飛航事故調查報告

ASC-AOR-05-08-001

中華民國 92 年 12 月 25 日
復興航空公司 GE006 班機
ATR72-212A 型機
國籍標誌及登記號碼 B-22805
於松山機場落地滾行時發動機失火

行政院飛航安全委員會
AVIATION SAFETY COUNCIL
中華民國九十四年八月

此頁空白

飛航事故調查法第五條第一項規定：

飛安會對於飛航事故之調查，旨在避免類似飛航事故之再發生，不以處分或追究責任爲目的。

國際民航公約第十三號附約第三章第 3.1 節規定：

The sole obiective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

因此，依據飛航事故調查法及國際民航公約第十三號附約，本調查報告專供改善飛航安全之用。

本報告一式兩份，分別以中文及英文繕寫，以中文版爲主。

此頁空白

摘要報告

民國 92 年 12 月 25 日，復興航空運輸股份有限公司（簡稱復興）GE006 班機，機型 ATR72-212A，國籍標誌及登記號碼 B-22805，於 0740 時[1]由花蓮飛松山，執行載客任務，機上有飛航組員 2 人、客艙組員 2 人與乘客 18 人。

飛航途中一切正常，直至進場 0813:20 時至 0813:55 時（飛航資料紀錄器記錄之高度分別爲 1,099 呎及 686 呎）之間，座艙語音紀錄器記錄十餘次警告音響（音響作動時間長短不一，最長約 1 秒鐘）。飛航組員發現中央組員警示系統（Centralized Crew Alerting System，CCAS）紅燈瞬間閃亮又熄滅，確切閃亮燈號未能辨明。0815 時在松山機場 10 跑道落地，著陸滾行時一號發動機火警警示燈亮。飛航組員按程序關斷一號發動機燃油開關手柄（Condition Lever，CL-1）並拉出該發動機 T 型斷油手柄（T-HANDLE），火警警示燈隨後熄滅。飛航組員請客艙組員檢視一號發動機外觀未發現異狀，未擊發滅火瓶，繼續滑行至停機坪。落地後檢查發現一號發動機附件齒輪箱匣右上方穿洞，其附近及線頭有燒灼痕跡。

該機滑至停機坪後機上人員依正常程序下機，人員無傷亡。航機結構經檢查未發現損害。

本會於接獲通報後，依中華民國民用航空法第 84 條[2]與航空器失事及重大意外事件調查處理規則第 15 條進行調查，並參考國際民航公約第 13 號附約（Annex 13 to the Convention on International Civil Aviation），邀請中華民國交通部民用航空局（簡稱民航局）、法國航空器失事調查局（Bureau d'Enquetes et d'Analyses，BEA）、加拿大運輸安全委員會（Transport Safety Board，TSB）授權代表，會同 ATR72 發動機製造廠（Pratt & Whitney Canada，PWC）代表分赴法國巴黎發動機維修廠

1本報告之時間均係當地時間，採 24 小時制。
2當時飛航事故調查法尚未生效施行。

（SECA）及加拿大蒙特婁普惠發動機製造廠（PWC）進行發動機拆檢及附件齒輪箱匣零組件之檢驗。本會於調查期間依所搜集之事實資料以及綜合分析，總結以下三類之調查結果：「與可能肇因有關之調查發現」、「與風險有關之調查發現」及「其它調查發現」。分述如下：

與可能肇因有關之調查發現

此類調查發現係屬已經顯示或幾乎可以確定爲與本事故發生有關之重要因素。其中包括：不安全作爲、不安全狀況或造成本次事故之安全缺失等。

與風險有關之調查發現

此類調查發現係涉及飛航安全之風險因素，包括未直接導致本次事故發生之不安全作爲、不安全條件及組織和整體性之安全缺失等，以及雖與本次事故無直接關連但對促進飛安有益之事項。

其它調查發現

此類調查發現係屬具有促進飛航安全、解決爭議或澄清疑慮之作用者。其中部分調查結果爲大眾所關切，且見於國際調查報告之標準格式中，以作爲資料分享、安全警示、教育及改善飛航安全之用。

與可能肇因有關之調查發現

1. 該發動機附件齒輪箱內溫度升高致引燃滑油。（1.8）
2. 油氣分離葉輪受熱解體甩出擊破附件齒輪箱匣，高溫滑油及熱氣自洞穿處逸出並引發一號發動機火警。（2.3.1）

與風險有關之調查發現

無。

其它調查發現

1. 飛航組員依中華民國民航法規持有合格有效證照。(1.3.1)
2. 飛航組員在事故前 72 小時內之工作及休息正常；無證據顯示在事故發生時，受到生理、心理或藥物、酒精等因素影響。(1.3.4)
3. 事故前該機符合民航法規之給證、裝備與維修條件。(1.4.1)
4. 查閱該機事故前一個月之相關維修紀錄，未發現發動機系統故障紀錄。(1.4.2)
5. 飛航組員在本次事故落地階段之決心下達及處置均正常。(2.1, 2.1.1)
6. 一號發動機冷、熱段及主軸運轉均正常。(2.2)
7. 該附件齒輪箱匣穿孔之失效模式爲單一事件，過去無類似故障紀錄。(2.2)

飛安改善建議

致加拿大普惠發動機製造廠

持續找尋該型發動機滑油產生高溫原因，並提供發現情況供同型發動機使用者參考。(ASC-ASR-05-08-001)

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英文縮寫對照表

CCAS	Centralized Crew Alerting System	中央組員警告系統
CL-1	Condition Lever 1	一號發動機燃油開關手柄
CVR	Cockpit Voice Recorder	座艙語音紀錄器
FCOM	Flight Crew Operating Manual	飛行組員操作手冊
FDR	Flight Data Recorder	飛航資料紀錄器
HRC	Rockwell Hardness C	硬度單位
PWC	Pratt & Whitney Canada	加拿大普惠發動機製造廠
SEM	Scanning Electron Microscopy	掃描電子顯微鏡
SOP	Standard Operation Procedures	標準作業程序
SSCVR	Solid-State Cockpit Voice Recorder	固態式座艙語音紀錄器
SSFDR	Solid-State Flight Data Recorder	固態式飛航資料紀錄器

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第一章　事實資料

1.1　飛航經過

民國 92 年 12 月 25 日，復興航空運輸股份有限公司（簡稱復興）GE006 班機，機型 ATR72-212A，國籍標誌及登記號碼 B-22805，於 0740 時[3]由花蓮飛松山，執行載客任務，機上有飛航組員 2 人、客艙組員 2 人與乘客 18 人。

飛航途中一切正常，直至進場 0813:20 時至 0813:55 時（飛航資料紀錄器記錄之高度分別爲 1,099 呎及 686 呎）之間，座艙語音紀錄器記錄十餘次警告音響（音響作動時間長短不一，最長約 1 秒鐘）。飛航組員發現中央組員警示系統（Centralized Crew Alerting System，CCAS）紅燈瞬間閃亮又熄滅，確切閃亮燈號未能辨明。0815 時在松山機場 10 跑道落地，著陸滾行時一號發動機火警警示燈亮。飛航組員按程序關斷一號發動機燃油開關手柄（Condition Lever，CL-1）並拉出該發動機 T 型斷油手柄（T-HANDLE），火警警示燈隨後熄滅。飛航組員請客艙組員檢視一號發動機外觀未發現異狀，未擊發滅火瓶，繼續滑行至停機坪。落地後檢查發現一號發動機附件齒輪箱匣右上方穿洞，其附近及線頭有燒灼痕跡。

該機滑至停機坪後機上人員依正常程序下機，人員無傷亡。航機結構經檢查未發現損害。

1.2　人員傷害及航空器損害情況

該機落地後滑至停機坪，機上人員依正常程序離機，人員無傷亡。該機結構經檢視未發現損害。檢視一號發動機內側（inboard）整流罩前方內部，發現局部受熱脫層，直流起動發電機線束保護套燒毀（如圖 1.2-1）。螺旋槳訊號/控制系統線束燒損，發動機上方火警偵測線燻黑，附件齒輪箱匣右上方穿洞（如圖 1.2-2）。

3本報告之時間均係當地時間，採 24 小時制。

圖 1.2-1 直流起動發電機線束保護套燒毀

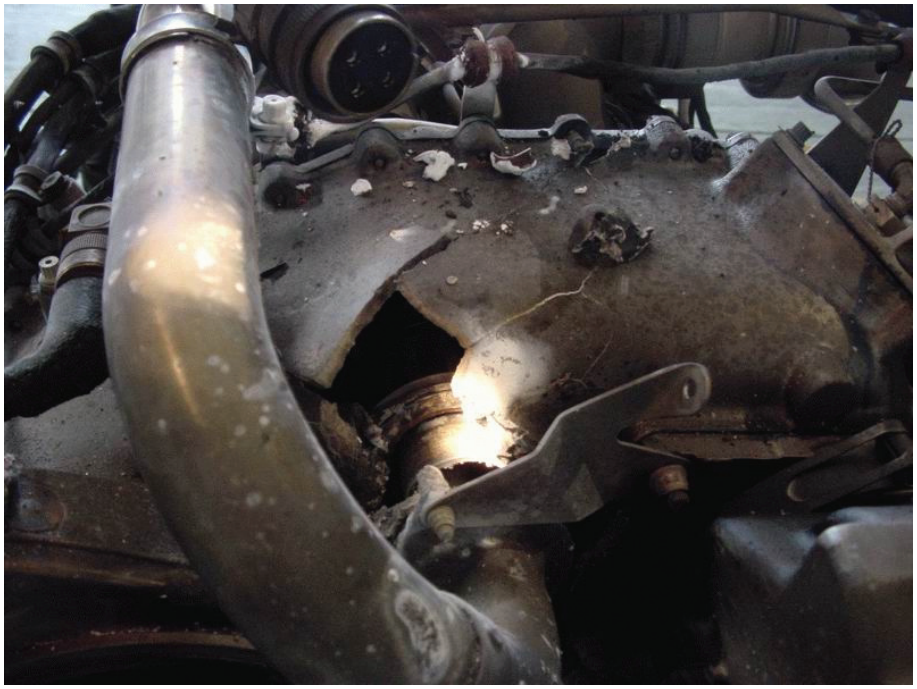


圖 1.2-2 附件齒輪箱匣右上方穿洞

1.3　飛航組員資料

1.3.1　基本資料

表 1.3-1 駕駛員基本資料表

項　　目	CM-1	CM-2
性別	男	男
事故發生時年齡(歲)	52	34
進入復興航空公司日期	83 年 9 月 5 日	89 年 2 月 10 日
執業證書種類	固定翼航空器 民航運輸駕駛員 101745	固定翼航空器 民航運輸駕駛員 102103
檢定證項目 到期日	ATR 72 93 年 7 月 4 日	ATR 72 F/O 93 年 5 月 18 日
體格檢查種類 到期日	甲類駕駛員 93 年 4 月 30 日	甲類駕駛員 93 年 1 月 31 日
最近一次飛航檢定	92 年 6 月 24 日	92 年 11 月 10 日
總飛航時間	10,549 小時 06 分	3,368 小時 21 分
最近 12 個月飛航時間	823 小時 05 分	831 小時 20 分
最近 90 日內飛航時間	225 小時 26 分	217 小時 23 分
最近 30 日內飛航時間	73 小時 02 分	77 小時 19 分
最近 7 日內飛航時間	16 小時 01 分	15 小時 39 分
ATR 42/72 飛航時間	7,657 小時 16 分	3,065 小時 21 分
事故當日已飛時間	0	0
事故前休息時間	14 小時	14 小時

1.3.1.1　正駕駛員（CM-1）

CM-1 爲中華民國籍，曾任軍方駕駛員，服役期間飛航時間爲 2,891:50 小時。

民國 83 年 9 月進入復興，同年 10 月接受 ATR42/72 型機「新進訓練」，84 年 2 月完訓擔任 ATR42/72 型機副駕駛員，88 年 10 月晉升爲 ATR42/72 型機正駕駛員。事故時，累計 ATR42/72 型機之飛航時間爲 7,657:16 小時，總飛航時間爲 10,549:06

小時。

1.3.1.2 副駕駛員（CM-2）

CM-2 爲中華民國籍，係自訓民航駕駛員，自訓期間飛航時間爲 303:00 小時。

民國 89 年 2 月，進入復興接受 ATR42/72 型機「新進訓練」，89 年 8 月完訓擔任 ATR42/72 型機副駕駛員。事故時，累計 ATR42/72 型機之飛航時間爲 3,065:21 小時，總飛航時間爲 3,368:21 小時。

1.3.2 訓練及考驗

1.3.2.1 CM-1

定期複訓與檢定紀錄顯示：最近兩年實施四次定期複訓及學科測驗/術科檢定等均合格。

1.3.2.2 CM-2

定期複訓與檢定紀錄顯示：最近兩年實施四次定期複訓及學科測驗/術科檢定等均合格。

1.3.3 健康狀況

1.3.3.1 CM-1

民航局核發 CM-1 之體格檢查及格證中之「限制」欄註明：「需戴眼鏡矯正視力」。

依 CM-1 自述：最近健康狀況良好，未曾服用藥物，亦無飲酒習慣。

1.3.3.2 CM-2

民航局核發 CM-2 之體格檢查及格證之「限制」欄註明：「需戴眼鏡矯正視力」。

依 CM-2 自述：最近健康狀況良好，未曾服用藥物，亦無飲酒習慣。

1.3.4　事故前 72 小時活動

據調查資料，CM-1 與 CM-2 於事故前 72 小時之作息情況正常。

1.4　航空器資料

1.4.1　基本資料

表 1.4-1 航空器基本資料

航空器基本資料	
國籍	中華民國
國籍標誌及登記號碼	B-22805
所有人	復興航空運輸股份有限公司
使用人	復興航空運輸股份有限公司
登記證書編號	92-871
登記證書發證日期	民國 92 年 2 月 27 日
適航證書編號	92-12-167
適航證書有效期限	民國 93 年 11 月 30 日
飛機總使用時間	11350 小時 00 分
飛機總落地次數	17136
上次週檢種類	A Check
上次週檢完成日期	民國 92 年 12 月 23 日
上次週檢後使用時間	2 小時 57 分
上次週檢後落地次數	4
下次 A 級週檢時間	民國 93 年 3 月 19 日
製造廠	Avions De Transport Regional
型號	ATR72-212A
序號	558
製造日期	JUN. 25, 1998
最大起飛重量	22000 KG/48051 LB

發動機基本資料	
製造廠	Pratt & Whitney Canada
型別	PW127F（#1 / #2）
序號	#1 / AV0063 ； #2 / AV0064
最大轉速	NP / 1212 rpm；NH / 34360 rpm；NL / 28870 rpm
最大馬力	2880 ESHP
使用總時間	#1 / 9658:00 小時；#2 / 9915:15 小時
上次週檢種類	A Check
上次週檢完成日期	民國 92 年 12 月 23 日
上次週檢後使用時間	2:57 小時

1.4.2 維修紀錄

查閱該機事故前一個月之相關維修紀錄，未發現該發動機系統故障紀錄。

1.5 天氣資料

以下爲事故發生前後，松山機場地面天氣觀測紀錄：

0800 時：靜風；能見度 4,500 公尺；天氣現象－靄；稀雲 800 呎、裂雲 1,800 呎、裂雲 4,000 呎；溫度 19℃，露點 16℃；高度表撥定值 1019 百帕。

0813 時：風向 180°，風速 2 浬/時；能見度 5,000 公尺；天氣現象－靄；疏雲 800 呎、裂雲 1,600 呎、裂雲 4,000 呎；溫度 19℃，露點 16℃；高度表撥定值 1020 百帕。

