## MINI PACK

## AJW

Model Radome

**Serial** 000309

Part number 284T0052-41

Condition REPAIRED

TSR 0 CSR 0 TSN 23,016 CSN 2159

Trace to Etihad (Last operator)

Tag by Société Air France

Tag date 05 JUL 2019

## Location

AJW Group The Headquarters, Maydwell Avenue, Slinfold, West Sussex, RH13 0AS, United Kingdom

Additional details For additional details on this unit please <u>contact</u> the AJW Major Assets Team.







# AIRWORTHY

## **CERTIFICATE/FORM**

Dir L'A	oving Competent Authority/Country 2. ECTION GÉNÉRALE DE /IATION CIVILE / FRANCE	Certificat EASA F	d'Autor ORM 1	RELEASE CE isation de Mis — Formulaire	e en Servi	ice	3. Form Num	n Tracking Number éro de traçage du formulaire *844334777
4. Org Nom	anisation Name and Address et adresse de l'organisme Al	SOCIÉTÉ AI RFRANCE 1/45 rue de Pa 95747 ROISS FRANCE	iris	lex		an a	Bon c	de Commande/Contrat/Facture
6. Item	7. Description		8. Part No /	Numéro de la pièce	9. Qty. / Qtá	10. Serial No. / Numi	មំល នម័រខែ	11. Status / Work Élat / Travaux
1.	RADOME ASSY		2847005	2-41	1	000389		REPAIRED
AND W SEE C For work The work in ress 13a Certi Certific	alions BOEING D634W210	IG AJW R0:T32533 DATED 05/APR 0/APR/2019. h same number as mentioned in ibed herein has been accompli proved for return to service actured in conformity to: abriqués conformément:	n block 3. ished in a under cer	ccordance with 14 tificate no. CNF 14a. 🛛 Part-145.A.50 Partie 145.A.5	19120. ) Release to Se 50 <i>Remise en se</i> wise specified in 1	SIN NE OH RE: 3 and rvice grvice block 12, the work identific	NCE HOURS W 023016 AUL PAIR V Other regula Autro regula	TCCA CERTIFICATE Ne897-28 ation specified in block 12 mentation visée à la case 12 described in block 12, was accomplished in se to service.
П	ion-approved design date specified in block 12 its données de définition non approtivées indiquées en			Certifie que, saul dispositio	ons contraires ment	ionnées dans la case 12-1	les travoux indianés ri	lans la case 11 el décrits dans la case 12, ont iont considérés comme prêts à être remis en
	nsed Signalure Iro.autorisën	13c. Approval / Authorisation Nu Numéro de l'agrément / auto	Imber	14b. Authorised Signa Signature autorise		AF EOTITROLE NE 12	N* de Cer	te / Approval Ref. No. tificat / d'agràment 5 - 0 0 1 0
13d. Name	l Nom	13e. Date (dd:mmm yyyy) / (jj mi	mm'aaaa)	14d. Name / Nom	FAVR	EAU Christian		ттт уууу) / (jj mmm авва) JUL2019
This certific Ce certifica Where the from the ain Lorsque fui s'assure qui Statements flown. Les mentior	TALLER RESPONSIBILITIES / RESPONSABILITÉS Ite does not automatically constitute authority to instal ne vaut pas automatiguement autorisation d'installer i isorfinistaller performs work in necordance with regula vorthiness authority specified in block 1 ilisateur/installateur effectue das travaux conformàmic i l'autorité responsabile de la navigabilité dont il relève in blocks 13a and 14a do not constitute installation ci s figurant dans los cases 13a et 14a ne constituent j istallateur avant que l'aéronet puisse décoller	l the ilem(s). e ou les óléments. Ilions of an airworthinoss authority diffurent t mt à la règlementation d'une autorité respo accepte les éléments approuvés par l'autorit ettification. In all cases elicraît maintenance	onsable de la n lé responsable i records must d	lavigabilité, autre que l'au de la navigabilité inscrite i contaîn an installation cert	lorité responsable h la case 1 lification issued in	de la navigabilité indiqui accordance with the natio	ée dans la case 1, . anal regulations by I	il est essentiel que l'utilisateur/installateur he user/installer before the aircraft may be

24 O

AIRFRAN	CE 🖉			
			FAX : 33 (0)	141 560 16
45 rue de PARIS F	95747 ROISSY CHARI	ES DE GAULLE CEDEX	TLX : RSYLOAF	a de la constante de la constan
	l.	VORK SHOP REPORT	No	: B483499
Customer: AJ WA Work Order.: T3253			Dossier Requisition No.	
Designation : RA	DOME ASSY	nga gang ang ang ang ang ang ang ang ang	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
Part Number: 28	4T0052-41		TSN.: UNKNOWN	
Serial Number.: 00	0309		CSN.: UNKNOWN	
Removal from A/C.: Aircraft Model:		Pos.: UNKNOWN	Time: Cycles.:	UNKNOWN UNKNOWN
Removal Date:	05APR19	Location.: CDG		
Removal Type: Removal Reason:	PLEASE QUOTE TO T	EST / RECERT - IF IT FAI OLD FPR A RESPONSE. DEFE	LS TEST PLEASE QUO CT : REMOVED SERVI	T C
Condition as receiv	ed		****	999-999-999 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5
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arranty requested.	:	Warranty Accepted	d.:	
Confirmation of Rem Repair Text:		IND - REMOVAL REASON CONF	IRMED	
	******	D634W210 SRM		MAY19
AND WORKSCOPE N	REPAIR PERFORMED F IUMBER AJW10042019 ? 77/53/C00346 CAT:	OLLOWING AJW R0:T32533 D DATED 10/APR/2019. A.	DATED 05/APR/2019	
lew Part Number: lew Serial Number.:				1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,
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evision date.: 05J	UL19 Signed	AF	and the second	CDG HEO2
		CONTROLE)	P	age l/l
	Company	and the second s		





## NON- INCIDENT

## **STATEMENT**



Date: 16 January, 2019 To: Altavair

## Non Incident / Non Accident Statement - Airframe

Aircraft

Registration	MSN	Туре	TSN	CSN
A6-LRC	36302	B777-200LR	44123:53	4796

To whom it may concern:

During operation by Etihad Airways from 06-Febraury-2014 until 16-January-2019 of the above Aircraft, we hereby confirm that the Aircraft:

- Has not been involved in any accident or serious incident as defined in Chapter 1 of ICAO Annex 13
- Has not been obtained from nor operated by any government or military source.
- Has not been subjected to severe stress or heat outside of normal operation and maintenance.
- Have not been submerged in salt water or otherwise exposed to corrosive agents outside of normal operation and maintenance.

Approved by Najeeb Hassan Ansari B777 Fleet Management Manager +971 2 511 5459 NAnsari@etihad.ae

Prepared by: Renz Estiva Technical Records Officer +971 2 511 5324 REstiva@etihad.ae

P.O. Box: 35566, Abu Dhabi United Arab Emirates Tel: +971 2 511 0000 An Etihad Aviation Group Company From Abu: Dheabi to the world



ص.ب: 35566، أبوظبي الدمـارات العربية المتحدة هـاتف: 5110000 2 971+ إحدي شركاتٍ مجموعة الدتحاد للطيران <mark>من أبوظبيٍ إلى العالـم</mark>

etihad.com









Air Salvage International, ID: 18-074-793

Part No: 284T0052-41 Desc: RADOME Serial No: 000309 Qty: 1 Notes: 100-5431 TO 100-5432

As removed from B777 MSN 36302 Registration A6-LRC On 01/04/2019 11:43:05

ASI 3

### ETIHAD AIRWAYS

FLEET ENGINEERING

	OCCM TIME STA	ATUS
44123:53	Unit Name:	A6-LRC
4796	Item:	B777-200LR
4231	Serial:	36302
36302	Status AS AT:	14-Jan-19
	4796 4231	44123:53     Unit Name:       4796     Item:       4231     Serial:



ΑΤΑ	ltem Desc	Item Number	Serial Number	Position	Installed Date	Installed Aircraft TSN	Installed Aircraft CSN	COMP TSN	COMP CSN
53-00	SNUBBER	87020-2	1322	SNUBBER_2	24-Jul-07	0	0	44123	4796
53-10	NOSE RADOME AY	284T0052-41	000309	RADOME	20-Apr-16	34046	3919	23016	2159
54-20	FAN COWL RIGHT HAND	314W1086-10	000457	FAN COWL RH_2	24-Jul-07	0	0	44123	4796
54-20	FAN COWL LEFT HAND	314W1086-7	000458	FAN COWL LH_1	24-Jul-07	0	0	44123	4796
54-20	FAN COWL RIGHT HAND	314W1086-8	000446	FAN COWL LH_2	24-Jul-07	0	0	44123	4796
54-20	FAN COWL LEFT HAND	314W1086-9	000445	FAN COWL RH_1	24-Jul-07	0	0	44123	4796
55-27	ELEVATOR	183W0061-15B	HDH633	ELEVATOR_LH	24-Jul-07	0	0	44123	4796
55-27	ELEVATOR	183W0061-16B	HDH632	ELEVATOR_RH	24-Jul-07	0	0	44123	4796
56-00	WDO AY, RH, 3POS TMPRD GLS	141T4004-22	07024H3613	WINDOW ASSY, RH NO. 3_RH3	24-Jul-07	0	0	44123	4796
56-00	WDO AY, LH, 3POS TEMPRD GL	141T4004-21	14067H8061	WDO AY,LH,#3POS TEMPRD GL_LH3	3-Mar-15	27899	3328	16223	1468
56-11	WINDOW, PO 2, RH, GLASS	141T4001-42	06331H8456	NO 2 WINDOW ASSY RH	24-Jul-07	0	0	44123	4796
56-11	WINDOW AY No 1 LH	141W7400-33	07032H4583	NO 1 WINDOW ASSY LH_LH1	24-Jul-07	0	0	44123	4796
56-11	WINDOW AY No 1 RH	141W7400-34	07032H4582	NO 1 WINDOW ASSY RH_RH1	24-Jul-07	0	0	44123	4796
56-11	WINDOW, LH, 2PO OPEN FRAME	141T4835-69	000059023	NO 2 WINDOW ASSY LH	17-Jan-16	32562	3787	11555	1007
57-43	LE SLAT 7	114W2100-107	000649	SLAT NO 7 LE_7	24-Jul-07	0	0	44123	4796
57-43	LE SLAT 8	114W2100-108	000631	SLAT NO 8 LE_8	24-Jul-07	0	0	44123	4796
57-43	SLAT NO 2 LE	114W4120-107	000631	SLAT NO 2 LE_2	24-Jul-07	0	0	44123	4796
57-43	SLAT ASSY FINAL NO 13 WING	114W4120-112	000629	SLAT NO 13 LE_13	24-Jul-07	0	0	44123	4796
57-43	SLAT NO 3 LE	114W4130-107	000631	SLAT NO 3 LE_3	24-Jul-07	0	0	44123	4796
57-43	POSITION NO 12 WING LE	114W4130-112	000629	SLAT NO 12 LE_12	24-Jul-07	0	0	44123	4796
57-43	SLAT ASSY FINAL NO 11 WINGS ON	114W4140-112	000629	SLAT NO 11 LE_11	24-Jul-07	0	0	44123	4796
57-43	SLAT ASSY FINAL NO 5	114W4150-111	000629	SLAT NO 5 LE_5	24-Jul-07	0	0	44123	4796
57-43	POSITION NO 10 WING LE	114W4150-112	000629	SLAT NO 10 LE_10	24-Jul-07	0	0	44123	4796
57-43	SLAT NO 6 LE	114W4160-103	000629	SLAT NO 6 LE_6	24-Jul-07	0	0	44123	4796
57-43	SLAT ASSY FINAL, NO 9	114W4160-106	000629	SLAT NO 9 LE_9	24-Jul-07	0	0	44123	4796
57-43	POSITION NO 1 WING LE	114W5110-10	000629	SLAT NO 14 LE_14	24-Jul-07	0	0	44123	4796

1

	TARMAC ARAGO CTRA A-1512 DE	N ALBARRACIN KM6		11/0 -		SCAN	ate 22/10/2018 12:50 NREF: 58433_409_579
	G Ó N 44396 Teruel - Sp VAT # ES B-4424	ain			ON ROUTINE	PER	page 1 of 3
Order Ref.: WO Y/Ref ATA 0000 INT	D- 58433 TRODUCTION	Title NRC - 3 Date 22/10/20		9 - 050 - RAD		ON	
	AIRCRAFT	COMPON	ENT			D-58433	
	Reg. A6-LRC Type B777-237LR GE90-110B MSN 36302		PERATC	R	Mandatory (Y/N WP-409 MNT.PROG:	I) Y	ETOPS (Y/N) N NRC : WO-58015
LIMIT FH FC Date	MSN 36302	AGED BY THE		'n.	Prepared by Received by		Sonia CANALES eSigned
COMPLAIN	T / REQUESTED WORK	<u> </u>	加工		TASK PERFORM	ED	
NRC (2) / Origir	1 WO-58015		REPD	RED I	ALU SRM 5	3-10-72	BR-O
DELAMINATION	1A-1 Rev No. / Date : 78	_		804 A/B	TUR	5 15-	NOV - 2018
note: see next page if the Engineer ID #1 FUP #2 H M P #3 #4 COMPONENT	here is not enough room here hh:mm Engineer IE #5 #6 #7 #8 REMOVED DESC	Calibrated			NON ROUTINE Ref: S/N S/N STALLED DESC		Complied With C/W NRC possible)
the identified control sy correctly, and in respec	ate safety inspection has been carried stem of the aircraft / component funct t of the maintenance performed, the c	ions		I LEASE REF AUTH No	S/N DATE	TRIG	POS SIGN/STAMP
certificatio				DATE & HOUI PART-145 App	n- 000 10	. 12Ø3 )	for administration



Reference: WO- 58433

## WORK ORDER

Title NRC - 36302 - 539 - 050 - RADOME DELAMINATION

Date	22/10/20	18 8:46:08	
ATA	0000	INTRODUCTION	page 2 of 3
	C	COMPLETED TASK & RESULTS DATE / ID / SIGN	
NRC (2)	/ Origin WO	58015	
DURING	INSPECTIC	N, IT APPEARS TO BE DELAMINATION INSIDE THE	RADOME
5- 20-			
PLEASE,	, INVESTIG	ATE	
Ref. SRM 53-	-10-72-1A-1	Rev No. / Date : 78 / 15 Sep 2018	
log n⁰ 11	751690 •		



TARMAC ARAGON CTRA A-1512 DE ALBARRACIN KM6 44396 Teruel - Spain VAT # ES B-44241933



page 3 of 3

Order Ref.: WO- 58433

#### Title NRC - 36302 - 539 - 050 - RADOME DELAMINATION

P/N SERIAL POS	NIL	DESCRIPTION REASON	
COMPONEN	IT INSTALLATION		
P/N	NIL	DESCRIPTION	
SERIAL		CERTIFICATE	
POS			
MATERIAL	SSUED		



P.O. Box 025263, Miami, FL 33102-5263 • Tel: 305.925.2600 • Fax: 305.507.7191 Plant Location: 10000 N.W. 15th Terrace, Miami, FL 33172 • SITA: MIAMMCR www.KLXaerospace.com

Shipped From: KISDORFER WEG 36-38, 24568, KALTENKIRCHEN, GERMANY

#### **Material Certification**

The items set forth on the purchase order referred to below have been visually inspected and the dimensions thereof have been measured by us, and based on the aforesaid, as well as the representation made to us by the manufacturers of the items subject of such purchase order, we hereby certify that such items are in conformity with all current governmental and manufacturer's requirements, specifications, drawings, and conform to the purchase order requirements. Said items are in new condition and have not been obtained from any U.S. Government or Military source and are traceable to KLX Aerospace Solutions.

### FIRM: TARMAC ARAGON

### PURCHASE ORDER#: PO - 209711

NE# QUANTITY	U/M PART-NUMBER	CUST REF#	LOT-NUMBER	HANUFACTURER	CCODE Eff Date	EXP DATE
	KT PS 090 B1/2 SK654 PS 090 B1/2 8K654	WO:58433	BZS 19045	SEALANTS BUROPE	FB8K9 00/15/18	05/31/19
Container Bize Material Size,	100 ML/BENAT	CAEROSAVE				
	UNDER A BATCH SPLIT OF CONCERNED SERIAL NUMBERS	5/11/2018 				
	NAME: CNA	STAMP & VISA :	G	f.		11/06/18

Senior Director, Global Quality

Inv # 11/06/10

Page: 1 of 1

P.O. Box 025263, Miami, FL 33102-5263 • Tel: 305.925.2600 • Fax: 305.507.7191 Plant Location: 10000 N.W. 15th Terrace, Miami, FL 33172 • SITA: MIAMMCR www.KLXaerospace.com

Shipped From: 2617 N. GREAT SOUTHWEST PARKWAY, GRAND PRAIRIE, TX 75050

#### **Material Certification**

The items set forth on the purchase order referred to below have been visually inspected and the dimensions thereof have been measured by us, and based on the aforesaid, as well as the representation made to us by the manufacturers of the items subject of such purchase order, we hereby certify that such items are in conformity with all current governmental and manufacturer's requirements, specifications, drawings, and conform to the purchase order requirements. Said items are in new condition and have not been obtained from any U.S. Government or Military source and are traceable to KLX Aerospace Solutions.

