

Digitizing MRO documents



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Dr. Johannes Jörg, Opremic

5 October 2023, Hanoi



Virgin Australia Finds Undocumented Parts On 737-800s

James Pozzi September 18, 2023

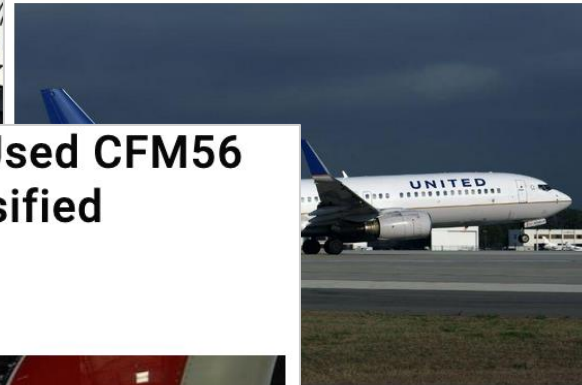


Two Virgin Australia
falsely certified.

Credit: Rob Finlayson

Two United Airlines 737NGs Found With Parts From AOG Technics

Christine Boynton September 19, 2023



CFM Warns Of Used CFM56 Blades With Falsified Records

May 29, 2015



Credit: Sean Broderick/AWST

Recurring challenges

- Falsely certified documents
- Forged documents
- Missing documents during an investigation

General challenges

1. Approving Civil Aviation Authority/Country: FAA/United States		2. AUTHORIZED RELEASE CERTIFICATE FAA Form 8130-3, AIRWORTHINESS APPROVAL TAG				3. Form Tracking Number: [unique alphanumeric sequence for tracking reference]	
4. Organization Name and Address: [DBA Name, Physical Street Address, (PAH certificate or Project Number, if applicable)]		5. Work Order/Contract/ Invoice Number: [work order # (# of attachments)]					
6. Item:	7. Description:	8. Part Number:	9. Quantity:	10. Serial Number:	11. Status/Work:		
[#] ex.002	[Descriptive product name] ex. "Actuator"	[Each part number or model designation]	[# of parts]	[14 CFR Required # or #'s] or (N/A)	[NEW, PROTOTYPE, REPAIRED or OVERHAULED]		
12. Remarks: [All information needed to certify airworthiness and cross-reference to each item listed in block 6] ex. Airworthiness Approval This [Acuator 002] is a subcomponent of an FAA PMA article. Learn more on pages 21-22 here: http://www.faa.gov/documentLibrary/media/Order/8130-216.pdf							
13a. Certifies the items identified above were manufactured in conformity to: <input checked="" type="checkbox"/> Approved design data and are in a condition for safe operation. <input type="checkbox"/> Non-approved design data specified in Block 12.			14a. <input type="checkbox"/> 14 CFR 43.9 Return to Service Certifies that unless otherwise in Block 11 and described in Title 14, Code of Federal Regulations, the items are approved for				
13b. Authorized Signature [Signature]		13c. Approval/Authorization No.: [FAA ASIF]		14b. Authorized Signature			
13d. Name (Typed or Printed): [Signer's Name]		13e. Date (dd/mm/yyyy): ex. 08/OCT/2020		14d. Name (Typed or Printed):			
User/Installer Responsibilities It is important to understand that the existence of this document alone does not automatically constitute authorization. Where the user/installer performs work in accordance with the national regulations of an airworthiness authority from the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority from the airworthiness authority of the country specified in Block 1. Statements in Blocks 13a and 14a do not constitute installation certification. In all cases, aircraft maintenance records issued in accordance with the applicable national regulations of the country of origin of the aircraft are required.							



- **Validation:** Usually relies on expert knowledge, however, expertise is dwindling:
 - Age
 - Occupation change (COVID-19)
- **Efficiency:** Time and space-consuming, manual process
- **Fraud:** Certain certification (e.g., B2B) is an incentive to tamper with records