1.6 飛航紀錄器

1.6.1 座艙語音紀錄器

該機裝置 Fairchild S200 型固態式座艙語音紀錄器（Solid-State Cockpit Voice Recorder，SSCVR），製造商爲 L3 Communication 公司，件號及序號分別爲 S200-0012-00 及 01064。所記錄之語音資料共 120 分鐘，紀錄品質良好，記錄範圍涵蓋自該班機發動機開車至該機落地滑入停機坪拔出斷電器後停止。

此紀錄器之四軌錄音分別來自：正駕駛員麥克風、副駕駛員麥克風、座艙區域麥克風及旅客廣播系統。自中正近場管制台要求該機與松山塔台聯絡始（0811:32時），至記錄結束止（0819:14 時）共 7 分 42 秒之語音抄件詳如附錄一，抄件時間係以飛航資料紀錄器記錄之時間參數爲參考基準。

CVR 與發動機火警警告相關訊息摘要如下：

時　　間	內　　容
0813:20	座艙內出現單聲警示聲（single chime）
0813:27 | 0814:01	出現四次單聲警示聲和連續重複警示聲（Continuous Repetitive Chime）
0813:42	副駕駛員稱：「一號的那個 一 機油壓力在降」
0814:21	副駕駛員稱：「機油壓力目前是零」
0815:25 | 0815:34	該機在落地過程中出現持續 8.4 秒之連續警示聲響
0815:39	副駕駛員稱：「number one engine fire」
0816:18	正駕駛員聯絡客艙組員檢查發動機有無冒煙或異狀

1.6.2　飛航資料紀錄器

該機裝置 Fairchild F1000 型固態式飛航資料紀錄器（Solid-State Flight Data Recorder，SSFDR），製造商爲 L3 Communication 公司，件號及序號分別爲 S800-2000-00 及 01651，該紀錄器具 25 小時記錄能力。

事故發生後，本會自法國失事調查局取得解讀該 ATR72 紀錄器所需之解讀文件，該文件顯示該紀錄器共記錄 383 項飛航參數。

解讀後之資料轉換成當地時間之 FDR 時間參數爲基準，解讀結果摘錄如下：

時　　間	內　　容
0734:12	該機之參數資料開始記錄
0740:30	該機開始加速起飛時間，磁航向 29.9 度，襟翼 15 度
0740:58	該機起飛離地
0741:18	自動駕駛啓動
0758:21	自動駕駛解除
0803:28	選擇高度（Selected Altitude）設定爲 3960 呎，標準大氣高度 7507 呎。一號及二號發動機渦輪溫度爲攝氏 553 度及 582 度。一號及二號發動機扭力比爲 55%及 56%
0807:44	選擇高度設定爲 2560 呎，標準大氣高度 3999 呎。一號及二號發動機渦輪溫度爲攝氏 517 度及 571 度。一號及二號發動機扭力比爲 42%及 43%
0813:27	主警告作動，標準大氣高度 1029 呎，無線電高度 1204 呎。一號及二號發動機渦輪溫度爲攝氏 482 度及 520 度。一號及二號發動機扭力比 20%及 19%
0813:31	主警告作動，標準大氣高度 980 呎，無線電高度 1144 呎。一號及二號發動機渦輪溫度爲攝氏 482 度及 520 度。一號及二號發動機扭力比爲 20%及 18%
0813:35	主警告作動，標準大氣高度 943 呎，無線電高度 1089 呎。一號及二號發動機渦輪溫度爲攝氏 482 度及 520 度。一號及二號發動機扭力比爲 20%及 18%
0813:38	主警告作動，標準大氣高度 906 呎，無線電高度 1039 呎。一號及二號發動機渦輪溫度爲攝氏 482 度及 520 度。一號及二號發動機扭力比爲 20%及 18%。
0813:41	主警告作動，標準大氣高度 849 呎，無線電高度 1013 呎。一號及二號發動機渦輪溫度爲攝氏 482 度及 520 度。一號及二號發動機扭力比爲 20%及 18%
0813:49	主警告作動，標準大氣高度 738 呎，無線電高度 915 呎。一號及二號發動機渦輪溫度爲攝氏 482 度及 520 度。一號及二號發動機扭力比爲 20%及 19%
0813:52	主警告連續作動兩秒，標準大氣高度 738 呎，無線電高度 915 呎。一號及二號發動機渦輪溫度爲攝氏 482 度及 520 度。一號及二號發動機扭力比爲 20%及 19%

時　　間	內　　容
0813:55	主警告連續作動七秒，標準大氣高度 686 呎，無線電高度 860 呎。一號及二號發動機渦輪溫度爲攝氏 482 度及 520 度。一號及二號發動機扭力比爲 21%及 19%
0815:13	一號發動機扭力比減爲 0%
0815:25	主警告連續作動九秒，無線電高度 0 呎減爲-3 呎。一號發動機渦輪溫度爲攝氏 485 度變爲 463 度。二號發動機渦輪溫度爲攝氏 530 度變爲 534 度
0815:29	該機主輪著陸
0815:50	主警告連續作動兩秒，無線電高度-3 呎。一號及二號發動機渦輪溫度爲攝氏 476 度及 517 度。一號及二號發動機扭力比爲 0%及 8%
0817:53	左空調組閥門（Pack Valve）關閉
0819:06	FDR 停止記錄

1.7　火災

該機落地滑行時，出現火警信號警告。飛航組員關斷一號發動機並拉出 T 型斷油手柄，火警信號警告熄滅。停機後檢查發現一號發動機附件齒輪箱匣右上方區域有燻燒過熱痕跡（如圖 1.2-1），部分線束亦有燃燒痕跡（如圖 1.7-1）。

圖 1.7-1 部分線束有燃燒痕跡

1.8 測試與實驗

飛安會共進行兩次檢驗作業，第一次在法國巴黎 EADS SECA 維修廠進行發動機拆檢，第二次於加拿大蒙特婁普惠發動機製造廠（PWC）執行附件齒輪箱匣失效組件鑑定。

民國 93 年 1 月 11 日至 18 日間，在 EADS SECA 維修廠拆檢該發動機。發現發動機之動、靜葉片與轉軸正常。七只軸承除六號軸承滾軸有磨損現象外其餘正常。洞穿之機匣內面有解體油氣分離器之撞擊痕跡。據飛安委員會所提之拆檢報告(附錄 2）及 SECA 所提之拆檢報告（附錄 3），油氣分離葉輪由軸上解體脫離可能原因有二：一爲運轉過程中無法承擔不確定之負荷而自然解體；一爲於發動機翻修過程中油氣分離葉輪軸封膠圈（安裝位置如圖 1.8-1 所示）未安裝所致，使油氣分離葉輪失去避震效果，於長期高頻震動情形下運轉終至龜裂解體。該兩則可能原因需經進一步之材質化驗後方能揭曉。

民國 93 年 2 月 22 日至 29 日間，飛安會代表會同 SECA 及 PWC 代表，在加

拿大蒙特婁普惠發動機製造廠進行油氣分離葉輪解體原因鑑定。於附件齒輪箱匣內蒐集燃燒過之殘渣內，發現疑似油氣分離葉輪軸封膠圈，經化驗證實其材質及形狀與應裝之膠圈吻合。可排除油氣分離葉輪軸封膠圈未安裝之可能。又發現油氣分離葉輪龜裂解體原因與受熱有關，熱源來自附件齒輪箱匣內部。詳如附錄 4：飛安會檢查報告。

加拿大普惠發動機製造廠對油氣分離葉輪之解體，作了進一步檢驗，並提出檢驗報告詳如附錄 5。

發動機故障極可能因油氣分離葉輪碳軸封附近起火，火勢蔓延至齒輪箱，在溫度升高後，使油氣分離葉輪局部受熱膨脹，終致超負荷而崩裂。解體之葉輪碎片撞穿附件齒輪箱匣。

起火原因很可能是碳晶油封附近之滑油到達自燃溫度所致。至於滑油溫升高到自燃之溫度，其原因尚無法確定。

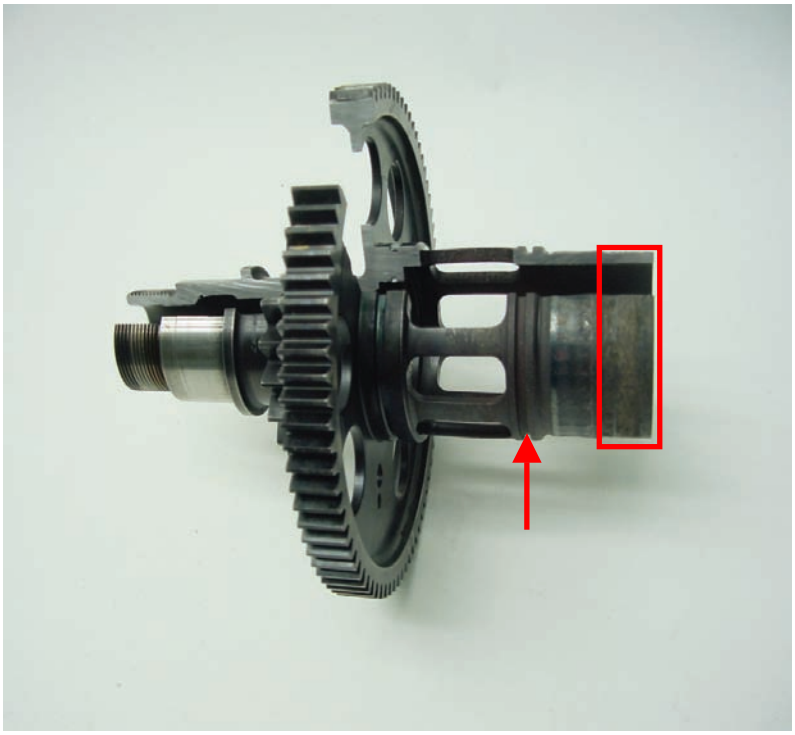
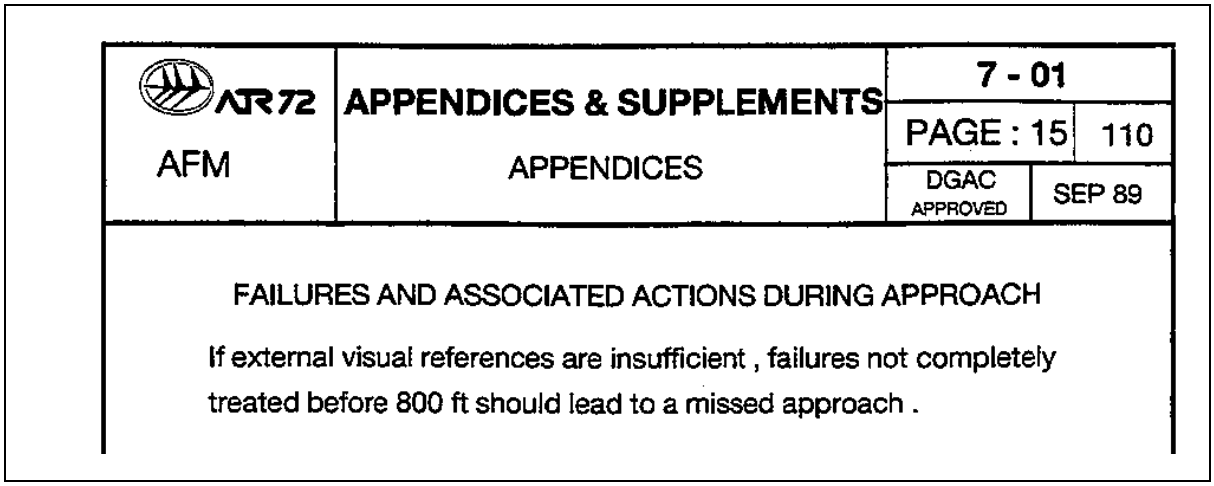


圖 1.8-1 軸封膠圈（紅箭處）及碳晶油封（紅框處）安裝位置圖

1.9 其他資料

1.9.1 ATR72 型機操作手冊

ATR72 型機飛航手冊（Airplane Flight Manual）中有關失敗進場相關行動（FAILURES AND ASSOCIATED ACTIONS DURING APPROACH）如下：



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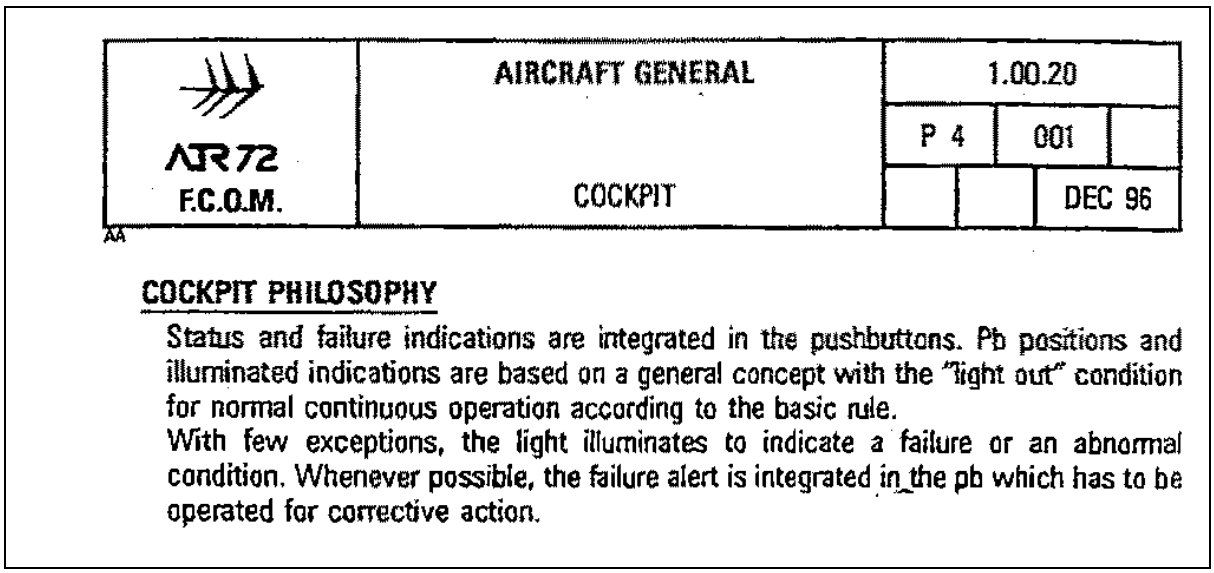
FAILURES AND ASSOCIATED ACTIONS DURING APPROACH

If external visual references are insufficient , failures not completely treated before 800 ft should lead to a missed approach .

ATR72 型機操作手冊（Flight Crew Operating Manual，FCOM）中有關駕駛艙哲理（COCKPIT PHILOSOPHY）如下：



ATR72 F.C.O.M. | AIRCRAFT GENERAL | 1.00.20
COCKPIT | P 4 | 001
DEC 96

AA

COCKPIT PHILOSOPHY

Status and failure indications are integrated in the pushbuttons. Pb positions and illuminated indications are based on a general concept with the "light out" condition for normal continuous operation according to the basic rule.
With few exceptions, the light illuminates to indicate a failure or an abnormal condition. Whenever possible, the failure alert is integrated in the pb which has to be operated for corrective action.

ATR72 型機操作手冊中有關啓用程序（PROCEDURES INITIATION）如下：

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AA

PROCEDURES INITIATION

– No action will be taken (apart from depressing MW pb):
  . Until flight path is stabilized.
R . Under 400 ft above runway (except for propeller feathering after engine failure during approach at reduced power if go around is considered).

– Before performing a procedure, the crew must assess the situation as a whole, taking
R into consideration the failures, when fully identified, and the constraints imposed.

