Group Captain Adrian Morrison
&
Mrs Laura Morrison

Cordially invite you

to

Adrian's Valedictory Dinner from RAAF

to be held at

Ipswich International Hotel
43 South Street (Cnr Foote Lane)
Ipswich City

on

Friday 30 November 2007

commencing at 1800 for 1900

(Cost of the Dinner is ***$45.00****)*

RSVP:
13 Nov 07
(07) 546 78001
Karren Steadman
e-mail:karren.steadman@defence.gov.au

Dress:
Air Force: "Red Sea Rig"
Smart Casual for Gentlemen
After Five for Ladies

Meal: Hors d'oeuvres and a 2 course meal will be served. Please advise if you have any special dietary requirements upon RSVP.

Reservations: RSVP and payment due by COB Tuesday 13 November 2007.

RSVP options:

Email:
karren.steadman@defence.gov.au

Post:
Karren Steadman
PA, SRSPO
Bld 861
RAAF Base Amberley QLD 4306

Payment: Preferred method-
Payment to be made directly into Defcredit Account:

From Defcredit account:
Member number: 3859031
Account number: 20749212
Reference information: Your Surname and Initial

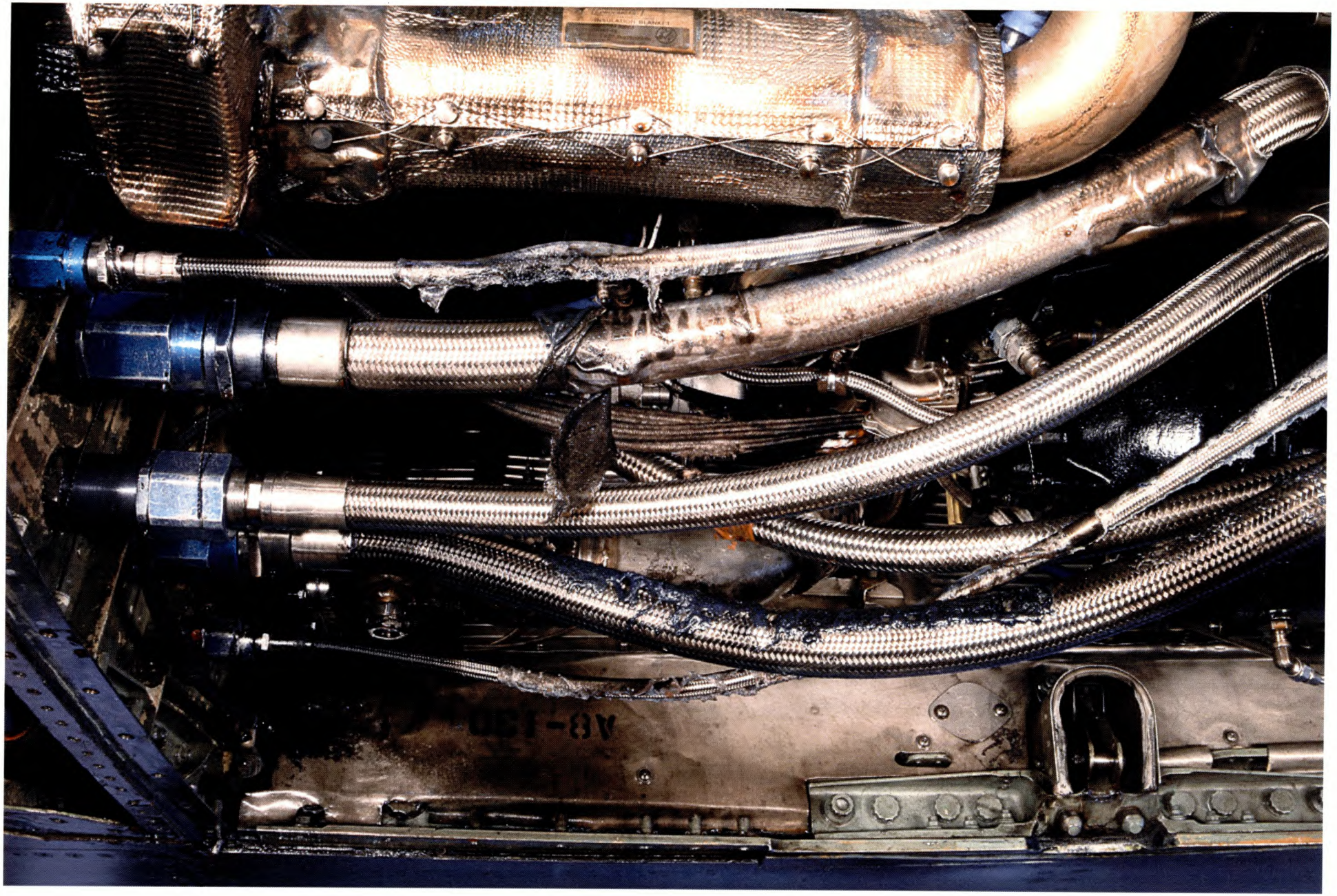
From another bank:
BSB: 803205
Account number: 3859031
Account name: Heidi Maher
Account Description: GPCAPT Morrison Dinner
Reference information: Your Surname and Initial

If this method is not possible payment by cheque to "Heidi Maher-GPCAPT Morrison Dinner" is accepted. Please post to: Karren Steadman (postal details outlined above). Please advise if you require a receipt.

Accommodation: Accommodation can be arranged at the Ipswich International Hotel. Single/Double/Twin Rooms @ $150 per room per night. Please contact the hotel direct on 07 3812 8077. For further accommodation options you may wish to contact the Ipswich Visitor Information Centre on 07 3281 0555.

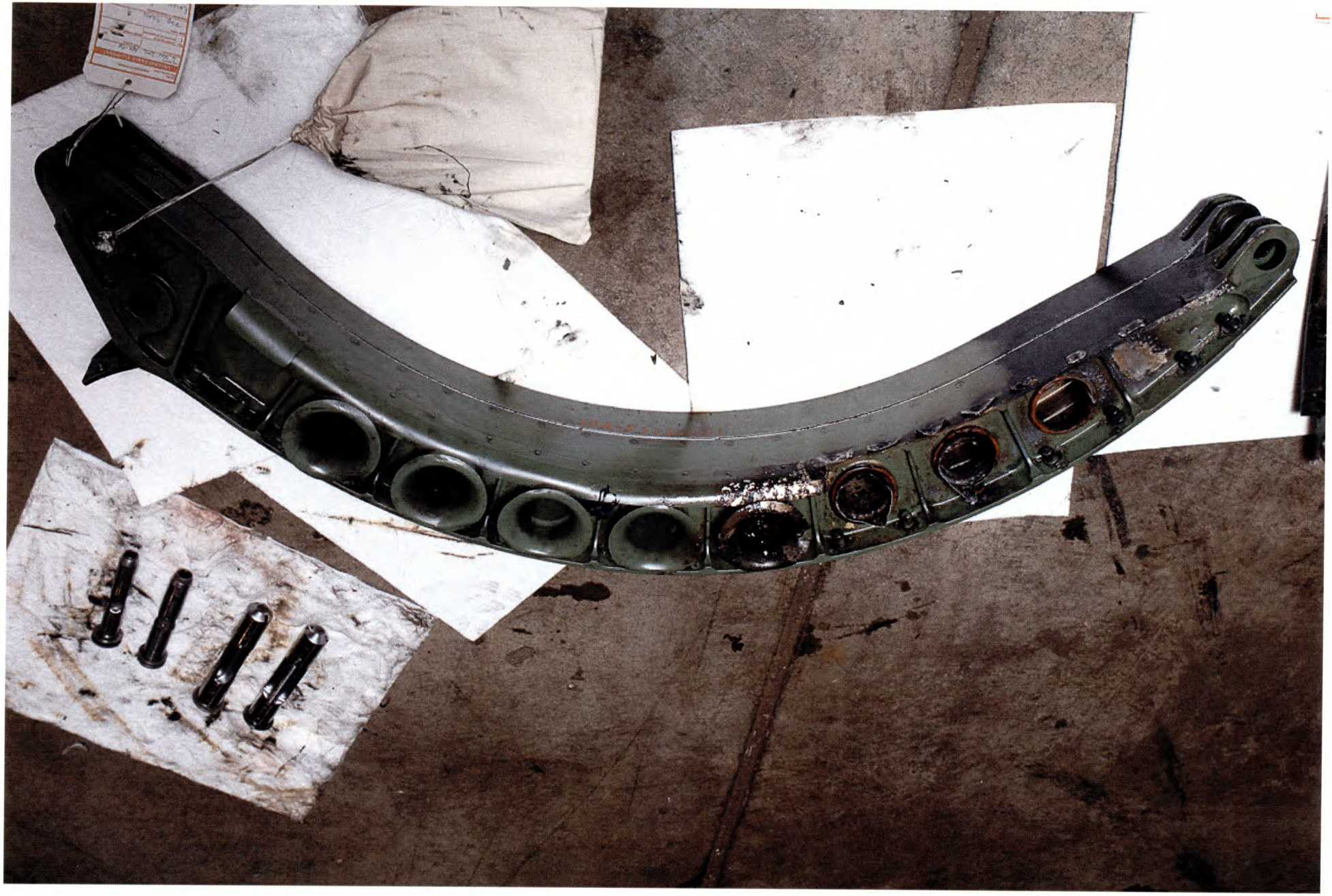
Queries: Please contact Karren Steadman on 07 5467 8001 or Heidi Maher, XO SRSPO, on 07 5467 8101

A8-130 – On-board Fire & Primary Hydraulic System Failure



A8-130 – LH Engine Bay

A8-130 – LH Engine – Chaffing between Generator DC Cable and Primary Hydraulic Pump Pressure Line



A8-130 – LH 770 Frame

A8-130 – LH Chaff Bucket Area

Received Copy	UNCLASSIFIED

PRECEDENCE ACTION	PRECEDENCE INFO	DATE TIME GROUP	ORIG NO
ROUTINE	ROUTINE	050537Z OCT 07	
SICS			
KQL			

FOLIO
Lifeline 058911
SRSPO / -2007
Entered By: DB

FROM: DFS-ADF-DAHRTS
TO: 82WG
DEFAIR DDAAFS
HQACG
INFO: 1SQN
6SQN
ACPA-ADF
? BOEING AMBERLEY
CSUAMB
DGTA DAIRMAINT
HQACAUST
SRSPO

RECEIVED
08 OCT 2007
SRSPO

SRSPO FOR CENGR
FOR DISSEMINATION AS APPROPRIATE TO BOEING CMS
CSUAMB FOR BFSO/BOPSO

SUBJ:AVIATION SAFETY OCCURRENCE REPORT: 6SQN-075-2007

REFERENCES:
A. AAP 7214.010-6-1M

1. SERIOUS INCIDENT

2. MATERIEL/ENGINE/ENGINE FIRE AND HYDRAULIC FAILURE

3. 01 1530 LOCAL OCT 07

4. LOCATION: OTHER - PLEASE SPECIFY/YCCA/290/35

5. ENVIRONMENTAL CONDITIONS: DAY/VMC/N/A
WEATHER: SMOKE HAZE

6. AIRCRAFT DETAILS:
F-111/A08C/130/SONIC 1
SPEED: 500 TO 600 KIAS
ALTITUDE: GREATER THAN 2000 FEET AMSL
FLT PATH: CLEAR
FLT PHASE: DESCENT
LAST DEPARTURE POINT: YAMB
INTENDED LANDING POINT: YAMB
MISSION: TRAINING/AP13P - OPCON DAY APPLIED PHASE

DRAFTER'S NAME AND TITLE	OPERATOR	PHONE No		REF FILE No
RELEASER'S NAME AND TITLE	BRANCH/UNIT	SIGNATURE		
DATE		No OF PAGES	PAGE No	OVERPAGE
8/10/2007		4	1	Yes

Received Copy	UNCLASSIFIED

PRECEDENCE ACTION	PRECEDENCE INFO	DATE TIME GROUP	ORIG NO
ROUTINE	ROUTINE	050537Z OCT 07	
SICS			
KQL			

NVD AIDED: NO
EXTERNAL NVG LIGHTING: OFF
NVG SEARCH LIGHTS: OFF
STROBE/ANTI COLL LIGHTS: ON
LNDG LIGHTS: OFF
NAV LIGHTS: ON
HELMET MOUNTED DEVICE: NO

7. PERSONNEL DETAILS:
AC/####/QFI-B/AUTHOFF:NO/AC563 REPORT:NO/
SP/####/U/AUTHOFF:NO/AC563 REPORT:NO/

8. HAZARD NARRATIVE:
THE INCIDENT MISSION WAS A DAY PAIRS OPCON STRIKE WITH THE PILOT UNDER TRAINING AND A QFI IN SONIC 1, AND A QFI AND ACO IN SONIC 2. ESTABLISHED AS LEAD WITH SONIC 2 IN 8NM TRAIL, SONIC 1 WAS AT MACH 0.9 IN A TERRAIN FOLLOWING RADAR (TFR) DESCENT THROUGH 5000 FT WHEN A TFR FLYUP OCCURRED. WHILST MANAGING THE SYSTEM FAILURE, THE L ENG FIRE LIGHT STARTED FLASHING FOLLOWED SHORTLY AFTER BY THE ILLUMINATION OF THE L BLEED DUCT FAIL WARNING LAMP. TFR OPS WERE DISCONTINUED, THE BOLDFACE ACTIONS COMPLETED AND SONIC 2 ADVISED IMMEDIATELY WITH A REQUEST FOR A VISUAL INSPECTION.

THE AIRCRAFT WAS TURNED TOWARD OAKEY AS THE CLOSEST SUITABLE AIRFIELD WHILE THE ENG FIRE LIGHT REMAINED LIT BUT NOT FLASHING. DURING THE TURN THE L AND R PRI HYD CAUTION LAMPS ILLUMINATED WITH SYTEM PRESSURE INDICATING ZERO. ADDITIONALLY, RUDDER AUTH, PITCH, ROLL AND YAW CHANNEL LAMPS ILLUMINATED COMMENSURATE WITH THE HYDRAULIC FAILURE. A MAYDAY WAS DECLARED WITH ATC AND INTENTIONS PASSED FOR A LANDING AT OAKEY. THE ENG FIRE INFLIGHT CHECKLIST WAS COMPLETED WITH SONIC 2 ADVISING NO SIGN OF FIRE BUT WITH TRAILING WHITE SMOKE. THE FIRE LIGHTS WERE TESTED FOR CORRECT OPERATION HOWEVER THE L ENG FIRE LIGHT DID NOT FLASH BUT REMAINED STEADILY LIT AND CONTINUED TO REMAIN LIT UNTIL AIRCRAFT SHUTDOWN AT AMB.

THE LOSS OF THE PRI HYD SYSTEM RESULTED IN NO NOSE WHEEL STEERING (NWS) CAPABILITY FOR LANDING AND ONLY RESIDUAL ACCUMULATOR BRAKE PRESSURE AVAILABLE TO STOP THE AIRCRAFT ON OAKEY'S 5400FT RUNWAY. WITH THE CHECKLIST RECOMMENDATION FOR A CABLE ENGAGEMENT ON LANDING WITH A HYD FAILURE, AIRCRAFT FUEL LOAD AT 23000LBS PLUS STORES AND NO MEANS TO REDUCE THIS FOLLOWING THE FIRE A DECISION WAS MADE TO TRACK FOR AMB INSTEAD (A FURTHER 40NM). THIS DECISION WAS PASSED TO SONIC 2 AND ATC UPDATED FOR AMENDED CLEARANCES AT 6000 TO 7000. WITH SONIC 2 IN CLOSE COMBAT A CHECK OF AB OPERATION ON THE GOOD ENGINE

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RELEASER'S NAME AND TITLE	BRANCH/UNIT	SIGNATURE		
DATE		No OF PAGES	PAGE No	OVERPAGE
8/10/2007		4	2	Yes

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PRECEDENCE ACTION	PRECEDENCE INFO	DATE TIME GROUP	ORIG NO
ROUTINE	ROUTINE	050537Z OCT 07	
SICS			
KQL			

WAS PERFORMED TO ENSURE ADEQUATE THRUST FOR CONFIGURED FLIGHT AND POSSIBLE OVERSHOOT WITH NO SIGN OF EXTERNAL FIRE OR ADVERSE INDICATIONS IN THE COCKPIT.

CONSIDERATIONS FOR A PRI HYD FAILURE LANDING WERE REVIEWED WITH THE DECISION TO RUN THE PRI HYD FAIL LANDING CHECKLIST FOLLOWED BY THE SINGLE ENG LANDING CHECKLIST AND THE CABLE ENGAGEMENT CHECKLIST. THESE CHECKLISTS WERE PERFORMED INSIDE 30NM AMB WHILST TRACKING FOR DOWNWIND. WITH ONLY ONE HYDRAULIC PUMP PROVIDING PRESSURE TO THE FLIGHT CONTROLS, THE DECISION WAS MADE TO USE FULL FLAP DESPITE THE HEAVIER WEIGHT TO PROVIDE GREATER DRAG AND THEREFORE HIGHER ENGINE RPM ON FINAL. AB WAS AVAILABLE ON THE RIGHT ENGINE PROVIDING SOME OVERSHOOT POTENTIAL. SONIC 2 WAS CLEARED OFF TO LAND AHEAD ONCE SONIC 1 HAD SUCCESSFULLY CONFIGURED FOR LANDING.

WHILST ON DESCENT ON DOWNWIND PASSING 5000FT THE PILOT UNDER TRAINING, WHO HAD BEEN FLYING TO THIS POINT, HIGHLIGHTED THAT THERE WAS SOME ADVERSE CONTROL FORCE REQUIRED TO MAINTAIN WINGS LEVEL. THIS WAS NOTED AT 170KIAS. THE QFI TOOK OVER AND NOTED A HORIZONTAL STABILISER SPLIT OF 10 TO 12 DEGREES WITH SOME FORCE REQUIRED. SATISFIED WITH THE CONTROLLABILITY THE DECISION WAS MADE TO CONTINUE FOR AN APPROACH WITH AN AWARENESS OF BOTH THE CONTROL FORCE REQUIRED FOR WINGS LEVEL AND THE REDUCED AVAILABLE HYDRAULIC SYSTEM PERFORMANCE. THE AIRCRAFT WAS LANDED VIA A CABLE ENGAGEMENT WITH THE CREW EGRESSING IMMEDIATELY. ATC CANCELLED THE MAYDAY FOLLOWING THE CREW EXITING THE AIRCRAFT.

9. INVESTIGATION: INVESTIGATION NOT APPROVED - SASOR TO FOLLOW.

10. AVIATION RISK MANAGEMENT: INVESTIGATION NOT APPROVED - SASOR TO FOLLOW.

11. ACTIONS AND RECOMMENDATIONS: INVESTIGATION NOT APPROVED - SASOR TO FOLLOW.

12. AIRCRAFT DAMAGE OR COMPONENT CHANGES: INVESTIGATION NOT APPROVED - SASOR TO FOLLOW.

13. RELATED CORRESPONDENCE:

14. SUPERVISOR REVIEW:
MAINTENANCE

DRAFTER'S NAME AND TITLE	OPERATOR	PHONE No		REF FILE No
RELEASER'S NAME AND TITLE	BRANCH/UNIT	SIGNATURE		
DATE		No OF PAGES	PAGE No	OVERPAGE
8/10/2007		4	3	Yes

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ROUTINE	ROUTINE	050537Z OCT 07	
SICS			
KQL			

FROM THE INITIAL INVESTIGATION THER CAUSE OF THE INCIDENT WAS THE RESULT OF CHAFFING THE PRIMARY HYDRAULIC LINE AND THE AC POWER LINE, WHICH RESULTED LEAD TO AN ENGINE FIRE. ONGOING INVESTIGATION IS BEING CONDUCTED.

15. CO/OC REVIEW:
NIL

16. SASOR TO FOLLOW

DISTRIBUTION
ACTION: [82WG] REGISTRY
DIST: [82WG] REGISTRY
[1SQN] REGISTRY
[6SQN] REGISTRY
[DS-AMB] REGISTRY
[SRSPO] REGISTRY (5)

DRAFTER'S NAME AND TITLE	OPERATOR	PHONE No		REF FILE No
RELEASER'S NAME AND TITLE	BRANCH/UNIT	SIGNATURE		
DATE		No OF PAGES	PAGE No	OVERPAGE
8/10/2007		4	4	No

SRSPO Form SR0193
AL update - Issued Nov 2006

TECHNICAL DOCUMENTATION ROUTING FORM

ASOR (Now including MASOR & MIR)	SASOR	STI (F-111 & External)	DEFECT	DIR	RODUM	ADR	MDR	MDIR	OTHER
	✓								

DOCUMENT No. 6SQN/075P7/SASOR1 (A8-130)

SRSPO APPLICABLE ☐ AVBU APPLICABLE ☐

SRSPO ACTIONABLE ☐ EWKBU APPLICABLE ☐

WSBU APPLICABLE ☐

LIFELINE No. 00297/2008

SCAN THIS FORM TO LL ☐

- All Technical Reports listed above are registered and scanned to Lifeline.
- ASORs and STIs are managed and archived by SRSPO CM. They are registered and scanned to Lifeline.

