and the ICD. It was agreed to delete the second sentence of the note. It was discussed whether the 10 second interval test for frame-to-frame variation should be reduced from 10 seconds to a different interval, like 2.5 seconds which corresponds with a transmission in every 5th frame. It was agreed that the 10 second interval test still appropriately tests whether the receiver could receive messages with signal power</p>	Mar 12 – Implemented only the note change in WG-4 Draft MOPS Update

Item	Section(s)	Issue	Discussion	Resolution
		The second sentence of the note is inconsistent with the DO-246D (Section 2.2.2) which states that “For each time slot in use, the VDB transmitter will broadcast a burst in at least one frame of every 5 consecutive frames.”	differences of Smax, in time slots between successive bursts and also ensured that the receiver worked in the presences of missed messages; although, a reduced interval would also be appropriate. Proposed Resolution: Delete the second sentence of the note “This scenario can be encountered if the LAAS ground facility transmits Type 4 messages at the minimum specified rate.” It was suggested that either the rationale for the 10 seconds should be incorporated into the note to replace the sentence that was deleted, or possibly consider modifying the test to a different interval (e.g., 2.5 seconds).	
36	2.2.9.2.1	Working Paper 12 from the June 2011 meeting questioned whether the FM out of band FCC requirement was ever evaluated in developing the VDB MOPS requirements (see pages numbered 2 through 5).	June 2011: The working paper was discussed. Action: Hamza Abduselam took the action to discuss the issue with the FAA Spectrum Office and report back to WG-4. November 2011: See P10. No further action required. FAA responsible for FM compatibility and assignment of VHF frequencies. March 2012: Hamza provided a briefing (P14) summarizing the FAA’s FM Interference Analysis Tool.	No action required.
37	2.3.9.6	Timing Requirements LAAS-355 should identify the time allowed to change to GAST C or revert to a subset that passes GAST D.	June 2011: Discussed the time allowed for transition between GAST D and GAST C, or to find a GAST D subset that meets the requirements. Agreed on 2 seconds. Proposed resolution: Change LAAS-355 as follows: “If a fault is detected, the equipment shall [LAAS-355] within 2 seconds change the active Approach Service Type to C and output appropriately per section 2.3.11.1.3.3, or use a subset geometry for which the limit is not	Mar 12 – Implemented in WG-4 Draft MOPS Update

Item	Section(s)	Issue	Discussion	Resolution
			exceeded.”	
38	2.3.6.11	CCD Filter Corrections from John Savoy’s briefing	November 2011: Refer to P13. Need to clarify the threshold and units. Matt and John to verify.	Mar 12 – Implemented in WG-4 Draft MOPS Update
39	2.3.9.5	Differential Correction Magnitude Check Lack of clarity on what the requirement is for different solutions and services.	November 2011: Refer to P13. The group decided that this DCM check should be done with the 100 sec smoothing/corrections and whatever projection matrix is used in the position solution.	Mar 12 – Implemented in WG-4 Draft MOPS Update
40	2.3.11.5.2.3	Definition of σ_{D_V} and σ_{D_L} in RRFM	November 2011: The group agreed that the terms are intended to be the standard deviation of the difference, not the standard deviation of the magnitude of the difference.	Mar 12 – Implemented in WG-4 Draft MOPS Update
41	2.3.11.1.3.3	LAAS-367 applies to external selection (not reversionary). Is the 2 seconds sufficient if the mode downgrade was reversionary?	November 2011: Identified issue from P15. March 2012: LAAS-367 applies to any service type change. The 400 msec invalidation of guidance is parallel to this action. Refer this to the “timing group.”	
42	2.3.11.5.2.1.2	LAAS-369 Invalidated → discredited	November 2011: Identified issue from P15. March 2012: The group was unhappy with the wording change. Matt and Laurent to determine if a note or wording change is the best approach to convey the notion that when the active approach service type is invalidated it means that the GAST D service level is no longer supported with the current set of data. In this case, “invalidate” doesn’t need to set the bus output to NCD.	
43	2.3.11.5.2.1.2 and 2.3.8.1.3.1	10 and 6 sec seem to be inconsistent	November 2011: Identified issue from P15.	
44	Multiple.	Typos and editorial errors.	November 2011: P16 identifies editorial issues in the MOPS by the Pegasus team. The group agreed to accept all identified errors.	Mar 12 – Implemented in WG-4 Draft MOPS Update for the body corrections (Appendix C source

Item	Section(s)	Issue	Discussion	Resolution
				document does not contain the errors. Likely a PDF conversation issue with the published document.)
45	Table 2-7	Region 3 has a typo. It has the included/excluded region reversed for the narrowest of correlators.	Ref: Email from Morten Stakkeland.	Mar 12 – Implemented in WG-4 Draft MOPS Update
46	Requirements for: 332, 339, 344, 345, 346, 324, VDB protocols, 347, 349, 350, 353, 357, 369, 371	Specific functions are specified due to GAST-D introduction. Some of them are required only when equipment is operating in GAST-D service type and others can operate whatever the active service type. Nevertheless, the distinction between both cases may be ambiguous.	The working group agreed to Active approach service type language updates from P15 November 2011 meeting.	Feb 14 – Implemented in the WG-4 Draft MOPS Update.
47		Is it clear that the PAR doesn't exist during a re-tune? Confusion because "downgrades" are essentially new approaches too, yet PAR definition is static. CAT III and CAT I approaches are on separate charts (in the US). Issue is what data gets flushed. Is it clear?	Refer to P15 from November 2011, section "Runway Change in PAR."	
48		Honeywell's initial proposal to reduce Region 1 for both EML and DD discriminators. For EML: Eliminate larger than 3 MHz BW and less than 0.31 Chips. For DD: Eliminate all of region 1 below 4 MHz.		
49		Replace DO-229() references with DO-316() references? (Interference, general satellite acquisition, etc.)		
50		VDB Authentication Protocol	October 2012: (Add discussion.) Add a note below 2.3.7.3.e) that reminds that the FASVAL and FASLAL are not included in the FAS Data Block.	Feb 14 – Implemented in the WG-4 Draft MOPS Update.
51		Block 0 and Block 1 difference – Play through 2	Consider a note?	

Item	Section(s)	Issue	Discussion	Resolution
		B-values		
52	2.3.6.11	The WG agreed the current wording in DO-253C added a new unjustified requirement to AEC D equipment. It is desirable for the CCD monitor to - Remove a satellite from a GAST D solution when the CCD statistic is greater than the threshold at any time in the preceding 20 minutes. - Remove any impact of the filter from GAST C.	The WG agreed (without modification) to John's proposal in WP:2013-10_10.	WG 20131010 meeting agreed. Feb 14 – Implemented in WG-4 Draft MOPS Update (as combined with previous modifications agreed in 38).
53	2.3.11.5.2.1.5 LPB _{Apr_e} [k] equation	The LPB equation and the definition of the $s_{Apr_lat,i}$ term have “run together.” A new paragraph mark needs to be inserted in between.	Editorial update.	WG-4 20140114 telecon agreed to change. Feb 14 – Implemented in WG-4 Draft MOPS Update
54	LAAS-401 and LAAS-367	As a result of the SESAR business aircraft validation activities (Ref: ICAO NSP May 2014 WP-27 and WP-28 and the CSG meeting report), the requirements for the transitions between GAST C and D need to be revisited, particularly the modification of the selected (vice achieved) approach service type based on GCID changes		