復興標準作業程序（Standard Operation Procedures，SOP）中有關不正常程序技術（Abnormal Procedure Techniques）摘要如下：

1. Abnormal Procedure Techniques

1. General

……

Main objective of the flight crew shall be to maintain always-positive aircraft control in simple words:

"KEEP IT FLYING"

Generally the flight crew shall not deal with technical problems except then:

－*the vertical and lateral flight path is under positive control and*

－*possible ground contact is no longer a threat*

－*altitude is more than 400 feet AGL.*

1.9.2 滑油系統簡介

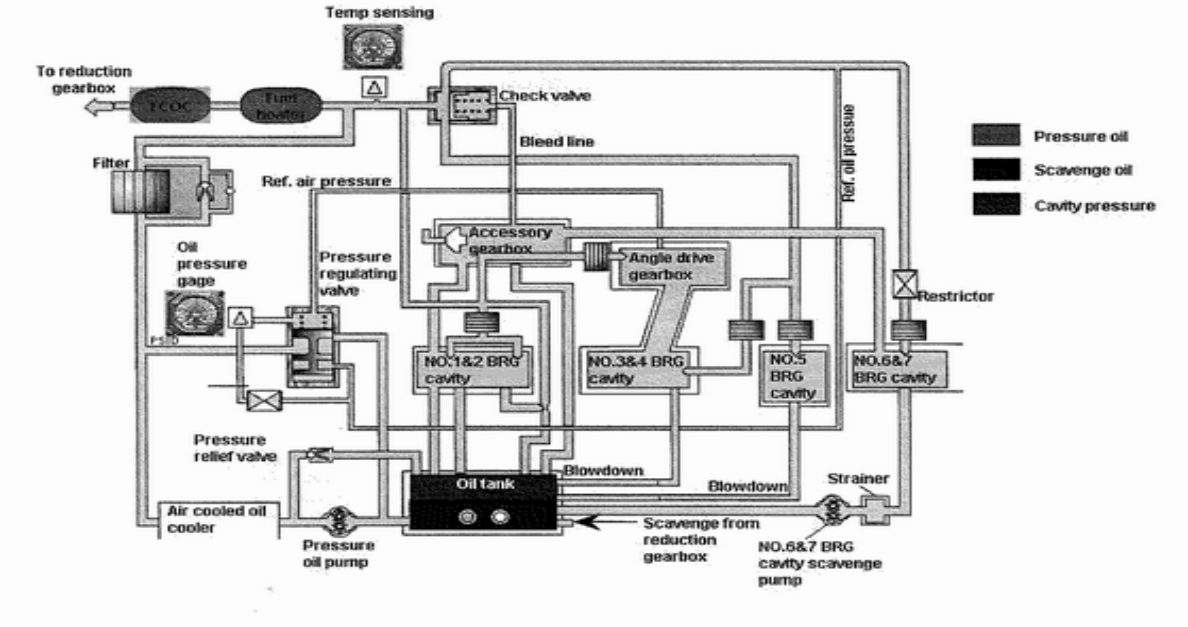

圖 1.9-1 PWC127 發動機滑油系統示意圖

該機所用 Esso 2380 滑油經滑油泵由滑油箱輸送至發動機軸承及減速齒輪箱。滑油泵由附件齒輪箱齒輪帶動，將滑油送往氣冷式滑油冷卻器，再經由壓力調節閥將滑油調整至 60±5 psi。滑油流經過濾器使滑油淨化，再流至感溫器顯示滑油溫度後分成三路，第一路至燃油/滑油熱交換器降溫後至減速齒輪箱冷卻及潤滑減速齒輪，回油經回收泵送回滑油箱；第二路至附件齒輪箱、1/2 號軸承室及驅動齒輪箱，回油則直接由回油管流回滑油箱；第三路則經由止回閥進入 3/4 號軸承室、5 號軸承室、6/7 號軸承室， 3/4 及 5 號軸承室回油以重力方式回流至滑油箱，6/7 號軸承室回油則經依驅油泵將回油送回滑油箱。除 6/7 號軸承室外，滑油箱、1/2 號軸承室、齒輪驅動箱、3/4 號軸承室及 5 號軸承室皆有通氣管將室（箱）內油氣排往附件齒輪箱[4]。附件齒輪箱內有一離心式油氣分離葉輪將油與氣分離，滑油經回油管流回滑油箱，氣體則經排氣管排至大氣。

4 通氣管之功用爲提供滑油箱將油氣疏通至附件齒輪箱之管道

第二章 分析

本調查分析著重於探討飛航組員之操作有無影響發動機之損壞;該發動機之維護是否正常及油氣分離葉輪之損壞原因。

本次事故前，GE006 之駕駛員持有符合民航法規之合格有效證照，事故前七十二小時內之工作及休息正常，無證據顯示在事故發生時，駕駛員曾受到生理、心理、藥物或酒精等因素之影響。

針對本次事故調查蒐獲之證據，分析如後。

2.1 CCAS 警示燈閃爍後駕駛員之處置

該機於實施台北松山機場「10 號跑道儀器降落系統進場」時，首次出現中央組員警告系統（CCAS）警示燈閃爍之時間爲 0813:20 時，航機高度[5]爲 1,242 呎，之後 35 秒 FDR 記錄有十餘次之 CCAS 警示紀錄。CVR 記錄之警示音響作動時間長短不一，最長約爲 1 秒鐘，未能辨出何燈閃爍。駕駛員檢視航機操作無異常現象，決定繼續進場。0814:01.6 時，高度 560 呎，駕駛員發現 CCAS 之一號滑油壓力警示燈亮，檢查滑油溫度正常，螺旋槳轉速及扭力亦正常。當時已目視跑道並已獲落地許可，駕駛員決定繼續進場並於 0815：25 落地。ATR72 型機飛航手冊第 7-01 節第 15 頁進場中故障及相關處置（FAILUREA AND ASSOCIATIONS DURING APPROACH）中敘述:「…在 800 呎前若未完成故障處置，則實施重飛…」。ATR72 型機操作手冊第 1.00.20 節第 4 頁駕駛艙原則（COCKPIT PHILOSOPHY）中敘述：「…一個通用原則是『燈未亮』情形時，視爲情況正常而繼續操作…」；第 2.04.01 節第 2 頁啓用程序（PROCEDURES INITIATION）中敘述:「…距跑道高度低於 400 呎後，除發動機失效之槳葉順槳外，不採取任何行動…」。詳如第 1.9 節。

5 本節所引用之高度係 FDR 記錄之無線電高度（radio altitude）。

綜上所述，依當時情況駕駛員下達決心繼續進場落地應屬正確之決定。

2.1.1 著陸後發生火警警示之處置

該機於 0815：25 著陸後，駕駛艙於 0815:39.6 時有一連續之警示音響。駕駛員隨即發現「ENG 1 FIRE」（一號發動機火警警告燈）及「T-HANDLE」（T 型手柄）之兩紅燈與警示音響同時作動，呼叫一號發動機火警，按程序關斷 CL-1（Condition Level 1）及拉出 L. T-HANDLE 後，火警警示燈熄滅，未擊發滅火瓶。駕駛員另要求客艙組員目視檢查一號發動機外觀，無異狀後，滑至指定機坪，讓乘客依正常程序下機。

駕駛員各項處置應屬正確，與該發動機之損壞應無關聯。

2.2 維修作業

執行發動機拆檢時，確認發動機之冷、熱段及軸均無異狀，應可排除翻修不當之爭議。據維修紀錄無使用不當或違反維修規定之處，應可排除維修不當之可能。

檢視過去該型發動機附件齒輪箱匣之故障紀錄，雖無類似故障紀錄，至於是否隱藏類似溫度突然上升之缺點，以目前所集維修紀錄，尚無定論。

2.3 油氣分離葉輪

2.3.1 葉輪軸之退火

自油氣分離葉輪軸進行掃描電子顯微鏡（SEM）物理檢驗，並未發現金屬疲勞之跡象。

碳晶軸封位置處之輪軸硬度經檢驗爲 28.5 HRC[6]（圖 2.3-1），較原設計規範軸硬度之 35~41HRC 爲小。觀察該處輪軸外徑嚴重磨損並呈褐色，顯示曾有嚴重摩

6 數字愈小表示硬度愈低，該輪軸硬度原為 38HRC。原軸硬度為 38 HRC。

擦而生高熱，又位於附件齒輪箱匣破損處附近白色灰漬顯示曾遭火勢（詳圖2.3-2），該處退火現象可能係上述原因所致。

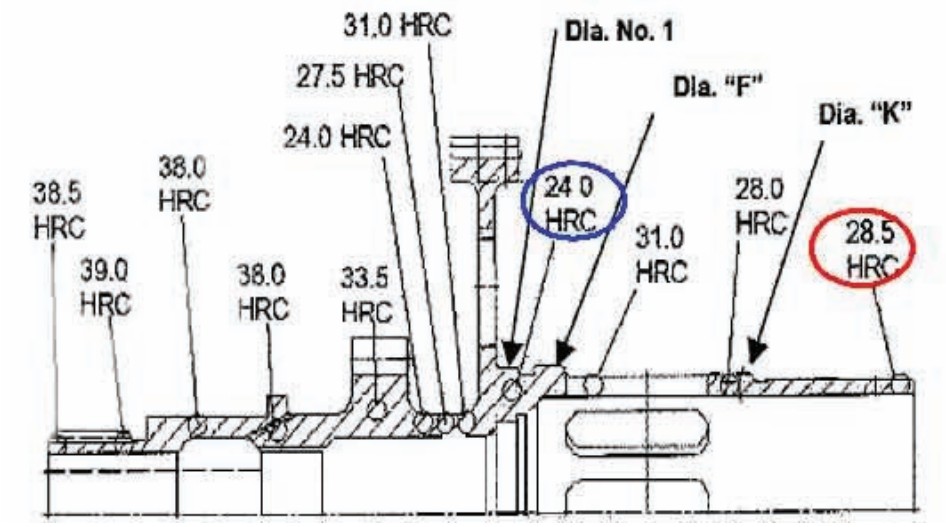

圖 2.3-1 該軸碳晶軸封處之硬度爲 28.5 HRC（紅圈處），高於葉輪另一側之 24.0 HRC（藍圈處）

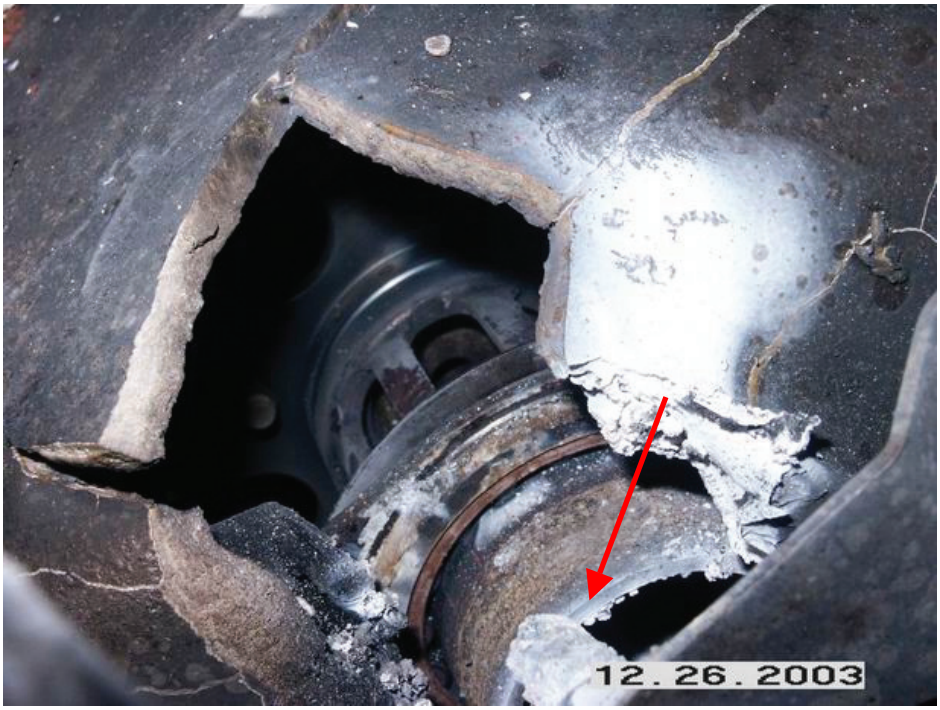

圖 2.3-2 輪軸外徑嚴重磨損並呈褐色（紅箭指處）；附件齒輪箱匣破洞外具白色灰漬

觀察圖 2.3-1，葉輪軸上退火最嚴重之處爲碳晶軸封部位之另一側（24.0 HRC），該處可能受熱最嚴重亦可能與火源最爲接近。此現象與 PWC 報告中所稱火源起始於油氣分離葉輪碳晶軸封附近之結論不盡相同。因火源如起源於碳晶軸封處附近，則該處距熱源最近及受熱時間亦應較長，應有較嚴重退火現象，但退火現象最嚴重部位卻在葉輪之另一側。飛安會認爲 PWC 所稱熱源來自油氣分離葉輪碳晶軸封附近之一說尚難確定，但由退火現象確定曾產生高溫甚至起火燃燒則已有共識。

葉輪軸中段爲葉輪包覆，亦有退火及硬度降低現象（31.0 HRC），顯示該處曾遭高溫。葉輪內之逸氣通道呈黑色（詳圖 2.3-3），顯示葉輪曾在高溫環境下運轉，所生之黑煙灌入逸氣管內通道呈黑色積碳。

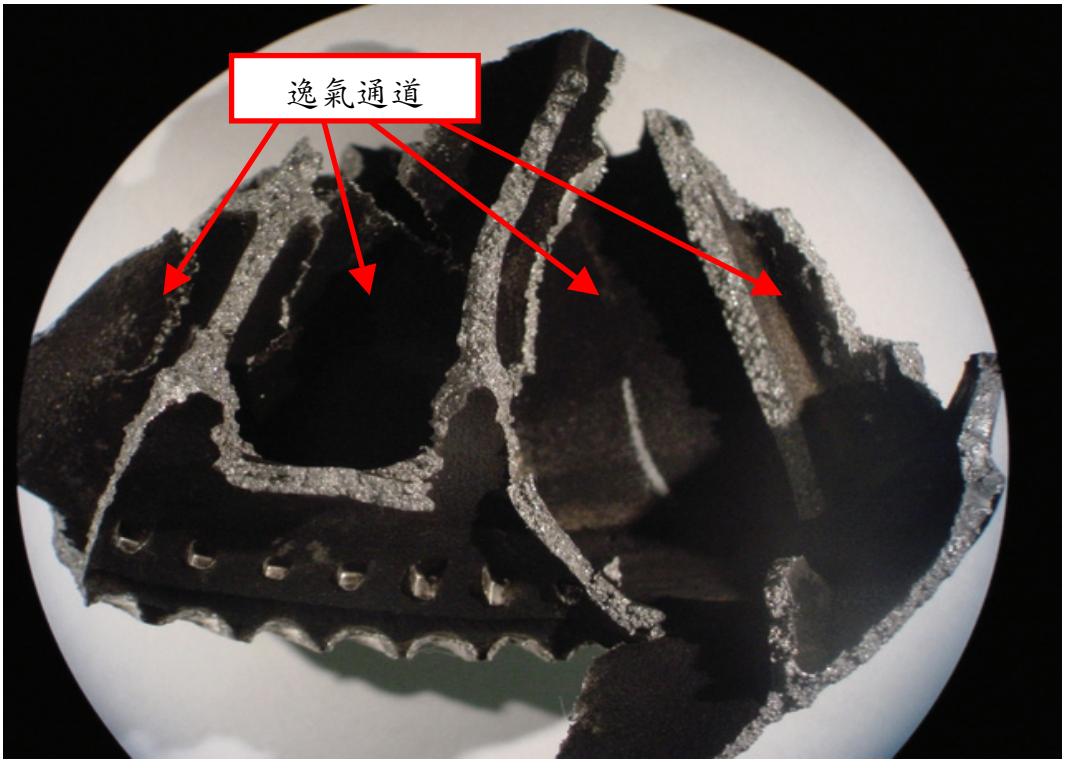

圖 2.3-3 葉輪內之逸氣通道呈黑色

2.3.2　　葉輪之過熱

附著於附件齒輪箱匣內壁上之鎂鋁合金融熔顆粒，顯示油氣分離葉輪於運轉時受高熱，致葉輪金屬晶粒產生位移析出後（詳圖 2.3-4），被離心力甩出而附著於附件齒輪箱匣內壁上（詳圖 2.3-5,-6）。大量葉輪金屬晶粒析出及葉輪結構過熱使強度驟降，經快速旋轉所生強大離心力使葉輪解體飛脫。油氣分離葉輪解體原因雖有兩種不同說法，一爲葉輪過熱晶粒析出以致強度變弱後離心飛脫；另一爲葉輪軸膨脹致使葉輪崩裂。但不論葉輪過熱使材質強度改變或葉輪軸膨脹皆源於先有高溫之產生，飛安會與 PWC 對此看法一致。至於該熱源由何而來，如何導致油氣分離葉輪解體飛脫或葉輪軸受熱膨脹而崩裂，經本會與廠家一再調查仍無法確認。

