

MANDATORY SERVICE BULLETIN

NO. MSB-40-060/1

NO. MSB-F4-016/1

SUPERSEDES MSB-40-060 and MSB-F4-016

I TECHNICAL DETAILS

I.1 Category

Mandatory.

I.2 Airplanes affected

Type: DA 40, DA 40 F

Serial Numbers: 40.377, 40.420, 40.422, 40.644 through 40.693, 40.695
through 40.842, 40.844, 40.846 through 40.887, 40.889
through 40.912, 40.915 through 40.917, 40.919 through
40.929, 40.931, 40.932, 40.934 through 40.940, 40.944
through 40.949, 40.951 through 40.953, 40.955 through
40.957, 40.961(RH only), 40.964, 40.971

40.FC007 through 40.FC029

I.3 Date of Effectivity

Initial inspection: 20-Oct-2008
Corrective action: 21-Dec-2009

I.4 Time of Compliance

Initial inspection: Within the next 100 flight hours from the date of effectivity for initial inspection but not later than 27-Feb-2009.

Corrective action: Within the next 200 flight hours from the date of effectivity for corrective action but not later than 30-Jun-2010.

I.5 Subject

This MSB addresses inspection for possible adhesive voids between upper wing skin and main spars and the correction of such voids, as required.

I.6 Reason

Some wings produced by Diamond Canada have been found to exhibit voids in the adhesive joint between the main spar caps and the upper wing skins. Static strength and endurance tests have shown that wings with voids as large as the inspection criteria referenced herein continue to meet the certification design limits and that safety of flight is not affected. The subject MSB requires inspection of all possibly affected aircraft to verify if there are any wings that have voids that exceed the inspection criteria and require immediate action.

Aircraft that have voids within the inspection criteria may continue to operate without restriction within a flight hour and a calendar time limit. Upon reaching the flight hour or the calendar time limit correction by adhesive injection is required.

Aircraft that have voids exceeding the inspection criteria require immediate correction i. a. w. an RÂM from Diamond Aircraft.

I.7 Concurrent Documents

None.

I.8 Approval

The technical content of this document has been approved under the authority of DOA No. EASA.21J.052.

I.9 Accomplishment/Instructions

Comply with WI-MSB 40-060 / WI-MSB F4-016, latest effective issue.
WI-MSB 40-060 / WI-MSB F4-016 is attached to this service bulletin.

I.10 Mass (Weight) and CG

Negligible.

II PLANNING INFORMATION

II.1 Material & Availability

Required materials are available through Diamond Aircraft Industries or may be purchased locally.

II.2 Special Tools

- Equipment for tap testing of composite structure (Refer to DA 40 Series AMM Chapter 51).
- Drill Stop

II.3 Labor Effort

1 ½ hours to 2 hours per aircraft to map spars and tap test the wing surface.
Up to 10 hours to perform the corrective action by injection.

II.4 Credit

2 hours labor credit per aircraft will be issued by Diamond Aircraft Industries (Canada) upon receipt of the inspection results and warranty application.

Additional 10 hours labor credit per aircraft will be issued by Diamond Aircraft Industries (Canada) upon receipt of the inspection results (void maps), a copy of the logbook entry showing that corrective action has been performed and warranty application.

II.5 Reference Documents

DA 40 Series Airplane Maintenance Manual Doc. No. 6.02.01, latest effective issue.

III REMARKS

1. The work must be carried out by an appropriately instructed, certified aircraft service station or an appropriately instructed, certified aircraft maintenance mechanic.
2. Accomplishment of the measures must be confirmed in the log book.
3. In case of doubt, contact Diamond Aircraft.
4. For warranty consideration, the SB must be completed by an authorized Diamond Service Center within the time of compliance and the Warranty Application must be sent not later than 30 days after completion of work.

WORK INSTRUCTION

WI-MSB-40-060

WI-MSB-F4-016

„Wing Skin to Spar Bond“

I GENERAL INFORMATION

I.1 Subject:

Detection of possible bonding paste voids between upper wing skin and main spars and corrective action thereof.