freepik.com



Vision: Example Teardown / Lease back

TODAY



VISION

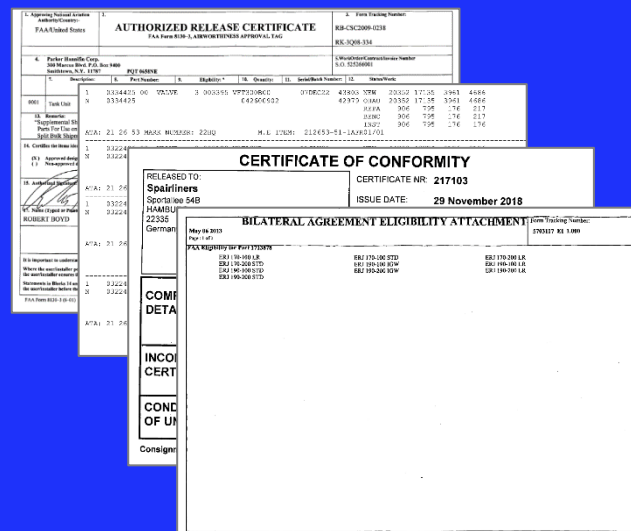


Teardown / Lease back

Paper documents



Digitized documents
(PDF)



Digitized information
(searchable data points)

Document details		
Main details		
Part number 2S7138	Serial number 0022	Part description VALVE CHECK APU BLEED
Status REPAIRED	Approving authority P. R. China	Certificate number F04900352
Date of issue 4 Jun 2014		
Additional details		
Airworthiness X	Form type Authorized Release Certificate / Airworthiness Approval Tag	Form tracking number LHT / CAAC/ A/ 14232755 00000002
Organization Lufthansa Technik AG Weg beim Jäger 193 22335 Hamburg Germany	Work order 15444326	Item of work order 01
Eligibility UNKNOWN	Quantity 1	Remarks ATA 3612 TP R MK-No. 10 Pack Code *A0 Resp. Workshop 32137030 Workshop Station HAM063
Time since new 33014	Cycles since new 3827	Operating days since new 2464
Time since overhaul 33014	Cycles since overhaul 3827	Operating days since overhaul 2464
Time since check 33014	Cycles since check 3827	Operating days since check 2464
Time since test 0	Cycles since test 0	Operating days since test 0

Categorization



AUTHORIZED RELEASE CERTIFICATE
 FAA Form 8130-1, AIRWORTHINESS APPROVAL TAG

CERTIFICATE OF CONFORMITY
 CERTIFICATE NR: 217103
 ISSUE DATE: 29 November 2018

BILATERAL AGREEMENT ELIGIBILITY ATTACHMENT
 May 16 2018

RELEASED TO: Spairliners
 Sportsline 54B
 HAMBURG
 22335
 Germany

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AUTHORIZED RELEASE CERTIFICATE
 FAA Form 8130-1, AIRWORTHINESS APPROVAL TAG

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Authorized release certificates



CERTIFICATE OF CONFORMITY
 CERTIFICATE NR: 217103
 ISSUE DATE: 29 November 2018
 ORDER NUMBER: 3000007321

RELEASED TO: Spairliners
 Sportsline 54B
 HAMBURG
 22335
 Germany

COMPONENT DETAILS
 Part Number: 020-240-002
 Description: P-18L QUANTITY PROBE
 Serial Number: 1085
 Batch Number: 340448

INCOMING CERTIFICATE
 Part Number Certificate (FAA Form 8130-1)
 Part Number: 020-240-002

CONDITION OF UNIT
 PNE: New
 T.S.G.: 0.0
 T.S.R.: 0.0
 T.S.L.: 0.0
 Life Type: T.S.M.

Shop reports



BILATERAL AGREEMENT ELIGIBILITY ATTACHMENT
 May 16 2018

FAA Form 8130-1, AIRWORTHINESS APPROVAL TAG

RELEASED TO: Spairliners
 Sportsline 54B
 HAMBURG
 22335
 Germany

Part lists



BILATERAL AGREEMENT ELIGIBILITY ATTACHMENT
 May 16 2018

FAA Form 8130-1, AIRWORTHINESS APPROVAL TAG


Other documents




Life-cycle analysis


- Interlink serial related documents
- Validate information
- View original documents


Part life-cycle information for P/N 2344H000-001 - S/N 0724
VALVE, BYPASS, HEAT EXCHANGE


2010-10-04 

ARC - EASA FORM 1 


Status: INSPECTED/TESTED Approving authority: Civil Aviation Authority UK


[Show ...](#) 


2011-05-12 

Shop report 


Click to show more information

[Show ...](#) 

2011-07-26 

ARC - EASA FORM 1 

Click to show more information

[Show ...](#) 

Digitized information

- **Cross-validate** and **infer** information from part catalogs or other databases
- Automatically **detect inconsistencies**
- Aggregate and evaluate **status** of documentation (e.g., completeness, quality)