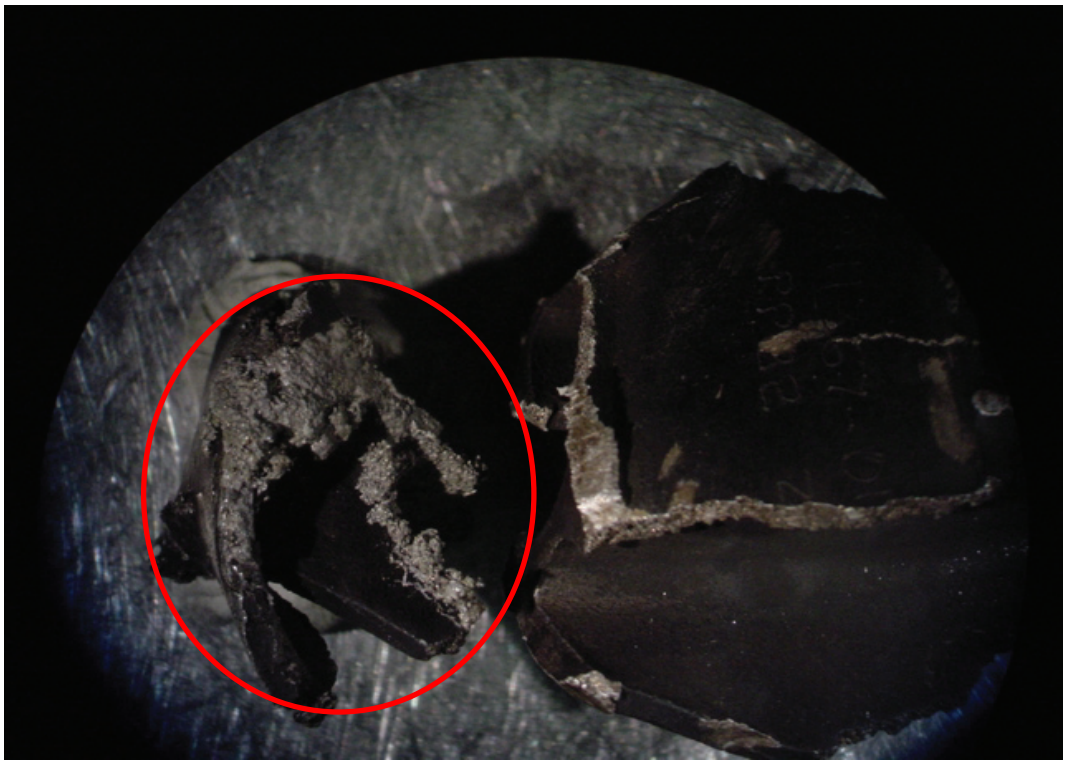

圖 2.3-4 葉輪金屬晶粒位移析出情形（紅圈處）

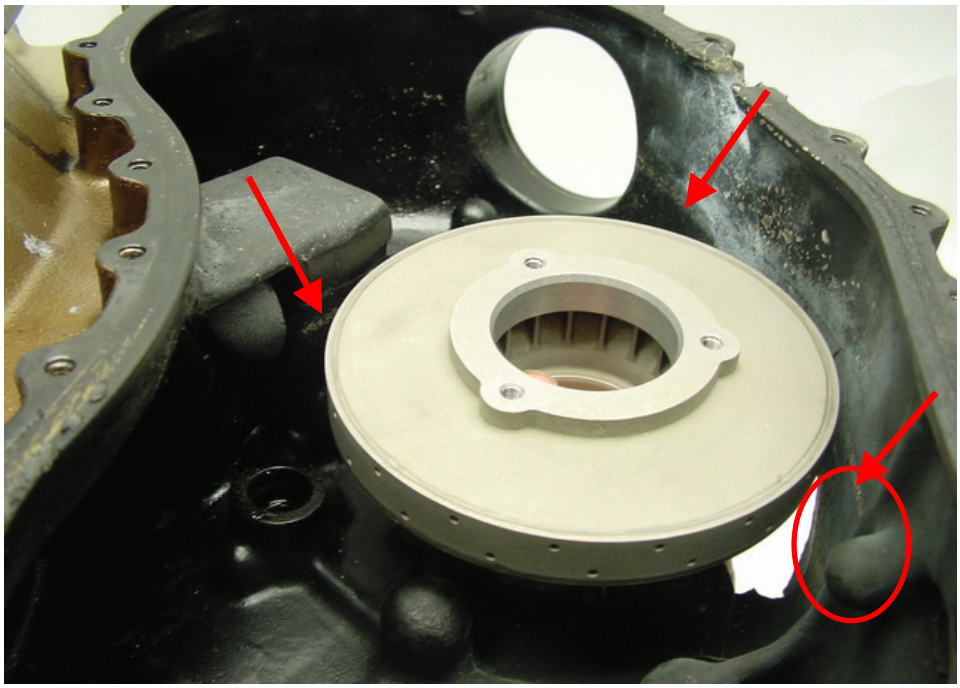

圖 2.3-5 附著於附件齒輪箱匣內壁上之鎂鋁合金融熔顆粒（紅箭指處），微觀紅圈處詳圖 2.3-6

圖 2.3-6 離心力甩出附著於附件齒輪箱匣內壁之葉輪熔解金屬顆粒

2.4　分析結果

2.4.1　葉輪輪軸

該軸表面硬度於事件後檢驗部分區域爲 24-33 HRC，較原設計之 35-41 HRC 爲小，應屬有退火之情形。該軸各不同部位表面硬度之改變，應與所承受周遭溫度變化有關。經檢驗硬度降低最嚴重之處，位於油氣分離葉輪背面之驅動齒輪區域。

2.4.2　葉輪軸封膠圈

最初懷疑此軸封膠圈是否未安裝或未正確安裝。但該發動機自翻修後已使用了 3,715 小時，如未安裝或未正確安裝，則早已產生故障及損壞，不會延至使用 3 千多小時才損壞。又由化驗附件齒輪箱底部之殘餘物，檢驗出含有燒過的軸封膠圈材質。故此軸封膠圈未安裝或未正確安裝之情況排除。

2.4.3　碳晶軸封

依據加拿大 PWC 發動機製造廠調查報告結論，該發動機附件齒輪箱匣之損壞，可能起源於油氣分離葉輪碳晶軸封附近之起火，高溫使管徑受熱膨脹造成油氣分離葉輪結構超過負荷而崩解。油氣分離葉輪解體之葉輪碎片撞擊附件齒輪箱匣造成破洞。油氣分離葉輪碳晶軸封起火原因，可能是碳晶軸封附近滑油到達自燃溫度所致，至於碳晶軸封附近滑油溫度升高原因無法確定。飛安會認爲該附件齒輪箱匣熱融蝕及撞擊損壞情形嚴重，碳晶軸封有可能因撞擊或熱蝕而碎裂致未尋獲，起火原因是否爲碳晶軸封附近滑油到達自燃溫度所致，因事實證據不足，飛安會持保留態度。

2.4.4　葉輪

檢驗附件齒輪箱內殘餘物時，發現有熔融鋁鎂合金物質附著在箱內。檢驗葉輪之損壞情況，是因受高溫產生熱融使結構劣化，並受高速迴轉之離心力解體。檢驗該油氣分離葉輪殘骸材質，均符合設計規範要求。葉輪渦流油氣通道內有滑油燃燒

之黑色碳化物，顯示葉輪運轉時即有黑色煙霧遭葉輪吸入。亦即葉輪解體前滑油即遭不明熱源引燃。

2.4.5 軸承

據 EADS SECA 之發動機拆檢事實報告，除 6 號軸承有磨耗現象及第 6、7 號軸承室發現有燒黑之硬化沉澱物，餘軸承並無缺乏潤滑之損壞現象。如滑油供應不足或不順暢，將造成所有軸承嚴重磨損現象，引發高溫甚至燒毀，但若在此情形下將無滑油供應熱源燃燒，亦不會產生大量燒黑之硬化沉澱物。由該處軸承上檢驗出之硬化物，可證明事故前大部分時間潤滑之滑油並不匱乏，而是事故（葉輪解體）後發生高溫及引燃滑油之可能。

由低壓渦輪尖端只有輕微磨損，可證明 6 號軸承磨損時間不長；即軸承之磨損，是在滑油受高溫影響之後，並非軸承先損壞才產生高溫點燃滑油，否則低壓渦輪尖端不只有輕微磨損。亦即所述軸承組合件之損壞是受高溫點燃滑油之影響。

2.4.6 附件機匣齒輪

檢視飛安會、SECA 及 PWC 發動機拆檢報告，附件機匣內三組齒輪分別爲齒俥驅動齒輪（gear train drive gear）、油氣分離泵從動齒輪（breather gear driven gear）及滑油泵從動齒輪（lub. oil pump driven gear），除了油氣分離泵從動齒輪因機匣破裂軸承座鬆脫及齒輪輾壓解體葉輪造成輪齒接合面凹陷印痕外（SECA 報告第 7 頁及 PWC 報告第 5 頁 2.22）無齒俥軸承異常輪軸不正及齒輪異常磨耗造成可能產生金屬碎削引發火星之現象。

2.4.7 滑油/燃油熱交換器

如果滑油/燃油熱交換器不良，將使較高壓力側之燃油滲漏至滑油側造成滑油含燃油現象，該現象除將使滑油黏滯性降低外亦將劣化滑油之油潤效果。檢驗燃油熱交換器無內漏，排除燃油滲漏至滑油系統以致滑油品質劣化之可能，亦排除滑油含燃油使燃油揮發氣體集中於附件機匣點燃滑油之可能。

2.4.8　滑油系統潤滑品質

滑油之主要功能在減少機械之摩擦及用流動之滑油帶走熱量以降低機件溫度。如果氣冷滑油散熱器或滑油與燃油熱交換器不良，或滑油泵輸出減少到無法適當地潤滑，軸承之溫度會在短時間內上升至高溫，軸承之損壞將在甚短時間內造成。檢驗燃油熱交換器無內漏，排除燃油滲漏至滑油系統以致滑油品質劣化之可能。

ATR72 型機滑油系統在駕駛艙裝有滑油溫度及滑油壓力表，無滑油容量表。CVR 及訪談紀錄無滑油高溫情形，顯示壓力滑油仍保持潤滑及冷卻品質。飛航中駕駛員對該發動機滑油系統之監控，除可參考滑油溫度及滑油壓力指示，又當滑油壓力低於 40 psi，將觸動主警告系發出鈴聲訊號給駕駛員。該機飛航中未發現滑油系有異狀，直至落地前 1 分 43 秒，主警告系發出鈴聲，表示當時滑油壓到達 40 psi 之下。

ATR72 型機 FDR 上無滑油壓力與溫度之紀錄資訊，滑油壓力於何時下降、滑油溫度何時上升無從查證。由 CVR 資料看出，從滑油壓降低至 40psi 到滑油壓力指 0，時間 39 秒；從滑油壓降低至 40psi 到發動機火警，是 1 分 57 秒。高速運轉之渦輪在短暫的缺少潤滑狀況下亦會引發軸承嚴重燒毀的可能，但該發動機所有軸承皆無潤滑不足過熱燒毀現象，顯示葉輪崩解機匣破裂非滑油不足軸承過熱所致。

ATR72 型機之駕駛艙儀表中無滑油量指示表，FDR 亦無滑油量指示紀錄，該機發生低滑油壓時之滑油量，僅能由主警告系滑油壓力警報鈴聲及滑油壓力表做一參考。檢視本 1 號發動機過去滑油添加紀錄，並無過量之消耗，由軸承完整之情況亦排除滑油短缺之可能。

2.4.9　FDR 及 CVR 紀錄

根據 FDR 所列時間點及 CVR 事故情況，列出滑油有關一號發動機資訊及分析如下：

依據 FDR 時間	飛航與特殊情況	依據 CVR 語音紀錄	分析
不確定	航機儀錶 無異常顯示		減速齒輪箱內不明熱源點燃滑油。
不確定	航機儀錶 無異常顯示		滑油燃燒產生高溫黑色含碳煙霧經葉輪排出。
不確定	航機儀錶 無異常顯示		高溫氣體使葉輪渦流通道積碳，葉輪融溶經旋轉離心力甩出鎂鋁熔珠。
不確定	航機儀錶 無異常顯示		葉輪受熱崩解撞破機匣油火迸出。
0813:20	滑油低壓警報初響	噹（單聲警示燈響）	滑油洩漏油量減少以致壓力由 60psi 逐漸降至 40psi 致動低壓警報。
0813:42	CAM2 發現滑油壓力錶指示壓力下降	滑油低壓警報後 22 秒	滑油及油火外洩造成滑油壓力降低。
0814:21	滑油壓力指 0	滑油低壓警報後 61 秒	滑油洩漏盡淨滑油泵抽吸不到滑油致壓力降至 0。
0815:16	扭力至 0	滑油低壓警報後 1 分 56 秒	緊鄰附件齒輪箱之扭力偵測訊號線斷路，應是遭火燒蝕產生斷路之故。
0815:25	飛機落地	滑油低壓警報後 2 分 05 秒	發動機軸承在缺油情況下持續運轉。
0815:30	EEC #1 故障訊號顯示	滑油低壓警報後 2 分 10 秒	緊鄰附件齒輪箱之 1 號發動機電子訊號線斷路，應是遭火燒蝕產生斷路之故。
0815:39	使用反推力器後 發動機火警	滑油低壓警報後 2 分 19 秒	飛機減速發動機艙冷卻空氣減少，火警偵測器感知火警。
0815:54	發動機關車	滑油低壓警報後 2 分 24 秒	發現附件齒輪箱匣破裂，裂口處及發動機艙有油火燒炙現象，1 號發動機電子訊號線束（包括扭力偵測訊號線）遭火燒蝕。

2.5　分析結論

本事故發動機失火原因爲飛行時附件齒輪箱內異常熱源點燃滑油，油氣分離葉輪因受熱後晶粒析出結構弱化，再受高速旋轉離心力終至崩解，高速解體之葉輪撞擊附件齒輪箱致機匣破裂，燃燒之滑油及油氣由機匣破洞噴濺而出觸及火警偵測器引發火警。附件齒輪箱內產生熱源點燃滑油之情況，因無足夠之事實證據，依目前所有資料本會及各參與調查之團隊均認爲原因不明。

此頁空白

第三章　結論

本會在此章中依據調查期間所搜集之事實資料以及綜合分析，總結以下三類之調查結果：「與可能肇因有關之調查發現」、「與風險有關之調查發現」及「其它調查發現」，分述如下。