### FIRM: TARMAC ARAGON

#### PURCHASE ORDER#: 209640

QUANTITY U	J/M PART-NUMBER	CUST RBF#	LOT-NUMBER	MANUPACTURER	CCODE Eff Date EXP DATE
1 8	T BY-3804 A/B		0000607438000060	7410 R.B. PULLER	5N867 07/22/18 03/05/19
nercial PN: E	sy-3804 λ/B				
rial Size: "	2,375 LB/KT (QT KIT)	)=			
U	TARINA OPY MADE ON (DATE) INDER A BATCH SPLIT OF	LO: 58433 AC AEROSAVE 13/11/2018. A PARTS OUT OF A TOTAL OF			1
	NAME:	STAMP & VISA :	Jason	Lewis	11/01/18





Nuñez de Balboa, 118 1 C 28006 Madrid Teléfono: 915.612.506 Fax: 915.634.663 C.I.F: B-81355117

## CERTIFICADO DE CONFORMIDAD

CERTIFICADO Nº: 3382 - 20181107

5	liente	1	Customer:	Tarmac Aragón, S.L.U.	•

N' Pedido / Purchase order:PO - 209651Focha Pedido / Order date:05-11-2018Albarán Nº / Waybill nº:3382Focha Albarán / Waybill date:07-11-2018Cod, Cliente:43000403

PIS 96, S.L. como distribuidor de materiales auxiliares para moldeo por vacio CERTIFICA que: Los materiales detallados a continuación se ajustan a nuestras hojas técnicas. De tro del ámbito de sus secretos empresariales, INP 96, S.L. se reserva el derecho a seleccionar o cambiar sus fuentes de suministro. Ningún pedido de compra de clientes problemanta la obligación de INP 96, S.L. INP 96, S.L. se reserva el derecho a actualizar sus hojas técnicas. Rogamos se ponga en contacto con nosotros para facilitarle la introación actualizada.

th/P S6, S.L. as distributor of vacuum bag materials CERTIFIES that the materials detailed above conform to our current data sheets. Within the scope of its trade secrets, INP 96, S.L. retains the right to select or alter its sources of supply and methods of manufacturing. No customer purchase order shall alter INP 96's obligation hereunder. INP 96, S.L. retains the right to update its data sheets. Please contact us if updated information is required.

En aquellos materiales que sean de aplicación, INP 96, S.L. (Airbus ARP approval Number 287096) como distribuidor de materiales auxiliares para moldeo por vacio de la empresa Tygavac Advanced Materials, Ltd. CERTIFICA que: Los materiales detallados a continuación están de acuerdo a los requerimientos técnicos de la especificación de Airbus Encaña y que han sido almacendaos de acuerdo a dicha especificación.

en spelication materials INP 96, S.L. ( Airbus ARP approval Number 287096 ) as distributor of vacuum bag materials of the company Tygavad Advanced Materials, Ltd. certifies etc. : the materials detailed above comform to technical requirements of Airbus España specification and have been stored according to that specification

Material	а <sup>с</sup> 1. н. н. 1. н.	Unidad Unit	Cantidad <i>Quantity</i>	Lote nº Batch nº	Fecha Fabricacion <i>Manuf, Date</i>	Fecha Caducidad Expily date
.)v:::238		m	10,00	85M208181934Z	10-07-2018	10-01-2021
0.61 · 1270 / TF970				10,00		

Tajido de fibra de vidrio Satin 8H Peso 305 gr/m² Referencia internacional 7781 Notiho 1270 mm

	: 584		AVE	
COPY MADE ON (DATE)	AC AL	1 20 1	ALOF 10	
COPY MADE ON (CONDER A BATCH SPLIT O CONCERNED SERIAL NU	WBERS :		A	
NAME:		STAMP &	VISA	
PLP		New York Contraction	Ali	PERSONAL PROPERTY

Andrés Vázquez Pérez Departamento de Calidad

\* En cumplimiento de lo establecido en la Ley Orgánica 15/1999, de 13 de diciembre, de Protección de Datos de Carácter Personal, le comunicamos que los datos que usted nos facilite quedarán incorporados y serán tratados en los ficheros titularidad de INP 96 S.L. con la única finalidad de gestionar y mantener los mismos, como medio para canailizar las oprtunas cuminaciones que se produzcan como consecuencia de la relación que mantiene con la empresa o algunos de sus empleados. La emempresa le garantiza la posibilidad de ejercitar sus derechos de acceso, rectificación, cancelación y oposición al tratamiento de los datos, dirigiendo una comunicación por escrito a la dirección Nuñez de Balboa nº118 1ºC, en la que constan ciertamente sus datos de contacto, y deberá acompañar la fotocopia del DNI/NIF o documento que acredite su identidad. Si el receptor de la comunicación no fuera el destinatario, le rogamos nos lo comunique de inmediato y proceda a destruir el mensaje recibido.

Inscrita en el Registro Mercantil de Madrid, Tomo 10,502, Libro 0, Folio 195, Hoja nº M-166730, Inscripción 1º, C.I.F.: B-81355117, V.A.T. ES 81355117



NDT REPORT Tarmac Aerosave

B777-237 MSN 36302

CR181434A Ver : 00



Bondmaster Inspection of Radome

31/10/2018

B777-237 MSN 36302





**Tarmac Aerosave** 

B777-237 MSN 36302

## CONTENTS

<u>1 Intr</u>	roduction	3
1.1		
<u>2</u> <u>Me</u>	asurement DEFINITION	3
2.1	Methodology	4
2.2	Technician qualification	4
<u>3 Me</u>	asurement progress	4

	3.1	Progress	and	environment	al
	condi	tions			4
	3.2	Problems	encou	ntered	4
<u>4</u>	Res	sults & CON	ICLU	SION	4
	4.1	Bondmast	er Insi	pection	4

## **RECORD OF REVISIONS**

Pages
5

## **QUALITY CONTROL**

Written by	Approved by
Quentin Vuylsteke	Mathieu Chaigneau 31/10/2018





**Tarmac Aerosave** 

## 1 INTRODUCTION

## 1.1 Aim of measurement

We performed Bondmaster inspection on the Radome of B777-237 MSN 36302 in your Tarmac aerosave hangar in Teruel (Spain).

## Reference documents

Contractual documents

G <sup>2</sup> Métric ref. quotation	D181948	
Purchase Order	PO-209348	

Others documents

Work Order	WO-58433
Procedure	NTM 51 01 01

### 2 MEASUREMENT DEFINITION

In accordance with your request, we performed Bondmaster inspection on the Radome of B777-237 MSN 36302 in your Tarmac hangar in Teruel (Spain).

Area of inspection:



Inside part of the radome





**Tarmac Aerosave** 

## B777-237 MSN 36302

Ver : 00

## 2.1 Methodology

The instrument used is:

Ultrasonic Tools	S/N	Validity
Bondmaster 600	60009161598	09/2019



## 2.2 Technician qualification

Name	Qualification	Level	Validity
Vuylsteke	UT	2	05/2019

## 3 MEASUREMENT PROGRESS

### 3.1 Progress and environmental conditions

Date	G2M Agent	Time slot	Temperature
31/10/18	Vuylsteke	8h-12h	10°C

### 3.2 Problems encountered

N/A

## 4 RESULTS & CONCLUSION

4.1 Bondmaster Inspection

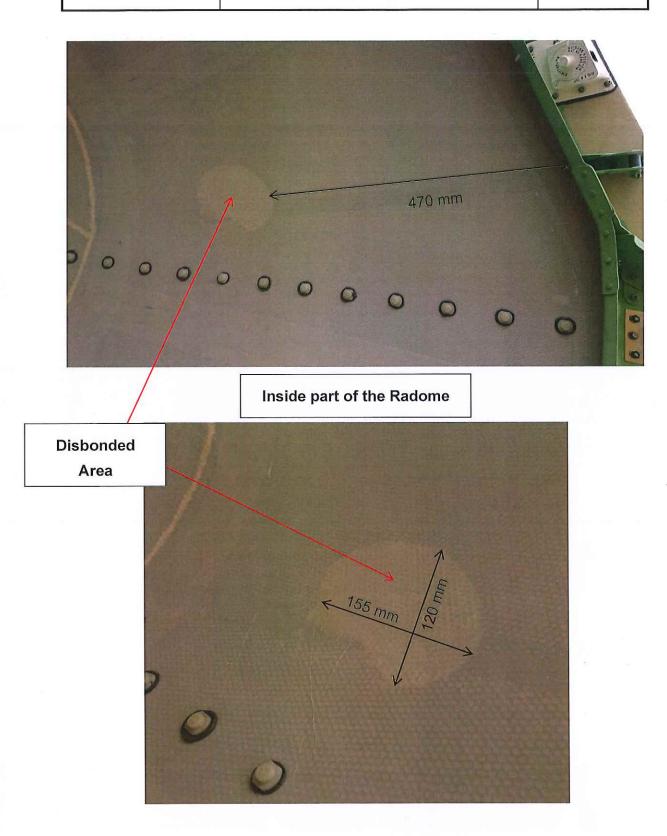
## Results: **DISBONDING FOUND**

See following pictures:





Tarmac Aerosave B777-237 MSN 36302 CR181434A Ver : 00





2. Sell		tion Inc.		F	Ref. ATA	Specification	on 106 (2001.
	anization:	tion mc.		3. Ref	ference / S	SO #:	970675
e3	680 South Lemon Ave. City of Industry, CA 91789 United States of America Ph: 909-348-1700, Fax: 90		¢ 1				
5A. Sel	ler's Contract / Invoice #: 1069	735	5B Buyor's New	ASS	ION SUPP	ON	
		_	5B. Buyer's Nam Buyer's PO	™: TARMA #: PO-2118	C ARAG	ON SLU	
6. Item	11 Becchiption	8. Manufacturer & Part	Number	9. Eligibility	10. Qty	11. Serial/Ba	
1 SL#2	CABLE TIE	MISC		Various	100	SN: NSN	atch # 12. Stat
A. Rem	arks: ove referenced part(s) or material tion provided to us and to the be as in a major engine failure, accid business.	COPY MADE ON (DATE)	STAMP & VIS	A:	Source, a ress or he ding this	and based up eat or immers material is o	oon sed in salt n file at our
ater (a	1	1				(*)	
ace of	In From:		13C. Last Certificat	ad Aganaw			
ace of	AIRWAYS ENGINEERING (PO# P2	95865)		sa Agency:			
. Obtai							
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53-12-01-01 RADOME INTEGRATION-NOSE EFFECTIVITY: ALL

Issue Date: 05 sep 2018

FIG ITEM	PART NUMBER	NOMENCLATURE	EFFECT FROM TO	UPA	TQ
		FIGURE 53-12-01-01: RADOME INTEGRATION-NOSE	001-999	1	1
-1	M0DREF138349	RADOME INSTL-NOSE SUPPLIER CODE: 81205 MODULE NUMBER: 141W0019-6 REV A	001-006, 021-300	RF	AR
-1 	MODREF461799	RADOME INSTL-NOSE SUPPLIER CODE: 81205 MODULE NUMBER: 141W0019-6 REV B	007-018, 301-303	Ŕŕ	AR
1	MODREF631634	RADOME INSTL-NOSE SUPPLIER CODE: 81205 MODULE NUMBER: 141W0019-6 REV.C.	019-020, 304-999	RF	AR
5	141T7864-2	•WASHER SUPPLIER CODE: 81205	001-999	1	AF
10	141T7864-3	•WASHER SUPPLIER CODE: 81205	001-999	1	AF
15	0450013HN	•NUT SUPPLIER CODE: 13764	001-999	1	AF
20	PLT1MM	•STRAP SUPPLIER CODE: 06383 SPECIFICATION NUMBER: BACS38K4 OPTIONAL PART: TOR180,53421 MAINTENANCE MANUAL REF: 53-12-01	001-999		AR
25	MS24665-153	PIN SUPPLIER CODE: 81205 STANDARD SUBSTITUTION:	001-999	3	AF

Selected 203

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Page 1 of 6

53-12-01-01 RADOME INTEGRATION-NOSE EFFECTIVITY: ALL

Issue Date: 05 sep 2018

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		BACP18BC02A06P MAINTENANCE MANUAL REF: 53-12-01			
30	AN960C416	•WASHER SUPPLIER CODE: 88044 STANDARD SUBSTITUTION: NAS1149C0463R	001-999	6	AR
35	BACN10JD4AU	•NUT SUPPLIER CODE: 81205	001-999	3	AR
65	284T0052-39	•RADOME ASSY SUPPLIER CODE: 81205 MISCELLANEOUS DATA: DELIVERED WITHOUT CUSTOMER LIVERY COLOR ACCESS PANEL NUMBER: 111AL REWORKED BY SB: 53-0063 MAINTENANCE MANUAL REF: 53-12-01	001-999	1	AR
65	284T0052-41	•RADOME ASSY SUPPLIER CODE: 81205 MISCELLANEOUS DATA: DELIVERED WITHOUT CUSTOMER LIVERY COLOR ACCESS PANEL NUMBER: 111AL MAINTENANCE MANUAL REF: 53-12-01	001-999	1	AR
70	284T0051-1	••SHELL ASSY SUPPLIER CODE: 81205	001-999	1	AR
75	141T7820-21	••STRUCTURE INSTL SUPPLIER CODE: 81205 USED ON: 284T0052-39 FOR DETAILS SEE: 53-13-51-01	001-999	1	AR

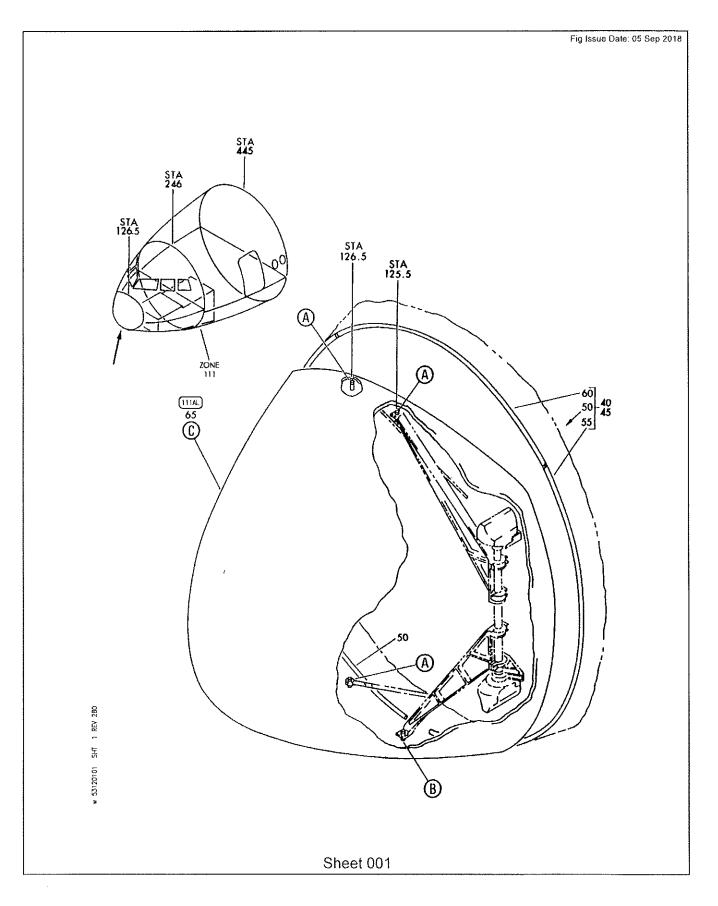
53-12-01-01 RADOME INTEGRATION-NOSE EFFECTIVITY: ALL

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53-12-01-01 RADOME INTEGRATION-NOSE EFFECTIVITY: ALL

Issue Date: 05 sep 2018

80	284T0053-3	••GROUNDING INSTL-LIGHTNING DIVERTER STRIP SUPPLIER CODE: 81205 FOR DETAILS SEE: 53-12-03-02	001-999	1	AR
85	284T0064-2	••ELEMENT INSTL-DIRECTOR SUPPLIER CODE: 81205	001-999	1	AR
90	BAC27TEX3698	•••DECAL SUPPLIER CODE: 81205 PLACARD CONTENT: GLIDESLOPE ANTENNA DIRECTOR BAR-M1330	001-999		AR
95	425	•••ELEMENT SUPPLIER CODE: 26066	001-999	1	AR

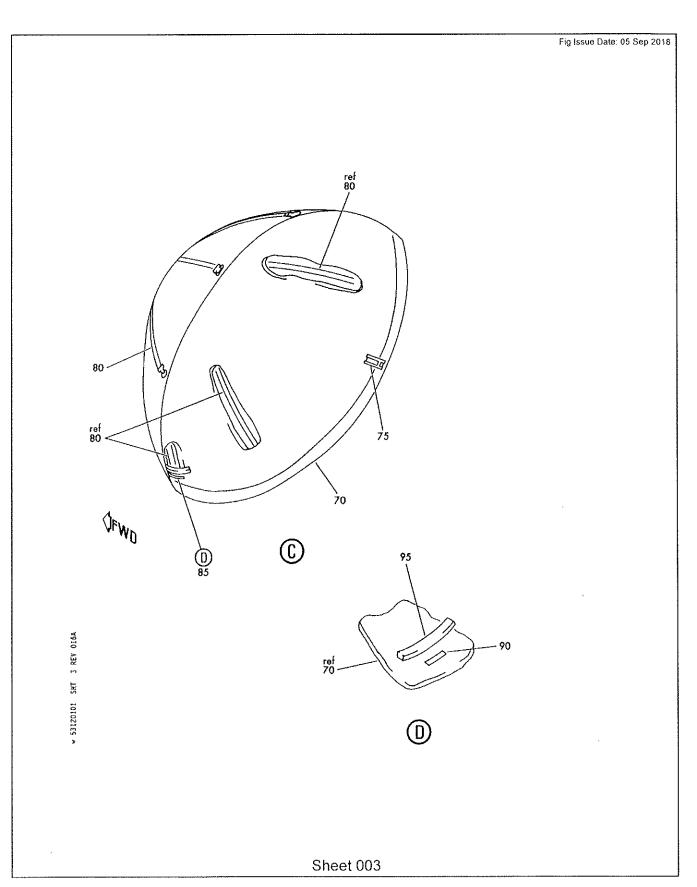
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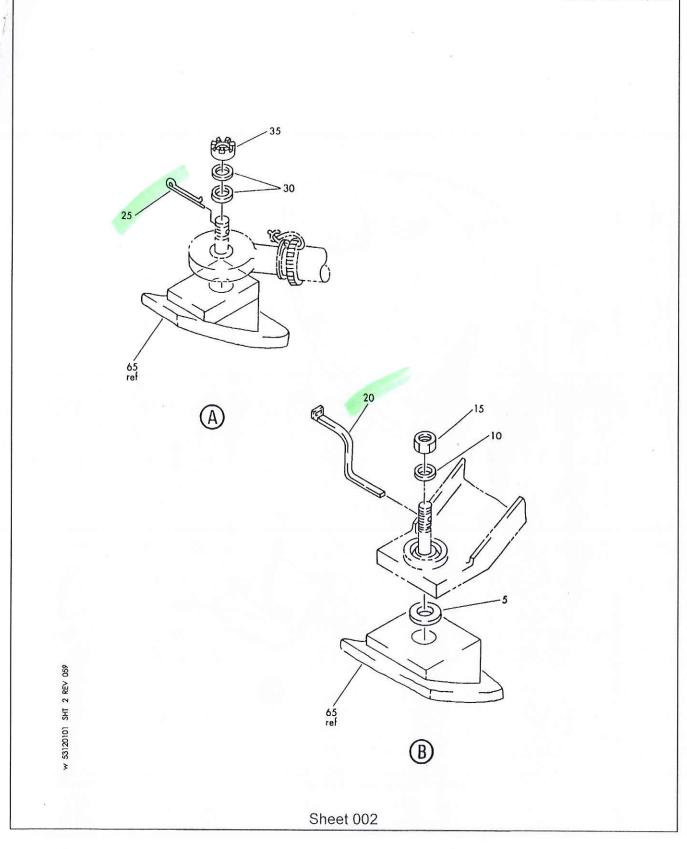
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Selected 203

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Page 5 of 6

EFFECTIVITY: ALL

Issue Date: 15 May 2018

## 1. Applicability

53-10-72-2R-0 REPAIR GENERAL - Nose Radome

A. This repair section is applicable and approved for the repair of radomes as delivered or approved by Boeing for use on this model airplane. Repairs that are made from this repair section are not approved for radomes that have been modified, rebuilt or re-ringed using processes and materials that have not been approved by Boeing for use on this model airplane.