Detect inconsistencies

- Improved based on the number of available documents
- Statistical analysis of capabilities
 - Frequency of tasks
 - Part scope
 - Anonymized individual capability
- Discrepancies in cycles or flight time for serials

Digitizing OCCM / HT lists

- **Challenge:** Tabular data is sent via an unusable format (e.g., PDF)
- **Objective:** Convert tabular data into machine-readable formats (e.g., CSV, XLSX)
- OCR detects fields and confidence
- Indication for potentially wrong fields

ALL MOTHER SHOPS DATE: 12JUN23 AIRCRAFT REGLEMENTARY INVENTORY : FGUGL M.E.: AF-A31/32 HOURS: 36268 CYCLES: 30366 PAGE: 47

LVL	RCN	POS	NOUN	T	ACTUAL	MANUFACT.	PART	INSTALL	TATI	ACCUMULATED				SPECS. VALUES				EP ID		
CDN	A.RCN			L	SERIAL	SERIAL		DATE	CATI	HOURS	CYCLE	DAYOP	DAYCA	S	HOURS	CYCLE	DAYOP	DAYCA	STATUS	
1	0851522	MID	STRIKE	3	003365	AR4714-11		16JUL11	12599	NEW	56670	37424	8896	9017	R					
Y	0851522					H-D6482			9839	OHAU	56670	37424	8896	9017						75000
										REPA	23669	20527	4371	4456						
										BENC	23669	20527	4371	4456						
										INST	23669	20527	4371	4371						
ATA: 52 51 01 MARK NUMBER: 31MQ M.E ITEM: 252035-51-1AFR01																				
1	0318504	LH	ELEV LH	3	003004	D5528000300000		07SEP15	21177	NEW	43070	32614	7057	7872	R					
Y	0318504					CG1430LH			17534	OHAU	15091	12832	2857	3380						60000 48000
										REPA	15091	12832	2857	3380						
										BENC	15091	12832	2857	3380						
										INST	15091	12832	2857	2857						
ATA: 55 20 01 MARK NUMBER: M.E ITEM: 20-55-0045-1/01																				
1	0380149	1	ENGINE	3	<< NO UNIT INSTALLED >>															
N																				
ATA: 72 00 01 MARK NUMBER: 1000EM1 M.E ITEM: 720000-51-1AFR02 720000-52-1AFR02																				
2	0325506	1	EXCH IDG	3	<< NO UNIT INSTALLED >>															
Y																				
ATA: 24 21 52 MARK NUMBER: M.E ITEM: 242100-05-1 242100-05-1/02																				
** UNFILLED POSITION ON WHICH A SPEC MAY EXIST **																				

ATA	POSITION	DESCRIPTION	P/N	S/N	MANUFACTURED	INSTALLED	TSN	CSN	REQUIREMENT	INTERVAL	TO GO	EXPECTED
21-26	15HQ	VALVE-SKIN AIR	VFT210B00	3132	27.Oct.1999	17.Aug.2013	49852	35983	MPD - RESTORATION	18000 H	1226 H	06.Feb.2021
21-26	22HQ	VALVE-SKIN AIR	VFT300B00	2396	25.Oct.2000	04.May.2015	48613	31227	MPD - RESTORATION	18000 H	5113 H	17.Jun.2022
21-31	6HL	VALVE-SAFETY	9024-15704-2	0172426	06.Mar.2004	31.Mar.2016	39864	27951	MPD - RESTORATION	6387 D	342 D	31.Aug.2021
21-31	6HL	VALVE-SAFETY	9024-15704-2	0172426	06.Mar.2004	31.Mar.2016	39864	27951	MPD - RESTORATION	50000 H	10134 H	19.Mar.2024
21-31	7HL	VALVE-SAFETY	9024-15704-2	0172436	04.Mar.2004	31.Mar.2016	39933	28232	MPD - RESTORATION	6387 D	340 D	29.Aug.2021
21-31	7HL	VALVE-SAFETY	9024-15704-2	0172436	04.Mar.2004	31.Mar.2016	39933	28232	MPD - RESTORATION	50000 H	10065 H	10.Mar.2024
21-52	10HM2	CONDENSER	756A0000-06	0756A00ES007139	01.Sep.2006	23.Apr.2018	36222	18987	MPD - FUNCTIONAL CHECK	18000 H	12559 H	22.Jan.2025
21-52	10HM3	REHEATER	755A0000-04	00256	01.Dec.1988	02.May.2019	17488	10121	MPD - FUNCTIONAL CHECK	12000 H	9361 H	11.Dec.2023
21-52	10HM3	REHEATER	755A0000-04	00256	01.Dec.1988	02.May.2019	17488	10121	MPD - FUNCTIONAL CHECK	12000 H	9361 H	11.Dec.2023
21-52	10HM6	EXCHANGER-HEAT,PRIMARY	753C0000-02	81211-52891	01.Dec.2010	02.May.2019	22918	16842	MPD - FUNCTIONAL CHECK	12000 H	9361 H	11.Dec.2023
21-52	10HM7	EXCHANGER-HEAT,MAIN	754C0000-01	81212-50906	17.May.2006	23.Apr.2018	36809	24552	MPD - FUNCTIONAL CHECK	12000 H	6559 H	18.Dec.2022
21-52	11HM2	CONDENSER	756A0000-06	841210-51202	01.Dec.2012	07.May.2019	19603	13121	MPD - FUNCTIONAL CHECK	18000 H	15361 H	15.Jan.2026
21-52	11HM3	REHEATER	755C0000-01	04624	01.Dec.2011	07.May.2019	11261	6574	MPD - FUNCTIONAL CHECK	12000 H	9361 H	11.Dec.2023
21-52	11HM6	EXCHANGER-HEAT,PRIMARY	753C0000-01	03397	01.Sep.1998	02.May.2019	43665	29734	MPD - FUNCTIONAL CHECK	12000 H	9361 H	11.Dec.2023