APPOINTMENT, INITIAL and DATE		COMMENTS (where appropriate)
CENGR	MJ 1 Feb 08	MSN MGR - please ensure closure of SRSPO actions.
DENGR	12/2/08	Noted
ASM	1 FEB 08	Greg, let me know if you need further info.
MSN MGR.	7/2/08	SRSPO RESPONSES TO ASOR RECOMMENDATIONS 1 THRU 4 ENTERED. THEY WILL PROBABLY BE RELEASED AS SASOR2
LMU IPT AF	AM AV WSBL 19 FEB 08	THE PROBLEM WAS INDUCED BY MAINTENANCE AND SHOULD HAVE BEEN CORRECTED THEN (SERVICING, COMPONENT OR ENGINE RI, FOD CHECKS, ZONALS ETC). THIS IS NOT A FLIGHT SERVICING OVERSIGHT. THE ROOT CAUSE HAS NOT BEEN ADDRESSED!
AV.	AVBU 03 MAR 08 AVBU MGR	Immediate action of the STI Released by Boeing following incident rebastlined all assy engines and installed and inspected blades and TALE. The exercise highlighted that the repair and manufacture of the electrical cables was the responsibility of the SQNs. this is an AMO issue and should address accordingly.
EN.	22 FEB	I also do not believe that deliberate recording of the AFoBF procedures will prevent future oversights during inspections across many other areas where electrical & hydraulic lines are situated. this is a general Practice failure which was exacerbated by poor configuration control by many AMOs including Boeing, TALE, ISQN and 6SQN
CM		PLEASE RETURN ALL Routing Slips and Reports to SRSPO EMU for archiving

SRSPO Procedure 4-1-5 (Technical Documentation Management (Lifeline))

PLEASE PASS RAPIDLY

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PRECEDENCE ACTION	PRECEDENCE INFO	DATE TIME GROUP	ORIG NO
ROUTINE	ROUTINE	220333Z JAN 08	FOLIO
SICS			Liteline 00297/ SRSPO / 2008
KQL			Entered By: DB

FROM: DFS-ADF-DAHRTS
TO: 82WG
DEFAIR DDAAFS
HQACG
INFO: 1SQN
ACPA-ADF
? CSUAMB
DGTA DAIRMAINT
HQACAUST
SRSPO

RECEIVED
22 JAN 2008
SRSPO

SRSPO FOR CENGR
CSUAMB FOR BFSO/BOPSO

SUBJ:AVIATION SAFETY OCCURRENCE REPORT: 6SQN-075-2007/SASOR-1

REFERENCES:
A. AAP 7214.010-6-1M
B. ACG SI(LOG) 2-7-6

1. SERIOUS INCIDENT

2. MATERIEL/ENGINE/ENGINE FIRE AND HYDRAULIC FAILURE

3. 01 1530 LOCAL OCT 07

4. LOCATION: OTHER - PLEASE SPECIFY/YCCA/290/35

5. ENVIRONMENTAL CONDITIONS: DAY/VMC/N/A
WEATHER: SMOKE HAZE

6. AIRCRAFT DETAILS:
F-111/A08C/130/SONIC 1
SPEED: 500 TO 600 KIAS
ALTITUDE: GREATER THAN 2000 FEET AMSL
FLT PATH: CLEAR
FLT PHASE: DESCENT
LAST DEPARTURE POINT: YAMB
INTENDED LANDING POINT: YAMB
MISSION: TRAINING/AP13P - OPCON DAY APPLIED PHASE
NVD AIDED: NO
EXTERNAL NVG LIGHTING: OFF
NVG SEARCH LIGHTS: OFF

DRAFTER'S NAME AND TITLE	OPERATOR	PHONE No	REF FILE No
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DATE		No OF PAGES	PAGE No	OVERPAGE
22/1/2008		11	1	Yes

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ROUTINE	ROUTINE	220333Z JAN 08	
SICS			
KQL			

STROBE/ANTI COLL LIGHTS: ON
LNDG LIGHTS: OFF
NAV LIGHTS: ON
HELMET MOUNTED DEVICE: NO

7. PERSONNEL DETAILS:
AC/####/QFI-B/AUTHOFF:NO/AC563 REPORT:NO/
SP/####/U/AUTHOFF:NO/AC563 REPORT:NO/

8. HAZARD NARRATIVE:
THE INCIDENT MISSION WAS A DAY PAIRS OPCON STRIKE WITH THE PILOT UNDER TRAINING AND A QFI IN SONIC 1, AND A QFI AND ACO IN SONIC 2. ESTABLISHED AS LEAD WITH SONIC 2 IN 8NM TRAIL, SONIC 1 WAS AT MACH 0.9 IN A TERRAIN FOLLOWING RADAR (TFR) DESCENT THROUGH 5000 FT WHEN A TFR FLYUP OCCURRED. WHILST MANAGING THE SYSTEM FAILURE, THE L ENG FIRE LIGHT STARTED FLASHING FOLLOWED SHORTLY AFTER BY THE ILLUMINATION OF THE L BLEED DUCT FAIL WARNING LAMP. TFR OPS WERE DISCONTINUED, THE BOLDFACE ACTIONS COMPLETED AND SONIC 2 ADVISED IMMEDIATELY WITH A REQUEST FOR A VISUAL INSPECTION.

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RELEASER'S NAME AND TITLE	BRANCH/UNIT	SIGNATURE	

DATE		No OF PAGES	PAGE No	OVERPAGE
22/1/2008		11	2	Yes

Received Copy	UNCLASSIFIED		
PRECEDENCE ACTION ROUTINE	PRECEDENCE INFO ROUTINE	DATE TIME GROUP 220333Z JAN 08	ORIG NO
SICS KQL			

CONSIDERATIONS FOR A PRI HYD FAILURE LANDING WERE REVIEWED WITH THE DECISION TO RUN THE PRI HYD FAIL LANDING CHECKLIST FOLLOWED BY THE SINGLE ENG LANDING CHECKLIST AND THE CABLE ENGAGEMENT CHECKLIST. THESE CHECKLISTS WERE PERFORMED INSIDE 30NM AMB WHILST TRACKING FOR DOWNWIND. WITH ONLY ONE HYDRAULIC PUMP PROVIDING PRESSURE TO THE FLIGHT CONTROLS, THE DECISION WAS MADE TO USE FULL FLAP DESPITE THE HEAVIER WEIGHT TO PROVIDE GREATER DRAG AND THEREFORE HIGHER ENGINE RPM ON FINAL. AB WAS AVAILABLE ON THE RIGHT ENGINE PROVIDING SOME OVERSHOOT POTENTIAL. SONIC 2 WAS CLEARED OFF TO LAND AHEAD ONCE SONIC 1 HAD SUCCESSFULLY CONFIGURED FOR LANDING.

WHILST ON DESCENT ON DOWNWIND PASSING 5000FT THE PILOT UNDER TRAINING, WHO HAD BEEN FLYING TO THIS POINT, HIGHLIGHTED THAT THERE WAS SOME ADVERSE CONTROL FORCE REQUIRED TO MAINTAIN WINGS LEVEL. THIS WAS NOTED AT 170KIAS. THE QFI TOOK OVER AND NOTED A HORIZONTAL STABILISER SPLIT OF 10 TO 12 DEGREES WITH SOME FORCE REQUIRED. SATISFIED WITH THE CONTROLLABILITY THE DECISION WAS MADE TO CONTINUE FOR AN APPROACH WITH AN AWARENESS OF BOTH THE CONTROL FORCE REQUIRED FOR WINGS LEVEL AND THE REDUCED AVAILABLE HYDRAULIC SYSTEM PERFORMANCE. THE AIRCRAFT WAS LANDED VIA A CABLE ENGAGEMENT WITH THE CREW EGRESSING IMMEDIATELY. ATC CANCELLED THE MAYDAY FOLLOWING THE CREW EXITING THE AIRCRAFT.

9. INVESTIGATION:
A. ANALYSIS:
6SQN
01: AIRCREW ACTIONS
THE AIRCREW COMPLETED THE CHECKLISTS FOR ENGINE FIRE IN FLIGHT, SINGLE ENGINE LANDING AND HYDRAULIC FAILURE LANDING. THE CREW DID NOT CONTACT SQUADRON OPERATIONS, HOWEVER AN AIRCREW MEMBER WAS AVAILABLE AT OPS IF REQUIRED AND HAD CONSULTED THE FLIGHT MANUAL FOR THE RELEVANT EMERGENCIES. THE EMERGENCY CREW PRIORITISED COMMUNICATION WITH THE WINGMAN OVER ATTEMPTING TO TALK TO OPS AND WERE HAPPY WITH THE GUIDANCE GIVEN BY THE CHECKLIST.
6SQN
02: STRIP CLEARANCE
ON ARRIVAL TO AMBERLEY, AIRCRAFT A08-130 WAS SAFED BY THE 6SQN STRIP CLEARANCE CREW. A PRELIMINARY VISUAL INSPECTION OF THE AIRCRAFT SHOWED NO FIRE. AS SUCH, THE AIRCRAFT WAS TOWED TO 6SQN LINES.
6SQN
03: PRELIMINARY INVESTIGATION
THE AIRCRAFT WAS IMMEDIATELY QUARANTINED FOR ASOR INVESTIGATION.

DRAFTER'S NAME AND TITLE	OPERATOR	PHONE No		REF FILE No
RELEASER'S NAME AND TITLE	BRANCH/UNIT	SIGNATURE		
DATE 22/1/2008		No OF PAGES 11	PAGE No 3	OVERPAGE Yes

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PRECEDENCE ACTION ROUTINE	PRECEDENCE INFO ROUTINE	DATE TIME GROUP 220333Z JAN 08	ORIG NO
SICS KQL			

ON REQUEST FROM THE ASOR I/C, 6SQN MAINTENANCE PERSONNEL REMOVED THE LH ENGINE BAY DOOR AND INSPECTED FOR DAMAGE. SIGNIFICANT FIRE DAMAGE WAS EVIDENT FROM THE FIREWALL AFT ALONG THE OUTBOARD SIDE OF THE ENGINE. IN PARTICULAR, FIRE DAMAGE WAS EVIDENT AROUND THE HYDRAULIC PUMPS, ENGINE STARTER MOTOR AND TO HYDRAULIC/ELECTRICAL LINES IN THE AREA.

INSPECTION OF THE LH SPEED BUMP AREA SHOWED SIGNIFICANT SIGNS OF FIRE DAMAGE, IN CLOSE VICINITY TO THE CHAFF AND FLARE INSTALLATION AREAS.

A SMALL HOLE WAS FOUND ON THE LH PRIMARY HYDRAULIC PUMP LINE APPROXIMATELY 30CM AFT OF THE FIREWALL. AN AC POWER LINE IN CLOSE VICINITY TO THE SMALL HOLE SHOWED EXCESSIVE SIGNS OF WEAR.
6SQN
04: FURTHER INVESTIGATION
HYDRAULIC LINE
INSPECTION OF THE HYDRAULIC LINE WITH THE SMALL HOLE REVEALED THAT "BI-SEAL" TAPE HAD BEEN USED TO WRAP PREVIOUS DAMAGE TO THE LINE IN THE SAME AREA. AS SUCH, IT IS POSSIBLE THAT THE SMALL HOLE DEVELOPED THROUGH THE SAME POINT WHERE PREVIOUS DAMAGE EXISTED. DAMAGE CONSISTENT WITH ELECTRICAL BURNING WAS EVIDENT AT THE SITE OF THE HOLE.

AC POWER LINE
VISUAL INSPECTION OF THE AC POWER LINE SHOWED THE INTERNAL WIRES WERE BARE AND CHAFFING DAMAGE.

FORWARD OF FIREWALL
INSPECTION OF THE BLEED AIR DUCTS AND HYDRAULIC SYSTEM FORWARD OF THE FIREWALL WAS CARRIED OUT. NO FAILURE WAS EVIDENT IN THIS AREA.

AFT END OF ENGINE
INSPECTION AT THE AFT END OF THE ENGINE REVEALED SIGNIFICANT DAMAGE TO THE ENGINE AIR/OIL COOLER (RESULTING IN EXCESSIVE ENGINE OIL LEAKAGE). FIRE DAMAGE WAS ALSO EVIDENT ON THE LH SPEED BUMP AREA.

FAILURE MODES
IT IS LIKELY THAT THE FAILURE IS A FUNCTION OF TWO FAULTS. THE FIRST BEING EXCESSIVE CHAFFING TO BOTH THE HYDRAULIC LINE AND THE AC POWER LINE. THE SECOND BEING ELECTRICAL ARCING BETWEEN THE TWO LINES.

FAILURE SEQUENCE

DRAFTER'S NAME AND TITLE	OPERATOR	PHONE No		REF FILE No
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DATE 22/1/2008		No OF PAGES 11	PAGE No 4	OVERPAGE Yes

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THE PROBABLE SEQUENCE OF EVENTS WHICH LEAD TO FAILURE IS THAT THE ELECTRICAL AND HYDRAULIC LINES EXPERIENCED SUFFICIENT CHAFFING TO ENABLE AN ELECTRICAL CONNECTION TO OCCUR BETWEEN THE TWO LINES. THIS ELECTRICAL CONNECTION ENABLED ARCING TO OCCUR WHICH BURNT A HOLE AT THE PREVIOUSLY DAMAGED AREA ON THE HYDRAULIC LINE. HYDRAULIC FLUID ESCAPED THROUGH THE HOLE, OVER THE AC POWER LINE, FORWARD ONTO THE JACOB'S LADDER INTO THE CAVITY BETWEEN THE FUSELAGE AND THE ENGINE (TO THE AIR/OIL COOLER). THE BARE WIRES ON THE AC POWER LINE PROVIDE A SUFFICIENTLY HIGH FLASHPOINT TO SET ALIGHT THE HYDRAULIC FLUID. THE FIRE FOLLOWED THE FLUID PATH FORM THE JACOB'S LADDER TO THE AIR/OIL COOLER, CAUSING SIGNIFICANT DAMAGE. THE EXCESSIVE LOSS OF HYDRAULIC FLUID, COUPLED WITH THE FIRE WOULD LEAD TO A LH ENGINE FIRE INDICATION AND A PRIMARY HYDRAULIC FAILURE (LH AND RH) INDICATION IN THE COCKPIT. IN ADDITION, THE BLEED DUCT SENSOR LINE IS LOCATED IN CLOSE VICINITY TO THE DAMAGED LINES. AS SUCH, A FIRE IN THIS AREA WOULD CAUSE A LH BLEED AIR DUCT FAILURE INDICATION IN THE COCKPIT.

FINAL METALLURGICAL ASSESSMENT OF THE A8-130 INCIDENT HOSES HAS CONFIRMED THE CAUSE OF THE INCIDENT TO THAT OF EXCESSIVE WEARING, ARCHING AND RUPTURING OF THE HYDRAULIC LINE, AND FIRE. THIS ASSESSMENT HAS RULED OUT ALL OTHER POSSIBLE FAILURE MODES UNDER CONSIDERATION.
6SQN
05: INSPECTION OF PAPERWORK
INSPECTION OF A08-130'S AIRCRAFT PAPERWORK OVER THE PERIOD OF 01 JAN 07 TO 01 OCT 07 HIGHLIGHTED SIX DISCREET INSTANCES OF MAINTENENACE BEING CARRIED OUT IN THE SUBJECT AREA. OF THESE INSTANCES, ONE WAS CARRIED OUT BY BOEING (22 FEB 07), TWO WERE CARRIED OUT BY 1SQN (6 JUN 07 AND 12 JUL 07) AND THREE WERE CARRIED OUT BY 6SQN (29 JAN 07, 28 AUG 07 AND 04 SEP 07).

IN ADDITION TO THE MAINTENANCE CARRIED OUT OVER THE LAST TEN MONTHS, THE AIRCRAFT HAD BEEN FLOWN NUMEROUS TIMES. AS SUCH, MANY AFTER AND BEFORE FLIGHT SERVICINGS HAD BEEN CARRIED OUT ON THE AIRCRAFT BY NUMEROUS PERSONNEL.
6SQN
06: AFTER FLIGHT INSPECTIONS
IN ACCORDANCE WITH REFERENCE A, THE AREAS UNDER PANELS 4101 AND 4201 ARE TO BE CHECKED FOR OBVIOUS DAMAGE. THERE ARE NO SPECIFIC INSPECTION REQUIREMENTS REGARDING THE SUBJECT ITEMS AND AN AMENDMENT MAY BE REQUIRED TO INCLUDE SUCH REQUIREMENTS. REFERENCE B, USED TO TRAIN PERSONNEL IN FLIGHTLINE SERVICINGS IN CONJUNCTION WITH REFERENCE A, ALSO DOES NOT SPECIFICALLY MENTION ANY INSPECTION

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REQUIREMENTS FOR THE HYDRAULIC AND ELECTRICAL LINES UNDER PANELS 4101 AND 4201.

THE AF AND BF PROCEDURES IN REFERENCE A AND B ARE QUITE INVOLVED AND VARY BETWEEN BOTH PUBLICATIONS. AS SUCH, THE POTENTIAL FOR PERSONNEL TO MISS AN INSPECTION IS SIGNIFICANTLY ENHANCED IF THEY DO NOT UTILISE THE CORRECT PUBLICATION FOR EVERY AF AND/OR BF.

ADDITIONAL INVESTIGATION IS REQUIRED TO ENSURE APPROPRIATE TRAINING IS PROVIDED TO PERSONNEL TO CONDUCT THE AF INSPECTIONS.
6SQN
07: CONFIGURATION ASSESSMENT AND MAINTENANCE PROCEDURES
VISUAL INSPECTIONS OF THE FLEET'S ENGINES SHOWED THAT THERE WAS CONSIDERABLE VARIANCE IN THE CONFIGURATION OF THE HYDRAULIC AND POWER LINES WITHIN THE ENGINE BAYS. DISCUSSION WITH VARIOUS MAINTENANCE PERSONNEL REVEALED THAT IT IS COMMON PRACTISE FOR MAINTAINERS TO CHANGE CONFIGURATIONS SO AS TO TRY AND ENSURE ALL OF THE LINES HAVE SUFFICIENT SPACE TO MINIMISE CHAFFING/WEAR. THE MAINTAINERS STATED THAT THEY OFTEN RECEIVED ENGINES WITH HYDRAULIC AND POWER LINES OF INCORRECT LENGTH.

ANOTHER CONFIGURATION CONCERN WAS THAT THE SUBJECT HYDRAULIC LINE ON A08-130 HAD "BI-SEAL" TAPE AROUND THE AREA THAT FAILED. BI-SEAL TAPE IS NOT AUTHORISED TO BE USED ON THIS HYDRAULIC LINE. IN ADDITION, IT IS A REQUIREMENT TO HAVE "SCUFF-GUARD" AROUND THE HYDRAULIC LINES. HOWEVER, THE CONFIGURATION ASSESSEMENT REVEALED THAT MANY LINES DID NOT HAVE SCUFF GUARD INSTALLED.

THERE WAS ALSO CONSIDERABLE AMBIGUITY IN REGARDS TO THE CORRECT POWER LINE CONFIGURATION. IN PARTICULAR, THE NUMBER OF WASHERS USED WHEN ATTACHING THE POWER LINE TO THE FIREWALL WAS AMBIGUOUS.

WHAT WAS REF C.

DUE TO THE CONFIGURATION VARIANCE, BASC GENERATED REFERENCE C, WHICH PROVIDES THE CORRECT COFIGURATIONS FOR BOTH THE HYDRAULIC AND POWER LINES. THE AEO HAS ALSO BEEN REQUESTED TO INVESTIGATE THE ADEQUACY OF MAINTENANCE PUBLICATIONS FOR INSTALLATION, REPAIR, REMOVAL AND INSPECTION OF THE SUBJECT LINES (REFER TO THE RECOMMENDATIONS).
6SQN
08: SYSTEMIC CONCERNS
FROM DISCUSSIONS WITH A VARIETY OF MAINTENANCE PERSONNEL ACROSS THE ATECH AND AVTECH MUSTERINGS, SOME SYSTEMIC ISSUES WERE HIGHLIGHTED THAT COULD HAVE LED TOWARDS THIS SERIOUS INCIDENT OCCURRING.