與可能肇因有關之調查發現

此類調查發現係屬已經顯示或幾乎可以確定爲與本事故發生有關之重要因素。其中包括：不安全作爲、不安全狀況或造成本次事故之安全缺失等。

與風險有關之調查發現

此類調查發現係涉及飛航安全之風險因素，包括未直接導致本次事故發生之不安全作爲、不安全條件及組織和整體性之安全缺失等，以及雖與本次事故無直接關連但對促進飛安有益之事項。

與其它調查發現

此類調查發現係屬具有促進飛航安全、解決爭議或澄清疑慮之作用者。其中部分調查發現爲大眾所關切，且見於國際調查報告之標準格式中，以作爲資料分享、安全警示、教育及改善飛航安全之用。

3.1　與可能肇因有關之調查發現

1. 該發動機附件齒輪箱內溫度升高致引燃滑油。(1.8)
2. 油氣分離葉輪受熱解體甩出擊破附件齒輪箱匣，高溫滑油及熱氣自洞穿處逸出並引發一號發動機火警。(2.3.1)

3.2　與風險有關之調查發現

無。

3.3 其它調查發現

1. 飛航組員依中華民國民航法規持有合格有效證照。(1.3.1)
2. 飛航組員在事故前 72 小時內之工作及休息正常；無證據顯示在事故發生時，受到生理、心理或藥物、酒精等因素影響。(1.3.4)
3. 事故前該機符合民航法規之給證、裝備與維修條件。(1.4.1)
4. 查閱該機事故前一個月之相關維修紀錄，未發現發動機系統故障紀錄。(1.4.2)
5. 飛航組員在本次事故落地階段之決心下達及處置均正常。(2.1, 2.1.1)
6. 一號發動機冷、熱段及主軸運轉均正常。(2.2)
7. 該附件齒輪箱匣穿孔之失效模式爲單一事件，過去無類似故障紀錄。(2.2)

第四章　飛安改善建議

4.1　改善建議

致加拿大普惠發動機製造廠

持續找尋該型發動機滑油產生高溫原因，並提供發現情況供同型發動機使用者參考。（ASC-ASR-05-08-001）

4.2　已完成或進行中之改善措施

復興航空公司辦理情形

（一）爲因應 GE006 班機發動機附件齒輪箱匣右上方穿孔及其附近線路有燃燒痕跡之飛航事故，經飛航安全委員會調查結果故障模式爲單一事件。本公司預防措施爲清查 ATR72 維修定義及工作卡之飛行前、過境、每日、每週檢查及 ATR72 持續適航維護計畫（Continuous Aircraft Maintenance Program，CAMP）有關發動機滑油情況、區域檢查等 TASK 工作項目如後：

1. 飛行前檢查：PRE-FLIGHT CHECK—WALK AROUND CHECK—ZONAL INSPECTION。
2. 過境檢查：TRANSIT CHECK—WALK AROUND CHECK—ZONAL INSPECTION。
3. 每日檢查：LINE CHECK—WALK AROUND CHECK—ZONAL INSPECTION。
4. 每週檢查：WEEK CHECK—WALK AROUND CHECK—ZONAL INSPECTION；—ENGINE OIL LEVEL CHECK；ENGINE OIL CONSUMPTION MONITORING-JIC 121379-CHK-10000。
5. “A” / “C”級檢查：7934000-OPT-10000；ZL-430-GVI-10000-1；ZL-440-GVI-10000-1；ZL-470-GVI-10000-1；ZL-480-GVI-10000-1。

（二）以上各級檢查工作項目之檢查時機涵蓋至每次飛行前後，復興航空公司已利用交接班時機特別提示機務人員注意發動機滑油滲漏檢查。

（三）且若工程組業管工程師於每週執行 PW124B/127F 發動機狀況趨勢監視系統（ENGINE CONDITION TREND MONITORING）及滑油消耗（OIL CONSUMPTION）監控期間，發現任何發動機參數變動或滑油消耗異常情況時，隨時通知企劃管理組發布工單（WORK/ORDER），交維修管制中心安排維修單位執行改正行動，並由工程師持續監控發動機狀況趨勢監視系統及滑油消耗直至回復正常。

（四）復興航空公司發布 0140 號 MCC 通告要求全體機務人員當執行 PW124B/127F 發動機定期（飛行前、過境、每日、”A”級或”C”級檢查）或不定期維修期間，若發現發動機任何異常滑油滲漏情況，或一次添加滑油達 3QUART 或以上時，務必採取維修行動，以排除故障情況，同時登錄維修紀錄本並通報相關單位建立後續追蹤。

（五）復興航空公司將飛航安全委員會調查報告、PWC 發動機製造廠調查報告及 SECA 發動機維修工廠拆檢報告等資料，提交訓練部門列入發動機異常事件複訓課程。

（六）將本事件事實報告送 SECA 發動機維修廠，供其加強該區域檢查參考。

附錄 1 座艙語音紀錄器抄件

GE006 座艙語音紀錄器抄本圖例說明：

CM1： 正駕駛員之無線電通話

CM2： 副駕駛員之無線電通話

TWR： 松山塔台之無線電通話

APP： 中正近場管制台之無線電通話

CAM： 座艙語音麥克風

CAM1：正駕駛員自 CAM 之發話

CAM2：副駕駛員自 CAM 之發話

ATN： 客艙組員

GS： 地勤人員

…： 無法辨識之話語

***： 不雅或與事故無關文字

FDR 當地時間	發話者	內　　容
0811:32.2	APP	transasia zero zero six contact tower one one eight point one
0811:35.4	CM2	contact tower transasia zero zero six
0811:36.3	ATN	（客艙組員廣播下降注意事項）
0811:36.6	CAM1	flap thirty
0811:38.5	CAM2	flap thirty thirty
0811:41.1	CAM1	before landing check
0811:42.9	CAM2	...on course on glide slope
0811:45.8	CAM2	現在偏高啊
0811:49.8	CAM2	其實現在還遠那個很好修
0811:51.7	CAM1	對 很好
0811:53.1	CAM1	很好修正
0811:58.1	CM2	good morning sungshan tower transasia zero zero six ILS approach seven mile final
0812:03.0	TWR	good morning transasia zero zero six sungshan tower runway one zero wind calm QNH one zero one niner
0812:09.1	CM2	wind calm one zero one niner transasia zero zero six
0812:09.7	CAM1	…wind calm
0812:12.7	CAM2	…問問那個…稍高一點點 兩仟呎 兩九五 set
0812:19.5	CAM1	（咳嗽聲）
0812:20.9	CAM1	okay
0812:23.0	CAM1	…
0812:23.3	CAM2	前方氣流超差
0812:30.8	CAM2	啊偏左一點偏高一點
0812:32.9	CAM1	okay 向右修正 繼續 嗯 俯仰修正
0812:37.4	CAM2	下降率這個是…
0812:42.5	CAM2	這 這 這下降率就好很好
0812:45.1	CAM1	方向…還可以 然後 左右修正太多 對不對
0812:46.4	CAM2	你講 你注意下降那個
0812:52.3	CAM2	注意到那個下降率的話 你的方向…
0812:55.1	CAM1	好 速度方向 嗯 下降率方向
0813:01.3	CAM1	速度到還是沒有問題

FDR 當地時間	發話者	內　　容
0813:03.7	CAM1	好 我等一下做個修正…
0813:04.8	TWR	transasia zero zero six wind calm cleared to land
0813:08.2	CM2	wind calm cleared to land transasia zero zero six
0813:09.9	CAM1	下降率快修回來咧 趕快回來
0813:12.6	CAM2	喔 往左修一點 啊
0813:19.0	CAM2	洞九洞推一下
0813:20.3	CAM	噹（單聲警示聲[1]）
0813:20.6	CAM1	喲 這什麼聲音
0813:21.9	CAM2	…
0813:23.6	CAM1	不會亮
0813:25.5	CAM1	我現在洞九洞
0813:27.5	CAM	噹噹（連續重覆警示聲[2]）
0813:28.3	CAM1	吔 爲什麼又亮
0813:29.0	CAM	噹（單聲警示聲）
0813:29.7	CAM2	那個 flap
0813:31.6	CAM	噹噹噹噹（連續重覆警示聲）
0813:33.1	CAM2	flight control flap … 剛剛那個會動一下
0813:35.5	CAM	噹噹噹噹（連續重覆警示聲）
0813:37.6	CAM	噹（單聲警示聲）
0813:38.2	CAM	噹噹噹噹（連續重覆警示聲）
0813:38.6	CAM2	engine one oil…
0813:41.1	CAM	噹（單聲警示聲）
0813:41.8	CAM	噹噹（連續重覆警示聲）
0813:42.4	CAM2	一號的那個 一 機油壓力在降
0813:44.2	CAM	噹噹（連續重覆警示聲）
0813:46.5	CAM	噹（單聲警示聲）
0813:46.9	CAM1	好 持續 check 一下
0813:48.1	CAM2	好

1 單聲警示聲（single chime）。
2 連續重覆警示聲（continuous repetitive chime，CRC）。

FDR 當地時間	發話者	內　　容
0813:48.4	CAM	嗚（升降舵配平[3]）
0813:49.1	CAM	噹噹噹噹噹（連續重覆警示聲）
0813:51.5	CAM1	吔 *** 這麼爛
0813:52.0	CAM	噹噹噹噹噹（連續重覆警示聲）
0813:53.7	CAM	噹噹噹噹（連續重覆警示聲）
0813:55.0	CAM	噹噹（連續重覆警示聲）
0813:56.0	CAM	噹噹噹噹（連續重覆警示聲）
0813:57.4	CAM	（連續重覆警示聲持續 4.6 秒）
0813:57.5	CAM2	慢慢有點偏左了啊
0813:59.0	CAM1	對
0814:01.6	CAM2	機油壓力下來 引擎目前還是正常 溫度正常
0814:05.9	CAM1	好 持續 check
0814:08.1	CAM1	現在用這樣航向來修
0814:14.9	CAM2	好 偏低一點啊
0814:17.1	CAM2	好 approach light insight
0814:17.1	CAM1	帶起來 帶起來
0814:21.4	CAM1	帶起來
0814:21.9	CAM2	機油壓力目前是零
0814:24.4	CAM1	這樣子呀
0814:25.1	CAM2	吔 引擎目前還是溫度 NP 都正常 torque 正常
0814:40.9	CAM2	oh runway insight 啊
0814:42.6	CAM2	approach minimum
0814:44.4	CAM1	好 繼續
0814:46.7	CAM1	有點偏　左
0814:48.8	CAM1	向右一點
0814:49.0	CAM2	啊偏低了
0814:50.2	CAM1	好偏低帶起來
0814:51.7	CAM2	okay minimum runway insight

3 升降舵配平（stabilizer trim）。

FDR 當地時間	發話者	內　　容
0814:52.9	CAM1	好給你
0814:53.8	CAM2	好 教官你來落好了
0814:55.3	CAM1	啊
0814:56.1	CAM2	你來落好了
0814:56.6	CAM1	好
0814:59.1	CAM	嗚（升降舵配平）
0814:59.1	CAM2	嗯 機油壓力目前是零　引擎目前溫度正常　ITT 正常
0815:04.0	CAM1	看看清楚 等一下看怎麼簽啊
0815:05.0	CAM2	啊
0815:10.7	CAM1	這個可以消掉
0815:11.7	CAM2	你要不要…
0815:14.1	CAM2	一百
0815:14.5	CAM	噹（單聲警示聲）
0815:16.2	CAM2	一號 torque 已經沒有了
0815:18.4	CAM1	這樣子啊
0815:18.8	CAM2	吔
0815:19.5	CAM1	…
0815:20.8	CAM2	三十
0815:21.7	CAM2	二十
0815:23.6	CAM2	十呎
0815:24.7	CAM2	五呎
0815:25.3	CAM	（連續重覆警示聲持續 8.4 秒）
0815:30.5	CAM2	吔 EEC number one fault
0815:32.0	CAM1	哦
0815:32.9	CAM2	不要用 reverse EEC number one fault
0815:35.2	CAM	roger
0815:35.9	CAM1	地面給他 reset 一下 啊 EEC 啊
0815:38.2	CAM2	吔
0815:39.6	CAM	噹（單聲警示聲）
0815:39.8	CAM2	number one engine fire
0815:41.9	CAM1	啊

FDR 當地時間	發話者	內　　容
0815:42.3	CAM2	number one engine fire
0815:42.9	CAM	（無法辨識聲響）
0815:44.0	CAM2	stop stop
0815:46.2	CAM1	好 等一下
0815:46.5	TWR	transasia zero zero six turn right via taxiway echo hotel contact one two one point niner
0815:47.4	CAM2	好…
0815:49.0	CAM1	我們先出去好了
0815:50.1	CAM	（連續重覆警示聲持續 5.5 秒）
0815:51.4	CM2	right turn now echo hotel transasia zero zero six
0815:53.0	CAM1	好 把他拉出來
0815:54.5	CAM2	先 feather shut off stop
0815:56.8	CAM1	好
0815:58.2	CAM1	feather shut off
0815:59.8	CAM2	…number one message
0816:00.3	CAM1	okay
0816:01.0	CAM	噹
0816:01.7	CAM1	好
0816:03.8	CMA2	…agent 要不要 要不要 先看一下
0816:05.3	CAM1	好 先不要打 先不要打
0816:10.1	CAM1	先保持…
0816:16.2	CAM1	跟後面講一下
0816:18.0	CAM1	跟後面那個 那個什麼空服講 叫他看看左邊 看看左邊發動機有沒有什麼怎麼樣
0816:26.9	CAM1	這邊沒有吧 engine fire
0816:29.3	CAM1	看看左邊發動機
0816:30.0	CAM	叮咚（內部對講機告示聲[4]）
0816:31.5	CAM2	嗯 那個看一下右邊 嗯 左邊的發動機有沒有冒煙或怎麼

4 內部對講機告示聲（high low chime）。

FDR 當地時間	發話者	內　　容
		樣
0816:32.9	CAM	叮咚（內部對講機告示聲）
0816:36.2	ATN	左邊哪
0816:38.5	CAM1	看左邊
0816:40.8	ATN	教官沒有吔
0816:41.3	TWR	transasia zero zero six contact ground one two one point niner
0816:45.3	CM2	contact ground good day transasia zero zero six
0816:47.4	CAM1	也沒有冒煙喔
0816:48.4	ATN	嗯
0816:49.1	CAM1	okay 沒問題我們就不動聲色了 okay
0816:49.9	ATN	好 okay 好
0816:55.1	CM2	taipei ground transasia zero zero six taxi with you
0817:00.0	GND	transasia zero zero six follow ground marshall for parking and please contact ground after vacated runway
0817:07.4	CM2	roger transasia zero zero six
0817:08.1	ATN	（客艙組員廣播下機前注意事項）
0817:13.3	CAM2	嗯 目前那個…
0817:16.1	CAM1	好 after landing checklist
0817:21.6	CAM1	（咳嗽聲）
0817:22.0	CAM1	應該是 sensor 的問題
0817:30.2	CAM	噹（單聲警示聲）
0817:35.4	CAM	嗚（升降舵配平）
0817:38.6	CAM2	喔 三號 bay
0817:40.0	CAM1	看到了
0817:45.1	CAM2	…
0817:54.0	CAM2	after landing checklist …
0818:02.7	CAM1	check 一下
0818:06.9	CAM1	壓力表
0818:07.8	CAM2	壓力目前…
0818:09.0	CAM1	我已經把這個　我剛把這個按出來 你又把他按進去是吧