I.2 Reference Documents:

Diamond Aircraft DA 40 Series Airplane Maintenance Manual, Doc. No. 6.02.01, latest effective issue.

I.3 Remarks:

- a) The work must be carried out by an appropriately instructed, certified aircraft service station or an appropriately instructed, certified aircraft maintenance mechanic.
- b) All works, particular those that are not especially described in this work instruction, must be carried out in accordance with the referenced maintenance manual.

II DRAWINGS, SPECIAL TOOLS & MATERIALS

II.1 Drawings:

None

II.2 Special Tools:

- Equipment for tap testing of composite structure (Refer to DA 40 Series AMM Chapter 51).
- Drill Stop.

II.3 Material:

For corrective action:

As needed	Henkel Hysol 9359.3 or Hexion MGS L285/H286	Two Component Epoxy Adhesive Bonding Paste acc. to AMM
-----------	---	---

Note: Henkel Hysol 9359.3 is available in 50 ml and 200 ml dual cartridges and quarter gallon, gallon and 5 gallon bulk containers.

Note: For mixing ratios of the bonding paste refer to paragraph III.2.2 Instruction, step 9.

Required materials are available from Diamond Aircraft Industries or may be purchased locally.

III INSTRUCTIONS

III.1 Inspection:

1.	Mark both main spar locations on upper wing skins (LH and RH side) using masking tape.
2.	<p>Examine the complete surface of the wings.</p> <ul style="list-style-type: none"> i. Look carefully for signs of damage (dents, cracks, holes and delamination). ii. Do a tap test for voids between the upper wing skins and spars. Refer to AMM Sections 51-10 and 57-10. <p>NOTE: The inspection should be performed at a time and/or location devoid of interfering background noise.</p> <p>NOTE: In some single cases, the voids may be extensive (larger than 1 m / 3 ft).</p>
3.	<p>Mark voids, fill in Void Map (Appendix A) and file with DAI (Fax: +43 - 2622 - 26700 - 1369, e-mail: airworthiness@diamond-air.at).</p> <p>The Void Map is attached to this WI. A sample Void Map which explains how to use the form is also attached.</p> <p>NOTE: Keep records of voids (copy of void map, pictures, ...) to find back for repair.</p>

4.	<p>If the voids exceed the following limits, contact DAI to obtain an appropriate Repair Instruction (RÄM). The aircraft may only be operated for one further flight to a suitable repair shop. The flight must be conducted under VMC, in calm air and without exceeding v_{NO}.</p> <p>Maximum void limits on one wing:</p> <ul style="list-style-type: none"> • Over all void length on either the forward or the aft spar must not exceed 2500 mm / 98 inches, and • Over all void length on both spars together must not exceed 3050 mm / 120 inches, and • Over a length of 1070 mm / 42 inches from the root rib, one spar (the forward or the aft) must be free of voids.
5.	<p>If the voids do not exceed the criteria stated in step 4, the aircraft may be operated within the limits stated in the current AFM until the time of compliance for corrective action as stated in the Service Bulletin MSB 40-060 / F4-016, latest effective issue. After the time of compliance for corrective action has expired the following limits apply:</p> <p>Maximum void limits on one wing:</p> <ul style="list-style-type: none"> • Over a length of 1070 mm / 42 inches from the root rib, one spar (the forward or the aft) must be free of voids. On the second spar the width of the bond line must be at least 38 mm / 1.5 inches in <u>each</u> cross section (i.e., at each wing station). Where the width of the bond line is less the bonded joint must be restored to its full width by paste injection. • At spanwise positions outboard of 1070 mm / 42 inches from the root rib, the width of the bond line must be at least 19 mm / 0.75 inches on <u>each</u> spar and in <u>each</u> cross section (i.e., at each wing station). Where the width of one or both bond lines is less the bonded joint(s) must be restored to a width of at least 38 mm / 1.5 inches by paste injection. <p>NOTE: For corrective action by injection refer to the “Correcive action” section of this Work Instruction.</p> <p>WARNING: The Airplane must not be operated after the time of compliance for corrective action unless the listed criteria are met.</p>
6.	Clean working area and check for foreign objects.
7.	Perform functional check of altered, repaired and new parts.
8.	Test all systems in working area for function.
9.	Make necessary entries into aircraft logs.