THE CURRENT FLIGHTLINE TRAINING FOR FITTERS CONSISTS OF

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APPROXIMATELY TWO MONTHS, WHEREBY THEY ARE TRAINED BY TNCOS (WHO CAN POTENTIALLY HAVE ONLY TWO YEARS EXPERIENCE). IN THE PAST (AROUND 10-15 YEARS AGO) FITTERS CARRIED OUT FLIGHTLINE DUTIES FOR A MINIMUM OF ONE YEAR AND THEY WERE TRAINED BY TECHNICIANS WITH AROUND 10 YEARS EXPERIENCE. AS SUCH, THE FITTERS TODAY GAIN A LOT LESS EXPERIENCE IN FLIGHTLINE DUTIES AND THE QUALITY OF TRAINING HAS POTENTIALLY DECREASED OVER TIME.

IN ADDITION TO THE SIGNIFICANT REDUCTION IN FLIGHTLINE TRAINING TIME AND A POSSIBLE REDUCTION IN QUALITY, 6SQN PERSONNEL ARE CURRENTLY ROTATED IN AND OUT OF FLIGHTLINE ON A REGULAR (WEEKLY) BASIS. THIS WOULD ALSO CONTRIBUTE TO A REDUCTION IN AFTER/BEFORE FLIGHT SERVICING QUALITY.

IN ORDER TO INCREASE INCREASE THE LEVEL OF FLIGHTLINE TRAINING AND STILL MAINTAIN JOURNAL PROGRESSION, A RECOMMENDATION HAS BEEN MADE TO WOE 6SQN TO INCREASE THE FLIGHTLINE ROTATION PERIOD FROM ONE TO TWO WEEKS.

B. FINDINGS:

01: PROBABLE CAUSE OF FAILURE

FAILURE SEQUENCE

THE PROBABLE SEQUENCE OF EVENTS WHICH LEAD TO FAILURE IS THAT THE ELECTRICAL AND HYDRAULIC LINES EXPERIENCED SUFFICIENT CHAFFING TO ENABLE AN ELECTRICAL CONNECTION TO OCCUR BETWEEN THE TWO LINES. THIS ELECTRICAL CONNECTION ENABLED ARCING TO OCCUR WHICH BURNT A HOLE AT THE PREVIOUSLY DAMAGED AREA ON THE HYDRAULIC LINE. HYDRAULIC FLUID ESCAPED THROUGH THE HOLE, OVER THE AC POWER LINE, FORWARD ONTO THE JACOB'S LADDER INTO THE CAVITY BETWEEN THE FUSELAGE AND THE ENGINE (TO THE AIR/OIL COOLER). THE BARE WIRES ON THE AC POWER LINE PROVIDE A SUFFICIENTLY HIGH FLASHPOINT TO SET ALIGHT THE HYDRAULIC FLUID. THE FIRE FOLLOWED THE FLUID PATH FORM THE JACOB'S LADDER TO THE AIR/OIL COOLER, CAUSING SIGNIFICANT DAMAGE. THE EXCESSIVE LOSS OF HYDRAULIC FLUID, COUPLED WITH THE FIRE WOULD LEAD TO A LH ENGINE FIRE INDICATION AND A PRIMARY HYDRAULIC FAILURE (LH AND RH) INDICATION IN THE COCKPIT. IN ADDITION, THE BLEED DUCT SENSOR LINE IS LOCATED IN CLOSE VICINITY TO THE DAMAGED LINES. AS SUCH, A FIRE IN THIS AREA WOULD CAUSE A LH BLEED AIR DUCT FAILURE INDICATION IN THE COCKPIT.

02: AIRCREW ACTIONS

THE FLIGHT MANUAL AND CHECKLIST PROCEDURES WERE APPROPRIATE FOR THE EMERGENCY AND THE CREW COMPLETED THEM CORRECTLY.

03: AFTER FLIGHT INSPECTIONS

IN ACCORDANCE WITH REFERENCE A, THE AREAS UNDER PANELS 4101 AND 4201 ARE TO BE CHECKED FOR OBVIOUS DAMAGE. THERE ARE NO SPECIFIC

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INSPECTION REQUIREMENTS REGARDING THE SUBJECT ITEMS. REFERENCE B, USED TO TRAIN PERSONNEL IN FLIGHTLINE SERVICINGS IN CONJUNCTION WITH REFERENCE A, ALSO DOES NOT SPECIFICALLY MENTION ANY INSPECTION REQUIREMENTS FOR THE HYDRAULIC AND ELECTRICAL LINES UNDER PANELS 4101 AND 4201.

04: CONFIGURATION ASSESSMENT AND MAINTENANCE PROCEDURES

THE FLEET'S INSPECTIONS OF ENGINES AND REVIEW OF THE PUBLICATIONS SHOWED THAT THERE WAS CONSIDERABLE VARIANCE IN THE CONFIGURATION OF THE HYDRAULIC AND POWER LINES WITHIN THE ENGINE BAYS. IN THE CASE OF THE PUBLICATIONS THIS LED TO CONSIDERABLE AMBIGUITY IN REGARDS TO THE CORRECT POWER LINE CONFIGURATION.

05: SYSTEMIC CONCERNS

THE REDUCTION IN THE FLIGHTLINE TRAINING TIME OF FITTERS, AND THE POTENTIAL REDUCTION IN THE QUALITY OF THE TRAINING PROVIDED, COMBINED WITH CURRENT WEEKLY ROTATION THROUGH FLIGHTLINE, IS THOUGHT TO HAVE CONTRIBUTED TO A REDUCTION IN AFTER/BEFORE FLIGHT SERVICING QUALITY.

IT IS NOT A FLIGHT SERVING FAILURE!

C. CONTRIBUTING FACTORS:

PRECONDITIONS FOR UNSAFE ACTS/SUBSTANDARD CONDITIONS/EQUIPMENT/ UNRELIABLE/FAULTY/1

ORGANISATIONAL INFLUENCES/ORGANISATIONAL PROCESSES/PROCEDURES/ INSTRUCTIONS/3

D. DEFENCES:

WHAT, IF ANYTHING, LIMITED THE CONSEQUENCES OF THE OCCURRENCE?/PROCEDURES/OPERATOR REACTION

DETECTION - HOW WAS THE PROBLEM REVEALED?/AIRCRAFT ON-BOARD WARNING SYSTEMS

10. AVIATION RISK MANAGEMENT:

11. ACTIONS AND RECOMMENDATIONS:

ACTIONS:

01: AMEND ACG SI(LOG) 2-7-6

UNIT ACTION: ACG SI(LOG) 2-7-6 IS TO BE AMENDED TO HIGHLIGHT THE REQUIREMENT TO INSPECT ALL HYDRAULIC AND ELECTRICAL LINES UNDER PANELS 4101 AND 4201 FOR ANY DAMAGE.

RESPONSE: AMENDMENTS TO THE SUBJECT SI HAVE BEEN RAISED AND FORWARDED TO THE SI SPONSOR FOR REVIEW AND RELEASE.

02: AMEND AAP 7214.010-6-1M

UNIT ACTION: AAP 7214.010-6-1M IS TO BE AMENDED TO HIGHLIGHT THE REQUIREMENT TO INSPECT HYDRAULIC AND ELECTRICAL LINES UNDER PANELS 4101 AND 4201 FOR DAMAGE.

RESPONSE: AS PER THE NOTES SECTION OF STK07-SB-00487, BASC IS CURRENTLY AMENDING AAP 7214.010-6-1M TO ENSURE INSPECTION OF THE

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SUBJECT HYDRAULIC AND ELECTRICAL LINES IS CARRIED OUT.
03: CONTINUATION TRAINING
UNIT ACTION: CT IS TO BE PROVIDED TO MAINTENANCE PERSONNEL TO HIGHLIGHT THE INSPECTION REQUIREMENTS FOR ALL HYDRAULIC AND ELECTRICAL LINES, WITH PARTICULAR ATTENTION TO THE AREAS UNDER PANELS 4101 AND 4201. THIS ACTION ITEM IS TO BE CONDUCTED ONCE ACTION ITEMS 01 AND 02 ARE INCORPORATED AND PROMULGATED.
RESPONSE:
04: CONDITION REPORT
UNIT ACTION: RAISE A CONDITION REPORT FOR PROMULGATION.
RESPONSE: CONDITION REPORT 6SQN-08-07 HAS BEEN RAISED AND PROMUGATED.

05: AIRCRAFT DAMAGE REPORT
UNIT ACTION: RAISE AN AIRCRAFT DAMAGE REPORT FOR PROMULGATION.
RESPONSE: AIRCRAFT DAMAGE REPORT 6SQN-005-07 RAISED AND PROMULGATED.
06: CONSOLIDATE DIFFERENCES BETWEEN ACG SI (LOG) AND AAP 7214.010-6-1M
UNIT ACTION: REVIEW BOTH INSTRUCTIONS AND IF DIFFERENCES EXIST ADDRESS THROUGH AN AMENDMENT AS APPROPRIATE.
RESPONSE:
B. RECOMMENDATIONS:
01: REVIEW OF SUPPLY PROCESS.
RECOMMENDATION: THE AEO IS REQUESTED TO INVESTIGATE THE CONFORMANCE OF REPLACEMENT ASSETS WHEN SUPPLIED TO USERS AND WITH SERVICEABLE ENGINES AS THIS IS OUTSIDE THE SCOPE OF THE AMO'S INVESTIGATION.
RESPONSE:
02: INVESTIGATE THE ADEQUACY MAINTENANCE PROCEDURES
RECOMMENDATION: THE AEO IS REQUESTED TO INVESTIGATE THE ADEQUACY OF MAINTENANCE PUBLICATIONS FOR THE INSTALLATION, REPAIR AND LIMITATIONS OF ELECTRICAL ENGINE POWER LINES AND HYDRAULIC PIPES, AS THIS IS OUTSIDE THE SCOPE OF THE AMO'S INVESTIGATION.
RESPONSE:
03: ASSESS REPAIRABILITY OF A08-130
RECOMMENDATION: SRSPO IS REQUESTED TO TASK THE DM CONTRACTOR TO ASSESS AND REPAIR, IF COST EFFECTIVE, THE DAMAGE SUSTAINED BY A08-130, AS THIS IS OUTSIDE THE SCOPE OF THE AMO'S INVESTIGATION AND MAINTENANCE CAPACITY.
RESPONSE:
04: ASSESS THE THE REPAIRABILITY OF THE ENGINE.
RECOMMENDATION: SRSPO IS REQUESTED TO TASK THE DM CONTRACTOR TO ASSESS AND REPAIR, IF COST EFFECTIVE, THE DAMAGE SUSTAINED BY ENGINE (SNO P71-4056), AS THIS IS OUTSIDE THE SCOPE OF THE AMO'S INVESTIGATION AND MAINTENANCE CAPACITY.
RESPONSE:

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05: REVIEW FLIGHTLINE ROTATIONS
RECOMMENDATION: WOE 6SQN IS REQUESTED TO REVIEW THE ROTATION PERIOD FOR MAINTENANCE PERSONNEL INTO FLIGHTLINE AND CONSIDER WHETHER OR NOT IT WOULD BE BENEFITIAL TO EXTEND THE ROTATION PERIOD TO INCREASE THE QUALITY OF THE AF/BFS.

ADDITIONALLY WOE 6SQN IS TO REVIEW THE TRAINING PRACTICES AND ENSURE ALL PROCEDURES ARE BEING FOLLOWED APPROPRIATELY.
RESPONSE:

12. AIRCRAFT DAMAGE OR COMPONENT CHANGES:
DAMAGE DETAILS: REFER TO CONDITION REPORT 6SQN-08-07 AND AIRCRAFT DAMAGE REPORT 6SQN-05-07

13. RELATED CORRESPONDENCE:

14. SUPERVISOR REVIEW:
MAINTENANCE

FROM THE INCIDENT INVESTIGATION THE DIRECT CAUSE OF THE INCIDENT WAS FOUND TO BE THE RESULT OF CHAFFING AND ARCING OF THE AC POWER LINE ON THE PRIMARY HYDRAULIC LINE, WHICH RESULTED IN AN ENGINE FIRE. HOWEVER, WHILST GENERAL INSPECTIONS OF THE AREA ARE CONDUCTED AS PART OF AF AND BF SERVICINGS THEY WERE INADEQUATE TO PICK UP THE DAMAGED HOSES. THIS WAS DUE TO BOTH HUMAN AND PROCEDURE DEFICIENCIES. IT IS A GENERAL INSPECTION REQUIREMENT THAT WAS INADEQUATE AS SIMILAR CHAFFING WAS FOUND ACROSS THE FLEET. APPROPRIATE PUBLICATION AND AWARENESS TRAINING HAS BEEN INITIATED TO ADDRESS THE PROBLEMS FOR THE LONG TERM, WITH THE FLEET HAVING BEEN RESTORED TO AN SERVICEABLE BASELINE TO ENSURE PREVENTION OF SUCH AN EVENT IN THE IMMEDIATE FUTURE.

15. CO/OC REVIEW:
THIS INCIDENT WAS WELL HANDLED BY ALL THE AIRCREW INVOLVED AND RESULTED IN THE SAFE RECOVERY OF THE AIRCRAFT . MECHANISMS HAVE BEEN PUT IN PLACE TO RESOLVE THE SHORT AND LONG TERM MAINTENANCE ISSUES HIGHLIGHTED BY THIS INCIDENT. THIS INCIDENT WILL BE REBRIEFED AT THE FIRST UNIT SAFETY DAY OF 2008 AND WILL BE USED AS THE CATALYST TO CONSIDER FURTHER IMPROVEMENTS TO UNIT TRAINING AND MANAGEMENT PRACTICES.

16. SASOR TO FOLLOW

DISTRIBUTION

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ACTION: [82WG] REGISTRY
DIST: [82WG] REGISTRY
[1SQN] REGISTRY
[SRSPO] REGISTRY (3)

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SRSPO Form SR0193
AL update - Issued Nov 2006

TECHNICAL DOCUMENTATION ROUTING FORM

ASOR (Now including MASOR & MIR)	SASOR	STI (F-111 & External)	DEFECT	DIR	RODUM	ADR	MDR	MDIR	OTHER

DOCUMENT No. 68QW/075/07 (A8-130 FIRE)

SRSPO APPLICABLE ☐
SRSPO ACTIONABLE ☑

AVBU APPLICABLE ☐
EWKBU APPLICABLE ☐
WSBU APPLICABLE ☐
SCAN THIS FORM TO LL ☐

LIFELINE No.

- All Technical Reports listed above are registered and scanned to Lifeline.
- ASORs and STIs are managed and archived by SRSPO CM. They are registered and scanned to Lifeline.

APPOINTMENT, INITIAL and DATE		COMMENTS (where appropriate)
MSN MGR	7/2/08	ASOR UPDATED WITH SRSPO RESPONSES DRAFT COPY ATTACHED.
PBS MGR		
CM.	22/,	REF PAGE 6. Item 3 & 4. Can LMU please advise to what extent we are pursuing the repair of A8-130 & Engnia
LMU IPT AF		GREG KEV & I are requested to complete the ASOR actions in DARTS.
AV		
EN		
CM		PLEASE RETURN ALL Routing Slips and Reports to SRSPO EMU for archiving

SRSPO Procedure 4-1-5 (Technical Documentation Management (Lifeline))

PLEASE PASS RAPIDLY

Reference Number: ASOR: 6SQN-075-2007-SASOR 1

References:

A. AAP 7214.010-6-1M

B. ACG SI(LOG) 2-7-6

Workflow Phase: Drafter Data Entry

Classification: Serious Incident

Title: Materiel / Engine / ENGINE FIRE AND HYDRAULIC FAILURE

Occurrence Date Time: 01 1530 LOCAL Oct 07

Location: Other - Please Specify

YCCA

Parachute Incident Report: No

Telephone Notification to **DDAAFS:** Yes **ATSB:** No

Weather: Smoke haze

Light Conds: Day **Meteorological Conds:** VMC **Environmental Facts:** N/A

Aircraft Details

F-111C and RF-111C / A08C / 130 / Sonic 1

Flight Phase:	Descent				
Last Dep Point:	YAMB				
Intended Land Point:	YAMB				
Mission:	Training				
	AP13P - OPCON day applied phase				
NVD Aided:	No	External NVG lighting:	Off	NVG Search lights:	Off
Strobe/Anti Coll lights:	On	Landing lights:	Off	Nav lights:	On
Helmet Mounted Device:	No	Engine In Flight Shut Down:	No	Engine related Mission Abort:	No
Fuel Dump:	No				
Fuel Dump Detail:					
Speed (KIAS):	500 to 600		Alt (Feet AMSL):	Greater than 2000	
Flight Path:	Clear		Flight Phase:	Descent	

Personnel Details

AC / # / QFI-B / AuthOff:No / AC563 Report:No

SP / # / U / AuthOff:No / AC563 Report:No

Hazard Narrative

The incident mission was a day pairs OPCON strike with the pilot under training and a QFI in SONIC 1, and a QFI and ACO in SONIC 2. Established as lead with SONIC 2 in 8nm trail, SONIC 1 was at Mach 0.9 in a terrain following radar (TFR) descent through 5000 ft when a TFR flyup occurred. Whilst managing the system failure, the L ENG FIRE light started flashing followed shortly after by the illumination of the L BLEED DUCT fail warning lamp. TFR ops were discontinued, the Boldface actions completed and SONIC 2 advised immediately with a request for a visual inspection.

The aircraft was turned toward Oakey as the closest suitable airfield while the ENG FIRE LIGHT remained lit but not flashing. During the turn the L and R PRI HYD caution lamps illuminated with sytem pressure indicating zero. Additionally, RUDDER AUTH, PITCH, ROLL AND YAW CHANNEL LAMPS illuminated commensurate with the Hydraulic Failure. A MAYDAY was declared with ATC and intentions passed for a landing at Oakey. The ENG FIRE INFLIGHT checklist was completed with SONIC 2 advising no sign of fire but with trailing white smoke. The fire lights were tested for correct operation however the L ENG FIRE light did not flash but remained steadily lit and continued to remain lit until aircraft shutdown at AMB.

The loss of the PRI HYD system resulted in no Nose Wheel Steering (NWS) capability for landing and only residual accumulator brake pressure available to stop the aircraft on Oakey's 5400ft runway. With the checklist recommendation for a cable engagement on landing with a HYD failure, aircraft fuel load at 23000lbs plus stores and no means to reduce this following the Fire a decision was made to track for AMB instead (a further 40nm). This decision was passed to SONIC 2 and ATC updated for amended clearances at 6000 to 7000. With SONIC 2 in close combat a check of AB operation on the good engine was performed to ensure adequate thrust for configured flight and possible overshoot with no sign of external fire or adverse indications in the cockpit.

Considerations for a PRI HYD failure landing were reviewed with the decision to run the PRI HYD FAIL LANDING checklist followed by the SINGLE ENG LANDING checklist and the cable engagement checklist. These checklists were performed inside 30nm AMB whilst tracking for downwind. With only one hydraulic pump providing pressure to the flight controls, the decision was made to use full flap despite the heavier weight to provide greater drag and therefore higher engine RPM on final. AB was available on the right engine providing some overshoot potential. SONIC 2 was cleared off to land ahead once SONIC 1 had successfully configured for landing.

Whilst on descent on downwind passing 5000ft the pilot under training, who had been flying to this point, highlighted that there was some adverse control force required to maintain wings level. This was noted at 170KIAS. The QFI took over and noted a horizontal stabiliser split of 10 to 12 degrees with some force required. Satisfied with the controllability the decision was made to continue for an approach with an awareness of both the control force required for wings level and the reduced available hydraulic system performance. The aircraft was landed via a cable engagement with the crew egressing immediately. ATC cancelled the MAYDAY following the crew exiting the aircraft.

Investigation

Investigation Status: Active

Analysis

001 6Sqn

Aircrew actions

The aircrew completed the checklists for engine fire in flight, single engine landing and hydraulic failure landing. The crew did not contact squadron operations, however an aircrew member was available at OPS if required and had consulted the flight manual for the relevant emergencies. The emergency crew prioritised communication with the wingman over attempting to talk to OPS and were happy with the guidance given by the checklist.

002 6Sqn

Strip Clearance

On arrival to Amberley, aircraft A08-130 was safed by the 6SQN Strip Clearance crew. A preliminary visual inspection of the aircraft showed no fire. As such, the aircraft was towed to 6SQN lines.

003 6Sqn

Preliminary Investigation

The aircraft was immediately quarantined for ASOR investigation.

On request from the ASOR I/C, 6SQN maintenance personnel removed the LH engine bay door and inspected for damage. Significant fire damage was evident from the firewall aft along the outboard side of the engine. In particular, fire damage was evident around the hydraulic pumps, engine starter motor and to hydraulic/electrical lines in the area.

Inspection of the LH speed bump area showed significant signs of fire damage, in close vicinity to the chaff and flare installation areas.