FDR 當地時間	發話者	內　　容
0818:11.3	CAM2	是呀
0818:11.7	CAM1	沒關係 好 就這樣可以
0818:13.5	CAM2	要不要講…
0818:28.1	CAM2	沒有滑油壓力 沒有滑油壓力
0818:32.5	CAM1	他現在一號關掉本來就沒有了
0818:34.3	CAM2	沒有 沒有 剛剛落地落地前…
0818:35.0	CAM1	剛剛就已經沒有了嘛 啊
0818:36.4	GS	…
0818:37.4	CAM2	兩百呎左右
0818:39.5	CM1	好 謝謝
0818:43.2	CAM1	先不要寫 我來看看應該要怎麼寫
0818:58.5	CAM	（單聲警示聲）
0819:04.4	CAM2	（咳嗽聲）
0819:04.8	CAM1	現在 engine fire 還是…
0819:06.0	CAM2	（咳嗽聲）
0819:08.0	CAM2	（咳嗽聲）
0819:08.4	CAM1	開了
0819:11.7	CAM	…
0819:14.2		記錄終止

附錄 2 赴法國 EADS SECA 維修廠拆檢 GE006 發動機 AV0063 報告

壹、目的

民國 92 年 12 月 25 日，復興航空公司 GE006 班機於松山機場落地時駕駛艙發生一號發動機火警警報，停機後檢視一號發動機，確有失火現象，飛安會已立案調查。

勘驗一號發動機時發現外側上方有火燒跡象，且附件齒輪機匣破裂。因損害模式罕見，需要拆解發動機以檢驗其內部結構及零件，方能瞭解事故原因。但國內尚無原廠授權檢驗之廠商進行拆解檢驗，遂將該具發動機送往法國 EADS SECA 維修廠拆檢。

貳、過程

行程：民國 93 年 1 月 13 日至 20 日

拆解地點：法國巴黎 EADS SECA 普惠發動機 100 型維修廠

參與單位：

飛安委員會、復興航空公司、法國民航局、加拿大普惠發動機製造廠及法國 EADS SECA 維修廠。

參、拆解情形

抵達 EADS SECA 維修廠時，發動機已備妥開箱作業，詳圖 1。發動機進氣口檢查，詳圖 2。

圖 1 EADS SECA 維修廠已備妥發動機開箱作業

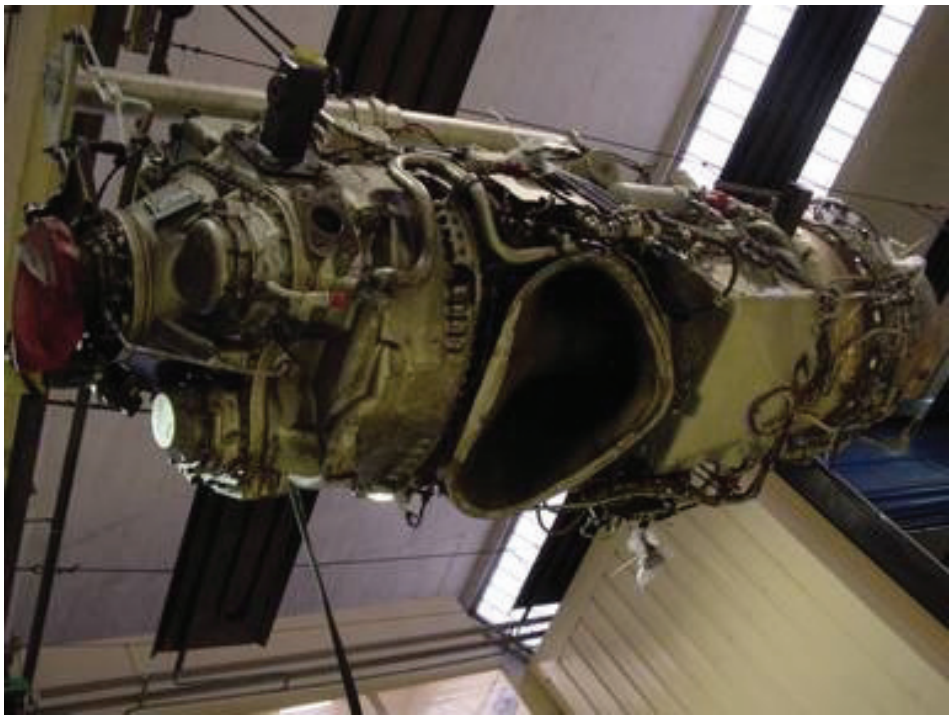

圖 2 發動機進氣口檢查

發動機進氣口潔淨無外物賭塞情形，詳圖 3。

圖 3 發動機進氣口潔淨無外物賭塞情形

附件齒輪箱匣前方上方機匣破裂，油氣分離葉輪輪失蹤，葉輪輪逸氣口清晰可見，詳圖 4。

圖 4 附件齒輪箱匣前方上方機匣破裂，油氣分離葉輪輪失蹤，葉輪輪逸氣口（紅圈處）清析可見

油氣分離葉輪輪解體碎片堆擠於發動機滑油葉輪進口，詳圖 5。

圖 5 油氣分離葉輪輪解體碎片堆擠於發動機滑油葉輪進口

由發動機拆下之滑油葉輪進口亦有逸氣葉輪輪解體碎片，詳圖 6。

圖 6 由發動機拆下之滑油葉輪進口亦有逸氣葉輪輪解體碎片

發動機熱段轉子與定子葉片皆正常，詳圖 7。

圖 7 發動機熱段轉子與定子葉片皆正常

發動機轉子及其七只軸承，除六號軸承外皆正常，詳圖 8。

圖 8 發動機轉子及其七只軸承除六號軸承外皆正常

六號軸承室外有油垢堆積現象，詳圖 9。

圖 9 五、六號軸承室外有油垢堆積現象

六號軸承滑油進口濾網處有油泥堆積，詳圖 10。

圖 10 五、六號軸承室滑油進口濾網處有油泥堆積

六號軸承滾軸中心有磨損，滾軸呈凹型，但無粗造摩擦及高溫熔融現象，詳圖 11。

圖 11 六號軸承滾軸中心有磨損，滾軸呈凹型，無粗造摩擦及高溫熔融現象。

減速齒輪箱後方機匣外部銀色塗料變成深褐色，詳圖 12。

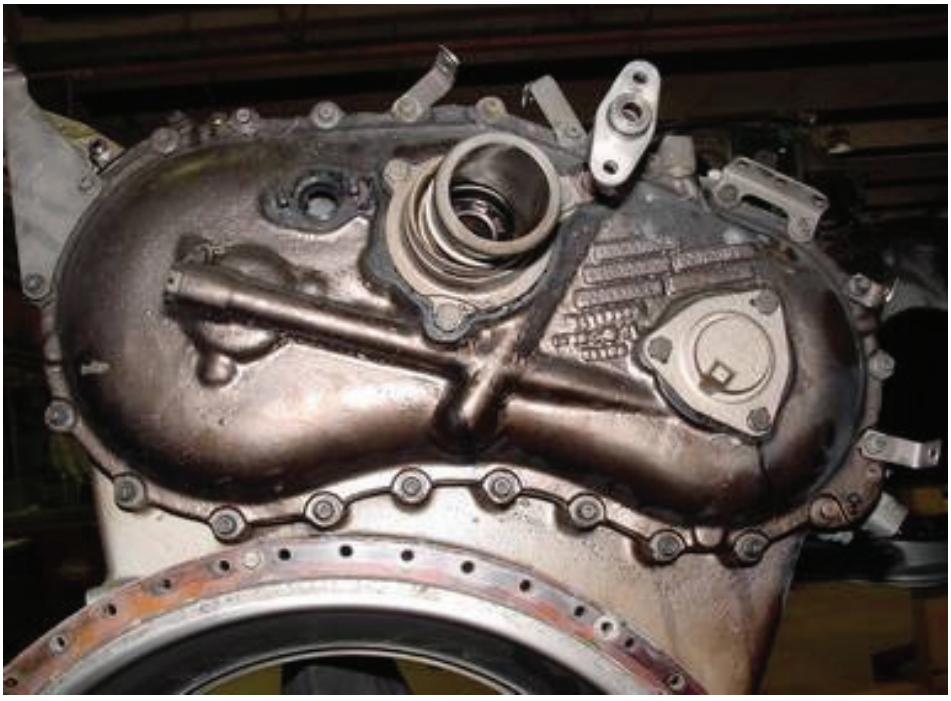

圖 12 減速齒輪箱後方機匣外部銀色塗料變成深褐色

減速齒輪箱後方機匣分解後內部齒輪及油氣分離葉輪失蹤情形，詳圖 13。

圖 13 減速齒輪箱後方機匣分解後內部齒輪及油氣分離葉輪失蹤情形（紅圈處爲油氣分離葉輪原來位置）

取另一油氣分離葉輪備品攝影存證以爲參考，詳圖 14。

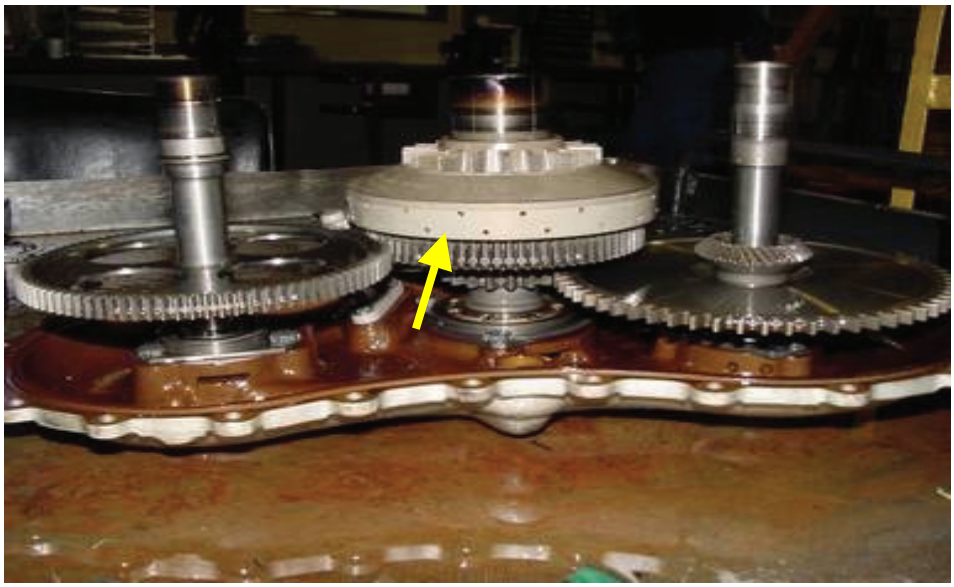

圖 14 黃箭指處爲油氣分離葉輪

附件齒輪箱匣前方機匣內部皆呈黑色碳化物附著現象，油氣分離葉輪軸承處無黑色碳化物附著現象，有轉動摩擦痕跡，詳圖 15。

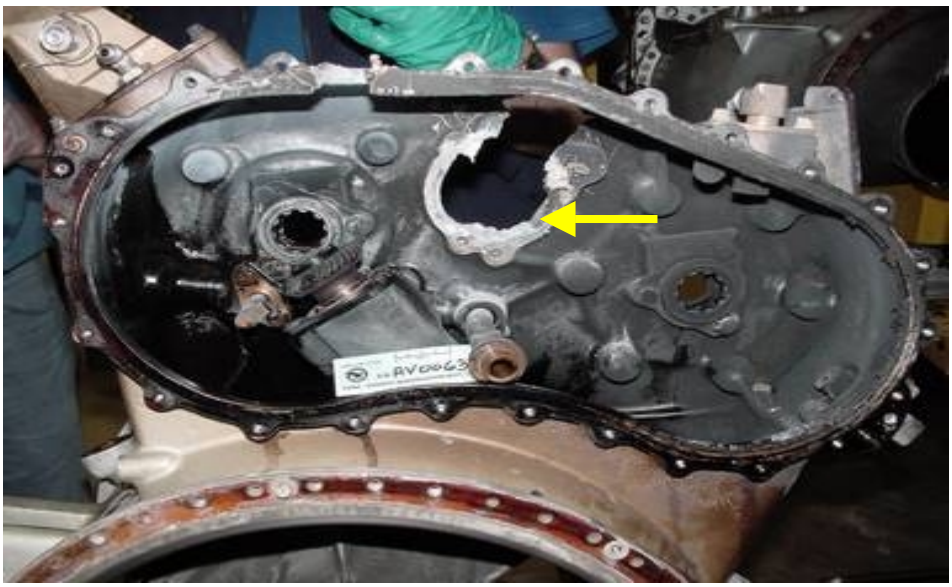

圖 15 附件齒輪箱匣前方機匣內部皆呈黑色碳化物附著現象，油氣分離葉輪軸承處無黑色碳化物附著現象（黃箭處），有轉動摩擦痕跡。

油氣分離葉輪前端軸承拆解前，其軸封橡圈座槽光滑潔淨，詳圖 16。

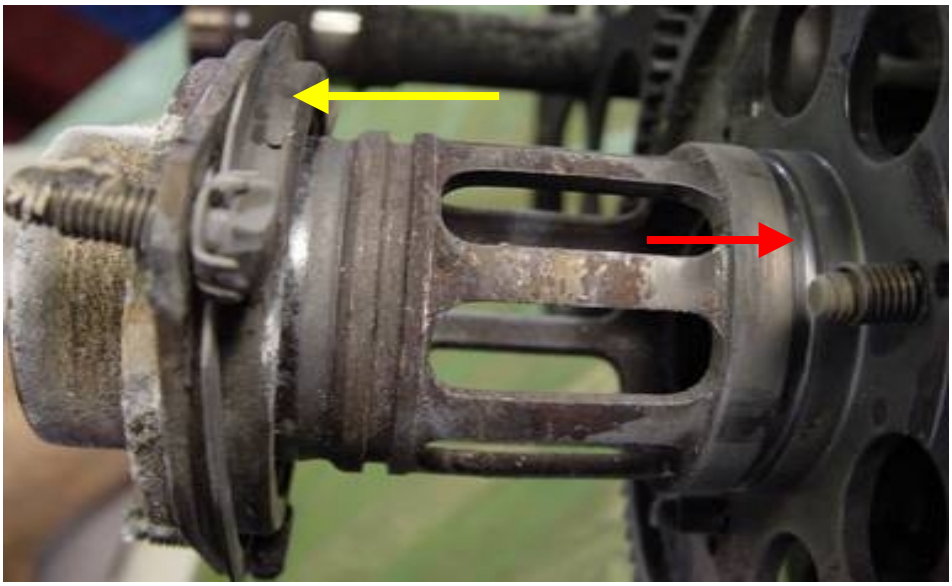

圖 16 油氣分離葉輪前端軸承（黃箭指處）拆解前，其軸封橡圈座槽（紅箭指處）光滑潔淨。

油氣分離葉輪前端軸承拆解後，其前端軸承處之轉軸有凹陷痕跡，後端軸承處之轉軸光滑，詳圖 17。

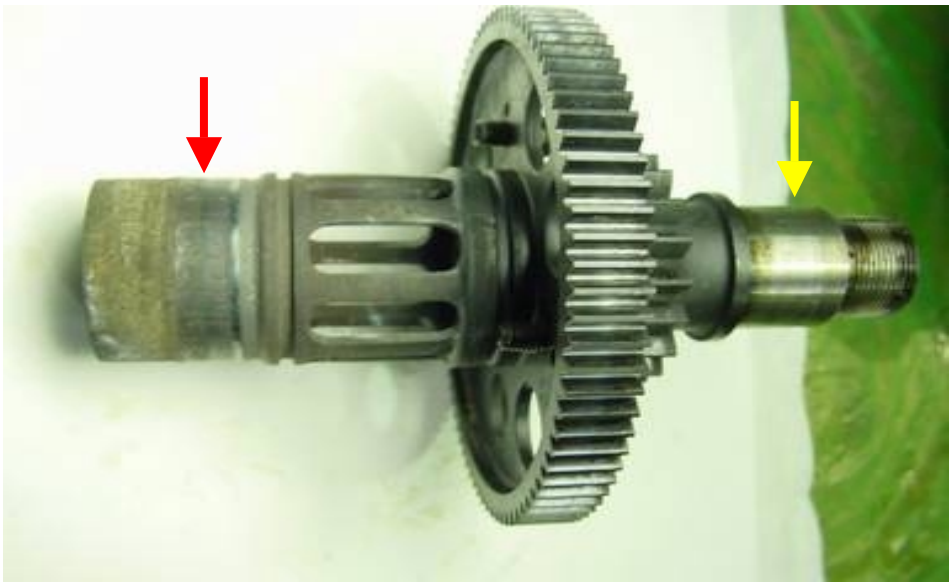

圖 17 油氣分離葉輪前端軸承拆解後，其軸承處之轉軸（紅箭指處）有凹陷痕跡，後端軸承處之轉軸光滑正常（黃箭指處）

油氣分離葉輪前端軸承處之轉軸有凹陷痕跡，詳圖 18。

圖 18 油氣分離葉輪前端軸承處之轉軸有凹陷痕跡

油氣分離葉輪前端軸承拆解後，其軸承滾柱兩端磨損，滾柱呈凸型，詳圖 19。

圖 19 油氣分離葉輪前端軸承拆解後，其軸承滾柱兩端磨損，滾柱呈凸型。

肆、完工會議摘要

普惠發動機製造廠：

發動機之動、靜葉片皆正常。轉軸正常。七只軸承除六號軸承滾軸有磨損現象外其餘皆正常。軸承潤滑處及其他可能位置未發現滑油洩漏現象。附件齒輪箱匣前端機匣上方有由內向外撞擊之破洞及熔融現象，油氣分離葉輪由軸上解體，碎屑堆積在附件齒輪箱匣底滑油葉輪進口處。油氣分離葉輪附近無鬆動或脫離之零件，由此判斷油氣分離葉輪應是自然解體，解體之碎屑撞擊附件齒輪箱匣前方機匣造成破洞。