#### 2. General

- A. This subject contains repair data for X-Band radomes with honeycomb core.
- B. On the inside of the radome, keep a record of damage and the extent of the repairs that are made.
- C. Electrical Test Requirements
  - (1) A new nose radome has the transmission requirements as given in RTCA/DO-213 for a Class B radome (the transmission efficiency is 87 percent average and 82 percent minimum). A 777 Class B radome can be repaired with the methods which follow in this document. A Class B radome repaired with the Alternative 2 repair in Figure 203/REPAIR GENERAL or the Alternative 4 repair in Figure 205/REPAIR GENERAL agrees with the transmission requirements given in RTCA/DO-213 for a Class C radome (the transmission efficiency is 84 percent average and 78 percent minimum). The interpretation of weather severity will be correct with a Class C radome and the standard 777 waveguide installation. Thus, post-repair electrical tests of the radome are not necessary. An operator can, however, do an electrical transmission test as given in Paragraph 2.C.(2)/REPAIR GENERAL to show better electrical transmission efficiency.
  - (2) A Class B radome repaired with the Alternative 1 repair in Figure 202/REPAIR GENERAL or the Alternative 3 repair in Figure 204/REPAIR GENERAL must be tested for electrical transmission efficiency (Refer to Paragraph 2.C.(3)/REPAIR GENERAL).
  - (3) If an operator thinks there is a question about the electrical performance of the radome, then it should be tested. Do an electrical transmission efficiency test as given in the Minimum Operations Performance Standards (MOPS) for Nose-Mounted Radomes, Document No. RTCA/DO-213, Paragraph 2.4.7.1. An operator can get a copy of this document from: RTCA, Incorporated 1140 Connecticut Avenue, Northwest Suite 1020 Washington, D.C. 20036-4001 U.S.A. Telephone: 202-833-9339 Facsimile (FAX): 202-833-9339
  - (4) The radome that was repaired and has the primer, decorative paint, antistatic system, the rain erosion protection applied, and the lightning diverter strips installed, must have the transmission efficiency requirements that follow:
    - (a) The average transmission efficiency for any continuous scan of the antenna in the radome window area must not be less than 84 percent. The radome window area is between  $\pm$  80 degrees azimuth and  $\pm$  20 degrees elevation.
    - (b) The minimum transmission efficiency at any point in the radome window must not be less than 78 percent.
      - NOTE: Thicknesses of paint which are more than 0.010 inch can decrease the necessary radome transmissivity. Use the correct anti-static paint (BMS 10-21, Type II). A radome wall that has been repaired should be put back to its initial thickness. If this is not done, radome transmission efficiency will be decreased.

For repaired radomes on airplanes that have Predictive Wind Shear (PWS), and that are finished with CAAPCO erosion and p-static protection (Caapcoat B-274 as specified in BAC5880 and Caapcoat AS-P108), do a transmission efficiency test. The efficiency test must show the radome to be Class C or better.

- D. For moisture removal from X-Band radomes with honeycomb core, see Paragraph 6./REPAIR GENERAL
- E. For repair of damage caused by electrical discharge, see Paragraph 16./REPAIR GENERAL
- F. For small repairs, see Paragraph 17./REPAIR GENERAL
- G. For wet layup repairs, see Paragraph 8./REPAIR GENERAL and Figure 202/REPAIR GENERAL (Alternative 1 Wet Layup Repair) or Figure 203/REPAIR GENERAL (Alternative 2 Wet Layup Repair).

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53-10-72-2R-0 REPAIR GENERAL - Nose Radome EFFECTIVITY: ALL

Issue Date: 15 May 2018

- H. For repairs that use preimpregnated (prepreg) material, see Paragraph 9./REPAIR GENERAL and Figure 204/REPAIR GENERAL (Alternative 3 Prepreg Repair) or Figure 205/REPAIR GENERAL (Alternative 4 Prepreg Repair).
- I. For aerodynamic smoothness requirements, refer to 51-10-01, GENERAL.
- J. For investigation and cleanup of damage, refer to 51-10-02, GENERAL.
- K. For a list of repair material sources, refer to 51-30-03, GENERAL.
- L. For repairs to the lightning strike diverter strips and the glide slope director element, refer to AMM PAGEBLOCK 53-12-03/601.
- 3. <u>References</u>

Reference	Title
51-10-01, GENERAL	Aerodynamic Smoothness Requirements
51-10-02, GENERAL	Inspection and Removal of Damage
51-30-03, GENERAL	Sources For Non-Metallic Repair Materials
51-30-10, GENERAL	Resins and Adhesives
51-70-04	REPAIR PROCEDURES FOR WET LAYUP MATERIALS
51-70-04, REPAIR GENERAL	Repair Procedures for Wet Layup Materials
AMM 53-12-01 P/B 601	NOSE RADOME - INSPECTION/CHECK
AMM 53-12-01 P/B 701	NOSE RADOME - CLEANING/PAINTING
AMM 53-12-03 P/B 601	LIGHTNING DIVERTER STRIPS - INSPECTION/CHECK
AMM 53-12-05 P/B 401	GLIDE SLOPE DIRECTOR ELEMENT - REMOVAL/INSTALLATION
NDT Part 1, 51-05-01	Tap Test Inspection of Honeycomb Sandwich Structure
NDT Part 2, 51-00-01	X-Ray Inspection for Water in Honeycomb Structure
NDT Part 4, 51-00-04	Inspection for Water in Honeycomb Structure
NDT Part 4, 51-00-05	Bondtest Inspection of Honeycomb Structure and Metal-To-Metal Skin Structure
NDT Part 6, 53-10-01	Inspection of Repair Areas of the Radome
NDT Part 9, 51-00-01	Inspection for Ice or Water in Honeycomb Parts

### 4. Repair Limitations

A. (Refer toParagraph 16./REPAIR GENERAL , Paragraph 17./REPAIR GENERAL , and Figure 207/REPAIR GENERAL )

## 5. Find the Extent of the Damage

#### CAUTION: DO NOT USE CHEMICAL PAINT STRIPPERS TO REMOVE THE PAINT FROM THE RADOME. DAMAGE TO THE ADHESIVE RESIN SYSTEM WILL OCCUR.

- A. Examine the radome visually to find the level of the damage and look for the entry of oil, fuel, dirt, or other unwanted material.
- B. Examine the radome for delamination and moisture as given in 51-70-04, REPAIR GENERAL. Some of the Non-Destructive Inspection (NDI) procedures that are available are as follows:
  - (1) Moisture can be found by instrumented NDI procedures as given in:
    - (a) AMM PAGEBLOCK 53-12-01/601
    - (b) NDT Part 2, 51-00-01
    - (c) NDT Part 4, 51-00-04

EFFECTIVITY: ALL

53-10-72-2R-0 REPAIR GENERAL - Nose Radome

(d) NDT Part 9, 51-00-01.

- (2) Delaminations can be found by instrumented NDI procedures as given in NDT Part 4, 51-00-05. If instrumented NDI equipment is not available, use the tap test procedure as given in NDT Part 1, 51-05-01.
- C. Examine the radome for damage to the lightning strike diverter strips and the glide slope director element (Figure 201/REPAIR GENERAL).

## 6. Moisture Removal from the Radome Honeycomb Structure

## **NOTE:** There are two moisture removal methods.

- A. Remove moisture from the honeycomb structure as given in Paragraph 6.B./REPAIR GENERAL or refer to 51-70-04, REPAIR GENERAL .
  - <u>NOTE:</u> Paragraph 6.B./REPAIR GENERAL gives a moisture removal procedure which adds a fiberglass repair ply over the damaged area. Paragraph 8.A./REPAIR GENERAL and Paragraph 9.A./REPAIR GENERAL give a skin replacement procedure. The skin replacement procedure is recommended. The skin replacement procedure does not add a repair ply. Thus, it does not cause a decrease in the transmission efficiency.
- B. You can remove moisture from the honeycomb cells of the radome in an area with a maximum diameter of 3.5 inches.
  - (1) Find the level of the moisture contamination as given in one of the references that follow:
    - (a) AMM PAGEBLOCK 53-12-01/601
    - (b) NDT Part 2, 51-00-01
    - (c) NDT Part 4, 51-00-04
    - (d) NDT Part 9, 51-00-01.
  - (2) Put masking tape around the area as given in Paragraph 7.B./REPAIR GENERAL (2 inches away all around from the moisture contamination).
  - (3) Remove the Tedlar cover (moisture barrier) from the internal surface 1 inch more all around than the damaged area. Use No. 240 or finer Scotch-Brite abrasive. Do not damage the fibers on the surface of the inner skin.
  - (4) On the inner surface, drill a 1/16 inch diameter hole into the approximate center of the of each cell that contains moisture. Do not damage the outer skin when you drill the holes.
  - (5) Apply a heat blanket on the outer surface as given in 51-70-04, REPAIR GENERAL.
  - (6) The use of vacuum over the 1/16 inch diameter holes will increase the speed of the removal of moisture. Refer to 51-70-04, REPAIR GENERAL.
  - (7) To make sure the area is fully dry, do a check for water in the vacuum line with a desiccant indicator.
  - (8) When the area is dry, clean it as given in Paragraph 7.C./REPAIR GENERAL
  - (9) Put down a layer of fiberglass fabric and resin as given in Paragraph 8./REPAIR GENERAL, or one prepreg ply as given in Paragraph 9./REPAIR GENERAL. Make sure the ply is a sufficient size to go over the damaged area plus 1 inch more all around. This layer can be a maximum diameter of 5.5 inches.
  - (10) Apply pressure to the layup as given in Paragraph 13./REPAIR GENERAL
  - (11) Cure the fiberglass fabric and resin as given in Paragraph 14./REPAIR GENERAL Cure the prepreg as given in Paragraph 14./REPAIR GENERAL
  - (12) Apply the finish to the repair area as given in Paragraph 15./REPAIR GENERAL

## 7. Removal and Preparation of the Damaged Area

- A. Remove the damage.
  - (1) When damage has occurred to the skins only, remove the damaged laminations to a circular or oval shape. Use care not to damage the undamaged plies, core, or surrounding material.

EFFECTIVITY: ALL

53-10-72-2R-0 REPAIR GENERAL - Nose Radome

Issue Date: 15 May 2018

- <u>NOTE:</u> Remove only the damaged plies.
- (2) When the core is also damaged, remove the core by trimming to a circular or oval shape. Refer to 51-70-04, REPAIR GENERAL for the core removal procedure. Use care to avoid cutting into an undamaged skin on the opposite side.
- (3) Areas that are contaminated by moisture and cannot be dried out by heating (the temperature must not be hotter than 180°F (83°C)) must be removed with the other damage.
- B. Prepare the damaged area (Refer to Figure 202/REPAIR GENERAL , Figure 203/REPAIR GENERAL , Figure 204/REPAIR GENERAL , and Figure 205/REPAIR GENERAL ).
  - (1) Determine the number of plies that have been cut. Use masking tape to isolate the area around the cutout allowing 1.00 inch for each ply that you replace.

## <u>NOTE:</u> When the damage is through the two skins, the repair patch overlap for each skin must be offset to each other (Refer to Figure 202/REPAIR GENERAL, Figure 203/REPAIR GENERAL and Figure 204/REPAIR GENERAL).

- CAUTION: SANDING OR ABRADING MUST NOT EXPOSE OR DAMAGE THE FIBERGLASS FILAMENTS IN THE UNDAMAGED SKIN. THE STRUCTURAL STRENGTH OF THE SKIN WILL BE REDUCED.
- (2) When damage has occurred to the internal skin, remove the Tedlar cover (moisture barrier) from the interior surface plus 1 inch more around the damaged area. Use No. 240 or finer Scotch-Brite abrasive.

## CAUTION: DO NOT USE PAINT STRIPPERS FOR FINISH REMOVAL. THE RESULT WILL BE DAMAGE TO THE FIBERGLASS RESIN SYSTEM.

(3) Remove the exterior finishes. Use No. 180 or finer sandpaper.

(4) Protect the exposed core with masking tape, metal plate or the equivalent.

#### WARNING: DO NOT BREATHE THE DUST MADE WHEN YOU ABRADE THE COMPOSITE SURFACES. THE FINE DUST CAN CAUSE SKIN IRRITATION. BREATHING AN EXCESSIVE AMOUNT OF THIS DUST CAN CAUSE INJURY. OBSERVE PRECAUTIONS FOR SKIN AND RESPIRATORY PROTECTION.

## USE EXPLOSION PROOF EQUIPMENT WHERE THE POSSIBILITY OF VAPOR IGNITION EXISTS. INJURY TO PERSONS CAN OCCUR.

(5) Put a uniform taper around the repair with No. 180 sandpaper. Make the taper 3 inches (1 inch per ply) for the Alternative 1 wet layup, the Alternative 2 wet layup, and the Alternative 3 prepreg layup. Make the taper 1.5 inches (0.5 inch per ply) for the Alternative 4 prepreg layup.

<u>NOTE:</u> For sanding, use a flexible disk sander, a belt sander, a rotating pad sander, or sand by hand.

(6) When damage has occurred to the skins only, remove the damaged area of the skin only and lightly sand the core where possible without reducing the core thickness.

CAUTION: USE A BACKUP FOR THE UNDAMAGED SKIN WHILE SANDING TO PREVENT DELAMINATION.

SANDING MUST NOT CAUSE EXPOSED OR DAMAGED FIBERGLASS FILAMENTS IN THE UNDAMAGED SKIN. THE STRUCTURAL STRENGTH OF THE SKIN WILL BE REDUCED.

- (7) When the core is damaged, but the opposite skin is undamaged, sand the core bonding surface using No. 180 or finer sandpaper to remove resin fillets for the replacement core to seat properly.
- C. Clean the repair area.

## WARNING: EXPLOSION PROOF EQUIPMENT MUST BE USED WHERE THE POSSIBILITY OF VAPOR IGNITION EXISTS. INJURY TO PERSONS CAN OCCUR.

(1) Remove all the sanding dust by applying oil-free compressed air and a vacuum cleaner.

## WARNING: WHEN USING SOLVENTS, AVOID BREATHING THE VAPORS. USE MECHANICAL VENTILATION OR RESPIRATORY PROTECTION WHEN WORKING IN A CONFINED SPACE OR AREA. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING. WEAR APPROVED GLOVES, PROTECTIVE CLOTHING, AND EYE PROTECTION. IT IS

Issue Date: 15 May 2018

## HAZARDOUS TO BREATH VAPORS OR PERMIT SOLVENT TO TOUCH THE SKIN OR EYES.

## KEEP AWAY FROM SOURCES OF HEAT, FIRE OR SPARKS OR AN EXPLOSION AND INJURY CAN BE THE RESULT.

#### CAUTION: DO NOT IMMERSE THE PARTS IN TRICHLOROETHANE OR PERMIT STANDING SOLVENT ON THE PARTS. DAMAGE TO THE PARTS WILL OCCUR.