A small hole was found on the LH primary hydraulic pump line approximately 30cm aft of the firewall. An AC power line in close vicinity to the small hole showed excessive signs of wear.

004 6Sqn

Further Investigation

Hydraulic Line
Inspection of the hydraulic line with the small hole revealed that "bi-seal" tape had been used to wrap previous damage to the line in the same area. As such, it is possible that the small hole developed through the same point where previous damage existed. Damage consistent with electrical burning was evident at the site of the hole.

AC Power Line
Visual inspection of the AC power line showed the internal wires were bare and chaffing damage.

Forward of Firewall
Inspection of the bleed air ducts and hydraulic system forward of the firewall was carried out. No failure was evident in this area.

Aft End of Engine
Inspection at the aft end of the engine revealed significant damage to the engine air/oil cooler (resulting in excessive engine oil leakage). Fire damage was also evident on the LH speed bump area.

Failure Modes
It is likely that the failure is a function of two faults. The first being excessive chaffing to both the hydraulic line and the AC power line. The second being electrical arcing between the two lines.

Failure Sequence
The probable sequence of events which lead to failure is that the electrical and hydraulic lines experienced sufficient chaffing to enable an electrical connection to occur between the two lines. This electrical connection enabled arcing to occur which burnt a hole at the previously damaged area on the hydraulic line. Hydraulic fluid escaped through the hole, over the AC power line, forward onto the Jacob's Ladder into the cavity between the fuselage and the engine (to the air/oil cooler). The bare wires on the AC power line provide a sufficiently high flashpoint to set alight the hydraulic fluid. The fire followed the fluid path form the Jacob's Ladder to the air/oil cooler, causing significant damage. The excessive loss of hydraulic fluid, coupled with the fire would lead to a LH engine fire indication and a primary hydraulic failure (LH and RH) indication in the cockpit. In addition, the bleed duct sensor line is located in close vicinity to the damaged lines. As such, a fire in this area would cause a LH bleed air duct failure indication in the cockpit.

Final metallurgical assessment of the A8-130 incident hoses has confirmed the cause of the incident to that of excessive wearing, arching and rupturing of the hydraulic line, and fire. This assessment has ruled out all other possible failure modes under consideration.

005 6Sqn

Inspection of Paperwork

Inspection of A08-130's aircraft paperwork over the period of 01 Jan 07 to 01 Oct 07 highlighted six discreet instances of maintenenace being carried out in the subject area. Of these instances, one was carried out by Boeing (22 Feb 07), two were carried out by 1SQN (6 Jun 07 and 12 Jul 07) and three were carried out by 6SQN (29 Jan 07, 28 Aug 07 and 04 Sep 07).

In addition to the maintenance carried out over the last ten months, the aircraft had been flown numerous times. As such, many after and before flight servicings had been carried out on the aircraft by numerous personnel.

006 6Sqn

After Flight Inspections

In accordance with reference A, the areas under panels 4101 and 4201 are to be checked for obvious damage. There are no specific inspection requirements regarding the subject items and an amendment may be required to include such requirements. Reference B, used to train personnel in flightline servicings in conjunction with reference A, also does not specifically mention any inspection requirements for the hydraulic and electrical lines under panels 4101 and 4201.

The AF and BF procedures in reference A and B are quite involved and vary between both publications. As such, the potential for personnel to miss an inspection is significantly enhanced if they do not utilise the correct publication for every AF and/or BF.

Additional investigation is required to ensure appropriate training is provided to personnel to conduct the AF inspections.

007 6Sqn

Configuration Assessment and maintenance procedures

Visual inspections of the fleet's engines showed that there was considerable variance in the configuration of the hydraulic and power lines within the engine bays. Discussion with various maintenance personnel revealed that it is common practise for maintainers to change configurations so as to try and ensure all of the lines have sufficient space to minimise chaffing/wear. The maintainers stated that they often received engines with hydraulic and power lines of incorrect length.

Another configuration concern was that the subject hydraulic line on A08-130 had "bi-seal" tape around the area that failed. Bi-seal tape is not authorised to be used on this hydraulic line. In addition, it is a requirement to have "scuff-guard" around the hydraulic lines. However, the configuration assessement revealed that many lines did not have scuff guard installed.

There was also considerable ambiguity in regards to the correct power line configuration. In particular, the number of washers used when attaching the power line to the firewall was ambiguous.

Due to the configuration variance, BASC generated reference C, which provides the correct cofigurations for both the hydraulic and power lines. The AEO has also been requested to investigate the adequacy of maintenance publications for installation, repair, removal and inspection of the subject lines (refer to the recommendations).

008 6Sqn

Systemic Concerns

From discussions with a variety of maintenance personnel across the ATECH and AVTECH musterings, some systemic issues were highlighted that could have led towards this serious incident occurring.

The current flightline training for fitters consists of approximately two months, whereby they are trained by TNCOs (who can potentially have only two years experience). In the past (around 10-15 years ago) fitters carried out flightline duties for a minimum of one year and they were trained by technicians with around 10 years experience. As such, the fitters today gain a lot less experience in flightline duties and the quality of training has potentially decreased over time.

In addition to the significant reduction in flightline training time and a possible reduction in quality, 6SQN personnel are currently rotated in and out of flightline on a regular (weekly) basis. This could also contribute to a reduction in after/before flight servicing quality.

In order to increase increase the level of flightline training and still maintain journal progression, a recommendation has been made to WOE 6SQN to increase the flightline rotation period from one to two weeks.

Findings

001 ***Probable Cause of Failure***

Failure Sequence

The probable sequence of events which lead to failure is that the electrical and hydraulic lines experienced sufficient chaffing to enable an electrical connection to occur between the two lines. This electrical connection enabled arcing to occur which burnt a hole at the previously damaged area on the hydraulic line. Hydraulic fluid escaped through the hole, over the AC power line, forward onto the Jacob's Ladder into the cavity between the fuselage and the engine (to the air/oil cooler). The bare wires on the AC power line provide a sufficiently high flashpoint to set alight the hydraulic fluid. The fire followed the fluid path form the Jacob's Ladder to the air/oil cooler, causing significant damage. The excessive loss of hydraulic fluid, coupled with the fire would lead to a LH engine fire indication and a primary hydraulic failure (LH and RH) indication in the cockpit. In addition, the bleed duct sensor line is located in close vicinity to the damaged lines. As such, a fire in this area would cause a LH bleed air duct failure indication in the cockpit.

002 ***Aircrew actions***

The flight manual and checklist procedures were appropriate for the emergency and the crew completed them correctly.

003 ***After Flight Inspections***

In accordance with reference A, the areas under panels 4101 and 4201 are to be checked for obvious damage. There are no specific inspection requirements regarding the subject items. Reference B, used to train personnel in flightline servicings in conjunction with reference A, also does not specifically mention any inspection requirements for the hydraulic and electrical lines under panels 4101 and 4201.

004 ***Configuration assessment and maintenance procedures***

The fleet's inspections of engines and review of the publications showed that there was considerable variance in the configuration of the hydraulic and power lines within the engine bays. In the case of the publications this led to considerable ambiguity in regards to the correct power line configuration.

005 ***Systemic concerns***

The reduction in the flightline training time of fitters, and the potential reduction in the quality of the training provided, combined with current weekly rotation through flightline, is thought to have contributed to a reduction in after/before flight servicing quality.

Contributing Factors

Preconditions for Unsafe Acts / Substandard Conditions / Equipment / Unreliable/Faulty / 1

Organisational Influences / Organisational Processes / Procedures / Instructions / 3

Defences

What, if anything, limited the consequences of the occurrence? / Procedures / Operator Reaction

Detection - How was the problem revealed? / Aircraft on-board warning systems

Risk Management

Risk Management Effective:

Actions

001 * Completed * ***Amend ACG SI(LOG) 2-7-6***

ACG SI(LOG) 2-7-6 is to be amended to highlight the requirement to inspect all hydraulic and electrical lines under panels 4101 and 4201 for any damage.

Response: Amendments to the subject SI have been raised and forwarded to the SI sponsor for review and release.

002 * Completed * ***Amend AAP 7214.010-6-1M***

AAP 7214.010-6-1M is to be amended to highlight the requirement to inspect hydraulic and electrical lines under panels 4101 and 4201 for damage.

Response: As per the notes section of STK07-SB-00487, BASC is currently amending AAP 7214.010-6-1M to ensure inspection of the subject hydraulic and electrical lines is carried out.

003 * Active * ***Continuation Training***

CT is to be provided to maintenance personnel to highlight the inspection requirements for all hydraulic and electrical lines, with particular attention to the areas under panels 4101 and 4201. This action item is to be conducted once action items 01 and 02 are incorporated and promulgated.

Response:

004 * Completed * ***Condition Report***

Raise a Condition Report for promulgation.

Response: Condition report 6SQN-08-07 has been raised and promugated.

005 * Completed * ***Aircraft Damage Report***

Raise an Aircraft Damage Report for promulgation.

Response: Aircraft Damage Report 6SQN-005-07 raised and promulgated.

006 * Active * ***Consolidate differences between ACG SI (LOG) and AAP 7214.010-6-1M***

Review both instructions and if differences exist address through an amendment as appropriate.

Response:

Recommendations

001 * Active * GREG ***Review of supply process.*** Engine Cables + Hyd Lines

The AEO is requested to investigate the conformance of replacement assets when supplied to users and with serviceable engines as this is outside the scope of the AMO's investigation.

Response:

002 * Active * KEV ***Investigate the adequacy Maintenance Procedures***

The AEO is requested to investigate the adequacy of maintenance publications for the installation, repair and limitations of electrical engine power lines and hydraulic pipes, as this is outside the scope of the AMO's investigation.

Response:

003 * Active * NED ***Assess repairability of A08-130***

SRSPO is requested to task the DM contractor to assess and repair, if cost effective, the damage sustained by A08-130, as this is outside the scope of the AMO's investigation and maintenance capacity.

Response:

004 * Active * NED ***Assess the the repairability of the engine.***

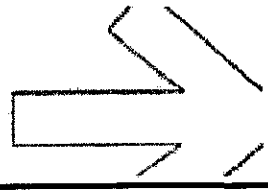
SRSPO is requested to task the DM contractor to assess and repair, if cost effective, the damage sustained by engine (SNo P71-4056), as this is outside the scope of the AMO's investigation and maintenance capacity.

Response:

005 * Active * 6SQN. ***Review Flightline Rotations***

WOE 6SQN is requested to review the rotation period for maintenance personnel into flightline and consider whether or not it would be benefitial to extend the rotation period to increase the quality of the AF/BFs.

Additionally WOE 6SQN is to review the training practices and ensure all procedures are being followed appropriately.



Response:

Damage Details

Refer to Condition Report 6SQN-08-07 and Aircraft Damage Report 6SQN-05-07

Related Correspondence

Unit Review

Supervisor Comments

Maintenance

From the incident investigation the direct cause of the incident was found to be the result of chaffing and arcing of the AC power line on the primary hydraulic line, which resulted in an engine fire. However, whilst general inspections of the area are conducted as part of AF and BF servicings they were inadequate to pick up the damaged hoses. This was due to both human and procedure deficiencies. It is a general inspection requirement that was inadequate as similar chaffing was found across the fleet. Appropriate publication and awareness training has been initiated to address the problems for the long term, with the fleet having been restored to an serviceable baseline to ensure prevention of such an event in the immediate future.

CO Comments

This incident was well handled by all the aircrew involved and resulted in the safe recovery of the aircraft . Mechanisms have been put in place to resolve the short and long term maintenance issues highlighted by this incident. This incident will be rebriefed at the first unit safety day of 2008 and will be used as the catalyst to consider further improvements to unit training and management practices.

Resolution

Analysis

Nil

Findings

Nil

Contributing Factors

Nil

Defences

Nil

Actions

Nil

Recommendations

Nil

Board Review

Reference Number: ASOR: 6SQN-075-2007-SASOR 1

References:

A. AAP 7214.010-6-1M

B. ACG SI(LOG) 2-7-6

Workflow Phase: Drafter Data Entry

Classification: Serious Incident

Title: Materiel / Engine / ENGINE FIRE AND HYDRAULIC FAILURE

Occurrence Date Time: 01 1530 LOCAL Oct 07

Location: Other - Please Specify

YCCA

Parachute Incident Report: No

Telephone Notification to **DDAAFS:** Yes **ATSB:** No

Weather: Smoke haze

Light Conds: Day **Meteorological Conds:** VMC **Environmental Facts:** N/A

Aircraft Details

F-111C and RF-111C / A08C / 130 / Sonic 1

Flight Phase:	Descent				
Last Dep Point:	YAMB				
Intended Land Point:	YAMB				
Mission:	Training				
	AP13P - OPCON day applied phase				
NVD Aided:	No	External NVG lighting:	Off	NVG Search lights:	Off
Strobe/Anti Coll lights:	On	Landing lights:	Off	Nav lights:	On
Helmet Mounted Device:	No	Engine In Flight Shut Down:	No	Engine related Mission Abort:	No
Fuel Dump:	No				
Fuel Dump Detail:					
Speed (KIAS):	500 to 600			Alt (Feet AMSL):	Greater than 2000
Flight Path:	Clear			Flight Phase:	Descent

Personnel Details

AC / # / QFI-B / AuthOff:No / AC563 Report:No

SP / # / U / AuthOff:No / AC563 Report:No

Hazard Narrative

The incident mission was a day pairs OPCON strike with the pilot under training and a QFI in SONIC 1, and a QFI and ACO in SONIC 2. Established as lead with SONIC 2 in 8nm trail, SONIC 1 was at Mach 0.9 in a terrain following radar (TFR) descent through 5000 ft when a TFR flyup occurred. Whilst managing the system failure, the L ENG FIRE light started flashing followed shortly after by the illumination of the L BLEED DUCT fail warning lamp. TFR ops were discontinued, the Boldface actions completed and SONIC 2 advised immediately with a request for a visual inspection.

The aircraft was turned toward Oakey as the closest suitable airfield while the ENG FIRE LIGHT remained lit but not flashing. During the turn the L and R PRI HYD caution lamps illuminated with sytem pressure indicating zero. Additionally, RUDDER AUTH, PITCH, ROLL AND YAW CHANNEL LAMPS illuminated commensurate with the Hydraulic Failure. A MAYDAY was declared with ATC and intentions passed for a landing at Oakey. The ENG FIRE INFLIGHT checklist was completed with SONIC 2 advising no sign of fire but with trailing white smoke. The fire lights were tested for correct operation however the L ENG FIRE light did not flash but remained steadily lit and continued to remain lit until aircraft shutdown at AMB.

The loss of the PRI HYD system resulted in no Nose Wheel Steering (NWS) capability for landing and only residual accumulator brake pressure available to stop the aircraft on Oakey's 5400ft runway. With the checklist recommendation for a cable engagement on landing with a HYD failure, aircraft fuel load at 23000lbs plus stores and no means to reduce this following the Fire a decision was made to track for AMB instead (a further 40nm). This decision was passed to SONIC 2 and ATC updated for amended clearances at 6000 to 7000. With SONIC 2 in close combat a check of AB operation on the good engine was performed to ensure adequate thrust for configured flight and possible overshoot with no sign of external fire or adverse indications in the cockpit.

Considerations for a PRI HYD failure landing were reviewed with the decision to run the PRI HYD FAIL LANDING checklist followed by the SINGLE ENG LANDING checklist and the cable engagement checklist. These checklists were performed inside 30nm AMB whilst tracking for downwind. With only one hydraulic pump providing pressure to the flight controls, the decision was made to use full flap despite the heavier weight to provide greater drag and therefore higher engine RPM on final. AB was available on the right engine providing some overshoot potential. SONIC 2 was cleared off to land ahead once SONIC 1 had successfully configured for landing.

Whilst on descent on downwind passing 5000ft the pilot under training, who had been flying to this point, highlighted that there was some adverse control force required to maintain wings level. This was noted at 170KIAS. The QFI took over and noted a horizontal stabiliser split of 10 to 12 degrees with some force required. Satisfied with the controllability the decision was made to continue for an approach with an awareness of both the control force required for wings level and the reduced available hydraulic system performance. The aircraft was landed via a cable engagement with the crew egressing immediately. ATC cancelled the MAYDAY following the crew exiting the aircraft.

Investigation

Investigation Status: Active

Analysis

001 6Sqn

Aircrew actions

The aircrew completed the checklists for engine fire in flight, single engine landing and hydraulic failure landing. The crew did not contact squadron operations, however an aircrew member was available at OPS if required and had consulted the flight manual for the relevant emergencies. The emergency crew prioritised communication with the wingman over attempting to talk to OPS and were happy with the guidance given by the checklist.

002 6Sqn

Strip Clearance

On arrival to Amberley, aircraft A08-130 was safed by the 6SQN Strip Clearance crew. A preliminary visual inspection of the aircraft showed no fire. As such, the aircraft was towed to 6SQN lines.

003 6Sqn

Preliminary Investigation

The aircraft was immediately quarantined for ASOR investigation.

On request from the ASOR I/C, 6SQN maintenance personnel removed the LH engine bay door and inspected for damage. Significant fire damage was evident from the firewall aft along the outboard side of the engine. In particular, fire damage was evident around the hydraulic pumps, engine starter motor and to hydraulic/electrical lines in the area.

Inspection of the LH speed bump area showed significant signs of fire damage, in close vicinity to the chaff and flare installation areas.

A small hole was found on the LH primary hydraulic pump line approximately 30cm aft of the firewall. An AC power line in close vicinity to the small hole showed excessive signs of wear.

004 6Sqn

Further Investigation

Hydraulic Line
Inspection of the hydraulic line with the small hole revealed that "bi-seal" tape had been used to wrap previous damage to the line in the same area. As such, it is possible that the small hole developed through the same point where previous damage existed. Damage consistent with electrical burning was evident at the site of the hole.

AC Power Line
Visual inspection of the AC power line showed the internal wires were bare and chaffing damage.

Forward of Firewall
Inspection of the bleed air ducts and hydraulic system forward of the firewall was carried out. No failure was evident in this area.

Aft End of Engine
Inspection at the aft end of the engine revealed significant damage to the engine air/oil cooler (resulting in excessive engine oil leakage). Fire damage was also evident on the LH speed bump area.

Failure Modes
It is likely that the failure is a function of two faults. The first being excessive chaffing to both the hydraulic line and the AC power line. The second being electrical arcing between the two lines.

Failure Sequence
The probable sequence of events which lead to failure is that the electrical and hydraulic lines experienced sufficient chaffing to enable an electrical connection to occur between the two lines. This electrical connection enabled arcing to occur which burnt a hole at the previously damaged area on the hydraulic line. Hydraulic fluid escaped through the hole, over the AC power line, forward onto the Jacob's Ladder into the cavity between the fuselage and the engine (to the air/oil cooler). The bare wires on the AC power line provide a sufficiently high flashpoint to set alight the hydraulic fluid. The fire followed the fluid path form the Jacob's Ladder to the air/oil cooler, causing significant damage. The excessive loss of hydraulic fluid, coupled with the fire would lead to a LH engine fire indication and a primary hydraulic failure (LH and RH) indication in the cockpit. In addition, the bleed duct sensor line is located in close vicinity to the damaged lines. As such, a fire in this area would cause a LH bleed air duct failure indication in the cockpit.

Final metallurgical assessment of the A8-130 incident hoses has confirmed the cause of the incident to that of excessive wearing, arching and rupturing of the hydraulic line, and fire. This assessment has ruled out all other possible failure modes under consideration.

005 6Sqn

Inspection of Paperwork

Inspection of A08-130's aircraft paperwork over the period of 01 Jan 07 to 01 Oct 07 highlighted six discreet instances of maintenenace being carried out in the subject area. Of these instances, one was carried out by Boeing (22 Feb 07), two were carried out by 1SQN (6 Jun 07 and 12 Jul 07) and three were carried out by 6SQN (29 Jan 07, 28 Aug 07 and 04 Sep 07).

In addition to the maintenance carried out over the last ten months, the aircraft had been flown numerous times. As such, many after and before flight servicings had been carried out on the aircraft by numerous personnel.

006 6Sqn

After Flight Inspections

In accordance with reference A, the areas under panels 4101 and 4201 are to be checked for obvious damage. There are no specific inspection requirements regarding the subject items and an amendment may be required to include such requirements. Reference B, used to train personnel in flightline servicings in conjunction with reference A, also does not specifically mention any inspection requirements for the hydraulic and electrical lines under panels 4101 and 4201.

The AF and BF procedures in reference A and B are quite involved and vary between both publications. As such, the potential for personnel to miss an inspection is significantly enhanced if they do not utilise the correct publication for every AF and/or BF.

Additional investigation is required to ensure appropriate training is provided to personnel to conduct the AF inspections.