III.2 Corrective action:

III.2.1 Preconditions:

The corrective action must be performed in an appropriately furnished clean and dry workshop.

If the action is combined with a 1000 h Inspection, it is advisable to perform the injection when the aircraft is disassembled and the tanks are removed from the wing.

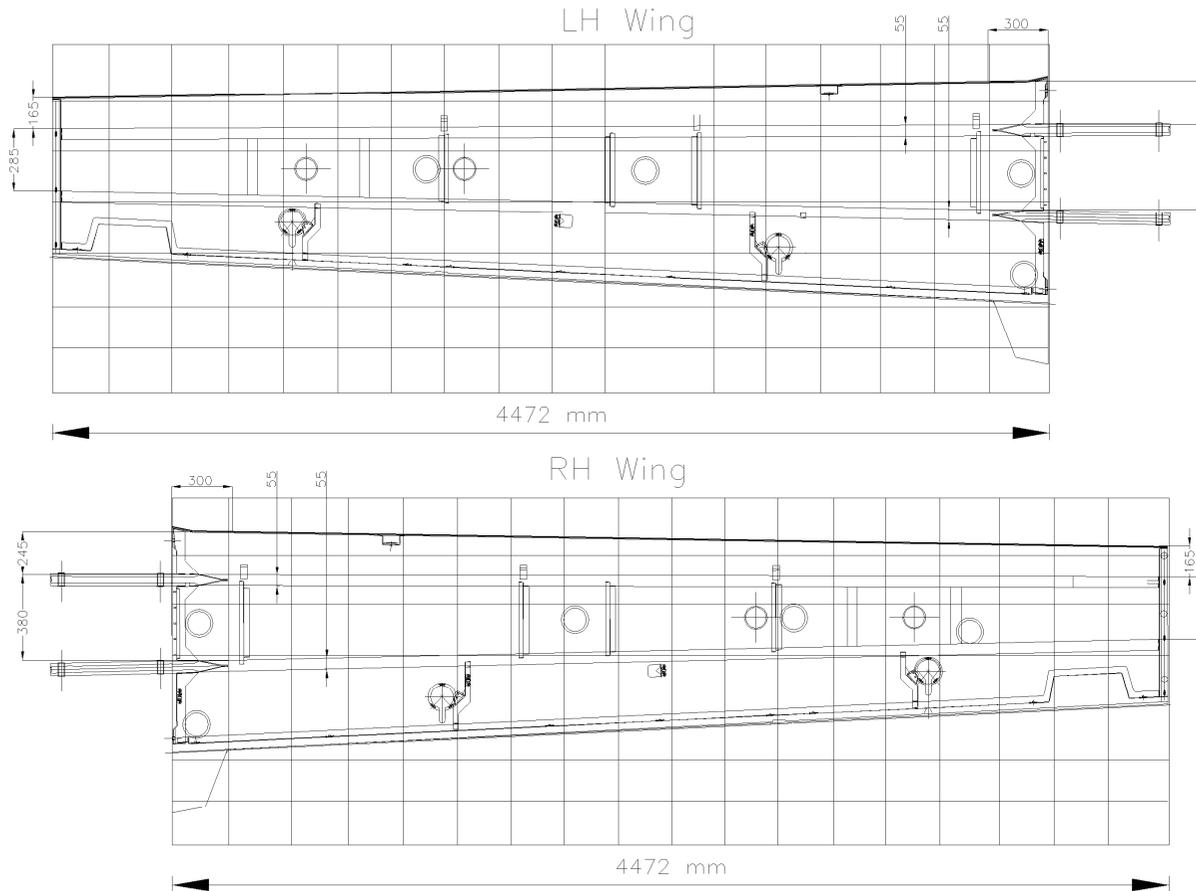
III.2.2 Instruction

1	<p>Mark both main spar locations on upper wing skins (LH and RH side) using masking tape.</p> <p>NOTE: Identify spar location by tapping or by sketch.</p> <p>NOTE: Do NOT use permanent markers.</p>
2	<p>Re-identify void locations by tap test or by sketch.</p> <p>CAUTION: WHEN USING SKETCH, CONFIRM VOID POSITIONS BY TAP TEST.</p>
3	<p>Remove all access covers from the wing.</p>
4	<p>Using a 2 mm (0.08 in) drill bit with drill stop (depth set to 8 mm / 0.315 inches) carefully drill 2 holes into each void at opposite edges (or one hole every 100 mm / 4 inches into each void).</p> <p>CAUTION: DO NOT DRILL PAST THE VOID INTO THE SPAR. DRILLING INTO THE SPAR CAN DAMAGE THE WING BEYOND REPAIR.</p>
5	<p>Remove loose particles with a vacuum cleaner.</p>
6	<p>Clean working area and check for foreign objects.</p>
7	<p>Calculate the expected maximum injection volume according to the following scheme for each void:</p> $44 \text{ mm} * 2 \text{ mm} * (\text{Length of void}) = (\text{injection volume})$ $1.75 \text{ inches} * 0.08 \text{ inches} * (\text{Length of void}) = (\text{injection volume})$ <p>CAUTION: IF EXCESSIVE ADHESIVE IS INJECTED THERE MIGHT BE A LEAK IN THE VOID AND THE ADHESIVE CAN FLOW INTO AND ACCUMULATE IN ONE OF THE CHAMBERS OF THE WING. THIS MIGHT LEAD TO A PERMANENT BONDING OF MOVABLE OR REMOVABLE PARTS.</p>

8	<p>To fill the voids use either Henkel Hysol 9359.3 adhesive or bonding paste according to step 9.</p> <p>CAUTION: ALWAYS OBSERVE THE APPLICABLE HEALTH AND SAFETY REGULATIONS GIVEN BY THE MANUFACTURER OF THE ADHESIVE OR GIVEN IN THE AMM FOR THE BONDING PASTE.</p>								