- (2) Wipe the surfaces with a clean cloth that is moist with a ketone based solvent. Allow the solvent to evaporate before proceeding with the repair.
- 8. Repairs Using Wet Layup (Refer to Figures 202 and 203)
  - <u>NOTE:</u> The repairs given in the steps of this must put the radome back to its initial thickness as shown in Figure 201/REPAIR GENERAL. Failure to make the radome that is repaired the same thickness as the initial thicknesses will decrease the electrical performance of the radome. If you do not know the thickness of the radome, measure the thickness as given in NDT Part 6, 53-10-01.

## CAUTION: DO NOT USE PAINT STRIPPERS FOR FINISH REMOVAL. THE RESULT WILL BE DAMAGE TO THE RESIN SYSTEM.

- A. Repair the damage that is a maximum of one skin in depth (Figure 206/REPAIR GENERAL, Layups B and C) as follows:
  - (1) Find the level of damage as given in Paragraph 5./REPAIR GENERAL
  - (2) Remove the damaged plies and prepare the repair area as given in Paragraph 7.A./REPAIR GENERAL
  - (3) Prepare the repair plies as given in Paragraph 10.A./REPAIR GENERAL
  - (4) Apply the repair plies as given in Paragraph 10.B./REPAIR GENERAL
  - (5) Apply the pressure as given in Paragraph 13.A./REPAIR GENERAL
  - (6) Cure the repair as given in Paragraph 14./REPAIR GENERAL
  - (7) Finish the repair as given in Paragraph 15./REPAIR GENERAL
- B. Repair the damage that is a maximum of one skin and the honeycomb core in depth (Figure 206/REPAIR GENERAL, Layups E and F) as follows:
  - (1) Find the level of damage as given in Paragraph 5./REPAIR GENERAL
  - (2) Remove the damaged skin and core and prepare the repair area as given in Paragraph 7.A./REPAIR GENERAL
  - (3) Fabricate, clean and install the replacement honeycomb core as given in Paragraph 12./REPAIR GENERAL
  - (4) Prepare the repair plies as given in Paragraph 10.A./REPAIR GENERAL
  - (5) Apply the repair plies as given in Paragraph 10.B./REPAIR GENERAL
  - (6) Apply the pressure as given in Paragraph 13.A./REPAIR GENERAL
  - (7) Cure the repair as given in Paragraph 14./REPAIR GENERAL
  - (8) Finish the repair as given in Paragraph 15./REPAIR GENERAL
- C. Repair the damage that goes through the two skins and the core of the radome (Figure 206/REPAIR GENERAL, Layups H and I) as follows:
  - (1) Find the level of damage as given in Paragraph 5./REPAIR GENERAL
  - (2) Remove the damaged skin and core as given in Paragraph 7.A./REPAIR GENERAL
  - (3) Make a plaster backup mold as follows:
    - (a) If the external skin is to be repaired first, fill the hole with a wooden plug (or the equivalent) so the inner surface is flush with the honeycomb core.

Issue Date: 15 May 2018

## <u>NOTE:</u> It is best to repair the internal skin first. The backup mold can be formed on the internal skin surface and the procedures reversed accordingly. When necessary, the backup mold can be made from a comparable area on another radome.

- (b) Cover the area with a parting film on the internal skin.
- (c) Make a dam around the area to give a mold thickness of 1 inch minimum.
- (d) Pour a water and plaster mixture into the dam.
- (e) When the plaster has hardened, remove it from the radome and dry it in an air circulating oven at 120°F (49°C) for approximately 24 hours.
- (4) Remove the plug and the parting film from the internal skin.
- (5) Taper sand and clean the external skin as given in Paragraph 7.B./REPAIR GENERAL and Paragraph 7.C./REPAIR GENERAL
- (6) Cover the area with a clean parting film on the internal skin and secure the backup mold in position with clamps, props or by lashing.
- (7) Fabricate, clean and install the replacement honeycomb core as given in Paragraph 12./REPAIR GENERAL
- (8) Prepare the repair plies as given in Paragraph 10.A./REPAIR GENERAL
- (9) Apply the repair plies as given in Paragraph 10.B./REPAIR GENERAL
- (10) Apply the pressure as given in Paragraph 13.A./REPAIR GENERAL
- (11) Cure the repair as given in Paragraph 14./REPAIR GENERAL
- (12) Remove the backup mold and solid parting film from the internal skin.
- (13) Taper sand and clean the external skin as given in Paragraph 7.B./REPAIR GENERAL and Paragraph 7.C./REPAIR GENERAL
- (14) Complete the repair as given in Paragraph 8.A.(3)/REPAIR GENERAL thru Paragraph 8.A.(7)/REPAIR GENERAL GENERAL
- 9. Repairs Using Preimpregnated (Prepreg) Material (Refer to Figures 204 and 205)
  - <u>NOTE:</u> The repairs given in the steps of this must put the radome back to its initial thickness as shown in Figure 201/REPAIR GENERAL. Failure to make the radome that is repaired the same thickness as the initial thicknesses will decrease the electrical performance of the radome. If you do not know the thickness of the radome, measure the thickness as given in NDT Part 6, 53-10-01.

## CAUTION: DO NOT USE PAINT STRIPPERS FOR FINISH REMOVAL. THE RESULT WILL BE DAMAGE TO THE RESIN SYSTEM.

- A. Repair the damage that is a maximum of one skin in depth (Figure 206/REPAIR GENERAL, Layup A, Alternative 3) as follows:
  - (1) Find the level of damage as given in Paragraph 5./REPAIR GENERAL
  - (2) Remove the damaged plies and prepare the repair area as given in Paragraph 7./REPAIR GENERAL
  - (3) Prepare the repair plies as given in Paragraph 11.A./REPAIR GENERAL
  - (4) Put down a piece of adhesive film on the honeycomb core that has been sanded. The adhesive film will bond the prepreg repair to the honeycomb core. Refer to Figure 206/REPAIR GENERAL, Layup A, Alternative 3.
  - (5) Install the repair plies as given in Paragraph 11.B./REPAIR GENERAL
  - (6) Apply the pressure as given in Paragraph 13./REPAIR GENERAL
  - (7) Cure the repair as given in Paragraph 14./REPAIR GENERAL
  - (8) Finish the repair as given in Paragraph 15./REPAIR GENERAL
- B. Repair the damage that is a maximum of one skin and the honeycomb core in depth (Figure 206/REPAIR GENERAL, Layup D) as follows:

- (1) Find the level of damage as given in Paragraph 5./REPAIR GENERAL
- (2) Remove the damaged plies and prepare the repair area as given in Paragraph 7.A./REPAIR GENERAL
- (3) Fabricate, clean and install the replacement honeycomb core as given in Paragraph 12./REPAIR GENERAL
- (4) Prepare the repair plies as given in Paragraph 11.A./REPAIR GENERAL
- (5) Install the repair plies as given in Paragraph 11.B./REPAIR GENERAL
- (6) Apply the pressure as given in Paragraph 13.A./REPAIR GENERAL
- (7) Cure the repair as given in Paragraph 14./REPAIR GENERAL
- (8) Finish the repair as given in Paragraph 15./REPAIR GENERAL
- C. Repair the damage that goes through the two skins and the core of the radome (Figure 206/REPAIR GENERAL, Layup G) as follows:
  - (1) Find the level of damage as given in Paragraph 5./REPAIR GENERAL
  - (2) Remove the damaged skins and core as given in Paragraph 7.A./REPAIR GENERAL
  - (3) Make a plaster backup mold as follows:
    - (a) If the external skin is to be repaired first, fill the hole with a wooden plug (or the equivalent) so the inner surface is flush with the honeycomb core.

## <u>NOTE:</u> It is best to repair the internal skin first. The backup mold can be formed on the internal skin surface and the procedures reversed accordingly. When necessary, the backup mold can be made from a comparable area on another radome.

- (b) Cover the area with parting film on the internal skin.
- (c) Dam the area to give a mold thickness of 1 inch minimum.
- (d) Pour a water and plaster mixture into the dam.
- (e) When the plaster has hardened, remove it from the radome and dry it in an air circulating oven at 120°F (49°C) for approximately 24 hours.
- (4) Remove the plug and the parting film from the internal skin.
- (5) Taper sand and clean the external skin as given in Paragraph 7.B./REPAIR GENERAL and Paragraph 7.C./REPAIR GENERAL
- (6) Cover the area with a clean parting film on the internal skin and secure the backup mold in position with clamps, props or by lashing.
- (7) Fabricate, clean and install the replacement honeycomb core as given in Paragraph 12./REPAIR GENERAL
- (8) Prepare and apply the repair plies as given in Paragraph 11.B./REPAIR GENERAL
- (9) Apply the pressure as given in Paragraph 13.A./REPAIR GENERAL
- (10) Cure the repair as given in Paragraph 14./REPAIR GENERAL
- (11) Remove the backup mold and solid parting film from the internal skin.
- (12) Taper sand and clean the internal skin as given in Paragraph 7.B./REPAIR GENERAL and Paragraph 7.C./REPAIR GENERAL
- (13) Complete the repair as given in Paragraph 9.A.(3)/REPAIR GENERAL thru Paragraph 9.A.(7)/REPAIR GENERAL GENERAL
- D. Repair the damage that is a maximum of one skin in depth (Figure 206/REPAIR GENERAL, Layup A, Alternative 4) as follows:
  - (1) Find the level of damage as given in Paragraph 5./REPAIR GENERAL
  - (2) Remove the damaged plies and prepare the repair area as given in Paragraph 7./REPAIR GENERAL
  - (3) Prepare the repair plies as given in Paragraph 11.A./REPAIR GENERAL

- (4) Put down a piece of adhesive film on the skin that has been taper sanded as given Paragraph 7.B.(5)/ REPAIR GENERAL The adhesive film will bond the prepreg repair to the taper sanded skin. Refer to Figure 206/REPAIR GENERAL, Layup A, Alternative 4.
- (5) Install the repair plies as given in Paragraph 11.B./REPAIR GENERAL
- (6) Apply the pressure as given in Paragraph 13./REPAIR GENERAL
- (7) Cure the repair as given in Paragraph 14./REPAIR GENERAL
- (8) Finish the repair as given in Paragraph 15./REPAIR GENERAL

### 10. Preparation and Application of Glass Fabric Repair Plies (Wet Layup) (Refer to Figures 202 and 203)

- A. Prepare the overlay patch.
  - (1) Cut the repair plies from BMS 9-3, Type H (or H-2 or H-3), Class 10 (or 11 or 13 or 19) fiberglass cloth.
  - (2) Cut two pieces of parting film that are approximately 3.0 inches larger all around than the glass fabric cloth. Tape one piece down to a smooth surface.

#### NOTE: Use PVA film or other parting film.

(3) Spread a layer of BMS 8-301, Class 2 or BMS 5-28, Types 15, 17 and 19 (prepared as given in 51-70-04, REPAIR GENERAL) over the parting film and put the glass cloth over the resin.

## <u>NOTE:</u> Resin that is approximately equal in weight to the glass fabric cloth is necessary to impregnate the cloth.

- (4) Cover the cloth on the parting film with a second piece of parting film.
- (5) Press the resin through the cloth by working over the parting film with a sweep or a roller. This will impregnate the cloth and remove entrapped air.
- (6) Cut the impregnated cloth to the necessary sizes for each ply of the patch. The parting film on the two sides of the cloth will reduce fraying at the edges while you cut the cloth. The direction of the lengthwise parallel yarns in the patch must be in the same direction as the lengthwise parallel yarns in the repair surface.
  - NOTE: Cut the first (smallest) ply patch 1.50 inches larger (for the repair in Figure 202/REPAIR GENERAL) or 1.00 inch larger (for the repair in Figure 203/REPAIR GENERAL) all around than the preceding inner edge of the taper. Cut each ply that follows 1.00 inch larger all around than the ply before it. Refer to Figure 202/REPAIR GENERAL and Figure 203/ REPAIR GENERAL.
- (7) To avoid excess resin build-up in the core cells (which would have a bad effect on the electrical properties), the area corresponding to the exposed core on each patch should be swept before the layup. Remove approximately one-third of the resin in this area.
- B. Apply the overlay plies (Refer to Figure 202/REPAIR GENERAL and Figure 203/REPAIR GENERAL).

## <u>NOTE:</u> When damage has occurred at a lap joint in the initial plies, it is not necessary to make a comparable lap in the repair plies.

- (1) Remove the parting film from one side of the smallest ply of the patch. Put the exposed face against the repair area, with the lengthwise parallel yarns of the ply in the same direction as those of the repair surface (Refer to Identification 1).
- (2) Use a sweep over the parting film that covers the ply to remove wrinkles and entrapped air. Do not apply excessive pressure which would cause the patch to be deficient in resin.
- (3) After the parting film is removed from the contact faces, put the next larger size ply of the impregnated fiberglass cloth over the ply on the repair area with a 1.00 inch overlap all around. Refer to Figure 203/ REPAIR GENERAL.
- (4) Put the subsequent plies of the patch in place as given in steps (2) and (3) above.
- (5) After the last ply is in place, cover the entire layup with a piece of parting film extending about 0.50 inch over the edges of the patch.
- (6) Sweep the excess resin to the edges of the parting film. Fair the edges of the patch to the contour of the of the repair surface. All the loose threads must be embedded in the resin.

(7) Wipe off the excess resin that has squeezed out at the edges of the parting film.

#### 11. <u>Preparation and Application of Preimpregnated (Prepreg) Glass Fabric Repair Plies (Refer to Figures</u> 204 and 205)

A. Prepare the repair plies.

#### CAUTION: THE PREIMPREGNATED MATERIAL MUST REMAIN FREE FROM CONTAMINATION DURING CUTTING AND HANDLING. WEAR CLEAN GLOVES WHEN YOU NEED TO TOUCH PREPREG MATERIALS.

(1) Cut the required number of plies from the BMS 8-79, Style 1581, Class III fiberglass prepreg material. The lengthwise parallel yarns in the ply must be in the same direction as the lengthwise parallel yarns of the repair surface (Refer to Identification 1).

<u>NOTE:</u> Cut the first (smallest) ply patch 1.50 inches larger (for the repair in Figure 204/REPAIR GENERAL), or 0.50 inch larger (for the repair in Figure 205/REPAIR GENERAL) all around than the preceding inner edge of the taper. Cut each ply that follows 1.00 inch larger all around (for the repair in Figure 204/REPAIR GENERAL) or 0.50 inch larger all around (for the repair in Figure 205/REPAIR GENERAL) than the ply before it.

- (2) Refer to Figure 204/REPAIR GENERAL, Figure 205/REPAIR GENERAL, and Figure 206/REPAIR GENERAL, Layups D and G for the application of the adhesive.
- B. Apply the repair plies.
  - <u>NOTE:</u> When damage has occurred at a lap joint in the initial plies, it is not necessary to make a comparable lap in the repair plies.
  - (1) Apply the repair plies starting with the smallest.

NOTE: Remove the polyethylene separator sheet before placing each ply.

#### 12. Fabrication, Cleaning, and Installation of the Replacement Honeycomb Core Plug

- A. Fabricate the core plug.
  - (1) Cut a plug from honeycomb core material that is the same as the initial core. Cut it to fit the repair hole. Keep a maximum gap of 0.06 inch between the initial and the repair core. (Refer to Figure 202/REPAIR GENERAL, Figure 203/REPAIR GENERAL and Figure 204/REPAIR GENERAL).
- B. Clean the core plug.

WARNING: WHEN USING SOLVENTS, AVOID BREATHING THE VAPORS. USE MECHANICAL VENTILATION OR RESPIRATORY PROTECTION WHEN WORKING IN A CONFINED SPACE. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING. WEAR APPROVED GLOVES AND PROTECTIVE CLOTHING, AND EYE PROTECTION. IT IS HAZARDOUS TO BREATH VAPORS OR PERMIT SOLVENT TO TOUCH THE SKIN OR EYES.

KEEP AWAY FROM SOURCES OF HEAT, FIRE OR SPARKS. AN EXPLOSION AND INJURY CAN BE THE RESULT.

## CAUTION: DO NOT USE CHLORINATED SOLVENTS. DAMAGE TO THE CORE MATERIAL WILL OCCUR.

- (1) Clean the contaminated core by dipping it in a keytone-based solvent bath for 1 minute.
- (2) Locally contaminated areas can be washed with a keytone-based solvent.
- (3) The core must be fully free from solvent before installation.
- C. Install the repair core.

## <u>NOTE:</u> Make sure that the core repair plug has a slight interference fit in the core hole after you apply adhesive or potting compound.

- (1) Install the repair core with the steps that follow if you use wet layup materials:
  - (a) When the damage does not extend through the two skin layers, prepare one ply for wet layup to fit the repair hole. Put it on the inside surface of the skin that is not damaged. Refer to Paragraph 10.A./REPAIR GENERAL and Figure 206/REPAIR GENERAL, Layups E, F, H or I.
  - (b) Apply the potting compound to the core plug as follows:

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53-10-72-2R-0 REPAIR GENERAL - Nose Radome EFFECTIVITY: ALL

- 1) Coat the edges of the initial core and the core plug with BMS 5-28 potting compound. You can use BMS 5-28, Types 15, 17 or 19.
  - NOTE: Mix the potting compound as given in the manufacturer's instructions. The gel time is 60 to 90 minutes at 75°F ±5°F (24°C ±3°C). The full cure time is 7 days at 77°F ±2°F (25°C ±1°C), or 5 hours at 125°F ±5°F (52°C ±3°C). The BMS 5-28 must gel at 75°F ±5°F (24°C ±3°C) for 60 minutes prior to the cure.
- 2) Install the core plug with the honeycomb cells aligned with the initial core.
- (2) Install the repair core with the steps that follow if you use preimpregnated layup materials. Refer to Paragraph 11.A./REPAIR GENERAL and Figure 206/REPAIR GENERAL Layups D and G.
  - (a) Cut pieces of BMS 5-129 film adhesive as necessary to make one layer around all surfaces of the repair core.
  - (b) Remove the separator sheet from one side of the adhesive.
  - (c) Wind the adhesive around the repair core.
  - (d) Remove the separator sheet from the second side of the adhesive.
  - (e) If the repair core is a honeycomb structure, align the core ribbon direction with that of the initial core.
  - (f) Carefully put the repair core into the core hole.