油氣分離葉輪自然解體之可能原因有二：一爲本身材質問題，於運轉過程中無法承擔正常負荷而自然解體；一爲於發動機翻修過程中油氣分離葉輪軸封橡圈疏於

安裝，使油氣分離葉輪失去避震效果，於長期高頻震動的情形下終至龜裂解體。確實原因需經進一步之材質化驗後方能揭曉。此建議將該油氣分離葉輪解體碎屑帶回加拿大原製造廠，進行材料化驗分析。分析報告將於一個月內完成，屆時將寄交各位參考。另飛安會如能提供黑盒子資料將有助於釐清案情。

EADS SECA維修廠：

經察該發動機於本廠翻修資料發現該發動機於靜壓測試時尚有 3.7 PSI 的壓力，雖低於 5 PSI 之標準值，但仍介於正常值之間，如果油氣分離葉輪軸封橡圈未裝的情形下將無法維持這般壓力，且滑油消耗量將立即顯著增加，但該發動機運轉三千多個小時期間並無滑油消耗過量現象，由此研判油氣分離葉輪軸封橡圈未裝的可能性極低。

附錄 3 SECA TECHICAL TEARDOWN REPORT

Diffusion : DO/SCW
DO/SE
DO/ST
DQ/SI

EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

TNA

PW127F
RGB S/N AV0005 TM S/N AV0063

TECHNICAL TEARDOWN REPORT
RAPPORT D'EXAMEN TECHNIQUE

Damages found on this teardown report are observed before cleaning, NDT and final inspection. Further damages will be mentioned by our quality dept. report.

Les dommages décrits dans ce rapport d'examen technique sont observés avant lavage, CND et inspection. Les autres dommages figureront au rapport de contrôle qualité.

Diffusion : DO/SCW
DO/SE
DO/ST
DQ/SI

EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

Forme DTL 004 IND "D" Nov. 02

ENGINE PW127F RGB S/N AV0005 TM S/N AV0063 2/2019~~19~~

Damages found on this teardown report are observed before cleaning, NDT and final inspection. Further damages will be mentioned by our quality dept. report.

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EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

ENGINE MANUFACTURER : PWC *CONSTRUCTEUR MOTEUR*	TYPE: PW127F	S/N RGB: AV0005	S/N TM: AV0063

	TSN	CSN	TSO	CSO	TSHSI	CSHSI
RGB:	11113	17186	5134	7642	///	///
TM:	9658	14557	3715	5526	///	///

OWNER/OPERATOR : *PROPRIETAIRE/OPERATEUR :*	*TNA*

CUSTOMER ORDER NUMBER : 04VA4024RR *NUMERO DE COMMANDE CLIENT*	SECA WORK NUMBER : 4010243 *OE SECA*

ENGINE HISTORY / *HISTORIQUE DU MOTEUR*

RGB Date of manufacture / *date de fabrication* : March 1997
Last inspection performed / *dernière inspection réalisée* :
Removal reason : Metal debris — Work performed : Repaired
Motif de dépose — *Travaux réalisés*
Date: February 04, 2002 — Overhaul shop : EADS / SECA — WO: 1120193
Atelier de révision
TSN: 7398 — CSN: 11660

TM Date of manufacture / *date de fabrication* : July 1998
Last inspection performed / *dernière inspection réalisée* :
Removal reason : Overhaul — Work performed : Overhauled
Motif de dépose — *Travaux réalisés*
Date: February 04, 2002 — Overhaul shop : EADS / SECA — WO: 1100332
Atelier de révision
TSN: 5943 — CSN: 9031

REASON OF ENGINE REMOVAL / *MOTIF DE LA DEPOSE*

Accessory Gearbox of Rear Inlet Case fracture.

DATE OF ENGINE REMOVAL / *DATE DE DEPOSE MOTEUR*

December 26, 2003.

FINDINGS AT INCOMING / *CONSTATATIONS A L'ARRIVEE*

Free rotation of power turbines assy.
Blocking of the HP compressor assy and hard point in the rotation of the LP compressor assy.

RGB oil filter:	Contamined.
RGB chip detector:	Nothing to report.
TM oil filter:	Contamined.
TM chip detector:	Contamined.
Bypass indicators (POP OUT):	Found in good position.

EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

ACCESSORIES AND PARTS MISSING /*ACCESSOIRES ET PIECES MANQUANTS*

Handling Bleed Valve.

ENGINE PW127F RGB S/N AV0005 TM S/N AV0063 4/2019~~19~~

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EADS SECA
SOGERMA SERVICES

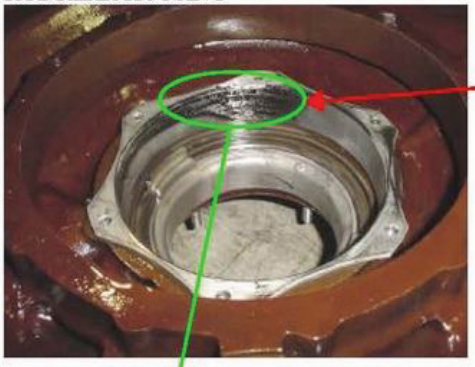
Ref: DO/SE

Date: December 5, 2003.

RGB MODULE S/N AV0005

MAIN PARTS / *PIECES PRINCIPALES*

RGB REAR HOUSING



Deposits located on the inner diameter of the N° 15 Roller Bearing sleeve.

N° 15 ROLLER BEARING

The corresponding deposits are observed on the outer diameter of N° 15 Roller Bearing outer race, too.

OIL SEAL RUNNER

Sealing diameter grooved.

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EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

TURBOMACHINERY MODULE S/N AV0063

COLD SECTION PARTS / *PIECES SECTION FROIDE*

REAR INLET CASE

The upper area is fractured around the Accessory Drive Spur Gearshaft location. The base metal of housing (AMS 4439) is melted near the N° 25 Roller Bearing location.

ENGINE PW127F RGB S/N AV0005 TM S/N AV0063 6/20~~19~~19

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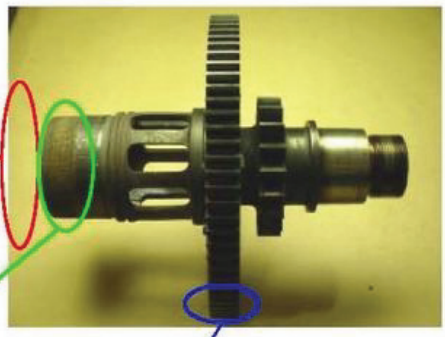
EADS SECA
SOGERMA SERVICES

Ref: DO/SE

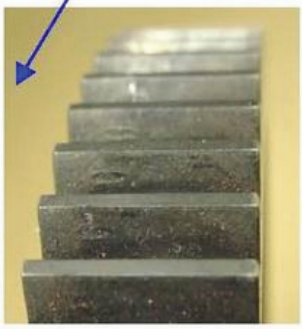
Date: December 5, 2003.

ACCESSORY DRIVE SPUR GEARSHAFT



The sealing face does not present major defect (red arrow).

The journal of the N° 25 Roller Front Bearing is worn and brinelled.



The gear teeth surface is spalled.

N° 25 FRONT ROLLER BEARING

The cage has been voluntarily fractured to accessed to the functional surfaces. The rollers are worn and the internal diameter of the inner raceway is galled.

EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

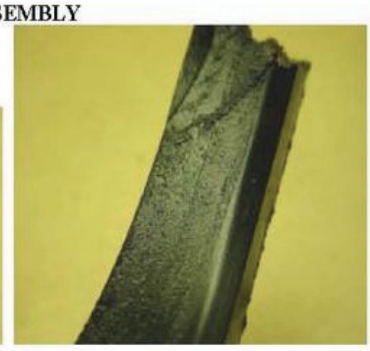
N° 25 REAR BALL BEARING

The bearing has been voluntarily separated to accessed to the functional surfaces. The outer raceway of the outer ring is brinelled.

COUPLING SHAFT STOP

This part (located inside the Accessory drive spur gearshaft) is discolored. Preformed packing remaining traces are present on the sealing groove.

CENTRIFUGAL BREATHER IMPELLER ASSEMBLY



View of the main debris. On the sealing diameter which receives the preformed packing, a black deposit is observed and could result to the burn of the preformed packing.

ENGINE PW127F RGB S/N AV0005 TM S/N AV0063 8/2019~~19~~

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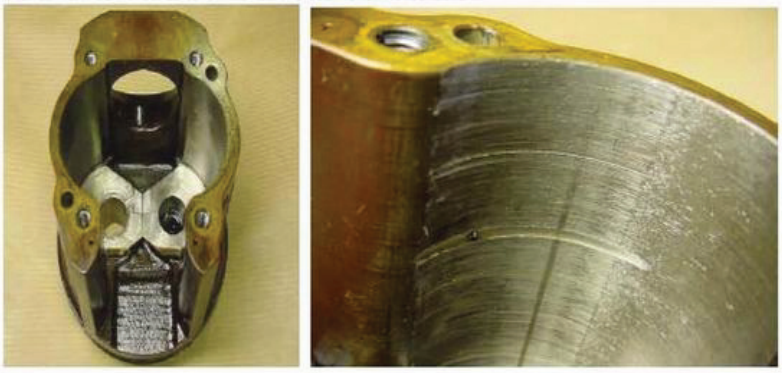
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

MAIN PRESSURE PUMP HOUSING ASSEMBLY



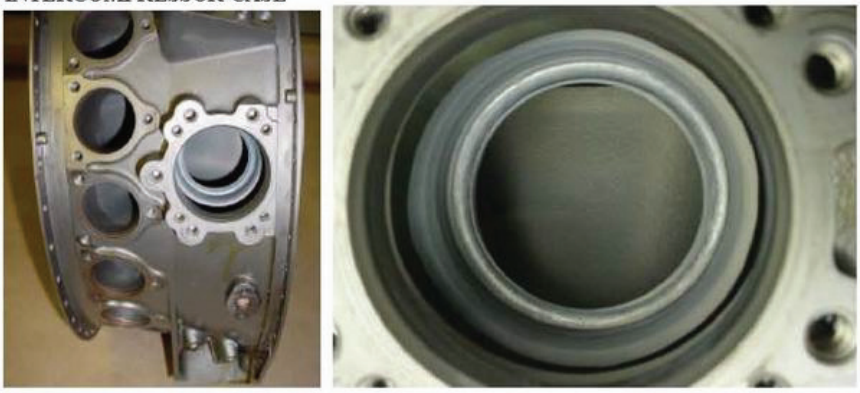
Circumferencial scratches on the inner diameter.

LP IMPELLER HOUSING
Dirty inspection has revealed no particular damage and no rubbing trace.

LP IMPELLER Life limit reached. Light circumferencial scratche on the rear area.

LP DIFFUSER CASE
Dirty inspection has revealed no particular damage but the rear face is oily.

INTERCOMPRESSOR CASE



A fretting wear is observed on the face and on the adjacent diameter. This diameter receives an air transfer tube for P2.5 air supplying to the airframe purposes.

ENGINE PW127F RGB S/N AV0005 TM S/N AV0063 9/2019~~19~~

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EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

HP IMPELLER HOUSING
Circumferencial scratches.

HP IMPELLER
Circumferencial scratches on the exducer areas.

HOT SECTION PARTS / *PIECES PARTIE CHAUDE*

GAS GENERATOR CASE

The front and rear surfaces of the N° 5 Bearing area are covered by coked oil deposits.

HP IMPELLER SEAL HOUSING

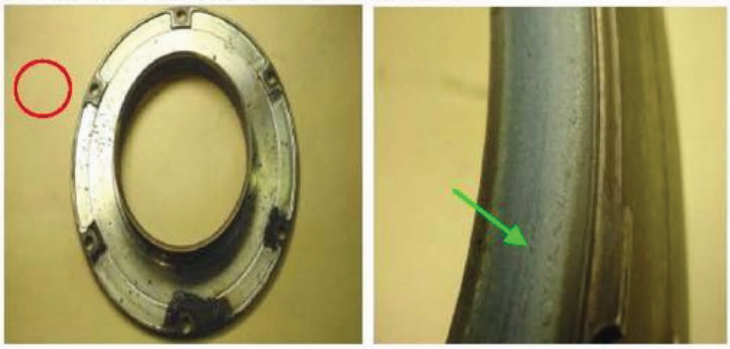
Loss of plasma coating on the air seal diameters.

EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

Nº 5 BEARING HOUSING STATOR AIR SEAL



Fretting wear on the face (red circle) and loss of plasma coating on the air diameter.

#5 BEARING HOUSING COVER

Important coked deposits on the internal surfaces of housing.

VANE RING FRONT INNER SUPPORT HOUSING

Loss of plasma coating on the air seal diameters.

ENGINE PW127F RGB S/N AV0005 TM S/N AV0063 11/2019~~19~~

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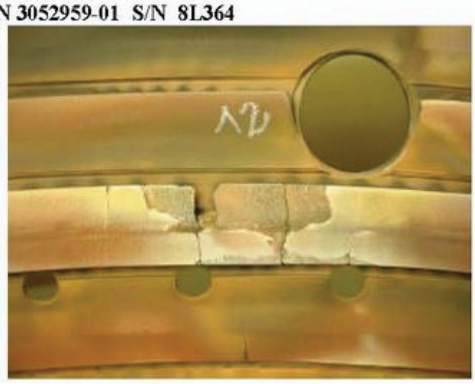
EADS SECA
SOGERMA SERVICES

Ref: DO/SE

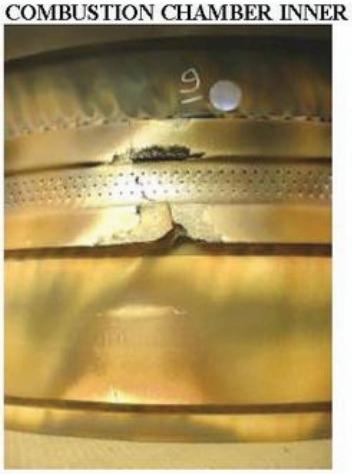
Date: December 5, 2003.