9	<p>If bonding paste is used to fill the voids, prepare adequate amount of paste, Reference DA 40 Series AMM chapter 51 for approved material. Use the following mixing ratios.</p> <table border="1"> <thead> <tr> <th>Material</th> <th>Percentage by Weight</th> </tr> </thead> <tbody> <tr> <td>Mixed Resin</td> <td>100</td> </tr> <tr> <td>Cotton Flakes or Cotton Flock</td> <td>8</td> </tr> <tr> <td>Eurocell 300 *)</td> <td>5</td> </tr> </tbody> </table> <p style="text-align: right;">*) formerly known as "Sil-Cell"</p>	Material	Percentage by Weight	Mixed Resin	100	Cotton Flakes or Cotton Flock	8	Eurocell 300 *)	5
Material	Percentage by Weight								
Mixed Resin	100								
Cotton Flakes or Cotton Flock	8								
Eurocell 300 *)	5								
10	<p>Using a syringe, inject adhesive into voids until voids are completely filled. (Inject from one hole until paste flows from opposite hole). If necessary seal void with sealant tape and bagging material to create a localized vacuum to ensure paste fills each void.</p> <p>NOTE: Always be cautious to inject the bonding paste gently and at a steady rate. Injecting too fast will plug the holes.</p>								
11	<p>If you reach the expected maximum injection volume for the void and it is not filled completely, inspect wing chambers for excessive adhesive accumulation. Remove excessive adhesive.</p> <p>CAUTION: IF EXCESSIVE ADHESIVE IS INJECTED THERE MIGHT BE A LEAK IN THE VOID AND THE ADHESIVE CAN FLOW INTO AND ACCUMULATE IN ONE OF THE CHAMBERS OF THE WING. THIS MIGHT LEAD TO A PERMANENT BONDING OF MOVABLE OR REMOVABLE PARTS.</p>								
12	<p>Apply sufficient pressure to each area. Maintain pressure until paste has cured (Ref. DA 40 Series AMM Chapter 51).</p>								
13	<p>Inspect wing chambers through inspection holes for excessive adhesive accumulation. Remove excessive adhesive.</p>								
14	<p>When using Henkel Hysol 9359.3 as adhesive, wait for at least 2 hours at 25 °C / 77 °F before post-curing.</p> <p>CAUTION: Do NOT apply higher temperatures within 2 hours after injection.</p>								