#### 13. Application of Pressure

A. Apply the pressure to the repair.

- (1) Remove the masking tape and clean the bonding area as given in Paragraph 7.C./REPAIR GENERAL
- (2) Apply the bleeder cloth all around the area. Lay the cloth approximately 1.0 inch away from the repair area. Use masking tape to hold the cloth in position. Refer to Figure 208/REPAIR GENERAL.
- (3) Apply extruded sealing compound fully around the repair area and tie in the vacuum probe and the thermocouple wire.

#### CAUTION: MAKE SURE THAT MYLAR, PVA, PVC, OR NYLON FILMS DO NOT TOUCH THE PREIMPREGNATED MATERIALS. THESE FILMS MUST BE SEPARATED FROM THE PREIMPREGNATED MATERIAL WITH PARTING FILM OR TEDLAR FILM.

- (4) Put a piece of vacuum bag material over all of the repair area and make a seal with the sealing compound. Make pleats in the bag so it will conform to the radome.
- (5) Evacuate the space under the vacuum bag. Keep a minimum vacuum of 22 inches of mercury.
- (6) Apply a thin layer of petroleum jelly or oil on the vacuum bag to aid in the sweeping.

#### CAUTION: DO NOT EXCEED THE HEAT AND TIME RESTRICTIONS (180°F (82°C) FOR A MAXIMUM OF 5 MINUTES) GIVEN FOR THE SWEEPING PROCESS. HEAT WILL REDUCE THE POT LIFE OF THE RESIN.

- (7) Sweep the repair with squeegees or rollers. The sweeping motion must be slow enough to permit the air inside the part to move to the front of the wave of excess resin (and thus be swept out). The sweeping must be done carefully to prevent displacement of the fabric. Continue to sweep until all of the air bubbles and excess resin have been removed. Where repairs have been done over an exposed core, make all the sweeping passes in a direction away from the exposed core. Prevent the excess resin from entering the core cells. Do not sweep the exposed core area. Heat, not hotter than 180°F (82°C), can be applied for a maximum of 5 minutes.
- (8) Use care to avoid puncturing a hole in the vacuum bag. If holes occur, do as follows:
  - · Wipe the area with a rag that is moist with acetone to remove the lubricant
  - Seal the hole with tape
  - Sweep the area again to remove the air.
- 14. Curing the Repair

<u>NOTE:</u> Heat can be applied with an oven, heat lamp, heat blanket or autoclave. The rate of temperature increase should be 8°F per minute. When you use an oven, begin the cure with a cold oven.

53-10-72-2R-0 REPAIR GENERAL - Nose Radome EFFECTIVITY: ALL

Refer to 51-70-04, REPAIR GENERAL for the cure times and temperature ranges. Remove trapped air bubbles as they occur during the cure.

#### CAUTION: DO NOT APPLY HEAT THAT IS HOTTER THAN 180°F (82°C) WITHOUT THE APPLICATION OF PRESSURE. THE RESULT CAN BE FURTHER DELAMINATION OF THE SKIN-TO-CORE BOND. IT IS RECOMMENDED THAT WHEN YOU ACCELERATE THE CURE WITH HEAT, THAT YOU INSTALL A VACUUM BAG OVER ALL OF THE RADOME, OR APPLY 3 TO 5 PSI PRESSURE TO THE REPAIR AREA WITH SHOT BAGS OR BY OTHER MECHANICAL MEANS.

- A. Do the room temperature, heat blanket, heat lamp, oven and autoclave cures with a vacuum of 22 inches of mercury minimum.
- B. Cure the repairs with the materials that follow:
  - (1) For the repairs with BMS 8-79 and BMS 5-129, cure at 260°F ±10°F (127°C ±6°C) for 90 minutes. The rate of temperature increase is 8°F (4.5°C) per minute maximum.
  - (2) For the repairs with BMS 8-301, Class 1, cure at 200°F ±10°F (93°C ±6°C) for 220 minutes. The rate of temperature increase is 1°F to 5°F (3°C) per minute maximum.
  - (3) For the repairs with BMS 8-301, Class 2, use one of the two cure procedures that follow:
    - (a) Cure at 150°F ±10°F (66°C ±6°C) for 180 minutes. The rate of temperature increase is 1°F to 5°F (3°C) per minute maximum
    - (b) Cure at 70°F ±5°F (21°C ±3°C) for 5 days.

#### 15. Refinish After the Repair

## CAUTION: DO NOT SAND INTO THE INITIAL STRUCTURE. A DECREASE IN THE STRENGTH OF THE PART CAN BE THE RESULT.

- A. Lightly sand the edges of the repair area. Remove the resin burrs and mold release that remains with No. 180 or finer sandpaper.
- B. Clean the repair area as given in Paragraph 7.B./REPAIR GENERAL and Paragraph 7.C./REPAIR GENERAL Do an inspection for defects.

#### NOTE: The repair area must be free of pits, blisters, void areas and excess resin deposits.

- C. Seal all the fibers that are open to the air with a thin layer of BMS 8-301, Class 2 or BMS 8-207, Type I. Mix and cure the resin as given in 51-30-10, GENERAL, Table 1.
- D. In areas where Tedlar (moisture barrier) on the inner surface of the radome has been removed, apply a thin layer of BMS 8-207, Type I or BMS 8-301, Class 2. Mix and cure the resin as given in 51-30-10, GENERAL, Table 1. Remove the excess resin before it gels.
- E. Apply a finish on the exterior surface of the radome as given in AMM PAGEBLOCK 53-12-01/701.
- F. If the glideslope director element (pressure sensitive aluminum foil tape) is removed or damaged, install it as given in AMM PAGEBLOCK 53-12-05/401.

#### 16. Repair of Damage Caused By an Electrical Discharge

#### CAUTION: DO NOT USE CHEMICAL PAINT STRIPPERS TO REMOVE THE PAINT FROM THE RADOME. DAMAGE TO THE ADHESIVE RESIN SYSTEM WILL OCCUR.

- A. Clean the inner and outer surfaces of the radome. The radome must be free from all moisture and dirt. Clean as given in AMM 51-12-01/701. Refer to Paragraph 6./REPAIR GENERAL for the moisture removal procedures, if necessary.
- B. Find the amount of damage on the inner skin surface. Remove the exterior finish from the outer skin that is opposite the damage sufficient to show all of the damage. Refer to Paragraph 7.B.(3)/REPAIR GENERAL
- C. A leakage test with positive air pressure can help you find defects in the outer skin that are not easily visible.
  - (1) Apply a layer of uncatalyzed resin film to the defect area of the outer skin.
  - (2) Use a flexible type funnel which encompasses the inner skin defect to apply a positive air pressure (not to exceed 3 psi) to the area.
  - (3) Bubbles in the resin film will show the outer skin defect.

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53-10-72-2R-0 REPAIR GENERAL - Nose Radome EFFECTIVITY: ALL

- <u>NOTE:</u> The maximum repairable size for a single damage caused by an electrical discharge is 1 square inch. This includes punctures to the inner and outer skins and the delaminated area.
  - The minimum spacing permitted between adjacent repairs is 3 inches (edge-to-edge).

For damage that exceeds these limits, refer to Paragraph 8.A./REPAIR GENERAL (Wet Layup) or Paragraph 9.A./REPAIR GENERAL (Prepreg).

- D. Drill a 0.06 inch diameter hole in the center of the defect. Insert a hypodermic needle through skin the and fill the core cell with BMS 8-301, Class 2.
- E. Insert the hypodermic needle between the delaminated plies of the skin and inject with BMS 8-301, Class 2.
- F. Apply a thin layer of BMS 8-301, Class 2 over the defects. Cover the resin with PVA or other parting film.
- G. When the resin has gelled, remove the parting film.
- H. Apply the finish to the repair as given in Paragraph 15./REPAIR GENERAL

#### 17. Small Repairs

<u>NOTE:</u> The small repairs given in this will not require electrical testing if the thickness limits shown in Figure 201/REPAIR GENERAL are not exceeded.

CAUTION: DO NOT USE CHEMICAL PAINT STRIPPERS TO REMOVE THE PAINT FROM THE RADOME. DAMAGE TO THE ADHESIVE RESIN SYSTEM WILL OCCUR.

- A. Repair the surface scratches that do not penetrate the glass fabric as follows:
  - (1) Remove the scratches by sanding with No. 180 or finer sandpaper.
  - (2) Clean the area as given in Paragraph 7.B./REPAIR GENERAL and Paragraph 7.C./REPAIR GENERAL
  - (3) Apply a layer of BMS 8-301, Class 2 or BMS 8–207, Type I. Mix and cure the resin as given in 51-30-10, GENERAL, Table 1.
  - (4) Sweep the area to fair in the resin and remove all the trapped air.
  - (5) Cure the repair as given in Paragraph 14./REPAIR GENERAL
  - (6) Apply the finish to the repair as given in Paragraph 15./REPAIR GENERAL
- B. Repair the surface scratches that penetrate one ply of glass fabric as follows:

## <u>NOTE:</u> This repair is applicable only when the damage does not exceed 2 inches in length and 0.125 inch in width and in one ply only. Damage that exceeds these limits requires replacement of the plies.

- (1) Sand out the scratches with No. 180 or finer sandpaper.
- (2) Clean the area as given in Paragraph 7.B./REPAIR GENERAL and Paragraph 7.C./REPAIR GENERAL
- (3) Fill the scratch with BMS 8-301, Class 2 resin, prepared as given in 51-70-04.
- (4) Cure for 24 hours minimum at 70°F ±5°F (21°C ±3°C), or cure as given in 51-70-04.
- (5) Apply a layer of BMS 8-301, Class 2 or BMS 8-207, Type I.
- (6) Mix and cure the resin as given in 51-30-10, GENERAL, Table 1.
- (7) Apply the finish to the repair as given in Paragraph 15./REPAIR GENERAL
- C. Repair punctures that are less than 0.25 inch in diameter as follows:
  - (1) Remove the damaged material from the area of the puncture.
  - (2) Clean the area as given in Paragraph 7.B./REPAIR GENERAL and Paragraph 7.C./REPAIR GENERAL
  - (3) Put the BMS 8-301, Class 2 resin, prepared as given in 51-70-04, REPAIR GENERAL, into the puncture.

## <u>NOTE:</u> As an alternative, use Presto Paste Resin made from 98 parts of Resin No. 49X2 and 2 parts of Methyl Ethyl Ketone (MEK) Peroxide by weight.

(4) Cure for 24 hours at 70°F (21°C) minimum.

EFFECTIVITY: ALL

53-10-72-2R-0 REPAIR GENERAL - Nose Radome

- (5) Sand to fair the resin even with the surrounding surface.
  - (6) Apply the finish to the repair as given in Paragraph 15./REPAIR GENERAL
- D. Repair delamination of glass fabric plies as follows:
  - <u>NOTE:</u> The repair given in this is applicable where the delamination is confined to an area that is 1 inch in diameter and where skin distortion is not excessive.

## If the delamination damage exceeds these limits, repair as given in Paragraph 8.A./REPAIR GENERAL or Paragraph 9.A./REPAIR GENERAL

- (1) Find the amount of delamination. Use the tap test as given in NDT Part 1, 51-05-01.
- (2) Inject BMS 8-301, Class 2 between the delaminated plies. Use a hypodermic needle to inject the resin as given in Paragraph 16.D./REPAIR GENERAL and Paragraph 16.E./REPAIR GENERAL
- (3) Apply the pressure as given in Paragraph 13.A./REPAIR GENERAL
- (4) Cure the repair as given in Paragraph 14./REPAIR GENERAL
- (5) Apply the finish to the repair as given in Paragraph 15./REPAIR GENERAL

#### Figure 201. Thicknesses for Nose Radome

Sheet 1

Figure 202. Alternative 1 - Wet Layup Repair

Sheet 1

Figure 203. Alternative 2 - Wet Layup Repair

Sheet 1

Figure 204. Alternative 3 - Prepreg Repair

Sheet 1

Figure 205. Alternative 4 - Prepreg Repair

Sheet 1

Figure 206. Nose Radome Repair Layups

Sheet 1

Sheet 2

Figure 207. Nose Radome Repair Sizes and Classifications

Sheet 1

Figure 208. Application of Pressure During Cure

Sheet 1

Sheet 2

777-200 - SRM ETI D634W201 Rev 78 - 15 Sep 2018

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Issue Date: 15 May 2018

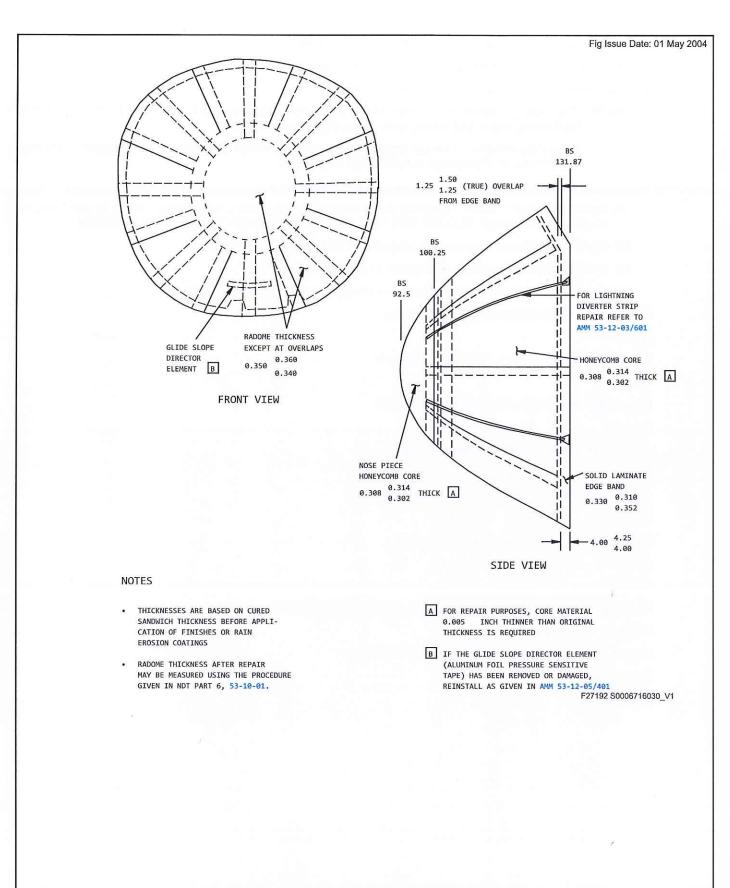


Figure 201. Thicknesses for Nose Radome

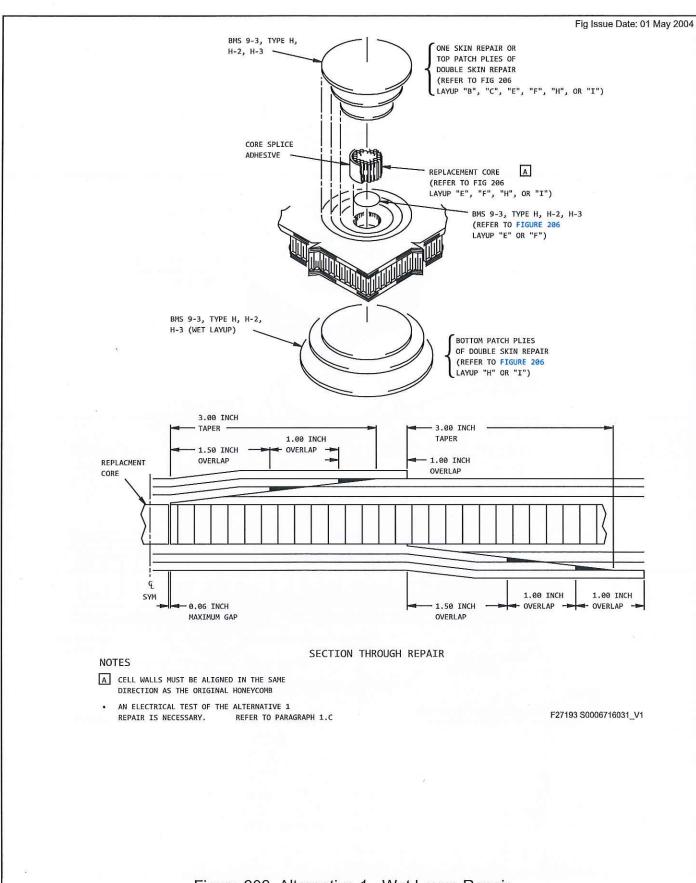
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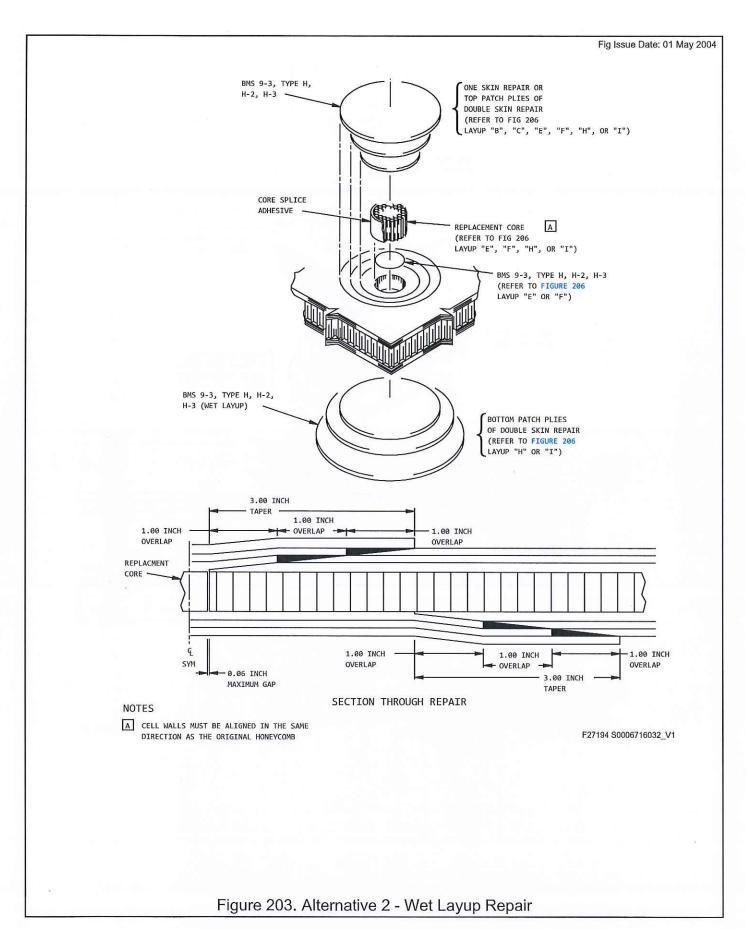
#### Figure 202. Alternative 1 - Wet Layup Repair