007 6Sqn

Configuration Assessment and maintenance procedures

Visual inspections of the fleet's engines showed that there was considerable variance in the configuration of the hydraulic and power lines within the engine bays. Discussion with various maintenance personnel revealed that it is common practise for maintainers to change configurations so as to try and ensure all of the lines have sufficient space to minimise chaffing/wear. The maintainers stated that they often received engines with hydraulic and power lines of incorrect length.

Another configuration concern was that the subject hydraulic line on A08-130 had "bi-seal" tape around the area that failed. Bi-seal tape is not authorised to be used on this hydraulic line. In addition, it is a requirement to have "scuff-guard" around the hydraulic lines. However, the configuration assessement revealed that many lines did not have scuff guard installed.

There was also considerable ambiguity in regards to the correct power line configuration. In particular, the number of washers used when attaching the power line to the firewall was ambiguous.

Due to the configuration variance, BASC generated reference C, which provides the correct cofigurations for both the hydraulic and power lines. The AEO has also been requested to investigate the adequacy of maintenance publications for installation, repair, removal and inspection of the subject lines (refer to the recommendations).

008 6Sqn

Systemic Concerns

From discussions with a variety of maintenance personnel across the ATECH and AVTECH musterings, some systemic issues were highlighted that could have led towards this serious incident occurring.

The current flightline training for fitters consists of approximately two months, whereby they are trained by TNCOs (who can potentially have only two years experience). In the past (around 10-15 years ago) fitters carried out flightline duties for a minimum of one year and they were trained by technicians with around 10 years experience. As such, the fitters today gain a lot less experience in flightline duties and the quality of training has potentially decreased over time.

In addition to the significant reduction in flightline training time and a possible reduction in quality, 6SQN personnel are currently rotated in and out of flightline on a regular (weekly) basis. This could also contribute to a reduction in after/before flight servicing quality.

In order to increase increase the level of flightline training and still maintain journal progression, a recommendation has been made to WOE 6SQN to increase the flightline rotation period from one to two weeks.

Findings

001 ***Probable Cause of Failure***

Failure Sequence

The probable sequence of events which lead to failure is that the electrical and hydraulic lines experienced sufficient chaffing to enable an electrical connection to occur between the two lines. This electrical connection enabled arcing to occur which burnt a hole at the previously damaged area on the hydraulic line. Hydraulic fluid escaped through the hole, over the AC power line, forward onto the Jacob's Ladder into the cavity between the fuselage and the engine (to the air/oil cooler). The bare wires on the AC power line provide a sufficiently high flashpoint to set alight the hydraulic fluid. The fire followed the fluid path form the Jacob's Ladder to the air/oil cooler, causing significant damage. The excessive loss of hydraulic fluid, coupled with the fire would lead to a LH engine fire indication and a primary hydraulic failure (LH and RH) indication in the cockpit. In addition, the bleed duct sensor line is located in close vicinity to the damaged lines. As such, a fire in this area would cause a LH bleed air duct failure indication in the cockpit.

002 ***Aircrew actions***

The flight manual and checklist procedures were appropriate for the emergency and the crew completed them correctly.

003 ***After Flight Inspections***

In accordance with reference A, the areas under panels 4101 and 4201 are to be checked for obvious damage. There are no specific inspection requirements regarding the subject items. Reference B, used to train personnel in flightline servicings in conjunction with reference A, also does not specifically mention any inspection requirements for the hydraulic and electrical lines under panels 4101 and 4201.

004 ***Configuration assessment and maintenance procedures***

The fleet's inspections of engines and review of the publications showed that there was considerable variance in the configuration of the hydraulic and power lines within the engine bays. In the case of the publications this led to considerable ambiguity in regards to the correct power line configuration.

005 ***Systemic concerns***

The reduction in the flightline training time of fitters, and the potential reduction in the quality of the training provided, combined with current weekly rotation through flightline, is thought to have contributed to a reduction in after/before flight servicing quality.

Contributing Factors

Preconditions for Unsafe Acts / Substandard Conditions / Equipment / Unreliable/Faulty / 1

Organisational Influences / Organisational Processes / Procedures / Instructions / 3

Defences

What, if anything, limited the consequences of the occurrence? / Procedures / Operator Reaction

Detection - How was the problem revealed? / Aircraft on-board warning systems

Risk Management

Risk Management Effective:

Actions

001 * Completed * ***Amend ACG SI(LOG) 2-7-6***

ACG SI(LOG) 2-7-6 is to be amended to highlight the requirement to inspect all hydraulic and electrical lines under panels 4101 and 4201 for any damage.

Response: Amendments to the subject SI have been raised and forwarded to the SI sponsor for review and release.

002 * Completed * ***Amend AAP 7214.010-6-1M***

AAP 7214.010-6-1M is to be amended to highlight the requirement to inspect hydraulic and electrical lines under panels 4101 and 4201 for damage.

Response: As per the notes section of STK07-SB-00487, BASC is currently amending AAP 7214.010-6-1M to ensure inspection of the subject hydraulic and electrical lines is carried out.

003 * Active * ***Continuation Training***

CT is to be provided to maintenance personnel to highlight the inspection requirements for all hydraulic and electrical lines, with particular attention to the areas under panels 4101 and 4201. This action item is to be conducted once action items 01 and 02 are incorporated and promulgated.

Response:

004 * Completed * ***Condition Report***

Raise a Condition Report for promulgation.

Response: Condition report 6SQN-08-07 has been raised and promugated.

005 * Completed * ***Aircraft Damage Report***

Raise an Aircraft Damage Report for promulgation.

Response: Aircraft Damage Report 6SQN-005-07 raised and promulgated.

006 * Active * ***Consolidate differences between ACG SI (LOG) and AAP 7214.010-6-1M***

Review both instructions and if differences exist address through an amendment as appropriate.

Response:

Recommendations

001 * Active * ***Review of supply process.***

The AEO is requested to investigate the conformance of replacement assets when supplied to users and with serviceable engines as this is outside the scope of the AMO's investigation.

Response: 29/1/08 SRSPO MSN Mgr
Cable Management
a - The SRSPO investigation identified that AC generator electrical cables were not being actively managed. Therefore, engineering management (including the repair methodology) has been assigned to an appropraite F-111 AEO. AAP 7214.003-2-6-1 - Powerplant and Related Systems is being amended to reflect this.
b - The DM facility is measuring cables prior to fitment to serviceable engines so as to ensure correct length cables are fitted when an engine arrives at an operating unit.
c - Replacement cables are being manufactured (as required) IAW the approved engineering specification.
Electrical Cable Protection
a - Electrical cables are now being fitted with heat shrink IAW Boeing Service Bulletin STK07-SB-00487 to provide cables with an additional layer of protection.
b - AAP 7214.003-2-6-1 - Powerplant and Related Systems F-111C Aircraft is being amended to include the intent of Boeing Service Bulletin STK07-SB-00487.
c - A black coloured heat shrink is being used to ensure chaffing that penetrates through the heat shrink to the white cable below will be easily identifiable (maximum contrast) to the naked eye.
Hydraulic Line Protection
All hydraulic lines (including installed and uninstalled serviceable assets) have been fitted with scuff guard IAW the applicable OEM drawing.

NOTE: For further detail refer to SRSPO Technical Investigation Report SRSPO/2003/1/23/TECH Pt 1 (43) - Technical Review of A8-130 Serious Incident of 1 Oct 07.

002 * Active * ***Investigate the adequacy Maintenance Procedures***

The AEO is requested to investigate the adequacy of maintenance publications for the installation, repair and limitations of electrical engine power lines and hydraulic pipes, as this is outside the scope of the AMO's investigation.

Response:

29/1/08 SRSPO MSN Mgr
Publication Amendments
The SRSPO investigation identified a number of discrepancies in F-111 maintenance publications. All publication amendments are currently being actioned.
Inspection Techniques
The wear and degradation in the engine bay did not occur in one flight. Therefore, there was an opportunity for this problem to be discovered during an After Flight servicing. Potentially the 'look' inspection is not enough to capture this problem and therefore a publication amendment has been initiated to upgrade the After Flight servicing to require technicians to 'examine' the engine bay. An 'examine' inspection should prompt technicians to perform a more thorough inspection of the engine bay, however it is important to note that this publication amendment is not a substitute for a vigalent technician using sound inspection techniques.
NOTE: For further detail refer to SRSPO Technical Investigation Report SRSPO/2003/1/23/TECH Pt 1 (43) - Technical Review of A8-130 Serious Incident of 1 Oct 07.

003 * Active * ***Assess repairability of A08-130***

SRSPO is requested to task the DM contractor to assess and repair, if cost effective, the damage sustained by A08-130, as this is outside the scope of the AMO's investigation and maintenance capacity.

Response:

29/1/08 SRSPO MSN Mgr
Boeing's current capacity to undertake and complete the damage assessment of A8-130 is limited due to the current DM schedule. SRSPO is consulting Boeing regarding a schedule for assessment of A8-130's damage and anticipates receiving Boeing's advice by Mid Feb 08.

004 * Active * ***Assess the the repairability of the engine.***

SRSPO is requested to task the DM contractor to assess and repair, if cost effective, the damage sustained by engine (SNo P71-4056), as this is outside the scope of the AMO's investigation and maintenance capacity.

Response:

7/2/08 SRSPO MSN Manager:
The subject engine (S/No P71-4056L) is tentatively programmed for Horizontal Repair induction at TAEQ on 05 Mar 08. The engine has undergone conditional assessments and TAEQ engineering have performed a review and cleared the engine for maintenance. TAE CM will prescribe appropriate penalty maintenance measures to ensure the ongoing integrity of the engine - post recovery maintenance.

005 * Active * ***Review Flightline Rotations***

WOE 6SQN is requested to review the rotation period for maintenance personnel into flightline and consider whether or not it would be benefitial to extend the rotation period to increase the quality of the AF/BFs.

Additionally WOE 6SQN is to review the training practices and ensure all procedures are being followed appropriately.

Response:

Damage Details

Refer to Condition Report 6SQN-08-07 and Aircraft Damage Report 6SQN-05-07

Related Correspondence

Unit Review

Supervisor Comments

Maintenance

From the incident investigation the direct cause of the incident was found to be the result of chaffing and arcing of the AC power line on the primary hydraulic line, which resulted in an engine fire. However, whilst general inspections of the area are conducted as part of AF and BF servicings they were inadequate to pick up the damaged hoses. This was due to both human and procedure deficiencies. It is a general inspection requirement that was inadequate as similar chaffing was found across the fleet. Appropriate publication and awareness training has been initiated to address the problems for the long term, with the fleet having been restored to an serviceable baseline to ensure prevention of such an event in the immediate future.

CO Comments

This incident was well handled by all the aircrew involved and resulted in the safe recovery of the aircraft . Mechanisms have been put in place to resolve the short and long term maintenance issues highlighted by this incident. This incident will be rebriefed at the first unit safety day of 2008 and will be used as the catalyst to consider further improvements to unit training and management practices.

Resolution

Analysis

Nil

Findings

Nil

Contributing Factors

Nil

Defences

Nil

Actions

Nil

Recommendations

Nil

Board Review

SRSPO Form SR0193
AL update - Issued Nov 2006

TECHNICAL DOCUMENTATION ROUTING FORM

ASOR (ow including MASOR & MIR)	SASOR	STI (F-111 & External)	DEFECT	DIR	RODUM	ADR	MDR	MDIR	OTHER
	✓								

DOCUMENT No. 6SQN/075/07 SASOR 2

SRSPO APPLICABLE ☐ AVBU APPLICABLE ☐

SRSPO ACTIONABLE ☐ EWKBU APPLICABLE ☐

LIFELINE No. 02169/08 WSBU APPLICABLE ☐

SCAN THIS FORM TO LL ☐

- All Technical Reports listed above are registered and scanned to Lifeline.
- ASORs and STIs are managed and archived by SRSPO CM. They are registered and scanned to Lifeline.

APPOINTMENT, INITIAL and DATE		COMMENTS (where appropriate)
CENGR	N/R.	coqr's report.
DEENGR	30/4/08.	Noted.
ASSM	8/5/08	
MSN MGR	29/4/08	Am wondering what the purpose of ACR SI (LOR) 2-7-6 is ?? Refer comments against ASOR sent!
LMC IPT AF	WSBU 1 WSBU 2 WSBU 3 WSBU 4	12/5. Root cause (poor trade sup & ind insp) has not been addressed. Blame "Training" again???
EN	12JUN08 13 Jun 08	
AV	AVBU 22MAY08 AVBU2 23MAY08 AVBU MGR - 23 MAY 08 WSBU MGR - 23 MAY 08	Look should remain as covered in AAP 7001 038 sect 3 chap 2. Examine is for deeper servicing.
AMSS MGR	9/5/08	
CM		PLEASE RETURN ALL Routing Slips and Reports to SRSPO EMU for archiving

SRSPO Procedure 4-1-5 (Technical Documentation Management (Lifeline))

PLEASE PASS RAPIDLY

Received Copy	UNCLASSIFIED

PRECEDENCE ACTION	PRECEDENCE INFO	DATE TIME GROUP	ORIG NO
ROUTINE	ROUTINE	250344Z APR 08	
SICS			
KQL			

FROM: DFS-ADF-DAHRTS
TO: 82WG
DEFAIR DDAAFS
HQACG
INFO: 1SQN
6SQN
ACPA-ADF
? CSUAMB
DGTA DAIRMAINT
HQACAUST
SRSPO

FOLIO
Lifeline 02169/
SRSPO/ 2008
Entered By: JP

SRSPO FOR CENGR
CSUAMB FOR BFSO/BOPSO

SUBJ:AVIATION SAFETY OCCURRENCE REPORT: 6SQN-075-2007/SASOR 2

REFERENCES:
A. AAP 7214.010-6-1M
B. ACG SI(LOG) 2-7-6

1. SERIOUS INCIDENT

2. MATERIEL/ENGINE/ENGINE FIRE AND HYDRAULIC FAILURE

3. 01 1530 LOCAL OCT 07

4. LOCATION: OTHER - PLEASE SPECIFY/YCCA/290/35

5. ENVIRONMENTAL CONDITIONS: DAY/VMC/N/A
WEATHER: SMOKE HAZE

RECEIVED
28 APR 2008
SRSPO

6. AIRCRAFT DETAILS:
F-111/A08C/130/SONIC 1
SPEED: 500 TO 600 KIAS
ALTITUDE: GREATER THAN 2000 FEET AMSL
FLT PATH: CLEAR
FLT PHASE: DESCENT
LAST DEPARTURE POINT: YAMB
INTENDED LANDING POINT: YAMB
MISSION: TRAINING/AP13P - OPCON DAY APPLIED PHASE
NVD AIDED: NO

DRAFTER'S NAME AND TITLE	OPERATOR	PHONE No	REF FILE No
RELEASER'S NAME AND TITLE	BRANCH/UNIT	SIGNATURE	

DATE		No OF PAGES	PAGE No	OVERPAGE
28/4/2008		12	1	Yes

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NVG SEARCH LIGHTS: OFF
STROBE/ANTI COLL LIGHTS: ON
LNDG LIGHTS: OFF
NAV LIGHTS: ON
HELMET MOUNTED DEVICE: NO

7. PERSONNEL DETAILS:
AC/####/QFI-B/AUTHOFF:NO/AC563 REPORT:NO/
SP/####/U/AUTHOFF:NO/AC563 REPORT:NO/

8. HAZARD NARRATIVE:
THE INCIDENT MISSION WAS A DAY PAIRS OPCON STRIKE WITH THE PILOT UNDER TRAINING AND A QFI IN SONIC 1, AND A QFI AND ACO IN SONIC 2. ESTABLISHED AS LEAD WITH SONIC 2 IN 8NM TRAIL, SONIC 1 WAS AT MACH 0.9 IN A TERRAIN FOLLOWING RADAR (TFR) DESCENT THROUGH 5000 FT WHEN A TFR FLYUP OCCURRED. WHILST MANAGING THE SYSTEM FAILURE, THE L ENG FIRE LIGHT STARTED FLASHING FOLLOWED SHORTLY AFTER BY THE ILLUMINATION OF THE L BLEED DUCT FAIL WARNING LAMP. TFR OPS WERE DISCONTINUED, THE BOLDFACE ACTIONS COMPLETED AND SONIC 2 ADVISED IMMEDIATELY WITH A REQUEST FOR A VISUAL INSPECTION.

THE AIRCRAFT WAS TURNED TOWARD OAKEY AS THE CLOSEST SUITABLE AIRFIELD WHILE THE ENG FIRE LIGHT REMAINED LIT BUT NOT FLASHING. DURING THE TURN THE L AND R PRI HYD CAUTION LAMPS ILLUMINATED WITH SYTEM PRESSURE INDICATING ZERO. ADDITIONALLY, RUDDER AUTH, PITCH, ROLL AND YAW CHANNEL LAMPS ILLUMINATED COMMENSURATE WITH THE HYDRAULIC FAILURE. A MAYDAY WAS DECLARED WITH ATC AND INTENTIONS PASSED FOR A LANDING AT OAKEY. THE ENG FIRE INFLIGHT CHECKLIST WAS COMPLETED WITH SONIC 2 ADVISING NO SIGN OF FIRE BUT WITH TRAILING WHITE SMOKE. THE FIRE LIGHTS WERE TESTED FOR CORRECT OPERATION HOWEVER THE L ENG FIRE LIGHT DID NOT FLASH BUT REMAINED STEADILY LIT AND CONTINUED TO REMAIN LIT UNTIL AIRCRAFT SHUTDOWN AT AMB.

THE LOSS OF THE PRI HYD SYSTEM RESULTED IN NO NOSE WHEEL STEERING (NWS) CAPABILITY FOR LANDING AND ONLY RESIDUAL ACCUMULATOR BRAKE PRESSURE AVAILABLE TO STOP THE AIRCRAFT ON OAKEY'S 5400FT RUNWAY. WITH THE CHECKLIST RECOMMENDATION FOR A CABLE ENGAGEMENT ON LANDING WITH A HYD FAILURE, AIRCRAFT FUEL LOAD AT 23000LBS PLUS STORES AND NO MEANS TO REDUCE THIS FOLLOWING THE FIRE A DECISION WAS MADE TO TRACK FOR AMB INSTEAD (A FURTHER 40NM). THIS DECISION WAS PASSED TO SONIC 2 AND ATC UPDATED FOR AMENDED CLEARANCES AT 6000 TO 7000. WITH SONIC 2 IN CLOSE COMBAT A CHECK OF AB OPERATION ON THE GOOD ENGINE WAS PERFORMED TO ENSURE ADEQUATE THRUST FOR CONFIGURED FLIGHT AND

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POSSIBLE OVERSHOOT WITH NO SIGN OF EXTERNAL FIRE OR ADVERSE INDICATIONS IN THE COCKPIT.

CONSIDERATIONS FOR A PRI HYD FAILURE LANDING WERE REVIEWED WITH THE DECISION TO RUN THE PRI HYD FAIL LANDING CHECKLIST FOLLOWED BY THE SINGLE ENG LANDING CHECKLIST AND THE CABLE ENGAGEMENT CHECKLIST. THESE CHECKLISTS WERE PERFORMED INSIDE 30NM AMB WHILST TRACKING FOR DOWNWIND. WITH ONLY ONE HYDRAULIC PUMP PROVIDING PRESSURE TO THE FLIGHT CONTROLS, THE DECISION WAS MADE TO USE FULL FLAP DESPITE THE HEAVIER WEIGHT TO PROVIDE GREATER DRAG AND THEREFORE HIGHER ENGINE RPM ON FINAL. AB WAS AVAILABLE ON THE RIGHT ENGINE PROVIDING SOME OVERSHOOT POTENTIAL. SONIC 2 WAS CLEARED OFF TO LAND AHEAD ONCE SONIC 1 HAD SUCCESSFULLY CONFIGURED FOR LANDING.

WHILST ON DESCENT ON DOWNWIND PASSING 5000FT THE PILOT UNDER TRAINING, WHO HAD BEEN FLYING TO THIS POINT, HIGHLIGHTED THAT THERE WAS SOME ADVERSE CONTROL FORCE REQUIRED TO MAINTAIN WINGS LEVEL. THIS WAS NOTED AT 170KIAS. THE QFI TOOK OVER AND NOTED A HORIZONTAL STABILISER SPLIT OF 10 TO 12 DEGREES WITH SOME FORCE REQUIRED. SATISFIED WITH THE CONTROLLABILITY THE DECISION WAS MADE TO CONTINUE FOR AN APPROACH WITH AN AWARENESS OF BOTH THE CONTROL FORCE REQUIRED FOR WINGS LEVEL AND THE REDUCED AVAILABLE HYDRAULIC SYSTEM PERFORMANCE. THE AIRCRAFT WAS LANDED VIA A CABLE ENGAGEMENT WITH THE CREW EGRESSING IMMEDIATELY. ATC CANCELLED THE MAYDAY FOLLOWING THE CREW EXITING THE AIRCRAFT.