15	<p>If bonding paste is used, perform local post-cure per AMM Chapter 51.</p> <p>When using Henkel Hysol 9359.3 perform local post-cure according to datasheet and one of the following configurations:</p> <table border="1"> <tr> <td>25 °C / 77 °F</td> <td>6 days</td> </tr> <tr> <td>30 °C / 86 °F</td> <td>4 days</td> </tr> <tr> <td>38 °C / 100 °F</td> <td>2 days</td> </tr> <tr> <td>46 °C / 115 °F</td> <td>24 hours</td> </tr> <tr> <td>54 °C / 129 °F</td> <td>12 hours</td> </tr> <tr> <td>60 °C / 140 °F</td> <td>7 hours</td> </tr> </table> <p>CAUTION: Do NOT exceed a temperature of 60 °C / 140 °F.</p>	25 °C / 77 °F	6 days	30 °C / 86 °F	4 days	38 °C / 100 °F	2 days	46 °C / 115 °F	24 hours	54 °C / 129 °F	12 hours	60 °C / 140 °F	7 hours
25 °C / 77 °F	6 days												
30 °C / 86 °F	4 days												
38 °C / 100 °F	2 days												
46 °C / 115 °F	24 hours												
54 °C / 129 °F	12 hours												
60 °C / 140 °F	7 hours												
16	<p>When post cure is complete, remove clamps, bagging material, sealing material, etc. Lightly sand each area with 220 grit, or finer, sandpaper to remove excess resin and to blend the area into adjoining surfaces.</p>												
17	<p>Inspect by coin tap test to ensure enough voids are filled to meet the criteria specified in paragraph III.1 Inspection, step 5.</p>												
18	<p>Close all inspection holes.</p>												
19	<p>Paint touch up per AMM Chapter 51.</p>												
20	<p>Test all systems in working area for function.</p>												
21	<p>Make necessary entries into aircraft logs.</p>												

Void Map, Airplane S/N: _____



(Grid spacing is 254 mm x 254 mm (10 in x 10 in))

File Void Map with DAI: Fax: +43 - 2622 - 26700 - 1369 or e-mail: airworthiness@diamond-air.at



Diamond Aircraft Industries GmbH
 N. A. Otto-Straße 5
 A-2700 Wiener Neustadt

WI-MSB 40-060
 WI-MSB F4-016
 Appendix A
 Revision 1
 Page 2 of 3
 21-Dec-2009

- Dimensions in inches
- Dimensions in millimeters

Void Map, Airplane S/N: _____

LH FWD Spar				RH FWD Spar			
Item	Length	Width	Start-Position	Item	Length	Width	Start-Position
1				1			
2				2			
3				3			
4				4			
5				5			
6				6			
Sum		free of void length from root rib		Sum		free of void length from root rib	

LH AFT Spar				RH AFT Spar			
Item	Length	Width	Start-Position	Item	Length	Width	Start-Position
1				1			
2				2			
3				3			
4				4			
5				5			
6				6			
Sum		free of void length from root rib		Sum		free of void length from root rib	