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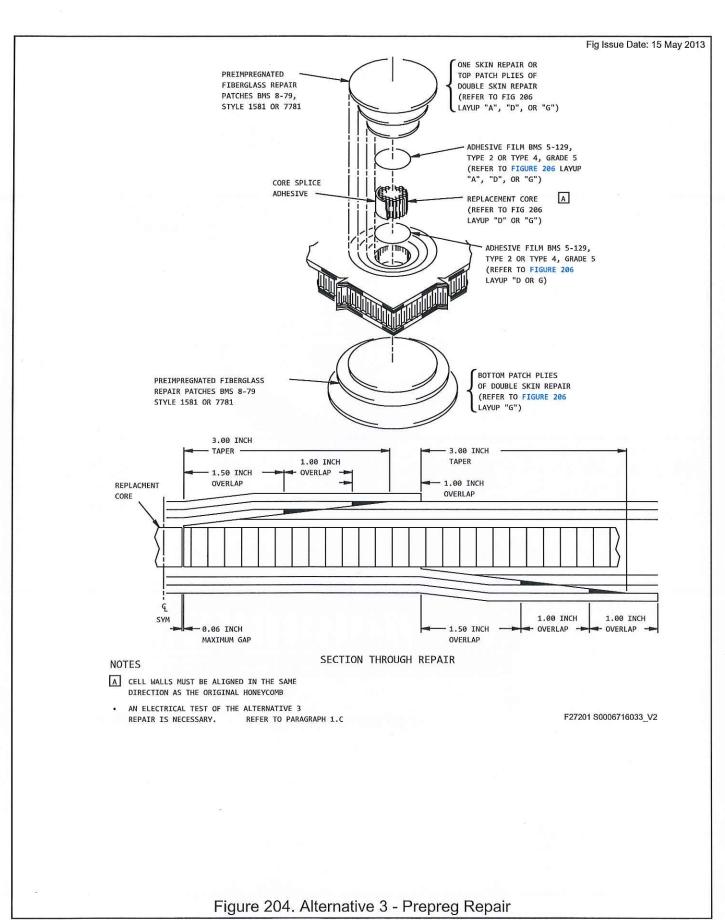
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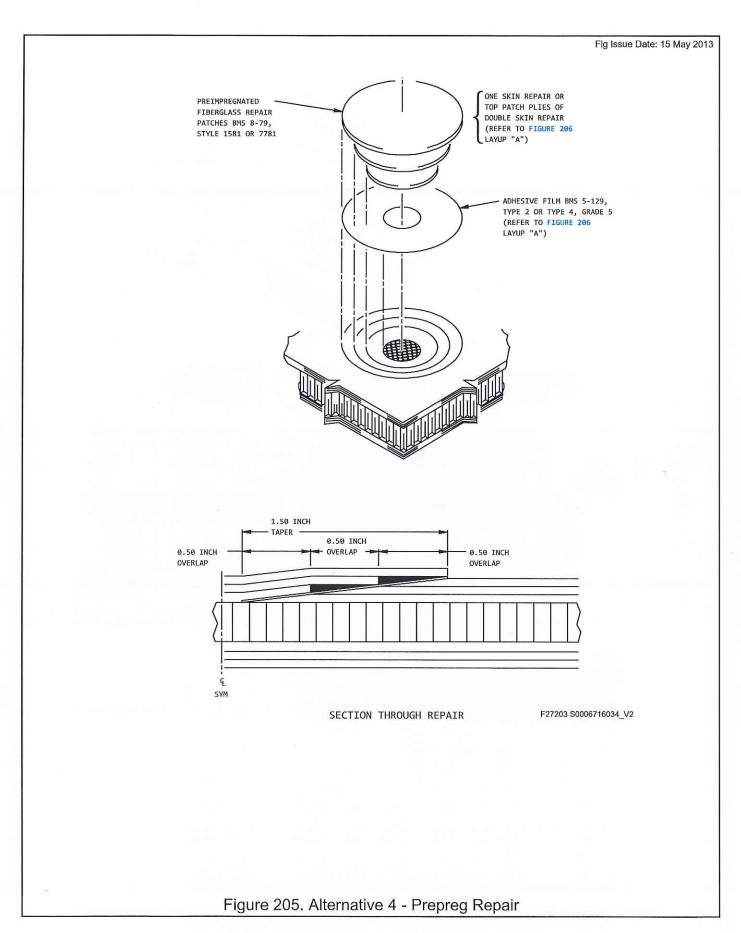


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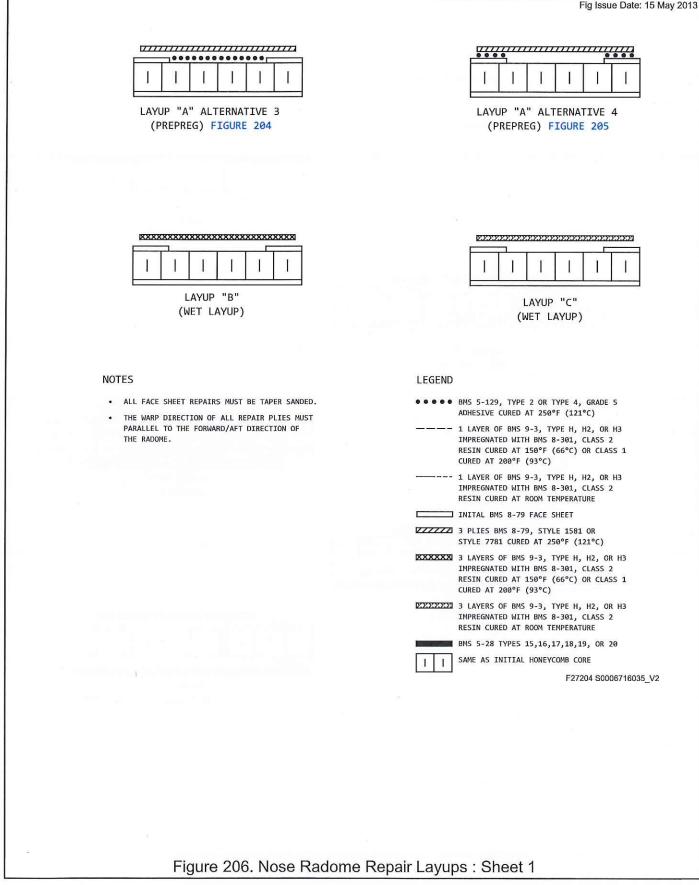
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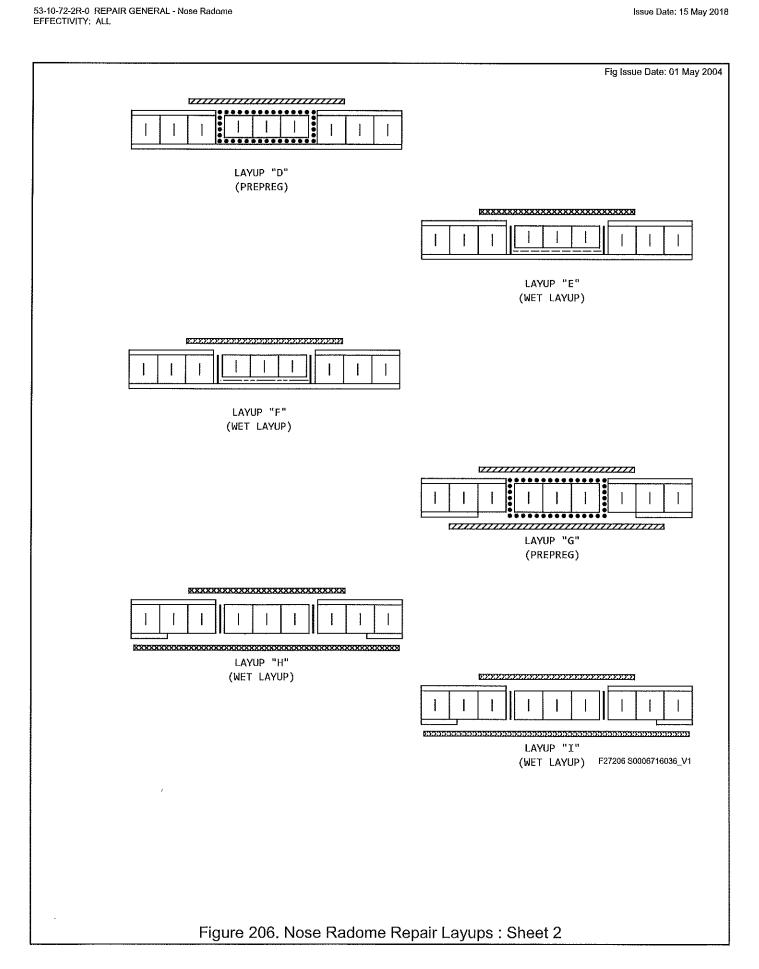
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						Fig Issue Da	ite: 01 Ma
REPAIR TYPE	LAYUP TYPE				REPAIR SIZE MAXIMUM DIAMETER	REPAIR	
NET AIN THE	FIG. 202	FIG. 203	FIG. 204	FIG. 205	(INCHES)	CLASSIFICATION	
	"B" D	50	"A" D	"A"	NO LIMIT	PERMANENT	A
					0-4	PERMANENT	A
FACE SHEET		"B"			4-30	PERMANENT	в
FACE SHEET AND					30-50	TEMPORARY	C
		"C"			0-15	TEMPORARY	c
	"Е"		"D"		NO LIMIT	PERMANENT	D
					0-4	PERMANENT	A
CORE		"Е"		1 - Carlos de 1997	4-25	PERMANENT	в
					25-40	TEMPORARY	C
		"F"			0-15	TEMPORARY	C
TWO FACE SHEETS AND CORE	"H"		"G"		NO LIMIT	PERMANENT	D
	l ent	"H"			0-10 10-20	PERMANENT TEMPORARY	B C
		"I"			0-10	TEMPORARY	C

RADOME REPAIR SIZES AND CLASSIFICATIONS

TABLE A

#### NOTES

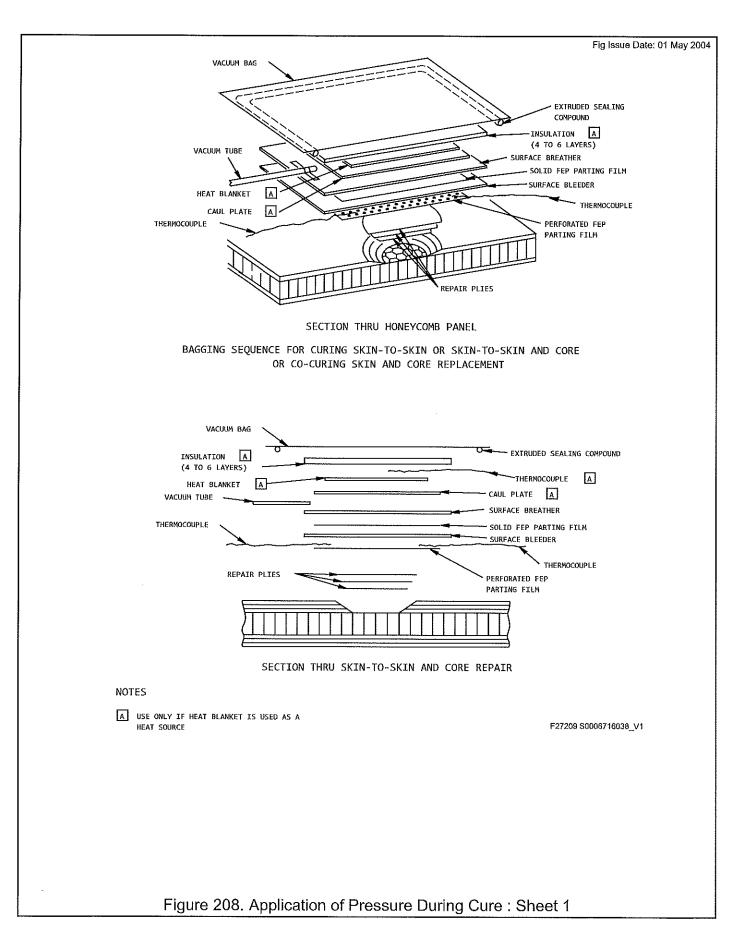
- TWO SMALL REPAIRS NEAR EACH OTHER CAN BE MADE INTO ONE LARGER REPAIR AS GIVEN IN TABLE A.
- A REPAIR SHOWN AS A TEMPORARY REPAIR MUST HAVE A VISUAL AND TAP TEST INSPECTION OF THE REPAIR AREA AT EACH '2A' CHECK.
  REPLACE A TEMPORARY REPAIR WITH A PERMANENT REPAIR BY THE NEXT 'C' CHECK.
- THE MAXIMUM DIAMETER OF THE DAMAGE IS EQUAL TO THE MAXIMUM DIAMETER OF THE DAMAGED AREA AFTER CLEANUP OR THE MAXIMUM CUT OUT DIA-METER BEFORE TAPER SANDING. THE DIAMETER OF THE REPAIR IS MEASURED ALONG THE CON-TOUR OF THE REPAIR.
- KEEP A MINIMUM DISTANCE OF 3.0 INCHES (EDGE-TO-EDGE OF THE LARGEST REPAIR PLIES) FROM ANY OTHER REPAIR PLIES (ON EITHER SIDE OF THE PANEL).
- INNER AND OUTER FACE SHEET REPAIRS WHICH ARE OPPOSITE EACH OTHER ARE NOT PERMITTED EXCEPT AS SHOWN IN LAYUPS "F" AND "G".
- A MORE THAN ONE REPAIR IS PERMITTED.
- B TWO OR MORE REPAIRS IN THIS CATEGORY ARE PERMITTED BUT ALL REPAIRS ARE THEN CLASSI-FIED AS TEMPORARY.
- C ONE REPAIR ONLY OF THIS SIZE IS PERMITTED.