9. INVESTIGATION:
A. ANALYSIS:
6SQN
01: AIRCREW ACTIONS
THE AIRCREW COMPLETED THE CHECKLISTS FOR ENGINE FIRE IN FLIGHT, SINGLE ENGINE LANDING AND HYDRAULIC FAILURE LANDING. THE CREW DID NOT CONTACT SQUADRON OPERATIONS, HOWEVER AN AIRCREW MEMBER WAS AVAILABLE AT OPS IF REQUIRED AND HAD CONSULTED THE FLIGHT MANUAL FOR THE RELEVANT EMERGENCIES. THE EMERGENCY CREW PRIORITISED COMMUNICATION WITH THE WINGMAN OVER ATTEMPTING TO TALK TO OPS AND WERE HAPPY WITH THE GUIDANCE GIVEN BY THE CHECKLIST.
6SQN
02: STRIP CLEARANCE
ON ARRIVAL TO AMBERLEY, AIRCRAFT A08-130 WAS SAFED BY THE 6SQN STRIP CLEARANCE CREW. A PRELIMINARY VISUAL INSPECTION OF THE AIRCRAFT SHOWED NO FIRE. AS SUCH, THE AIRCRAFT WAS TOWED TO 6SQN LINES.
6SQN

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03: PRELIMINARY INVESTIGATION
THE AIRCRAFT WAS IMMEDIATELY QUARANTINED FOR ASOR INVESTIGATION.

ON REQUEST FROM THE ASOR I/C, 6SQN MAINTENANCE PERSONNEL REMOVED THE LH ENGINE BAY DOOR AND INSPECTED FOR DAMAGE. SIGNIFICANT FIRE DAMAGE WAS EVIDENT FROM THE FIREWALL AFT ALONG THE OUTBOARD SIDE OF THE ENGINE. IN PARTICULAR, FIRE DAMAGE WAS EVIDENT AROUND THE HYDRAULIC PUMPS, ENGINE STARTER MOTOR AND TO HYDRAULIC/ELECTRICAL LINES IN THE AREA.

INSPECTION OF THE LH SPEED BUMP AREA SHOWED SIGNIFICANT SIGNS OF FIRE DAMAGE, IN CLOSE VICINITY TO THE CHAFF AND FLARE INSTALLATION AREAS.

A SMALL HOLE WAS FOUND ON THE LH PRIMARY HYDRAULIC PUMP LINE APPROXIMATELY 30CM AFT OF THE FIREWALL. AN AC POWER LINE IN CLOSE VICINITY TO THE SMALL HOLE SHOWED EXCESSIVE SIGNS OF WEAR.
6SQN
04: FURTHER INVESTIGATION
HYDRAULIC LINE
INSPECTION OF THE HYDRAULIC LINE WITH THE SMALL HOLE REVEALED THAT "BI-SEAL" TAPE HAD BEEN USED TO WRAP PREVIOUS DAMAGE TO THE LINE IN THE SAME AREA. AS SUCH, IT IS POSSIBLE THAT THE SMALL HOLE DEVELOPED THROUGH THE SAME POINT WHERE PREVIOUS DAMAGE EXISTED. DAMAGE CONSISTENT WITH ELECTRICAL BURNING WAS EVIDENT AT THE SITE OF THE HOLE.

AC POWER LINE
VISUAL INSPECTION OF THE AC POWER LINE SHOWED THE INTERNAL WIRES WERE BARE AND CHAFFING DAMAGE.

FORWARD OF FIREWALL
INSPECTION OF THE BLEED AIR DUCTS AND HYDRAULIC SYSTEM FORWARD OF THE FIREWALL WAS CARRIED OUT. NO FAILURE WAS EVIDENT IN THIS AREA.

AFT END OF ENGINE
INSPECTION AT THE AFT END OF THE ENGINE REVEALED SIGNIFICANT DAMAGE TO THE ENGINE AIR/OIL COOLER (RESULTING IN EXCESSIVE ENGINE OIL LEAKAGE). FIRE DAMAGE WAS ALSO EVIDENT ON THE LH SPEED BUMP AREA.

FAILURE MODES
IT IS LIKELY THAT THE FAILURE IS A FUNCTION OF TWO FAULTS. THE FIRST BEING EXCESSIVE CHAFFING TO BOTH THE HYDRAULIC LINE AND THE AC POWER LINE. THE SECOND BEING ELECTRICAL ARCING BETWEEN THE TWO LINES.

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FAILURE SEQUENCE
THE PROBABLE SEQUENCE OF EVENTS WHICH LEAD TO FAILURE IS THAT THE ELECTRICAL AND HYDRAULIC LINES EXPERIENCED SUFFICIENT CHAFFING TO ENABLE AN ELECTRICAL CONNECTION TO OCCUR BETWEEN THE TWO LINES. THIS ELECTRICAL CONNECTION ENABLED ARCING TO OCCUR WHICH BURNT A HOLE AT THE PREVIOUSLY DAMAGED AREA ON THE HYDRAULIC LINE. HYDRAULIC FLUID ESCAPED THROUGH THE HOLE, OVER THE AC POWER LINE, FORWARD ONTO THE JACOB'S LADDER INTO THE CAVITY BETWEEN THE FUSELAGE AND THE ENGINE (TO THE AIR/OIL COOLER). THE BARE WIRES ON THE AC POWER LINE PROVIDE A SUFFICIENTLY HIGH FLASHPOINT TO SET ALIGHT THE HYDRAULIC FLUID. THE FIRE FOLLOWED THE FLUID PATH FORM THE JACOB'S LADDER TO THE AIR/OIL COOLER, CAUSING SIGNIFICANT DAMAGE. THE EXCESSIVE LOSS OF HYDRAULIC FLUID, COUPLED WITH THE FIRE WOULD LEAD TO A LH ENGINE FIRE INDICATION AND A PRIMARY HYDRAULIC FAILURE (LH AND RH) INDICATION IN THE COCKPIT. IN ADDITION, THE BLEED DUCT SENSOR LINE IS LOCATED IN CLOSE VICINITY TO THE DAMAGED LINES. AS SUCH, A FIRE IN THIS AREA WOULD CAUSE A LH BLEED AIR DUCT FAILURE INDICATION IN THE COCKPIT.

FINAL METALLURGICAL ASSESSMENT OF THE A8-130 INCIDENT HOSES HAS CONFIRMED THE CAUSE OF THE INCIDENT TO THAT OF EXCESSIVE WEARING, ARCHING AND RUPTURING OF THE HYDRAULIC LINE, AND FIRE. THIS ASSESSMENT HAS RULED OUT ALL OTHER POSSIBLE FAILURE MODES UNDER CONSIDERATION.
6SQN
05: INSPECTION OF PAPERWORK
INSPECTION OF A08-130'S AIRCRAFT PAPERWORK OVER THE PERIOD OF 01 JAN 07 TO 01 OCT 07 HIGHLIGHTED SIX DISCREET INSTANCES OF MAINTENENACE BEING CARRIED OUT IN THE SUBJECT AREA. OF THESE INSTANCES, ONE WAS CARRIED OUT BY BOEING (22 FEB 07), TWO WERE CARRIED OUT BY 1SQN (6 JUN 07 AND 12 JUL 07) AND THREE WERE CARRIED OUT BY 6SQN (29 JAN 07, 28 AUG 07 AND 04 SEP 07).

IN ADDITION TO THE MAINTENANCE CARRIED OUT OVER THE LAST TEN MONTHS, THE AIRCRAFT HAD BEEN FLOWN NUMEROUS TIMES. AS SUCH, MANY AFTER AND BEFORE FLIGHT SERVICINGS HAD BEEN CARRIED OUT ON THE AIRCRAFT BY NUMEROUS PERSONNEL.
6SQN
06: AFTER FLIGHT INSPECTIONS
IN ACCORDANCE WITH REFERENCE A, THE AREAS UNDER PANELS 4101 AND 4201 ARE TO BE CHECKED FOR OBVIOUS DAMAGE. THERE ARE NO SPECIFIC INSPECTION REQUIREMENTS REGARDING THE SUBJECT ITEMS AND AN AMENDMENT MAY BE REQUIRED TO INCLUDE SUCH REQUIREMENTS. REFERENCE B, USED TO

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TRAIN PERSONNEL IN FLIGHTLINE SERVICINGS IN CONJUNCTION WITH REFERENCE A, ALSO DOES NOT SPECIFICALLY MENTION ANY INSPECTION REQUIREMENTS FOR THE HYDRAULIC AND ELECTRICAL LINES UNDER PANELS 4101 AND 4201.

THE AF AND BF PROCEDURES IN REFERENCE A AND B ARE QUITE INVOLVED AND VARY BETWEEN BOTH PUBLICATIONS. AS SUCH, THE POTENTIAL FOR PERSONNEL TO MISS AN INSPECTION IS SIGNIFICANTLY ENHANCED IF THEY DO NOT UTILISE THE CORRECT PUBLICATION FOR EVERY AF AND/OR BF.

why ? (A) AAP
(B) ACG si

ADDITIONAL INVESTIGATION IS REQUIRED TO ENSURE APPROPRIATE TRAINING IS PROVIDED TO PERSONNEL TO CONDUCT THE AF INSPECTIONS.
6SQN
07: CONFIGURATION ASSESSMENT AND MAINTENANCE PROCEDURES
VISUAL INSPECTIONS OF THE FLEET'S ENGINES SHOWED THAT THERE WAS CONSIDERABLE VARIANCE IN THE CONFIGURATION OF THE HYDRAULIC AND POWER LINES WITHIN THE ENGINE BAYS. DISCUSSION WITH VARIOUS MAINTENANCE PERSONNEL REVEALED THAT IT IS COMMON PRACTISE FOR MAINTAINERS TO CHANGE CONFIGURATIONS SO AS TO TRY AND ENSURE ALL OF THE LINES HAVE SUFFICIENT SPACE TO MINIMISE CHAFFING/WEAR. THE MAINTAINERS STATED THAT THEY OFTEN RECEIVED ENGINES WITH HYDRAULIC AND POWER LINES OF INCORRECT LENGTH.

ANOTHER CONFIGURATION CONCERN WAS THAT THE SUBJECT HYDRAULIC LINE ON A08-130 HAD "BI-SEAL" TAPE AROUND THE AREA THAT FAILED. BI-SEAL TAPE IS NOT AUTHORISED TO BE USED ON THIS HYDRAULIC LINE. IN ADDITION, IT IS A REQUIREMENT TO HAVE "SCUFF-GUARD" AROUND THE HYDRAULIC LINES. HOWEVER, THE CONFIGURATION ASSESSEMENT REVEALED THAT MANY LINES DID NOT HAVE SCUFF GUARD INSTALLED.

THERE WAS ALSO CONSIDERABLE AMBIGUITY IN REGARDS TO THE CORRECT POWER LINE CONFIGURATION. IN PARTICULAR, THE NUMBER OF WASHERS USED WHEN ATTACHING THE POWER LINE TO THE FIREWALL WAS AMBIGUOUS.

(?)

DUE TO THE CONFIGURATION VARIANCE, BASC GENERATED REFERENCE C, WHICH PROVIDES THE CORRECT COFIGURATIONS FOR BOTH THE HYDRAULIC AND POWER LINES. THE AEO HAS ALSO BEEN REQUESTED TO INVESTIGATE THE ADEQUACY OF MAINTENANCE PUBLICATIONS FOR INSTALLATION, REPAIR, REMOVAL AND INSPECTION OF THE SUBJECT LINES (REFER TO THE RECOMMENDATIONS).
6SQN
08: SYSTEMIC CONCERNS
FROM DISCUSSIONS WITH A VARIETY OF MAINTENANCE PERSONNEL ACROSS THE ATECH AND AVTECH MUSTERINGS, SOME SYSTEMIC ISSUES WERE HIGHLIGHTED THAT COULD HAVE LED TOWARDS THIS SERIOUS INCIDENT OCCURRING.

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THE CURRENT FLIGHTLINE TRAINING FOR FITTERS CONSISTS OF APPROXIMATELY TWO MONTHS, WHEREBY THEY ARE TRAINED BY TNCOS (WHO CAN POTENTIALLY HAVE ONLY TWO YEARS EXPERIENCE). IN THE PAST (AROUND 10-15 YEARS AGO) FITTERS CARRIED OUT FLIGHTLINE DUTIES FOR A MINIMUM OF ONE YEAR AND THEY WERE TRAINED BY TECHNICIANS WITH AROUND 10 YEARS EXPERIENCE. AS SUCH, THE FITTERS TODAY GAIN A LOT LESS EXPERIENCE IN FLIGHTLINE DUTIES AND THE QUALITY OF TRAINING HAS POTENTIALLY DECREASED OVER TIME.

INCORRECT
TRAINING IS VIA LAC'S (TECHS WHO HAVE COMPLETED TRADE SUPERVISOR PROVIDED COURSE.
ONLY TSUPS CAN SIGN UP SOMEONE AS PROFICIENT.

IN ADDITION TO THE SIGNIFICANT REDUCTION IN FLIGHTLINE TRAINING TIME AND A POSSIBLE REDUCTION IN QUALITY, 6SQN PERSONNEL ARE CURRENTLY ROTATED IN AND OUT OF FLIGHTLINE ON A REGULAR (WEEKLY) BASIS. THIS COULD ALSO CONTRIBUTE TO A REDUCTION IN AFTER/BEFORE FLIGHT SERVICING QUALITY.

IN ORDER TO INCREASE ~~INCREASE~~ THE LEVEL OF FLIGHTLINE TRAINING AND STILL MAINTAIN JOURNAL PROGRESSION, A RECOMMENDATION HAS BEEN MADE TO WOE 6SQN TO INCREASE THE FLIGHTLINE ROTATION PERIOD FROM ONE TO TWO WEEKS.

B. FINDINGS:

01: PROBABLE CAUSE OF FAILURE

FAILURE SEQUENCE

THE PROBABLE SEQUENCE OF EVENTS WHICH LED TO THE FAILURE IS THAT THE ELECTRICAL AND HYDRAULIC LINES EXPERIENCED SUFFICIENT CHAFFING TO ENABLE AN ELECTRICAL CONNECTION TO OCCUR BETWEEN THE TWO LINES. THIS ELECTRICAL CONNECTION ENABLED ARCING TO OCCUR WHICH BURNT A HOLE AT THE PREVIOUSLY DAMAGED AREA ON THE HYDRAULIC LINE. HYDRAULIC FLUID ESCAPED THROUGH THE HOLE, OVER THE AC POWER LINE, FORWARD ONTO THE JACOB'S LADDER INTO THE CAVITY BETWEEN THE FUSELAGE AND THE ENGINE (TO THE AIR/OIL COOLER). THE BARE WIRES ON THE AC POWER LINE PROVIDE A SUFFICIENTLY HIGH FLASHPOINT TO SET ALIGHT THE HYDRAULIC FLUID. THE FIRE FOLLOWED THE FLUID PATH FROM THE JACOB'S LADDER TO THE AIR/OIL COOLER, CAUSING SIGNIFICANT DAMAGE. THE EXCESSIVE LOSS OF HYDRAULIC FLUID, COUPLED WITH THE FIRE WOULD LEAD TO A LH ENGINE FIRE INDICATION AND A PRIMARY HYDRAULIC FAILURE (LH AND RH) INDICATION IN THE COCKPIT. IN ADDITION, THE BLEED DUCT SENSOR LINE IS LOCATED IN CLOSE VICINITY TO THE DAMAGED LINES. AS SUCH, A FIRE IN THIS AREA WOULD CAUSE A LH BLEED AIR DUCT FAILURE INDICATION IN THE COCKPIT.

02: AIRCREW ACTIONS

THE FLIGHT MANUAL AND CHECKLIST PROCEDURES WERE APPROPRIATE FOR THE EMERGENCY AND THE CREW COMPLETED THEM CORRECTLY.

03: AFTER FLIGHT INSPECTIONS

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IN ACCORDANCE WITH REFERENCE A, THE AREAS UNDER PANELS 4101 AND 4201 ARE TO BE CHECKED FOR OBVIOUS DAMAGE. THERE ARE NO SPECIFIC INSPECTION REQUIREMENTS REGARDING THE SUBJECT ITEMS. REFERENCE B, USED TO TRAIN PERSONNEL IN FLIGHTLINE SERVICINGS IN CONJUNCTION WITH REFERENCE A, ALSO DOES NOT SPECIFICALLY MENTION ANY INSPECTION REQUIREMENTS FOR THE HYDRAULIC AND ELECTRICAL LINES UNDER PANELS 4101 AND 4201.

04: CONFIGURATION ASSESSMENT AND MAINTENANCE PROCEDURES

THE FLEET'S INSPECTIONS OF ENGINES AND REVIEW OF THE PUBLICATIONS SHOWED THAT THERE WAS CONSIDERABLE VARIANCE IN THE CONFIGURATION OF THE HYDRAULIC AND POWER LINES WITHIN THE ENGINE BAYS. IN THE CASE OF THE PUBLICATIONS THIS LED TO CONSIDERABLE AMBIGUITY IN REGARDS TO THE CORRECT POWER LINE CONFIGURATION.

ROOT CAUSE IS HOW THIS CONDITION CAME ABOUT (POOR TRADE SUP & IND INSPECT) FLIGHT LINE TRAINING MAY HAVE DETECTED THE PROB BUT IS NOT THE ROOT CAUSE!

05: SYSTEMIC CONCERNS

THE REDUCTION IN THE FLIGHTLINE TRAINING TIME OF FITTERS, AND THE POTENTIAL REDUCTION IN THE QUALITY OF THE TRAINING PROVIDED, COMBINED WITH CURRENT WEEKLY ROTATION THROUGH FLIGHTLINE, IS THOUGHT TO HAVE CONTRIBUTED TO A REDUCTION IN AFTER/BEFORE FLIGHT SERVICING QUALITY.

C. CONTRIBUTING FACTORS:

UNSAFE ACTS OR CONDITIONS/VIOLATIONS/ROUTINE/FAILED TO USE PUBLICATIONS/3

PRECONDITIONS FOR UNSAFE ACTS/SUBSTANDARD CONDITIONS/EQUIPMENT/ UNRELIABLE/FAULTY/1

ORGANISATIONAL INFLUENCES/ORGANISATIONAL PROCESSES/PROCEDURES/ INSTRUCTIONS/3

ORGANISATIONAL INFLUENCES/ORGANISATIONAL CLIMATE/CULTURE/NORMS AND RULES/3

D. DEFENCES:

WHAT, IF ANYTHING, LIMITED THE CONSEQUENCES OF THE OCCURRENCE?/PROCEDURES/OPERATOR REACTION

DETECTION - HOW WAS THE PROBLEM REVEALED?/AIRCRAFT ON-BOARD WARNING SYSTEMS

10. AVIATION RISK MANAGEMENT:

11. ACTIONS AND RECOMMENDATIONS:

A. ACTIONS:

01: AMEND ACG SI(LOG) 2-7-6

UNIT ACTION: ACG SI(LOG) 2-7-6 IS TO BE AMENDED TO HIGHLIGHT THE REQUIREMENT TO INSPECT ALL HYDRAULIC AND ELECTRICAL LINES UNDER PANELS 4101 AND 4201 FOR ANY DAMAGE.

RESPONSE: AMENDMENTS TO THE SUBJECT SI HAVE BEEN RAISED AND FORWARDED TO THE SI SPONSOR FOR REVIEW AND RELEASE.

→ WHY AN SI ?? AF, BF + TA SERVS SHOULD BE CONDUCTED IAW AEO AUTH PROV EX 7214.010-6 SERIES

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02: AMEND AAP 7214.010-6-1M
UNIT ACTION: AAP 7214.010-6-1M IS TO BE AMENDED TO HIGHLIGHT THE REQUIREMENT TO INSPECT HYDRAULIC AND ELECTRICAL LINES UNDER PANELS 4101 AND 4201 FOR DAMAGE.
RESPONSE: AS PER THE NOTES SECTION OF STK07-SB-00487, BASC IS CURRENTLY AMENDING AAP 7214.010-6-1M TO ENSURE INSPECTION OF THE SUBJECT HYDRAULIC AND ELECTRICAL LINES IS CARRIED OUT.
03: CONTINUATION TRAINING
UNIT ACTION: CT IS TO BE PROVIDED TO MAINTENANCE PERSONNEL TO HIGHLIGHT THE INSPECTION REQUIREMENTS FOR ALL HYDRAULIC AND ELECTRICAL LINES, WITH PARTICULAR ATTENTION TO THE AREAS UNDER PANELS 4101 AND 4201. THIS ACTION ITEM IS TO BE CONDUCTED ONCE ACTION ITEMS 01 AND 02 ARE INCORPORATED AND PROMULGATED.
RESPONSE: CT SESSION HAS BEEN CARRIED OUT ON AMO DAY FEB 08.
04: CONDITION REPORT
UNIT ACTION: RAISE A CONDITION REPORT FOR PROMULGATION.
RESPONSE: CONDITION REPORT 6SQN-08-07 HAS BEEN RAISED AND PROMUGATED.