File Void Map with DAI: Fax: +43 - 2622 - 26700 - 1369 or e-mail: airworthiness@diamond-air.at



Diamond Aircraft Industries GmbH
 N. A. Otto-Straße 5
 A-2700 Wiener Neustadt

WI-MSB 40-060
 WI-MSB F4-016
 Appendix A
 Revision 1
 Page 3 of 3
 21-Dec-2009

- Dimensions in inches
- Dimensions in millimeters

Void Map, Airplane S/N: _____

Results:

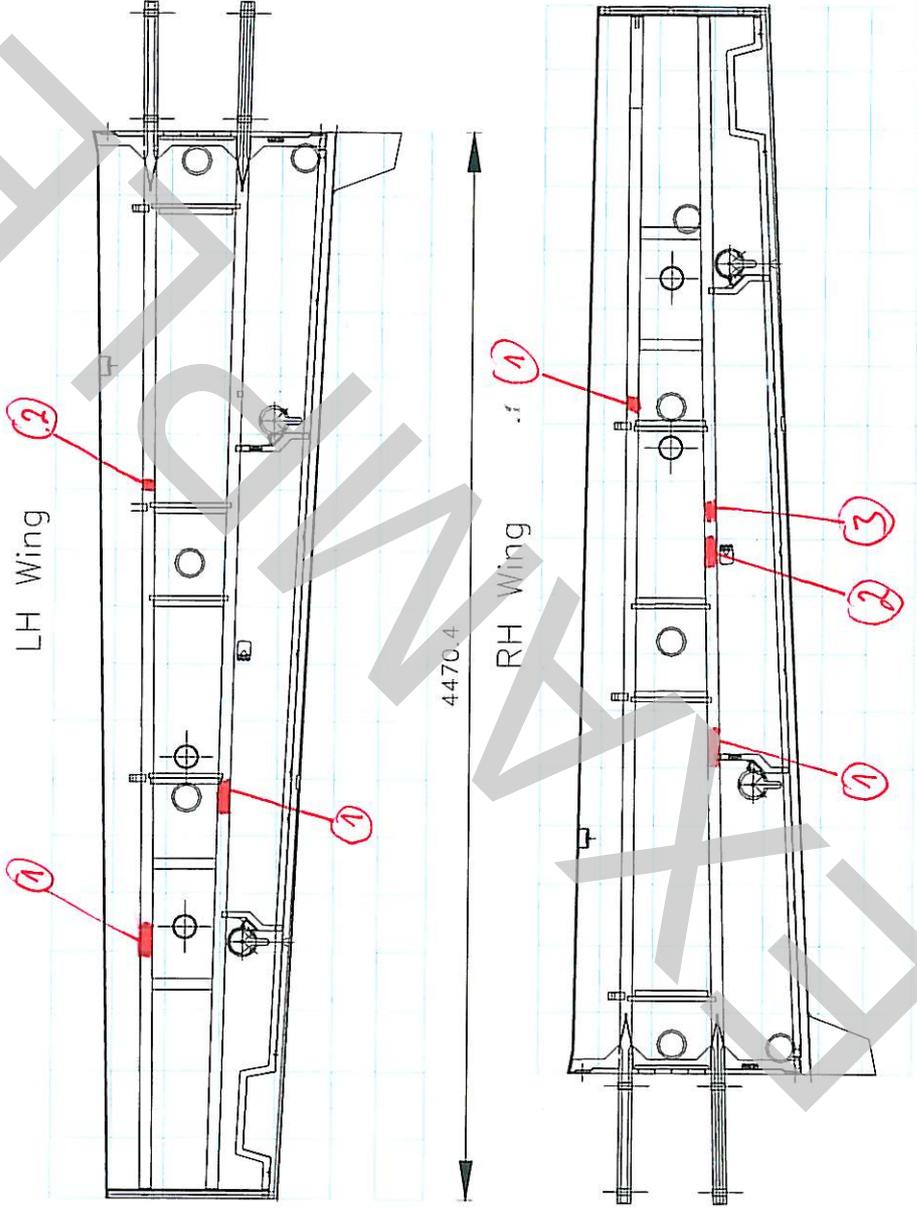
	LH Wing				RH Wing				
	Length	Criteria	Yes	No	Length	Criteria	Yes	No	
FWD Spar over all void length		< 2500 mm (98 inches)				< 2500 mm (98 inches)			
AFT Spar over all void length		< 2500 mm (98 inches)				< 2500 mm (98 inches)			
Both Spars over all void length		< 3050 mm (120 inches)				< 3050 mm (120 inches)			
Free of void length FWD Spar		greater value > 1070 mm (42 inches)				greater value > 1070 mm (42 inches)			
Free of void length AFT Spar									
Passed (further operation permitted until end of time of compliance for corrective action)					Passed (further operation permitted until end of time of compliance for corrective action)				