F27207 S0006716037\_V1

#### Figure 207. Nose Radome Repair Sizes and Classifications

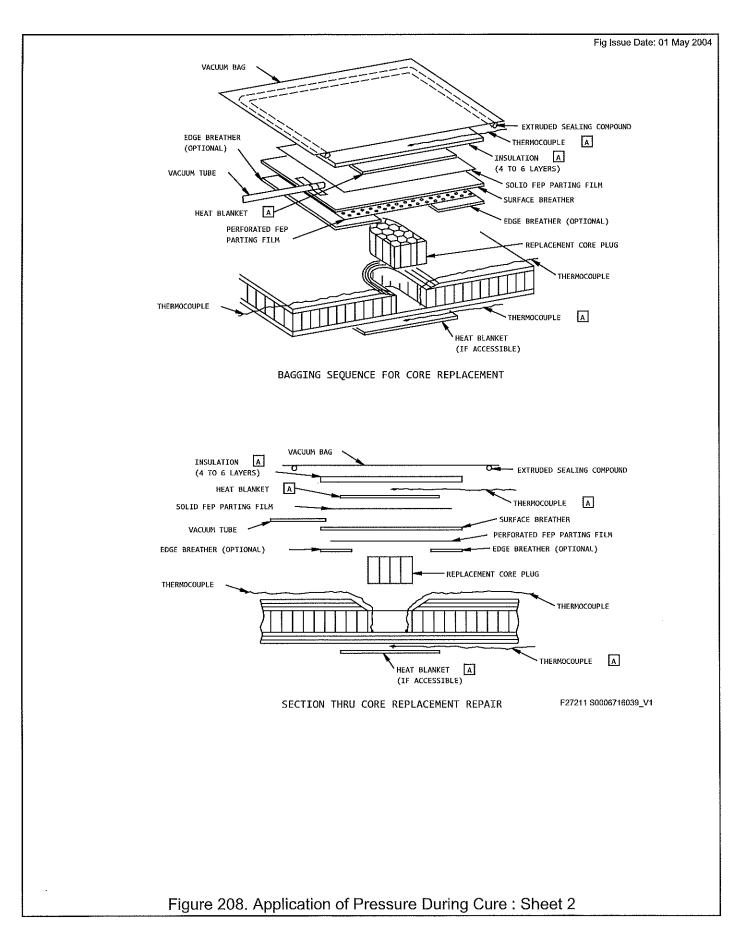
C.BOEING

53-10-72-2R-0 REPAIR GENERAL - Nose Radome EFFECTIVITY: ALL



Ø BOEING

53-10-72-2R-0 REPAIR GENERAL - Nose Radome EFFECTIVITY: ALL



## Defect and Repair Description



Informations : CSDR Nu	mber: 77/53/C00229			
Engine Type : B777	Flight Hours: 12939			
<b>SN Component</b> : 000309 16130275				
Departure PN Component : 284T0052-41				

Arrival Date : 22/02/2016 Cycles : 1282

Compiled by : CHEVAL

Ex	hi	bit	N°	•	1



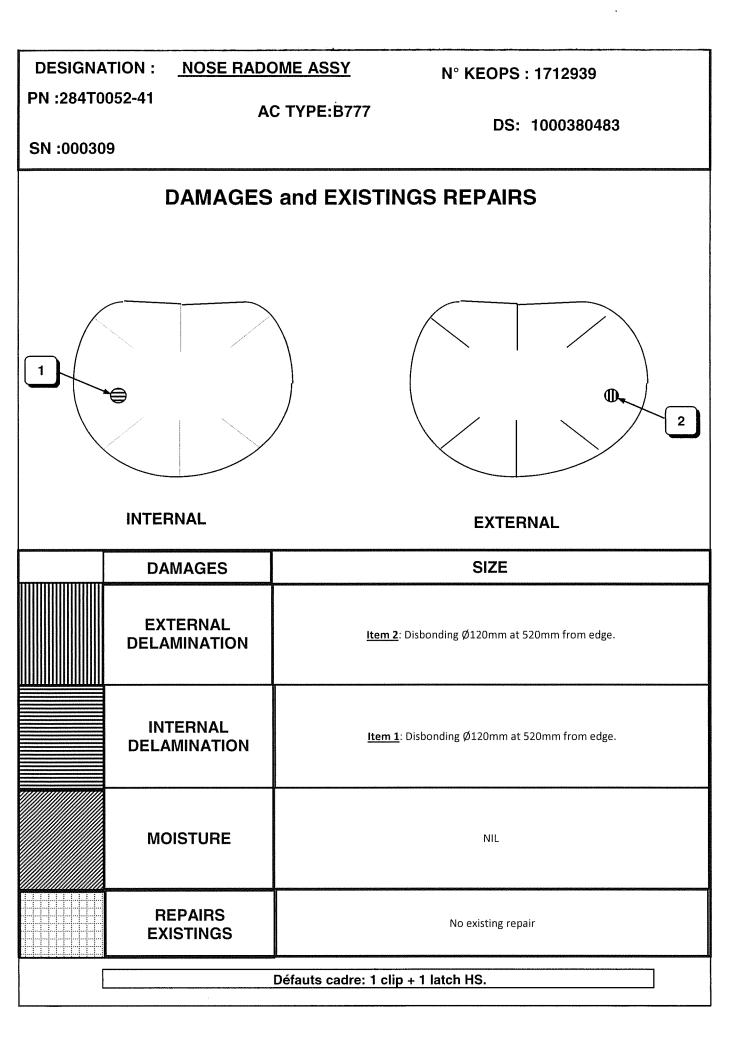
Defect

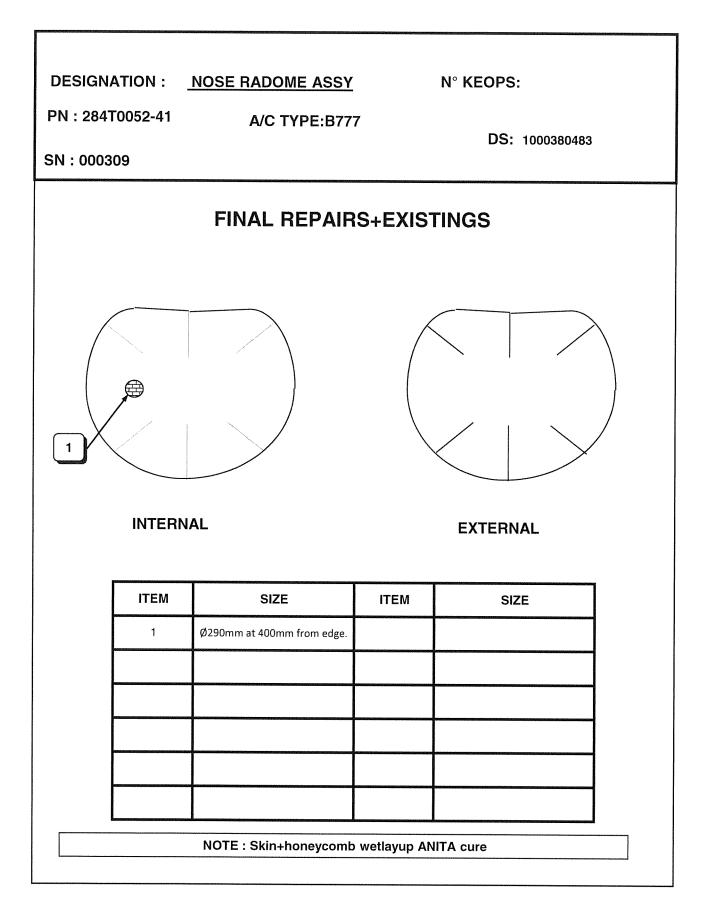
Describe View	RADOME	
Description of the defect :	On inner skin ,1 disbonding area :diameter 120 m/m at 520 m/m from edge On outer ,1 gouge and a disbonding : diameter 120 m/m at 520 m/m from edge	
Repair Description:	Repared IAW SRM 53-10-72 Alternative 2 Wet Layup repair Figure 203	



Repair

Approval Data SRM B777-300 CHAPTER 53-10-72 REV 55





More and and in start all Address   AIRFRANCE   Subtract AIR PRANCE   B. Work of control Contrelance Contend Contreconte Control Control Control Control Control	DIR L'A'	ECTION GÉNÉRALE DE VIATION CIVILE / FRANCE	Certificat d'Autorisation de Mise en Service					Tracking Number ro de traçage du formulaire Willia Willia Willia *9113223*	
	Nom	Nom et adresse de l'organisme AIRFRANCE / 45 rue de Paris 95747 ROISSY CDG Cedex			Bon de	5. Work Order/Contract/Invoice Bon de Commande/Contrat/Facture			
12. Remarks   2841 0032-41   1   08339   REPAIRED     12. Remarks   Doservations   DOE INE   D634V210   SRM 53-10-72 REV55   JAN16     Second State Colspan="4">REPAIRED 101 FEB2016 AND WORKSCOPE NUMBER ETD-23022016     DATE D 17AR22016.   TSM 12333, 5689   CSM 1282     DATE D 17AR22016.   TSM 12333, 5689   CSM 1282     The work identified Block 11 and discribed horins have been accomplement of a more conflicted in 2004 name to the second in according on the 10 CMP/912C.   Max 1282     Centre duel in Block 11 and discribed horins have been accomplement of a more conflicted in 2004 name to the second in according on the 11 and discribed in block 12.   Parth 145 A.50 Release to Service   Mile Cherrise on service   Attre reglementation vises a late case 12     Centre duel in Block 11 and discribed horins have been accomplement on the second in according on the number of the order on service in the work item infection refers to second and the other been according to the order of the order on second on the other been according to the order on the othe second and the other been according to the order of the order on the other been according to the othe been according to the othe been according to	6. Item	7. Description		8. Part No I Nu	méro de la pièce	9. Qty. / Qté	10. Serial No. / Numéro se		
Observations   DETN   D634V20   SR 53-10-72 REV55   JAN16     Separate Rest Detries   Separate PERFORMED FOLLOWING REPAIR ORDER NUMBER   Separate PERFORMED FOLLOWING REPAIR ORDER NUMBER     10003050653-000010376-REP DATED 01FER2016 AND WORKSCOPE NUMBER ETD-23022016   TSW 12359,5649   CSW 1222     SEE CSDR NUMBER T7/53/C00229   TSV 12359,5649   CSW 1232     Wenk (induiting in Block 11 and exolution to service under configure to activity in Conformity in Tesperiod (in Block 12, Block and we were menumelicative) in Conformity in Tesperiod (in Block 12, Block 22,	1			284T0052-41		1	000309	Table in succession of the	REPAIRED
ISER / INSTALLER RESPONSIBILITIES / RESPONSABILITES DE L'UTILISATEUR / INSTALLATEUR. This certificate does not automatically constitue authority to install the item(s). Se certificat ne vaut pas automatiquement autorisation d'installer le ou les éléments. Where the user/installer performs work in accordance with regulations of an airworthiness authority different than the airworthiness authority specified in block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts items orsque l'autorité responsable de la navigabilité dont il refève accepte les éléments annouvés nat l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'autorité respo	SEE SEE The work in <u>n respect i</u> 13a. Certi Certifie Sertifie 13b. Author Signati	D 17MAR2016. CSDR NUMBER 77/53/C00229. dentified in Block 11 and described herein ha <u>o that work, the items are approved for return</u> fies that the items identified above were <i>que les éléments identifiés ci-dessus on</i> approved design data and are in condition for sal <i>aux données de définition approuvées et sont er</i> NN-approved design data specified in block 12 <i>aux données de définition non approuvées indiqu</i> rised Signature <i>me autorisée</i>	TSN/ 12939,9689 CSN/ TSO/ 12939,9689 CSO/ as been accomplished in accordance with 14 n to service under certificate no. CNFY912C manufactured in conformity to n etc. fabriqués: conformément e operation rélat de fonctionner en toute sécurité ées en case 12 13c: Approval //Authonsatio Numéro de l'agrêment./	1282 1282 CFR part 43 and Ce acc Ce été ser n Number Butonsetion 14	Partie 145.A.5 entifies that unless other cordance with Part-145 a entifie que, sauf disposition à accomplis conforméme rvice. Ib. Authorised Signa Signature autorisé	50 Remise en se rwise specified in t and in respect to the ons contraires ment ent à la Partie 145	brvice block 12, the work identified in i at work the items are considered ionnées dans la case 12, les trav et, compte tenu de ces travaux, 1 440000000000000000000000000000000000	Autre règleme block 11 and de ready for release reux indiqués dan les éléments son Ac. Certificate N° de Certifi	entalion visée à la case 12 escribed in block 12, was accomplished in e to service. Ins la case 11 et décrits dans la case 12, ont nt considérés comme prêts à être remis en 
a certificate does not automatically constitute authonity to install the item(s). In certificat ne vaut pas automatiquement autorisation d'installer le ou les éléments. There the user/installer performs work in accordance with regulations of an airworthiness authority different than the airworthiness authority specified in block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts items on the airworthiness authority specified in block 1. Disque l'utilisateur/installateur effectue des travaux conformément à la règlementation d'une autorité responsable de la navigabilité indiquée dans la case 1, il est essential que l'utilisateur/installateur assure que l'autorité responsable de la navigabilité dont il relève accepte les éléments approvivés par l'autorité responsable de la navigabilité indiquée dans la case 1, il est essentiel que l'utilisateur/installateur						CONK			•
tatements in blocks 13a and 14a do not constitute installation certification. In all cases aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be es mentions figurant dans les cases 13a et 14a ne constituent pas une certification d'installation. Dans tous les cas, le dossier d'entretien de l'aéronef doit contenir une certification d'installation délivrée conformément aux règlementations nationales par utilisateur/installateur avant que l'aéronef puisse décoller.	This certificat Ce certificat Where the u rom the airw orsque l'util 'assure que itatements i own.	te does not automatically constitute authority te ne vaut pas automatiquement autorisation d'in eser/installer performs work in accordance with worthiness authority specified in block 1. Ilsateur/installateur effectue des travaux confe l'autorité responsable de la navigabilité dont il n blocks 13a and 14a do not constitute installe	o install the item(s). stalier le ou les éléments. a regulations of an airworthiness authority diffe armément à la règlemantation d'une autorité r relève accepte les éléments approuvés par l'a ation certification. In all cases aircraft mainten	rent than the airworthin esponsable de la navi utorité responsable de l ance records must con	igabliité, autre que l'au la navigabilité inscrite à Itain an installation cert	<i>torité responsable à la case 1.</i> Mication issued in	de la navigabilité indiquée dan accordance with the national m	is la case 1, 11 guiallons by the	est essentiel que l'utilisateur/installateur

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		FAX : 33 (0) 141 560 16
45 rue de PARIS F-9574	7 ROISSY CHARLES DE GAULLE CEDEX	TLX : RSYLOAF
	WORK SHOP REPORT	No: 9113223
Customer: ETIHAD AI	RWAYS ENGINEERING	Dossigr 1443130
Nork Order.: 100038048		Requisition No.: 0048329
Designation : RADOME	ASSY	и <u>ла станити и полно и п</u> 
Part Number: 284T00	52-41	TSN.: UNKNOWN
Serial Number.: 000309		CSN.: UNKNOWN
Removal from A/C.: EAE	00 Pos.: UNKNOW	WN Time: UNKNOWN
Aircraft Model: UNK	NOWN	Cycles.: UNKNOWN
Removal Date: 17F	EB16 Location.: CDG	
Removal Type: UNS		
	SON FOR REMOVAL: FOUND DENT ON LEFT Ension: Length 82 Mm, WDTH 82MM AND	
	BIR	RD STRIKE

Condition as received.....: REQ 00483295

Work requested....: REPAIR

Warranty requested.:

Warranty Accepted.:

Shop Finding.....: REPAIR PERFORMED FOLLOWING REPAIR ORDER NUMBER 1000380483-30 DATED 01FEB2016 AND AND WORKSCOPE NUMBER ETD-23022016 .

Confirmation of Removal.: FAILURE FOUND - REMOVAL REASON CONFIRMED

Repair Text....: SEE CSDR NUMBER 77/53/C00229.

Documentation Reference.: BOEING D634W210 SRM 53-10-72 REV55 JAN16

Modif/Remarks....: REPAIR PERFORMED FOLLOWING REPAIR ORDER NUMBER

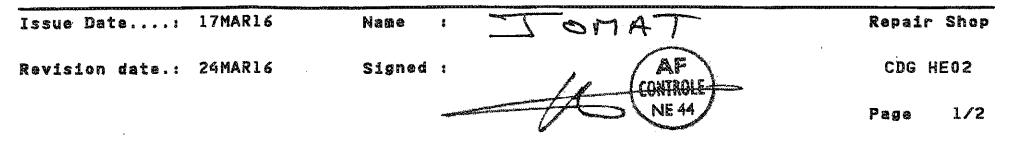
1000380483-3000069176-REP DATED 01FEB2016 AND WORKSCOPE NUMBER ETD-23022016DATED 17MAR2016.TSN/ 12939,9689CSN/ 1282SEE CSDR NUMBER 77/53/C00229.TSO/ 12939,9689CSO/ 1282

New Part Number...:

New Serial Number.:

.

Parts replaced : SEE PART LIST



AIRFRANCE			
		FAX : 33 (	0) 141 560 165
45 rue de PARIS F-95747	ROISSY CHÁRLES DE GAULLE CEDEX	TLX : RSYL	OAF
	WORK SHOP REPORT	۰.	No: 9113223
	Parts replaced		
Part Number / Alt	Description	QTY	UX.
ASNA2397-10L	WASHER FLAT CARBON STEEL	30	EA
EPOCAST1617AB	KIT ADHESIF EPOXY	1	EA
EY3804AB	ADHESIF /EY 3804 A/B	2	EA
MS21042L3	NUT	30	EA
NAS514P1032-12P	SCREW -100¢ FLAT HEAD	15	EA
NAS514P1032-14P	SCREW -100¢ FLAT HEAD	15	EA
NAS514P1032-18P	SCREW -100¢ FLAT HEAD	6	EA
NAS601-7P	SCREW PAN HEAD	90	EA .
PS870B2KIT25	MASTIC KIT 25	4	EA
S141T782-26	LATCH AY	1	EA

•

Issue Date....: 17MAR16

r 1 v 1

Revision date.: 24MAR16

r

**Repair Shop** 

CDG HE02

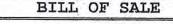
Page 2/2





# COMMERCIAL

# TRACE



KNOW ALL PERSONS BY THESE PRESENTS;

THAT THE BOEING COMPANY (SELLER), a Delaware corporation whose address is Box 3707, Seattle, Washington, is the owner of the full legal and beneficial title to that certain BOEING MODEL 777-237LR AIRCRAFT (generic airframe model 777-200) manufactured by THE BOEING COMPANY bearing REGISTRATION IDENTIFICATION VT-ALC and MANUFACTURER'S SERIAL NUMBER 36302, together with the two (2) GE90-110B1 series engines (generic engine model GE90-110B1) installed thereon, manufactured by General Electric, bearing MANUFACTURER'S SERIAL NUMBERS 906302 and 906303, respectively, together with all appliances, parts, instruments, appurtenances, accessories, furnishings, or other equipment or property installed on or attached to said aircraft and engines, other than equipment furnished by AIR INDIA LIMITED(BFE).

THAT for and in consideration of the sum of \$1.00 and other valuable consideration SELLER does this <u>7</u> day of JULY, 2007, grant, convey, transfer, bargain and sell, deliver and set over, at Everett, Washington, pursuant and subject to the terms and conditions of Purchase Agreement No. 2997 dated December 30, 2005, all of SELLER'S right, title and interest in and to the above described aircraft, engines, appliances, parts, instruments, appurtenances, accessories, furnishings and/or other equipment or property (other than BFE) unto AIR INDIA LIMITED (BUYER), and unto its successors and assigns forever.