05: AIRCRAFT DAMAGE REPORT
UNIT ACTION: RAISE AN AIRCRAFT DAMAGE REPORT FOR PROMULGATION.
RESPONSE: AIRCRAFT DAMAGE REPORT 6SQN-005-07 RAISED AND PROMULGATED.
06: CONSOLIDATE DIFFERENCES BETWEEN ACG SI (LOG) AND AAP 7214.010-6-1M
UNIT ACTION: REVIEW BOTH INSTRUCTIONS AND IF DIFFERENCES EXIST ADDRESS THROUGH AN AMENDMENT AS APPROPRIATE.
RESPONSE: WOE 6SQN HAS BEEN TASKED TO AMEND ACG SI(LOG) 2-7-6.
B. RECOMMENDATIONS:
01: REVIEW OF SUPPLY PROCESS.
RECOMMENDATION: THE AEO IS REQUESTED TO INVESTIGATE THE CONFORMANCE OF REPLACEMENT ASSETS WHEN SUPPLIED TO USERS AND WITH SERVICEABLE ENGINES AS THIS IS OUTSIDE THE SCOPE OF THE AMO'S INVESTIGATION.
RESPONSE: 29/1/08 SRSPO MSN MGR ?
CABLE MANAGEMENT
A - THE SRSPO INVESTIGATION IDENTIFIED THAT AC GENERATOR ELECTRICAL CABLES WERE NOT BEING ACTIVELY MANAGED. THEREFORE, ENGINEERING MANAGEMENT (INCLUDING THE REPAIR METHODOLOGY) HAS BEEN ASSIGNED TO AN APPROPRAITE F-111 AEO. AAP 7214.003-2-6-1 - POWERPLANT AND RELATED SYSTEMS IS BEING AMENDED TO REFLECT THIS.
B - THE DM FACILITY IS MEASURING CABLES PRIOR TO FITMENT TO SERVICEABLE ENGINES SO AS TO ENSURE CORRECT LENGTH CABLES ARE FITTED WHEN AN ENGINE ARRIVES AT AN OPERATING UNIT.
C - REPLACEMENT CABLES ARE BEING MANUFACTURED (AS REQUIRED) IAW THE APPROVED ENGINEERING SPECIFICATION.
ELECTRICAL CABLE PROTECTION

WHAT IS THE PURPOSE OF THE SI IF IT HAS SAME INFO/REQ AS AAP ??

NEITHER THE SI OR THE PUB IS TAUGHT TO THE AIRCRAFT ENGINE AFFSF TRAINING.

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A - ELECTRICAL CABLES ARE NOW BEING FITTED WITH HEAT SHRINK IAW BOEING SERVICE BULLETIN STK07-SB-00487 TO PROVIDE CABLES WITH AN ADDITIONAL LAYER OF PROTECTION.
B - AAP 7214.003-2-6-1 - POWERPLANT AND RELATED SYSTEMS F-111C AIRCRAFT IS BEING AMENDED TO INCLUDE THE INTENT OF BOEING SERVICE BULLETIN STK07-SB-00487.
C - A BLACK COLOURED HEAT SHRINK IS BEING USED TO ENSURE CHAFFING THAT PENETRATES THROUGH THE HEAT SHRINK TO THE WHITE CABLE BELOW WILL BE EASILY IDENTIFIABLE (MAXIMUM CONTRAST) TO THE NAKED EYE.

Not mandated as Black reason to SB allows any colour.

HYDRAULIC LINE PROTECTION
ALL HYDRAULIC LINES (INCLUDING INSTALLED AND UNINSTALLED SERVICEABLE ASSETS) HAVE BEEN FITTED WITH SCUFF GUARD IAW THE APPLICABLE OEM DRAWING. 3002 Qtm
NOTE: FOR FURTHER DETAIL REFER TO SRSPO TECHNICAL INVESTIGATION REPORT SRSPO/2003/1/23/TECH PT 1 (43) - TECHNICAL REVIEW OF A8-130 SERIOUS INCIDENT OF 1 OCT 07.
02: INVESTIGATE THE ADEQUACY MAINTENANCE PROCEDURES
RECOMMENDATION: THE AEO IS REQUESTED TO INVESTIGATE THE ADEQUACY OF MAINTENANCE PUBLICATIONS FOR THE INSTALLATION, REPAIR AND LIMITATIONS OF ELECTRICAL ENGINE POWER LINES AND HYDRAULIC PIPES, AS THIS IS OUTSIDE THE SCOPE OF THE AMO'S INVESTIGATION.
RESPONSE: 29/1/08 SRSPO MSN MGR
PUBLICATION AMENDMENTS
THE SRSPO INVESTIGATION IDENTIFIED A NUMBER OF DISCREPANCIES IN F-111 MAINTENANCE PUBLICATIONS. ALL PUBLICATION AMENDMENTS ARE CURRENTLY BEING ACTIONED.
INSPECTION TECHNIQUES
THE WEAR AND DEGRADATION IN THE ENGINE BAY DID NOT OCCUR IN ONE FLIGHT. THEREFORE, THERE WAS AN OPPORTUNITY FOR THIS PROBLEM TO BE DISCOVERED DURING AN AFTER FLIGHT SERVICING. POTENTIALLY THE 'LOOK' INSPECTION IS NOT ENOUGH TO CAPTURE THIS PROBLEM AND THEREFORE A PUBLICATION AMENDMENT HAS BEEN INITIATED TO UPGRADE THE AFTER FLIGHT SERVICING TO REQUIRE TECHNICIANS TO 'EXAMINE' THE ENGINE BAY. AN 'EXAMINE' INSPECTION SHOULD PROMPT TECHNICIANS TO PERFORM A MORE THOROUGH INSPECTION OF THE ENGINE BAY, HOWEVER IT IS IMPORTANT TO NOTE THAT THIS PUBLICATION AMENDMENT IS NOT A SUBSTITUTE FOR A VIGALENT TECHNICIAN USING SOUND INSPECTION TECHNIQUES.
NOTE: FOR FURTHER DETAIL REFER TO SRSPO TECHNICAL INVESTIGATION REPORT SRSPO/2003/1/23/TECH PT 1 (43) - TECHNICAL REVIEW OF A8-130 SERIOUS INCIDENT OF 1 OCT 07.
03: ASSESS REPAIRABILITY OF A08-130
RECOMMENDATION: SRSPO IS REQUESTED TO TASK THE DM CONTRACTOR TO ASSESS AND REPAIR, IF COST EFFECTIVE, THE DAMAGE SUSTAINED BY A08-130, AS THIS IS OUTSIDE THE SCOPE OF THE AMO'S INVESTIGATION AND

DRAFTER'S NAME AND TITLE	OPERATOR	PHONE No	REF FILE No
RELEASER'S NAME AND TITLE	BRANCH/UNIT	SIGNATURE	

DATE		No OF PAGES	PAGE No	OVERPAGE
28/4/2008		12	10	Yes

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PRECEDENCE ACTION	PRECEDENCE INFO	DATE TIME GROUP	ORIG NO
ROUTINE	ROUTINE	250344Z APR 08	
SICS			
KQL			

MAINTENANCE CAPACITY.
RESPONSE: 29/1/08 SRSPO MSN MGR
BOEING'S CURRENT CAPACITY TO UNDERTAKE AND COMPLETE THE DAMAGE ASSESSMENT OF A8-130 IS LIMITED DUE TO THE CURRENT DM SCHEDULE. SRSPO IS CONSULTING BOEING REGARDING A SCHEDULE FOR ASSESSMENT OF A8-130'S DAMAGE AND ANTICIPATES RECEIVING BOEING'S ADVICE BY MID FEB 08.

21/4/08 6SQN AMO
SRSPO HAVE ENGAGED BOEING TO MAKE A RECOMMENDATION ON WHETHER THE REPAIR IS VIABLE. QUOTE FROM BOEING IS EXPECTED BY 02 MAY 08, THEREFORE IT IS EXPECTED THAT A DECISION WILL BE MADE BY THE END OF MAY 08.
04. ASSESS THE THE REPAIRABILITY OF THE ENGINE.
RECOMMENDATION: SRSPO IS REQUESTED TO TASK THE DM CONTRACTOR TO ASSESS AND REPAIR, IF COST EFFECTIVE, THE DAMAGE SUSTAINED BY ENGINE (SNO P71-4056), AS THIS IS OUTSIDE THE SCOPE OF THE AMO'S INVESTIGATION AND MAINTENANCE CAPACITY.
RESPONSE: 7/2/08 SRSPO MSN MANAGER:
THE SUBJECT ENGINE (S/NO P71- 4056L) IS TENTATIVELY PROGRAMMED FOR HORIZONTAL REPAIR INDUCTION AT TAEQ ON 05 MAR 08. THE ENGINE HAS UNDERGONE CONDITIONAL ASSESSMENTS AND TAEQ ENGINEERING HAVE PERFORMED A REVIEW AND CLEARED THE ENGINE FOR MAINTENANCE. TAE CM WILL PRESCRIBE APPROPRIATE PENALTY MAINTENANCE MEASURES TO ENSURE THE ONGOING INTEGRITY OF THE ENGINE - POST RECOVERY MAINTENANCE.

21/4/08 6SQN AMO
TAE ARE CURRENTLY WORKING THE REPAIR. THEY HAVE PERFORMED VISUAL INSPECTIONS AND PARTIAL DISASSEMBLY TO VIEW CONDITION OF BEARINGS, AND ARE GENERATING A LIST OF COMPONENTS TO BE REPLACED.
05. REVIEW FLIGHTLINE ROTATIONS
RECOMMENDATION: WOE 6SQN IS REQUESTED TO REVIEW THE ROTATION PERIOD FOR MAINTENANCE PERSONNEL INTO FLIGHTLINE AND CONSIDER WHETHER OR NOT IT WOULD BE BENEFITIAL TO EXTEND THE ROTATION PERIOD TO INCREASE THE QUALITY OF THE AF/BFS.

ADDITIONALLY WOE 6SQN IS TO REVIEW THE TRAINING PRACTICES AND ENSURE ALL PROCEDURES ARE BEING FOLLOWED APPROPRIATELY.
RESPONSE: ROTATION PERIOD HAS BEEN REVIEWED. IT IS CURRENTLY NOT POSSIBLE TO INCREASE THE AMOUNT OF TIME PERSONNEL SPEND ON FLIGHTLINE, DUE TO THE LOW SERVICEABILITY RATE OF AIRCRAFT, AND THE LARGE NUMBER OF PERSONNEL AWAITING FLIGHTLINE EXPERIENCE.

THE TRAINING PRACTICES HAVE BEEN REVIEWED AND ARE ASSESSED AS

DRAFTER'S NAME AND TITLE	OPERATOR	PHONE No	REF FILE No
RELEASER'S NAME AND TITLE	BRANCH/UNIT	SIGNATURE	

DATE		No OF PAGES	PAGE No	OVERPAGE
28/4/2008		12	11	Yes

Received Copy	UNCLASSIFIED

PRECEDENCE ACTION	PRECEDENCE INFO	DATE TIME GROUP	ORIG NO
ROUTINE	ROUTINE	250344Z APR 08	
SICS			
KQL			

APPROPRIATE. CT SESSIONS HAVE BEEN CONDUCTED TO INCREASE AWARENESS OF THE IMPORTANCE OF FLIGHTLINE INSPECTIONS.

12. AIRCRAFT DAMAGE OR COMPONENT CHANGES:
DAMAGE DETAILS: REFER TO CONDITION REPORT 6SQN-08-07 AND AIRCRAFT DAMAGE REPORT 6SQN-05-07

13. RELATED CORRESPONDENCE:

14. SUPERVISOR REVIEW:
MAINTENANCE

FROM THE INCIDENT INVESTIGATION THE DIRECT CAUSE OF THE INCIDENT WAS FOUND TO BE THE RESULT OF CHAFFING AND ARCING OF THE AC POWER LINE ON THE PRIMARY HYDRAULIC LINE, WHICH RESULTED IN AN ENGINE FIRE. HOWEVER, WHILST GENERAL INSPECTIONS OF THE AREA ARE CONDUCTED AS PART OF AF AND BF SERVICINGS THEY WERE INADEQUATE TO PICK UP THE DAMAGED HOSES. THIS WAS DUE TO BOTH HUMAN AND PROCEDURE DEFICIENCIES. IT IS A GENERAL INSPECTION REQUIREMENT THAT WAS INADEQUATE AS SIMILAR CHAFFING WAS FOUND ACROSS THE FLEET. APPROPRIATE PUBLICATION AMENDMENTS AND AWARENESS TRAINING HAS BEEN UNDERTAKEN TO ADDRESS THE PROBLEMS FOR THE LONG TERM, WITH THE FLEET HAVING BEEN RESTORED TO AN SERVICEABLE BASELINE TO ENSURE PREVENTION OF SUCH AN EVENT IN THE IMMEDIATE FUTURE.

WRONG! IT WAS POOR TRADE SUPERVISION & IND INSP IN THE FIRST PLACE. ↑ YES!.. THIS WAS installed incorrectly the failed as a result.

15. CO/OC REVIEW:
THIS INCIDENT WAS WELL HANDLED BY ALL THE AIRCREW INVOLVED AND RESULTED IN THE SAFE RECOVERY OF THE AIRCRAFT . MECHANISMS HAVE BEEN PUT IN PLACE TO RESOLVE THE SHORT AND LONG TERM MAINTENANCE ISSUES HIGHLIGHTED BY THIS INCIDENT. THIS INCIDENT WILL BE REBRIEFED AT THE FIRST UNIT SAFETY DAY OF 2008 AND WILL BE USED AS THE CATALYST TO CONSIDER FURTHER IMPROVEMENTS TO UNIT TRAINING AND MANAGEMENT PRACTICES.

16. NO SASOR

DISTRIBUTION
ACTION: [82WG] REGISTRY
DIST: [82WG] REGISTRY
[1SQN] REGISTRY
[6SQN] REGISTRY
[SRSPO] REGISTRY (4)

DRAFTER'S NAME AND TITLE	OPERATOR	PHONE No	REF FILE No
RELEASER'S NAME AND TITLE	BRANCH/UNIT	SIGNATURE	

DATE		No OF PAGES	PAGE No	OVERPAGE
28/4/2008		12	12	No

Hazard Report

Reference Number: **ASOR: 6SQN-075-2007-SASOR 2**

References:

A. AAP 7214.010-6-1M
B. ACG SI(LOG) 2-7-6

Workflow Phase: Resolution
Classification: Serious Incident
Title: Materiel / Engine / ENGINE FIRE AND HYDRAULIC FAILURE
Occurrence Date Time: 01 1530 LOCAL Oct 07
Location: Other - Please Specify
YCCA
Parachute Incident Report: No
Telephone Notification to **DDAAFS:** Yes **ATSB:** No
Weather: Smoke haze
Light Conds: Day **Meteorological Conds:** VMC **Environmental Facts:** N/A

Aircraft Details

F-111C and RF-111C / A08C / 130 / Sonic 1

Flight Phase: Descent
Last Dep Point: YAMB
Intended Land Point: YAMB
Mission: Training
AP13P - OPCON day applied phase

NVD Aided:	No	External NVG lighting:	Off	NVG Search lights:	Off
Strobe/Anti Coll lights:	On	Landing lights:	Off	Nav lights:	On
Helmet Mounted Device:	No	Engine In Flight Shut Down:	No	Engine related Mission Abort:	No

Fuel Dump: No
Fuel Dump Detail:

Speed (KIAS):	500 to 600	Alt (Feet AMSL):	Greater than 2000
Flight Path:	Clear	Flight Phase:	Descent

Personnel Details

AC / # / QFI-B / AuthOff:No / AC563 Report:No

SP / # / U / AuthOff:No / AC563 Report:No

Hazard Narrative

The incident mission was a day pairs OPCON strike with the pilot under training and a QFI in SONIC 1, and a QFI and ACO in SONIC 2. Established as lead with SONIC 2 in 8nm trail, SONIC 1 was at Mach 0.9 in a terrain following radar (TFR) descent through 5000 ft when a TFR flyup occurred. Whilst managing the system failure, the L ENG FIRE light started flashing followed shortly after by the illumination of the L BLEED DUCT fail warning lamp. TFR ops were discontinued, the Boldface actions completed and SONIC 2 advised immediately with a request for a visual inspection.

The aircraft was turned toward Oakey as the closest suitable airfield while the ENG FIRE LIGHT remained lit but not flashing. During the turn the L and R PRI HYD caution lamps illuminated with sytem pressure indicating zero. Additionally, RUDDER AUTH, PITCH, ROLL AND YAW CHANNEL LAMPS illuminated commensurate with the Hydraulic Failure. A MAYDAY was declared with ATC and intentions passed for a landing at Oakey. The ENG FIRE INFLIGHT checklist was completed with SONIC 2 advising no sign of fire but with trailing white smoke. The fire lights were tested for correct operation however the L ENG FIRE light did not flash but remained steadily lit and continued to remain lit until aircraft shutdown at AMB.

The loss of the PRI HYD system resulted in no Nose Wheel Steering (NWS) capability for landing and only residual accumulator brake pressure available to stop the aircraft on Oakey's 5400ft runway. With the checklist recommendation for a cable engagement on landing with a HYD failure, aircraft fuel load at 23000lbs plus stores and no means to reduce this following the Fire a decision was made to track for AMB instead (a further 40nm). This decision was passed to SONIC 2 and ATC updated for amended clearances at 6000 to 7000. With SONIC 2 in close combat a check of AB operation on the good engine was performed to ensure adequate thrust for configured flight and possible overshoot with no sign of external fire or adverse indications in the cockpit.

Considerations for a PRI HYD failure landing were reviewed with the decision to run the PRI HYD FAIL LANDING checklist followed by the SINGLE ENG LANDING checklist and the cable engagement checklist. These checklists were performed inside 30nm AMB whilst tracking for downwind. With only one hydraulic pump providing pressure to the flight controls, the decision was made to use full flap despite the heavier weight to provide greater drag and therefore higher engine RPM on final. AB was available on the right engine providing some overshoot potential. SONIC 2 was cleared off to land ahead once SONIC 1 had successfully configured for landing.

Whilst on descent on downwind passing 5000ft the pilot under training, who had been flying to this point, highlighted that there was some adverse control force required to maintain wings level. This was noted at 170KIAS. The QFI took over and noted a horizontal stabiliser split of 10 to 12 degrees with some force required. Satisfied with the controllability the decision was made to continue for an approach with an awareness of both the control force required for wings level and the reduced available hydraulic system performance. The aircraft was landed via a cable engagement with the crew egressing immediately. ATC cancelled the MAYDAY following the crew exiting the aircraft.

Investigation

Investigation Status: Completed

Analysis

001 6Sqn

Aircrew actions

The aircrew completed the checklists for engine fire in flight, single engine landing and hydraulic failure landing. The crew did not contact squadron operations, however an aircrew member was available at OPS if required and had consulted the flight manual for the relevant emergencies. The emergency crew prioritised communication with the wingman over attempting to talk to OPS and were happy with the guidance given by the checklist.

002 6Sqn

Strip Clearance

On arrival to Amberley, aircraft A08-130 was safed by the 6SQN Strip Clearance crew. A preliminary visual inspection of the aircraft showed no fire. As such, the aircraft was towed to 6SQN lines.

003 6Sqn

Preliminary Investigation

The aircraft was immediately quarantined for ASOR investigation.

On request from the ASOR I/C, 6SQN maintenance personnel removed the LH engine bay door and inspected for damage. Significant fire damage was evident from the firewall aft along the outboard side of the engine. In particular, fire damage was evident around the hydraulic pumps, engine starter motor and to hydraulic/electrical

lines in the area.

Inspection of the LH speed bump area showed significant signs of fire damage, in close vicinity to the chaff and flare installation areas.

A small hole was found on the LH primary hydraulic pump line approximately 30cm aft of the firewall. An AC power line in close vicinity to the small hole showed excessive signs of wear.

004 6Sqn

Further Investigation

Hydraulic Line
Inspection of the hydraulic line with the small hole revealed that "bi-seal" tape had been used to wrap previous damage to the line in the same area. As such, it is possible that the small hole developed through the same point where previous damage existed. Damage consistent with electrical burning was evident at the site of the hole.

AC Power Line
Visual inspection of the AC power line showed the internal wires were bare and chaffing damage.