Outlook: New certificates

- Create new documentation digitally
- Only for authenticated users
- Digital signing via QES (Qualified electronic signature)



1. Approving Civil Aviation Authority/Country: FAA/United States		2. AUTHORIZED RELEASE CERTIFICATE FAA Form 8130-3, AIRWORTHINESS APPROVAL TAG				3. Form Tracking Number: <small>(unique alphanumeric sequence for tracking reference)</small>	
4. Organization Name and Address: <small>(DBA Name, Physical Street Address, (PAH certificate or Project Number, if applicable))</small>				5. Work Order/Contract/ Invoice Number: <small>(work order # [if of attachments])</small>			
6. Item	7. Description:	8. Part Number:	9. Quantity	10. Serial Number	11. Status/Work		
<small>[F] ex.002</small>	<small>(Descriptive product name) ex. 'Actuator'</small>	<small>(Each part number or model designation)</small>	<small>(# of parts)</small>	<small>(14 CFR Required # or #'s) or (N/A)</small>	<small>(NEW, PROTOTYPE, REPAIRED or OVERHAULED)</small>		
12. Remarks: <small>(All information needed to certify airworthiness and cross-reference to each time listed in block 6)</small> ex. Airworthiness Approval This [Actuator 002] is a subcomponent of an FAA PMA article. <small>Learn more on pages 21-22 here: http://www.faa.gov/documentLibrary/media/Order/8130-210.pdf</small>							
13a. Certifies the items identified above were manufactured in conformity to: <input checked="" type="checkbox"/> Approved design data and are in a condition for safe operation. <input type="checkbox"/> Non-approved design data specified in Block 12.				14a. <input type="checkbox"/> 14 CFR 43.9 Return to Service <input type="checkbox"/> Other regulations specified in Block 12 Certifies that unless otherwise specified in Block 12, the work identified in Block 11 and described in Block 12 was accomplished in accordance with Title 14, Code of Federal Regulations, part 43 and in respect to that work, the items are approved for return to service.			
13b. Authorized Signature <small>(Signature)</small>		13c. Approval/Authorization No.: <small>(FAA ASIF)</small>		14b. Authorized Signature		14c. Approval/Authorization No.:	
13d. Name (Typed or Printed): <small>(Signer's Name)</small>		13e. Date (dd/mm/yyyy): <small>ex. 08/OCT/2020</small>		14d. Name (Typed or Printed):		14e. Date (dd/mm/yyyy):	
User/Installer Responsibilities							
It is important to understand that the existence of this document alone does not automatically constitute authority to install the aircraft engine/propeller/article . Where the user/installer performs work in accordance with the national regulations of an airworthiness authority different than the airworthiness authority of the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts aircraft engine(s)/propeller(s)/article(s) from the airworthiness authority of the country specified in Block 1.							
Statements 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 may be flown.							
FAA Form 8130-3 (02-140)						NSN: 0052-00-012-9005	



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- ✓ **Validate** documents and increase **trust**
- ✓ Get rid of **paperwork and manual labor**



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