THAT SELLER hereby warrants to BUYER, its successors and assigns, that there is hereby conveyed to BUYER on the date hereof, good title to the aforesaid aircraft, engines, appliances, parts, instruments, appurtenances, accessories, furnishings and/or other equipment or property (other than BFE), free and clear of all liens, encumbrances and rights of others, and that it will warrant and defend such title forever against all claims and demands whatsoever.

THIS Bill of Sale is delivered by SELLER to BUYER in Everett, Washington, and governed by the law of the State of Washington.

IN WITNESS WHEREOF, SELLER has caused this instrument to be executed by its duly authorized Attorney-In-Fact this 2.7 day of JULY, 2007.

THE BOEING COMPAN By Attorney-In-Fact Title

#### ACKNOWLEDGMENT.

) )ss.

)

STATE OF WASHINGTON

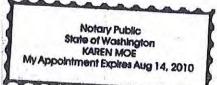
COUNTY OF KING

On this <u>37</u> day of JULY, 2007, S. M. Douglas, known to me, the undersigned (a Notary Public in and for the State of Washington, duly commissioned and sworn), to be the duly authorized Attorney-In-Fact of THE BOEING COMPANY, the corporation that executed the foregoing instrument, to me acknowledged the said instrument to be the free and voluntary act and deed of said corporation for the uses and purposes therein mentioned, and on oath stated that he is authorized to execute the said instrument on behalf of said corporation by authority of their Boards of Directors.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal.

aren

KAREN MOE Notary Public in and for the State of Washington, residing at Kirkland, County of King. Commission expiration date: 08/14/10.



#### BILL OF SALE

Know all men by these presents that National Aviation Company of India Limited (the "Seller"), having an office at Old Airport, Santacruz (E), Mumbai 400 029, India, is the owner of the title to the following airframe (the "Airframe"), the engines as specified (the "Engines"), and all appliances, components, parts, instruments, appurtenances, accessories, furnishings, modules and other equipment of any nature incorporated therein, installed thereon or attached thereto on the date hereof and all records, documents and technical manuals related thereto (the "Parts").

#### MANUFACTURER OF AIRFRAME: MANUFACTURER OF ENGINES:

THE BOEING COMPANYGENERAL ELECTRIC COMPANYMODEL:777-200LRMODEL:MANUFACTURER'S SERIALMANUFACTURER'S SERIALNO:36302NOs:906302 and 906303

**REGISTRATION MARK: VT-ALC** 

The Airframe, Engines and Parts are hereafter together referred to as the "Equipment".

That for and in consideration of the sum of \$1.00 and other good and valuable consideration, receipt of which is hereby acknowledged, the Seller does this  $b^{t}$  day of  $W_{outpute}$  2007 hereby grant, bargain, sell, convey, transfer, set over and deliver all of its rights, title and interest to and in the Equipment to the following entity and to its successors and permitted assigns for its and their use forever:

Golden State Aircraft LLC (the "Buyer")

Rodney Square North

1100 North Market Street

Wilmington, Delaware

19890-0001

The Seller hereby warrants to the Buyer, its successors and permitted assigns that it has on the date hereof good and lawful right to sell, deliver and transfer title to the Equipment to the Buyer and that there is hereby conveyed to the Buyer on the date hereof good, legal and valid

title to the Equipment, free and clear of all claims, charges, Liens (other than Permitted Liens) and rights of others and that the Seller will warrant and defend such title forever against all claims and demands whatsoever.

This Bill of Sale is executed and delivered by Seller to Buyer pursuant to the Sale Agreement dated even date herewith between Seller and Buyer (the "Sale Agreement").

Terms used herein bear the same respective meanings as are ascribed thereto (whether directly or by incorporation therein) in the Sale Agreement.

This Bill of Sale shall in all respects be governed by, and construed in accordance with, the internal laws of the State of New York, United States of America without reference to principles of conflicts of law other than Section 5-1401 and Section 5-1402 of the New York General Obligations Law.

IN WITNESS WHEREOF, the undersigned have caused this instrument to be executed by their duly authorised representatives this  $06^{t}$  day of Abundus 2007 at  $3.9^{0.4}$  (New York time), at which time the Airframe and the Engine bearing MSN 906302 was located at John F. Kennedy Airport, New York, New York and the Engine bearing MSN 906303 was located in international airspace.

Accepted:

### qm

#### GOLDEN STATE AIRCRAFT LLC

by Golden State Statutory Trust, its Manager

by Wilmington Trust Company, not in its individual capacity, but solely as trustee

Name:

J. Christopher Murphy Financial Services Officer

Title:

Bill of Sale MSN 36302

NATIONAL AVIATION COMPANY OF INDIA LIMITED

Name: H.J. MEHTAJI

Title: Regional finance & Accounts Manager-USA & CANADA

#### AIRCRAFT BILL OF SALE

#### Date: 5 Sebruary 2014

#### KNOW ALL MEN BY THESE PRESENTS:

THAT GOLDEN STATE AIRCRAFT LLC, a company incorporated and existing under the laws of Delaware (hereinafter referred to as the "Owner") is the legal owner of (a) that one (1) Boeing 777-200LR aircraft bearing manufacturer's serial number 36302 (the "Aircraft"), (b) all appliances, components, parts, instruments, accessories, furnishings, modules, navigational and communications equipment and other equipment and property of whatever nature (other than complete Engines, as hereinafter defined) incorporated in, installed on or attached to the Aircraft on the date hereof (collectively, the "Parts"), (c) two (2) General Electric GE90-110B1L1 engines bearing manufacturer's serial numbers 906275 and 906376 and any and all Parts incorporated in, installed on or attached to such engines on the date hereof (the "Engines") and (d) all logbooks, Aircraft records, books, handbooks, drawings, manuals, flight records, historical, operational and maintenance data for the Aircraft and any other document owned by the Seller in connection with the Aircraft (the "Aircraft Documentation").

**THAT** for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Owner does hereby grant, convey, transfer, bargain and sell, deliver and set over in favour of Etihad Airways P.J.S.C. all of the Owner's right, title and interest in and to the Aircraft, the Engines, the Aircraft Documentation and the Parts and each of its successors and assigns forever.

**THAT** this Bill of Sale is delivered pursuant to the Sale and Purchase Agreement dated 5 December 2013 between Air India Limited and Etihad Airways P.J.S.C. and capitalized terms used herein and not otherwise expressly defined shall have the meanings given such terms (or assigned to them by reference) therein.

THAT the Aircraft, Engines, the Aircraft Documentation and Parts are sold in an "as-is, where-is" condition and without recourse or warranty being given by the Seller (and any and all implied warranties or terms are hereby expressly excluded).

THAT this Bill of Sale shall be governed by and construed in accordance with the laws of England and is executed as a deed and delivered by a duly authorised representative of the Owner on this  $5^{++}$  day of <u>February</u>, 2014, at Abu Dhabi, United Arab Emirates, at which time the Aircraft is located at Abu Dhabi, United Arab Emirates.

**CERTIFIED COPY OF THE ORIGINAL DOCUMENT** CLIFFORD CHANCE L.L.P. Name: NICHOLAS DILOA Position: SENIOR ASSOCIATE Date:\_ Contact Tel. +97156684986

Executed as a deed by

#### **GOLDEN STATE AIRCRAFT LLC**

by Golden State Statutory Trust, as Manager by Wilmington Trust Company, not in its individual capacity but solely as Trustee

Signed by a duly authorised representative for and on behalf of Golden State Aircraft LLC

Steve Barone Assistant Vice President

By its countersignature below, Air India Limited hereby grants, conveys, transfers, bargains and sells, delivers and sets over in favour of Etihad Airways P.J.S.C. all of Air India's right, title and interest in and to the Aircraft, the Engines, the Aircraft Documentation and the Parts and each of its successors and assigns forever and warrants to the Buyer, and its successors and assigns and hereby warrants to the Buyer, and its successors and assigns, that there is hereby conveyed to the Buyer with full title guarantee good and marketable title to the Aircraft, the Engines, the Aircraft Documentation and the Parts and all of the Seller's and all of Air India's right, title and interest in and to the Aircraft, the Engines, the Aircraft Documentation and the Parts and all of the Parts free and clear of all Security Interests.

))

)

)

Executed as a deed by

#### AIR INDIA LIMITED

Signed by)a duly authorised)representative for and)on behalf of)Air India Limited)

Executed as a deed by

#### GOLDEN STATE AIRCRAFT LLC

by Golden State Statutory Trust, as Manager by Wilmington Trust Company, not in its individual capacity but solely as Trustee

Signed by	)
a duly authorised	)
representative for and	)
on behalf of	)
Golden State Aircraft LLC	)

By its countersignature below, Air India Limited hereby grants, conveys, transfers, bargains and sells, delivers and sets over in favour of Etihad Airways P.J.S.C. all of Air India's right, title and interest in and to the Aircraft, the Engines, the Aircraft Documentation and the Parts and each of its successors and assigns forever and warrants to the Buyer, and its successors and assigns and hereby warrants to the Buyer, and its successors and assigns and hereby warrants to the Buyer, and its successors and assigns, that there is hereby conveyed to the Buyer with full title guarantee good and marketable title to the Aircraft, the Engines, the Aircraft Documentation and the Parts and all of the Seller's and all of Air India's right, title and interest in and to the Aircraft, the Engines, the Aircraft Documentation and the Parts free and clear of all Security Interests.

))

)

)

)

Executed as a deed by

#### AIR INDIA LIMITED

Signed by a duly authorised representative for and on behalf of Air India Limited

arjeet Sawhney Manager - Air India Abu Dhabi & Al Ain



#### BILL OF SALE

By this Bill of Sale, ETIHAD AIRWAYS P.J.S.C., (the Seller) for good and valuable consideration (the receipt of which is hereby acknowledged) confirms that pursuant to an aircraft sale and purchase agreement dated \_\_\_\_\_\_\_\_September 2014 (the Aircraft Sale and Purchase Agreement) made between the Seller and UNION 23 LEASING LIMITED (the Buyer), the Seller did sell, grant, transfer and deliver to the Buyer at Abu Dhabi on \_\_\_\_\_\_\_September 2014 at \_\_\_\_\_\_\_ a.m./p.m. (Abu Dhabi time) all its right, title and interest in and to:

- 1. one Boeing 777-200LR aircraft bearing manufacturer's serial number 36302;
- 1. one GE90-115B engine and one GE90-110B engine bearing manufacturer's serial numbers 906275 and 906376;
- 2. all Parts; and
- 3. the Manuals and Technical Records,

(hereinafter referred to as the Aircraft),

and hereby conveys, transfers, sells and delivers with full title guarantee to the Buyer such title to the Aircraft and all its right, title and interest in and to the Aircraft free and clear of any Security Interests, other than Permitted Security Interests and the Seller hereby agrees to warrant and defend such title forever against all claims and demands whatsoever.

In this Bill of Sale, words and expressions defined in the Aircraft Sale and Purchase Agreement (whether defined therein or incorporated by reference) will bear the same respective meanings unless otherwise defined herein.

This Bill of Sale is governed and construed in accordance with English law.

**IN WITNESS** whereof, the Seller has caused this Bill of Sale to be duly executed and delivered as a deed this  $\sqrt{3}$  day of September 2014.

SIGNED, SEALED and DELIVERED as a deed by JAMES RIGNEY

as lawful attorney for and in the name of

#### ETIHAD AIRWAYS P.J.S.C.

in the presence of: Witness' signature: Witness' name: AJAI RAMAKRISHNAN Witness' Address: ETIHAD AIRWAYS P.J.S.C,

ABU DHABI

P.O. Box: 35566, Abu Dhabi, United Arab Emirates Tel: +971 2 5110000, Fax: +971 2 5111200, www.etiho033995.0000032 BK:29082066.2 National Airline of the United Arab Emirates





#### **BILL OF SALE**

By this Bill of Sale, UNION 23 LEASING LIMITED (the Seller) hereby confirms that the Seller grants, transfers and delivers to ETIHAD AIRWAYS P.J.S.C. (the Buyer) at Abu Dhabi on <u>1 October</u> 2018 at <u>4:13</u> a.m./p.m. (Abu Dhabi time) all its right, title and interest in and to:

- 1. one Boeing 777-200LR aircraft bearing manufacturer's serial number 36302;
- one GE90 115B engine and one GE90 110B engine bearing manufacturer's serial numbers 906275 and 906376;
- 3. all Parts; and
- 4. the Manuals and Technical Records,

(hereinafter referred to as the Aircraft), as originally granted, transferred and delivered to the Seller pursuant to an aircraft sale and purchase agreement dated 23 September 2014 (the Aircraft Sale and Purchase Agreement),

and hereby conveys, transfers, sells and delivers with full title guarantee to the Buyer such title to the Aircraft and all its right, title and interest in and to the Aircraft free and clear of all liens, claims, charges encumbrances and rights of others and the Seller hereby agrees to warrant and defend such title forever against all claims and demands whatsoever.

In this Bill of Sale, words and expressions defined in the Aircraft Sale and Purchase Agreement (whether defined therein or incorporated by reference) will bear the same respective meanings unless otherwise defined herein.

This Bill of Sale is governed and construed in accordance with English law.

IN WITNESS whereof, the Seller has caused this Bill of Sale to be duly executed and delivered as a deed this <u>1st</u> day of <u>October</u> 2018

)

)

))

SIGNED, SEALED and DELIVERED as a deed by

as authorised signatory for and in the name of

John Curran Director

**UNION 23 LEASING LIMITED** 

in the presence of: Witness' signature: Witness' name: Witness' Address:

Michael Byrne Unit C1407 Level 14, Burj Daman DIFC PO Box 506734, Dubai United Arab Emirates

#### Bill of Sale – MSN 36302 Airframe

For good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, Etihad Airways PJSC ("Seller"), owner of the full legal and beneficial title to the aircraft airframe, equipment and documents described below (hereinafter referred to as the "Airframe"):

- 1 one (1) Boeing 777-200LR airframe bearing manufacturer's serial number 36302;
- 2 all equipment, accessories and parts belonging to, installed in or appurtenant to such aircraft airframe; and
- 3 the Aircraft Documents (as defined below),

does hereby sell, grant, transfer and deliver all its right, title and interest in and to the Airframe to SFTS EY-777 Airframes, LP ("**Purchaser**"), with full title guarantee to have and to hold the Airframe forever. Seller hereby warrants to Purchaser, and its successors and assigns, that it is the legal and beneficial owner of the Airframe, that there is hereby conveyed to Purchaser full legal and beneficial good and marketable title to the Airframe free and clear of any Security Interests (as defined below), and that it will forever defend such title against any and all such non-permitted claims and demands whatsoever.

The terms "Aircraft Documents" and "Security Interests" shall have the following meanings in this Bill of Sale as such terms relate to the Airframe:

Aircraft Documents means all records, logs, manuals, technical data, tags and other documents in respect of the specification, maintenance, modification and repair of the Airframe whether printed on paper or stored on any disk or electronic medium, and in the case of the latter includes any software not generally available to Purchaser and necessary to store and retrieve such data; and

**Security Interest** means any mortgage, charge (whether fixed or floating), pledge, lien, hypothecation, assignment, trust arrangement, or security interest of any kind or other agreement or arrangement having the effect of conferring security (including title transfer and/or retention arrangements having a similar effect).

This Bill of Sale is governed by, and shall be construed in accordance with, the laws of England.

IN WITNESS WHEREOF, Seller has caused this Bill of Sale to be duly executed as a deed and

delivered this <u>16</u> day of <u>January</u> 2019, while the Airframe was located at Kemble, UK , at <u>10:06 AM</u> local time.



EXECUTED as a DEED and DELIVERED for and on behalf of Etihad Airways PJSC by

#### ANDRON SISHER

being persons who, in accordance with the laws of its jurisdiction of incorporation, are duly authorized to execute this deed on its behalf



in the presence of Witness Signature: Witness Signature: Witness Name: DUVER WINDE Witness Occupation: HEAD FLEET PLOJECTS Witness Address: ETIHAD AIRWAYS, NEW AIRPORT RD. Foreign Seller KHALIFA CITY, ABU DHABI, UAE



#### Bill of Sale

By this Bill of Sale, SFTS EY-777 Airframes, LP (the "Seller") does hereby sell, grant and transfer to A J Walter Aviation Limited (the "Buyer") free and clear of any and all Security created by the Seller, in accordance with the terms of an Airframe Sale Agreement dated 7 September 2018 (the "Sale Agreement") and made between the Seller and the Buyer, all its rights, title and interest in and to:

1. one (1) Boeing 777-200LR airframe with manufacturer's serial number 36302;

- 2. all equipment, accessories and Parts belonging to, installed in or appurtenant to such airframe to the extent title thereto is vested in the Seller on the Delivery Date; and
- 3. the Technical Records,

(the "Airframe") whilst the Airframe is located at Kemble, United Kingdom at 2.07 pc (local hime)

The Airframe is sold "as is where is" to the Buyer for good and valuable consideration, receipt of which is hereby acknowledged by the Seller.

The Seller hereby warrants to the Buyer, its successors and assigns that the Seller has conveyed to the Buyer, subject to and in accordance with the provisions of the Sale Agreement, good marketable title to the Airframe free and clear of all Security and the Seller agrees with the Buyer and its successors and assigns that the Seller will warrant and defend such title forever against all claims and demands whatsoever.

Capitalised terms used but not defined herein shall have the meanings given to them in the Sale Agreement.

This Bill of Sale and any non-contractual obligations arising out of or in connection with it are governed by English law.

Dated the  $16^{11}$  day of January 2019

**IN WITNESS WHEREOF** SFTS EY-777 Airframes, LP by its duly authorised representative, executed this Bill of Sale.

Timothy D. A. O'Hara **Vice President** 

For and on behalf of

SFTS EY-777 Airframes, LP (by Shooting for the Stars VII, LLC, its general partner)