Forward of Firewall
Inspection of the bleed air ducts and hydraulic system forward of the firewall was carried out. No failure was evident in this area.

Aft End of Engine
Inspection at the aft end of the engine revealed significant damage to the engine air/oil cooler (resulting in excessive engine oil leakage). Fire damage was also evident on the LH speed bump area.

Failure Modes
It is likely that the failure is a function of two faults. The first being excessive chaffing to both the hydraulic line and the AC power line. The second being electrical arcing between the two lines.

Failure Sequence
The probable sequence of events which lead to failure is that the electrical and hydraulic lines experienced sufficient chaffing to enable an electrical connection to occur between the two lines. This electrical connection enabled arcing to occur which burnt a hole at the previously damaged area on the hydraulic line. Hydraulic fluid escaped through the hole, over the AC power line, forward onto the Jacob's Ladder into the cavity between the fuselage and the engine (to the air/oil cooler). The bare wires on the AC power line provide a sufficiently high flashpoint to set alight the hydraulic fluid. The fire followed the fluid path form the Jacob's Ladder to the air/oil cooler, causing significant damage. The excessive loss of hydraulic fluid, coupled with the fire would lead to a LH engine fire indication and a primary hydraulic failure (LH and RH) indication in the cockpit. In addition, the bleed duct sensor line is located in close vicinity to the damaged lines. As such, a fire in this area would cause a LH bleed air duct failure indication in the cockpit.

Final metallurgical assessment of the A8-130 incident hoses has confirmed the cause of the incident to that of excessive wearing, arching and rupturing of the hydraulic line, and fire. This assessment has ruled out all other possible failure modes under consideration.

005 6Sqn

Inspection of Paperwork

Inspection of A08-130's aircraft paperwork over the period of 01 Jan 07 to 01 Oct 07 highlighted six discreet instances of maintenenace being carried out in the subject area. Of these instances, one was carried out by Boeing (22 Feb 07), two were carried out by 1SQN (6 Jun 07 and 12 Jul 07) and three were carried out by 6SQN (29 Jan 07, 28 Aug 07 and 04 Sep 07).

In addition to the maintenance carried out over the last ten months, the aircraft had been flown numerous times. As such, many after and before flight servicings had been carried out on the aircraft by numerous personnel.

006 6Sqn

After Flight Inspections

In accordance with reference A, the areas under panels 4101 and 4201 are to be checked for obvious damage. There are no specific inspection requirements regarding the subject items and an amendment may be required to include such requirements. Reference B, used to train personnel in flightline servicings in conjunction with reference A, also does not specifically mention any inspection requirements for the hydraulic and electrical lines under panels 4101 and 4201.

The AF and BF procedures in reference A and B are quite involved and vary between both publications. As such, the potential for personnel to miss an inspection is significantly enhanced if they do not utilise the correct publication for every AF and/or BF.

Additional investigation is required to ensure appropriate training is provided to personnel to conduct the AF inspections.

007 6Sqn

Configuration Assessment and maintenance procedures

Visual inspections of the fleet's engines showed that there was considerable variance in the configuration of the hydraulic and power lines within the engine bays. Discussion with various maintenance personnel revealed that it is common practise for maintainers to change configurations so as to try and ensure all of the lines have sufficient space to minimise chaffing/wear. The maintainers stated that they often received engines with hydraulic and power lines of incorrect length.

Another configuration concern was that the subject hydraulic line on A08-130 had "bi-seal" tape around the area that failed. Bi-seal tape is not authorised to be used on this hydraulic line. In addition, it is a requirement to have "scuff-guard" around the hydraulic lines. However, the configuration assessement revealed that many lines did not have scuff guard installed.

There was also considerable ambiguity in regards to the correct power line configuration. In particular, the number of washers used when attaching the power line to the firewall was ambiguous.

Due to the configuration variance, BASC generated reference C, which provides the correct cofigurations for both the hydraulic and power lines. The AEO has also been requested to investigate the adequacy of maintenance publications for installation, repair, removal and inspection of the subject lines (refer to the recommendations).

008 6Sqn

Systemic Concerns

From discussions with a variety of maintenance personnel across the ATECH and AVTECH musterings, some systemic issues were highlighted that could have led towards this serious incident occurring.

The current flightline training for fitters consists of approximately two months, whereby they are trained by TNCOs (who can potentially have only two years experience). In the past (around 10-15 years ago) fitters carried out flightline duties for a minimum of one year and they were trained by technicians with around 10 years experience. As such, the fitters today gain a lot less experience in flightline duties and the quality of training has potentially decreased over time.

In addition to the significant reduction in flightline training time and a possible reduction in quality, 6SQN personnel are currently rotated in and out of flightline on a regular (weekly) basis. This could also contribute to a reduction in after/before flight servicing quality.

In order to increase increase the level of flightline training and still maintain journal progression, a recommendation has been made to WOE 6SQN to increase the flightline rotation period from one to two weeks.

Findings

001 ***Probable Cause of Failure***

Failure Sequence

The probable sequence of events which led to the failure is that the electrical and hydraulic lines experienced sufficient chaffing to enable an electrical connection to occur between the two lines. This electrical connection enabled arcing to occur which burnt a hole at the previously damaged area on the hydraulic line. Hydraulic fluid escaped through the hole, over the AC power line, forward onto the Jacob's Ladder into the cavity between the fuselage and the engine (to the air/oil cooler). The bare wires on the AC power line provide a sufficiently high flashpoint to set alight the hydraulic fluid. The fire followed the fluid path from the Jacob's Ladder to the air/oil cooler, causing significant damage. The excessive loss of hydraulic fluid, coupled with the fire would lead to a LH engine fire indication and a primary hydraulic failure (LH and RH) indication in the cockpit. In addition, the bleed duct sensor line is located in close vicinity to the damaged lines. As such, a fire in this area would cause a LH bleed air duct failure indication in the cockpit.

002 Aircrew actions

The flight manual and checklist procedures were appropriate for the emergency and the crew completed them correctly.

003 After Flight Inspections

In accordance with reference A, the areas under panels 4101 and 4201 are to be checked for obvious damage. There are no specific inspection requirements regarding the subject items. Reference B, used to train personnel in flightline servicings in conjunction with reference A, also does not specifically mention any inspection requirements for the hydraulic and electrical lines under panels 4101 and 4201.

004 Configuration assessment and maintenance procedures

The fleet's inspections of engines and review of the publications showed that there was considerable variance in the configuration of the hydraulic and power lines within the engine bays. In the case of the publications this led to considerable ambiguity in regards to the correct power line configuration.

005 Systemic concerns

The reduction in the flightline training time of fitters, and the potential reduction in the quality of the training provided, combined with current weekly rotation through flightline, is thought to have contributed to a reduction in after/before flight servicing quality.

Contributing Factors

Unsafe Acts or Conditions / Violations / Routine / Failed to Use Publications / 3

Preconditions for Unsafe Acts / Substandard Conditions / Equipment / Unreliable/Faulty / 1

Organisational Influences / Organisational Climate / Culture / Norms and Rules / 3

Organisational Influences / Organisational Processes / Procedures / Instructions / 3

Defences

What, if anything, limited the consequences of the occurrence? / Procedures / Operator Reaction

Detection - How was the problem revealed? / Aircraft on-board warning systems

Risk Management

Risk Management Effective:

Actions

001 * Completed * ***Amend ACG SI(LOG) 2-7-6***

ACG SI(LOG) 2-7-6 is to be amended to highlight the requirement to inspect all hydraulic and electrical lines under panels 4101 and 4201 for any damage.

Response: Amendments to the subject SI have been raised and forwarded to the SI sponsor for review and release.

002 * Completed * ***Amend AAP 7214.010-6-1M***

AAP 7214.010-6-1M is to be amended to highlight the requirement to inspect hydraulic and electrical lines under panels 4101 and 4201 for damage.

Response: As per the notes section of STK07-SB-00487, BASC is currently amending AAP 7214.010-6-1M to ensure inspection of the subject hydraulic and electrical lines is carried out.

003 * Completed * ***Continuation Training***

CT is to be provided to maintenance personnel to highlight the inspection requirements for all hydraulic and electrical lines, with particular attention to the areas under panels 4101 and 4201. This action item is to be conducted once action items 01 and 02 are incorporated and promulgated.

Response: CT session has been carried out on AMO day Feb 08.

004 * Completed * ***Condition Report***

Raise a Condition Report for promulgation.

Response: Condition report 6SQN-08-07 has been raised and promugated.

005 * Completed * ***Aircraft Damage Report***

Raise an Aircraft Damage Report for promulgation.

Response: Aircraft Damage Report 6SQN-005-07 raised and promulgated.

006 * Completed * ***Consolidate differences between ACG SI (LOG) and AAP 7214.010-6-1M***

Review both instructions and if differences exist address through an amendment as appropriate.

Response: WOE 6SQN has been tasked to amend ACG SI(LOG) 2-7-6.

Recommendations

001 * Accepted * * Completed * ***Review of supply process.***

The AEO is requested to investigate the conformance of replacement assets when supplied to users and with serviceable engines as this is outside the scope of the AMO's investigation.

Response: 29/1/08 SRSPO MSN Mgr
Cable Management
a - The SRSPO investigation identified that AC generator electrical cables were not being actively managed. Therefore, engineering management (including the repair methodology) has been assigned to an appropraite F-111 AEO. AAP 7214.003-2-6-1 - Powerplant and Related Systems is being amended to reflect this.
b - The DM facility is measuring cables prior to fitment to serviceable engines so as to ensure correct length cables are fitted when an engine arrives at an operating unit.
c - Replacement cables are being manufactured (as required) IAW the approved engineering specification.
Electrical Cable Protection
a - Electrical cables are now being fitted with heat shrink IAW Boeing Service Bulletin STK07-SB-00487 to provide cables with an additional layer of protection.
b - AAP 7214.003-2-6-1 - Powerplant and Related Systems F-111C Aircraft is being amended to include the intent of Boeing Service Bulletin STK07-SB-00487.
c - A black coloured heat shrink is being used to ensure chaffing that penetrates through the heat shrink to the white cable below will be easily identifiable (maximum contrast) to the naked eye.
Hydraulic Line Protection
All hydraulic lines (including installed and uninstalled serviceable assets) have been fitted with scuff guard IAW the applicable OEM drawing.

NOTE: For further detail refer to SRSPO Technical Investigation Report SRSPO/2003/1/23/TECH Pt 1 (43) - Technical Review of A8-130 Serious Incident of 1 Oct 07.

002 * Accepted * * Completed * ***Investigate the adequacy Maintenance Procedures***

The AEO is requested to investigate the adequacy of maintenance publications for the installation, repair and limitations of electrical engine power lines and hydraulic pipes, as this is outside the scope of the AMO's investigation.

Response:

29/1/08 SRSPO MSN Mgr
Publication Amendments
The SRSPO investigation identified a number of discrepancies in F-111 maintenance publications. All publication amendments are currently being actioned.
Inspection Techniques
The wear and degradation in the engine bay did not occur in one flight. Therefore, there was an opportunity for this problem to be discovered during an After Flight servicing. Potentially the 'look' inspection is not enough to capture this problem and therefore a publication amendment has been initiated to upgrade the After Flight servicing to require technicians to 'examine' the engine bay. An 'examine' inspection should prompt technicians to perform a more thorough inspection of the engine bay, however it is important to note that this publication amendment is not a substitute for a vigalent technician using sound inspection techniques.
NOTE: For further detail refer to SRSPO Technical Investigation Report SRSPO/2003/1/23/TECH Pt 1 (43) - Technical Review of A8-130 Serious Incident of 1 Oct 07.

003 * Accepted * * Completed * ***Assess repairability of A08-130***

SRSPO is requested to task the DM contractor to assess and repair, if cost effective, the damage sustained by A08-130, as this is outside the scope of the AMO's investigation and maintenance capacity.

Response:

29/1/08 SRSPO MSN Mgr
Boeing's current capacity to undertake and complete the damage assessment of A8-130 is limited due to the current DM schedule. SRSPO is consulting Boeing regarding a schedule for assessment of A8-130's damage and anticipates receiving Boeing's advice by Mid Feb 08.

21/4/08 6SQN AMO
SRSPO have engaged Boeing to make a recommendation on whether the repair is viable. Quote from Boeing is expected by 02 May 08, therefore it is expected that a decision will be made by the end of May 08.

004 * Accepted * * Completed * ***Assess the the repairability of the engine.***

SRSPO is requested to task the DM contractor to assess and repair, if cost effective, the damage sustained by engine (SNo P71-4056), as this is outside the scope of the AMO's investigation and maintenance capacity.

Response:

7/2/08 SRSPO MSN Manager:
The subject engine (S/No P71- 4056L) is tentatively programmed for Horizontal Repair induction at TAEQ on 05 Mar 08. The engine has undergone conditional assessments and TAEQ engineering have performed a review and cleared the engine for maintenance. TAE CM will prescribe appropriate penalty maintenance measures to ensure the ongoing integrity of the engine - post recovery maintenance.

21/4/08 6SQN AMO
TAE are currently working the repair. They have performed visual inspections and partial disassembly to view condition of bearings, and are generating a list of components to be replaced.

005 * Accepted * * Completed * ***Review Flightline Rotations***

WOE 6SQN is requested to review the rotation period for maintenance personnel into flightline and consider whether or not it would be benefitial to extend the rotation period to increase the quality of the AF/BFs.

Additionally WOE 6SQN is to review the training practices and ensure all procedures are being followed appropriately.

Response:

Rotation period has been reviewed. It is currently not possible to increase the amount of time personnel spend on flightline, due to the low serviceability rate of aircraft, and the large number of personnel awaiting flightline experience.

The training practices have been reviewed and are assessed as appropriate. CT sessions have been conducted to increase awareness of the importance of flightline inspections.

Damage Details

Refer to Condition Report 6SQN-08-07 and Aircraft Damage Report 6SQN-05-07

Related Correspondence

Unit Review

Supervisor Comments

Maintenance

From the incident investigation the direct cause of the incident was found to be the result of chaffing and arcing of the AC power line on the primary hydraulic line, which resulted in an engine fire. However, whilst general inspections of the area are conducted as part of AF and BF servicings they were inadequate to pick up the damaged hoses. This was due to both human and procedure deficiencies. It is a general inspection requirement that was inadequate as similar chaffing was found across the fleet. Appropriate publication amendments and awareness training has been undertaken to address the problems for the long term, with the fleet having been restored to an serviceable baseline to ensure prevention of such an event in the immediate future.

CO Comments

This incident was well handled by all the aircrew involved and resulted in the safe recovery of the aircraft . Mechanisms have been put in place to resolve the short and long term maintenance issues highlighted by this incident. This incident will be rebriefed at the first unit safety day of 2008 and will be used as the catalyst to consider further improvements to unit training and management practices.

Resolution

Analysis

Nil

Findings

Nil

Contributing Factors

Nil

Defences

Nil

Actions

Nil

Recommendations

Nil

Board Review

FOLIO	
Lifeline 03481/ SRSPO / 2008	
Entered By: SR	

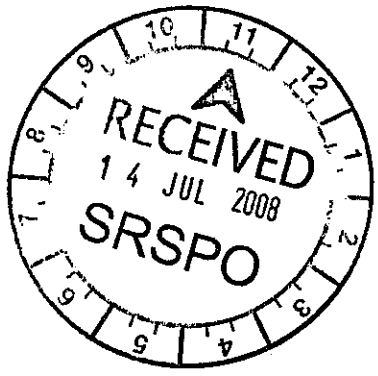
TAE/11/20/01/01 Pt 12 (8)

SENGO
6SQN

SENGO
1SQN

SMM
BASC

CENGR
SRSPO



ECU TF30-P-109RA S/NO P71-4056 – ECU RECTIFICATION

Reference:

A. ASOR 6SQN/075/07 Engine Fire and Hydraulic Failure dated 01 Oct 07.

1. Reference A reported that on the 01 Oct 07, aircraft A8-130 experienced a loss of hydraulic pressure and associated fire warning cockpit indications. Initial investigation by 6SQN revealed the failure occurred due to chafing between the 115V 3-phase AC power cable and the primary hydraulic system pressure hose. LH ECU S/No P71-4056 suffered secondary damage as a result of the engine nacelle fire fuelled by hydraulic oil from the damaged hydraulic hose and by engine oil leaking from the burnt engine air-oil cooler. The ECU was removed from A8-130 and forwarded to TAE for repair.

2. Initial external visual and internal RVI inspections confirmed that the damage to the ECU was restricted to external accessories and components on the left-hand side of the engine including significant heat damage to the Air Oil Cooler and the Afterburner Nozzle and Ejector Assembly. There was no apparent physical damage to the internal engine gas path components or evidence of damage to oil wetted components even though the majority of the oil in the engine gearbox oil tank was lost through the damaged air oil cooler during the flight back to base with the engine shutdown and windmilling.

3. Following several inspections and assessments of the possible damage sustained by the engine during the nacelle fire event, a structured repair strategy was implemented resulting in the successful testing of the ECU on Engine Test Cell 1. The testing included a Spectrometric Oil Analysis (SOA) and Wear Debris Analysis (WDA) program of the engine oil system developed by TAE Condition Monitoring Group to ensure the integrity of the engine Mainline and Gearbox bearings. The engine is now on a Code "C" SOA oil sampling frequency for approximately 25 ENHR in order to quickly re-establish the engine's SOA Trend to a consistent level for monitoring and is not a reflection of the engine serviceability.

4. In summary, the rectification of ECU S/No P71-4056 included the following:

   a. Replacement of the Afterburner Nozzle and Ejector Assy (AB) and Engine Air Oil Cooler.

   b. Replacement of MFP, MFCU and ABFCU. Checks of the ABFCU on the RHTF found no damage and following the replacement of the throttle lever seal as a precaution and a full "Matroc" functional test, the control was returned to Serv Stk.

   c. Replacement of all external components, wiring looms, bleed air ducts and tubing on the left-hand side of the ECU. All removed components were either disposed of or sent for check test dependent on an assessment authorised by TAE Engineering.

   d. The engine gearbox assembly was cleaned of soot inspected for damage. Nil damage was found. The gearbox assembly was not replaced however as a precaution the left hand throttle crossover shaft bearing was replaced.

   e. Partial Horizontal disassembly of the ECU was carried out to gain access to the No1, No 41/2 and No 6 Bearings. The bearings were removed from the engine and inspected to overhaul standards. All three bearing were found in excellent condition and complied to overhaul inspection limits. Nos 1 and 6 bearings were refitted to the engine, however as a precaution another serviceable No 41/2 bearing was fitted and the original bearing forwarded to ESA for disposal.

   f. The Fan Pack (1st to 3rd Stage Fan) was disassembled to gain access to the fibreglass rubstrips. A visual inspection found no heat damage to the rubstrips.

   g. At Engine Test Cell 1, the ECU underwent a comprehensive oil system penalty test. The test consisted of a complete oil system flush and replenishment, 4 SOA samples and 4 engine filter inspections taken over a period of 3.5 ENHR of engine test. The tests confirmed that there was no rise in element contamination and no evidence of engine mainline or accessory bearings failure or other potential oil system failure modes.

5. Based on a review of all repair activity and test results and a recommendation from TAE Condition Monitoring Group, TAE Engineering released ECU S/No P71-4056 from the investigation to allow it to be returned to Serv Stk following successful completion of all related maintenance activity.

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TSO 4
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TAE

Tel: 13554

07 Jul 08

Kelly, Peter MR 2

Subject: Final G Model
Location: 6SQN

Start: Mon 3/09/2007 12:00
End: Mon 3/09/2007 13:30

Recurrence: (none)

AIRMSHL Shepherd, Chief of Air Force (CAF), will be visiting RAAF Amberley on Mon 3 Sep 07 to attend the F111G Withdrawal Ceremony and visit selected units at RAAF Amberley.

SRSPO will not be visited by CAF.

OC SRSPO extends an invitation to SRSPO personnel to attend the F111G Withdrawal Ceremony. Please do not extend this invitation to others.

Visit co-ordination has been arranged by 82WG and the BCDR.

Ceremony to be held at F111 Flight Line 4

1200h	**Final flight in F111G aircraft- note: aircraft to land at 1200h**
1230h	**F111G Withdrawal Ceremony- CDR ACG and CAF address**
1255h	**Conclusion of ceremony**

If you would like to attend the event please be aware that seating has only been reserved for key attendees. You would need to stand for the duration of the ceremony.

'AIR FORCE'
Dated 17 Sep 07

LAST FLIGHT WAS MON 3 Sep 07

END PLAY: Left, CAF AIRMSHL Geoff Shepherd prepares to pilot the last F-111G mission out of RAAF Base Amberley. The F-111G was used to train aircrew before transition to the F-111C.
Photo by LAC Scott Woodward