Test performed on (Date) _____

Test performed by _____

File Void Map with DAI: Fax: +43 - 2622 - 26700 - 1369 or e-mail: airworthiness@diamond-air.at

Void Map, Airplane S/N: 40.919



(Grid dimension for one cell is 254mm² (10 in²))

File Void Map with DAI: Fax: +43 - 2622 - 26700 - 1369 or email: airworthiness@diamond-air.at



Diamond Aircraft Industries GmbH
 N. A. Otto-Straße 5
 A-2700 Wiener Neustadt

WI-MSB-40-060
 WI-MSB-F4-016
 Appendix A
 Revision 0
 Page 2 of 3
 20-Oct-2008

Dimensions in inches
 Dimensions in millimeters

Void Map, Airplane S/N: 40.919

LH FWD Spar				RH FWD Spar			
Item	Length	Wide	Start-Position	Item	Length	Wide	Start-Position
1	102 mm	64 mm	3708 mm	1	51 mm	25 mm	2845 mm
2	51 mm	25 mm	1473 mm	2			
3				3			
4				4			
5				5			
6				6			
Sum	153 mm	free of void length from root rib	1473 mm	Sum	51 mm	free of void length from root rib	2845 mm

LH AFT Spar				RH AFT Spar			
Item	Length	Wide	Start-Position	Item	Length	Wide	Start-Position
1	102 mm	51 mm	2781 mm	1	152 mm	51 mm	1283 mm
2				2	127 mm	51 mm	2159 mm
3				3	76 mm	51 mm	2362 mm
4				4			
5				5			
6				6			
Sum	102 mm	free of void length from root rib	2781 mm	Sum	355 mm	free of void length from root rib	1283 mm

File Void Map with DAI: Fax: +43 - 2622 - 26700 - 1369 or email: airworthiness@diamond-air.at



Diamond Aircraft Industries GmbH
 N. A. Otto-Straße 5
 A-2700 Wiener Neustadt

WI-MSB-40-060
 WI-MSB-F4-016
 Appendix A
 Revision 0
 Page 3 of 3
 20-Oct-2008

Dimensions in inches
 Dimensions in millimeters

Void Map, Airplane S/N: 40.919

Results:

	LH Wing		RH Wing		Yes	No
	Length	Criteria	Length	Criteria		
FWD Spar over all void length	153 mm	< 2500 mm (98 inches)	51 mm	< 2500 mm (98 inches)	X	X
AFT Spar over all void length	102 mm	< 2500 mm (98 inches)	355 mm	< 2500 mm (98 inches)	X	X
Both Spars over all void length	255 mm	< 3050 mm (120 inches)	406 mm	< 3050 mm (120 inches)	X	X
Free of void length FWD Spar	1473 mm	greater value > 1070 mm (42 inches)	2845 mm	greater value > 1070 mm (42 inches)	X	X
	2781 mm		1283 mm			
Free of void length AFT Spar	Passed (further operation permitted)	X	X			

Test performed on (Date) 20-Oct-2008

Test performed by Max Mustermann