COMBUSTION CHAMBER OUTER LINER P/N 3052959-01 S/N 8L364



Dual cooling ring : axial cracks with missing material, loss of ceramic coating, distortion and hot gas path erosion in the vicinity of the fuel nozzle ports N° 6 & 12.

COMBUSTION CHAMBER INNER LINER P/N 3048934-01 S/N 4M535



Cooling ring : axial crack with missing material, loss of ceramic coating in the vicinity of the Fuel nozzle port N° 9.

IGNITION PLUGS
Tips eroded.

COMBUSTION CHAMBER SMALL EXIT DUCT
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

ENGINE PW127F RGB S/N AV0005 TM S/N AV0063 12/2019~~19~~

Damages found on this teardown report are observed before cleaning, NDT and final inspection. Further damages will be mentioned by our quality dept. report.

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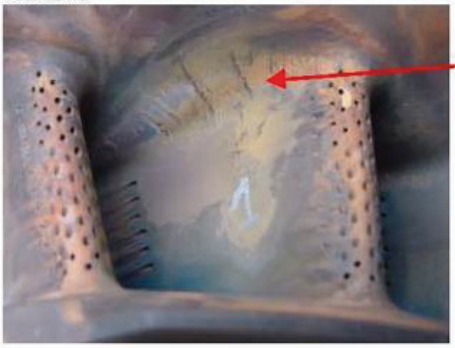
EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

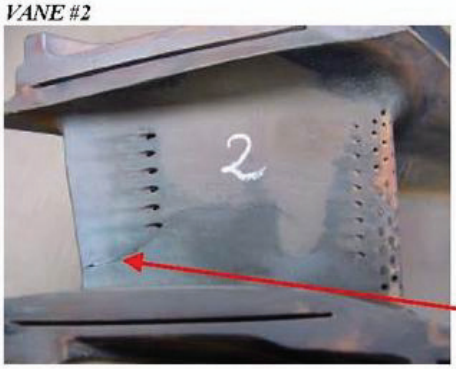
HP VANE SEGMENTS (A4)

VANE #1



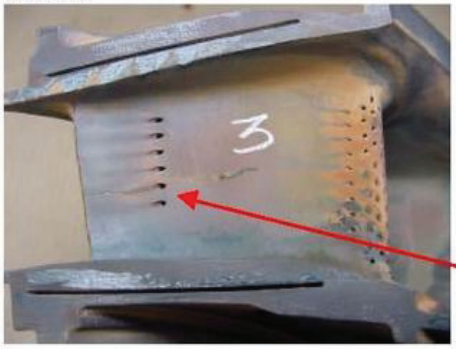
Many cracks extending through the airfoil fillet radii.

VANE #2



Airfoil trailing edge : crack on the both side on the airfoil with light missing material.

VANE #2



Airfoil trailing edge : crack on the both side on the airfoil.

ENGINE PW127F RGB S/N AV0005 TM S/N AV0063 13/20~~19~~~~19~~

Damages found on this teardown report are observed before cleaning, NDT and final inspection. Further damages will be mentioned by our quality dept. report.

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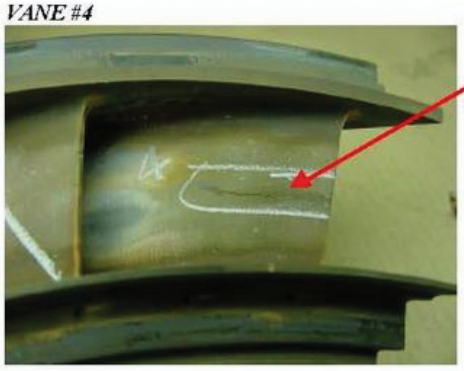
EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

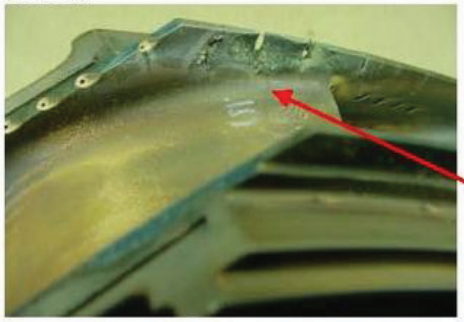
HP VANE SEGMENTS (A4) Continued

VANE #4



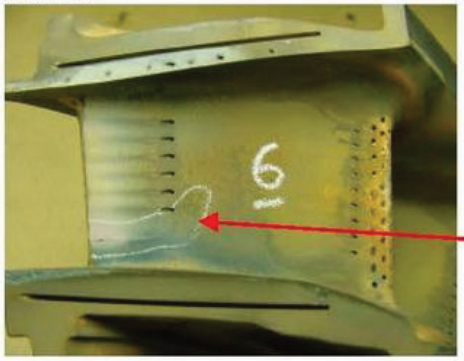
Airfoil trailing edge : crack on the both side on the airfoil.

VANE #5



Axial cracks with erosion on the outer shroud surfaces trailing edge lips.

VANE #6



Airfoil trailing edge : crack on the both side on the airfoil.

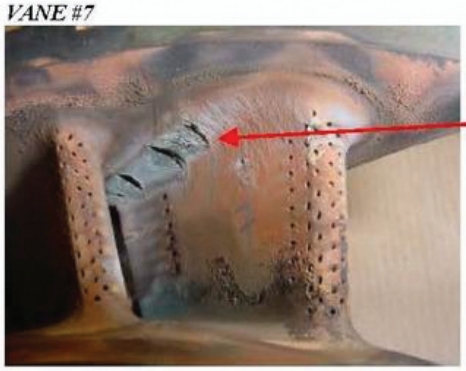
EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

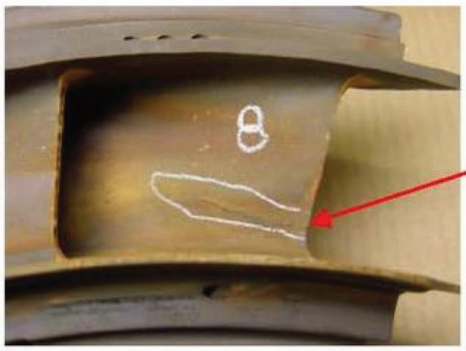
HP VANE SEGMENTS (A4) Continued

VANE #7



Many cracks extending through the airfoil fillet radii.

VANE #8



Airfoil trailing edge : crack on the both side on the airfoil.

VANE SEGMENT OUTER SUPPORT HOUSING
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

HP TURBINE ASSY
Total cycle limit live reached on the HPT Disk and on the HPT Rear cover.
Mineral deposits on the feather seal pocket of HPT blades.
Dirty inspection has revealed no particular damage on the remaining components.

EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

HP SHROUD SEGMENTS

Thermal cracks on the plasma coating and light oxydation.

HP SEALING RING
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

TURBINE SUPPORT CASE
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

LP STATOR (A5)

Many cracks on some airfoil leading edges with erosion at 7 o' clock position.

LP TURBINE ASSY
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

LP TURBINE HOUSING
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

ENGINE PW127F RGB S/N AV0005 TM S/N AV0063 16/2019~~19~~

Damages found on this teardown report are observed before cleaning, NDT and final inspection. Further damages will be mentioned by our quality dept. report.

Les dommages décrits dans ce rapport d'examen technique sont observés avant lavage, CND et inspection. Les autres dommages figureront au rapport de contrôle qualité.

EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

LP SHROUD SEGMENTS

Prints and rubbing traces.

LP SEALING RING
Excessive wear.

TURBINE INTERSTAGE CASE
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

N° 6 & 7 BEARING PRESSURE, SCAVENGE, VENT TRANSFER TUBES
External diameters found sooty and internal diameters found not obstructed.

N° 6 & 7 BEARING HOUSING.

Coked oil deposits inside the housing. The strainer installed on the oil feed was found blocked by the coked oil deposit.

EADS SECA
SOGERMA SERVICES

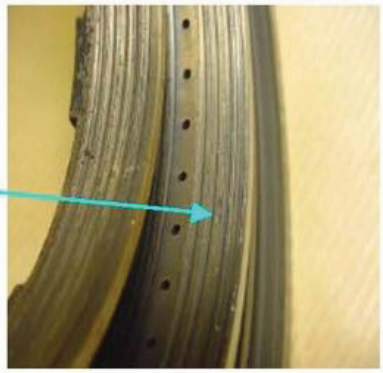
Ref: DO/SE

Date: December 5, 2003.

N° 6 ROLLER BEARING

The outer raceway presents heat discoloration, the inner raceway is galled and the rollers are worn. This bearing has suffered by the lubrification defect due to the low oil pressure but also by a blocking of oil

N° 6 & 7 BEARING HOUSING SEAL.



All the internal surfaces are covered by coked oil deposits.
The two air seal diameters are grooved.

ENGINE PW127F RGB S/N AV0005 TM S/N AV0063 18/2019~~19~~

Damages found on this teardown report are observed before cleaning, NDT and final inspection. Further damages will be mentioned by our quality dept. report.

Les dommages décrits dans ce rapport d'examen technique sont observés avant lavage, CND et inspection. Les autres dommages figureront au rapport de contrôle qualité.

EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

INTERSTAGE DUCT INSULATION BLANKET.
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

POWER TURBINE SHAFT.
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

FIRST STAGE POWER TURBINE STATOR (A6)
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

PT STATOR RETAINING RINGS
Important wear on the slots.

FIRST STAGE PT DISKS ASSY
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

2ND STAGE POWER TURBINE STATOR ASSY (A7)
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

SECOND STAGE PT DISKS ASSY
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

PT STATOR METAL SEAL RING
Excessive wear.

T6 PROBES
Dirty inspection has revealed no particular damage, will be confirmed after inspection.

FUEL NOZZLE SET & DUMP VALVE
Test as received has revealed a blockage on the fuel nozzle N° 2 (part repaired) and an overhaul has been performed on the dump valve.

EADS SECA
SOGERMA SERVICES

Ref: DO/SE

Date: December 5, 2003.

CONCLUSION & RECOMMENDATIONS / *CONCLUSION & RECOMMANDATIONS*

The Accessory Gearbox fracture of the Rear Inlet Case is most probably due to the centrifugal breather impeller assembly fracture.
The centrifugal breather impeller and AGB accessories associated parts (cf. scrap list) are send to the P&WC laboratory to try to determine the origin of the fracture.
The oil pressure loss and the internal oil fire are considered like been the consequences of this distress.

All incriminated components will be under P&WC's disposal for further investigation into the cause of this damage.

WORKSCOPE PERFORMED / *TRAVAUX REALISES*

REDUCTION GEARBOX WORKSCOPE :

This module will be inspected and repaired i.a.w. the Light Overhaul Manual procedure (Oil pressure loss).

TURBOMACHINERY WORKSCOPE :

This module will be overhauled i.a.w. the P&WC Cleaning Inspection Repair and the Overhaul Manual instructions.

This module will be inspected and repaired i.a.w. the Light Overhaul Manual procedures :
- Oil pressure loss.
- Oil system contamination.

MAIN PARTS SCRAPPED BEFORE FINAL INSPECTION
PIECES PRINCIPALES REBUTEES AVANT INSPECTION

All main and not-demountable bearings of the Turbomachinery module.

附錄 4 赴加拿大普惠廠檢查 GE006 發動機 AV0063 報告

壹、目的

民國 92 年 12 月 25 日，復興航空公司 GE006 班機於松山機場落地滾行時駕駛艙發生一號發動機火警警報，停機後檢視一號發動機，確有失火現象，飛安會已立案調查。

93 年 1 月 11 日至 93 年 1 月 18 日，復興公司將該具發動機送往 EADS SECA 維修廠拆檢，發現發動機之動、靜葉片皆正常，轉軸正常。七只軸承除六號軸承滾軸有磨損現象外其餘皆正常。油氣分離葉輪由軸上解體，判斷應是自然解體。油氣分離葉輪自然解體之可能原因有二：一爲本身材質問題，於運轉過程中無法承擔正常負荷自然解體；一爲於發動機翻修過程中油氣分離葉輪軸封橡圈疏於安裝，使油氣分離葉輪失去避震效果，於長期高頻震動情形下終至龜裂解體。該兩則可能原因需經進一步之材質化驗後方有可能揭曉，本次出國目的即爲調查上述可能原因。

貳、過程

行程：民國 93 年 2 月 22 日至民國 93 年 2 月 29 日

調查作業地點：加拿大魁北克普惠發動機 100 型製造廠

參與單位：

飛安委員會、加拿大運輸安全局、加拿大普惠發動機製造廠及 EADS SECA 維修廠。

參、檢視情形

第一天

2/23 日（星期一）

1. 微觀檢驗油氣分離葉輪碎片外觀及斷裂面

2. 微觀搜尋葉輪軸膠封

3. SEM 物理特性驗證封座殘留物

4. 光譜驗證尋獲膠封

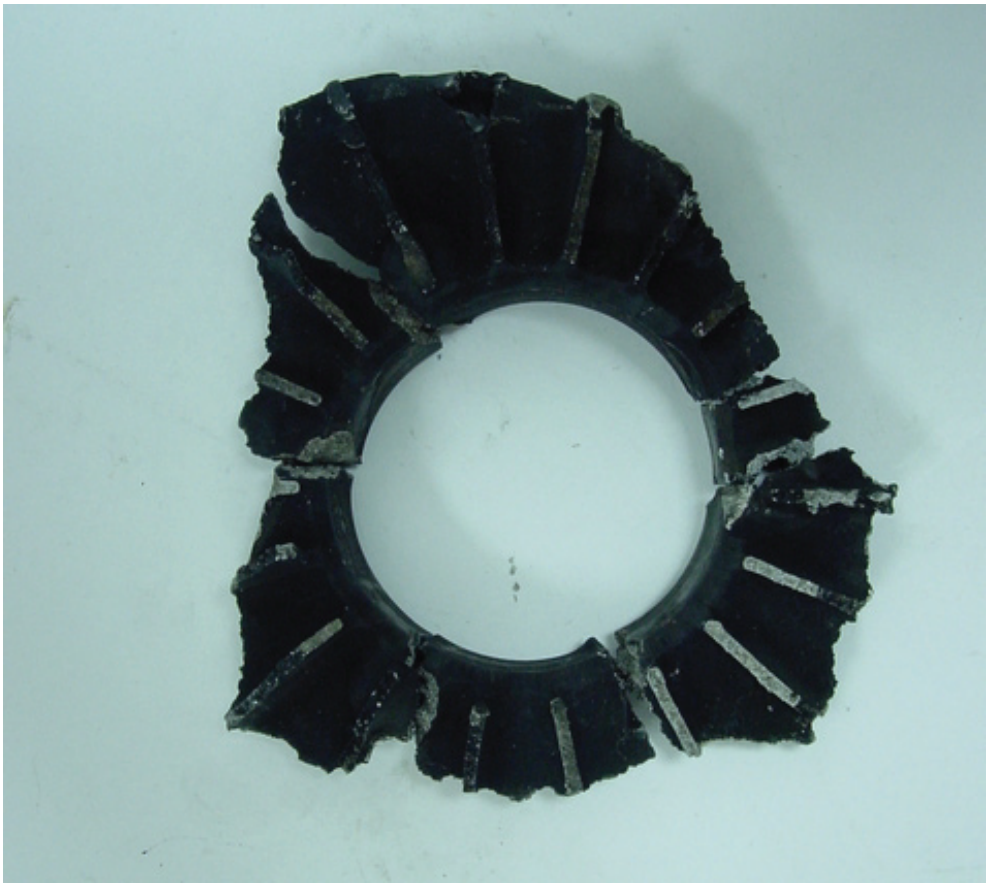


圖 1 微觀檢驗油氣分離葉輪斷裂面（a）

圖 2 微觀檢驗油氣分離葉輪斷裂面（b）

圖 3 微觀檢驗油氣分離葉輪斷裂面（c）

圖 4 微觀搜尋葉輪軸膠封（a）

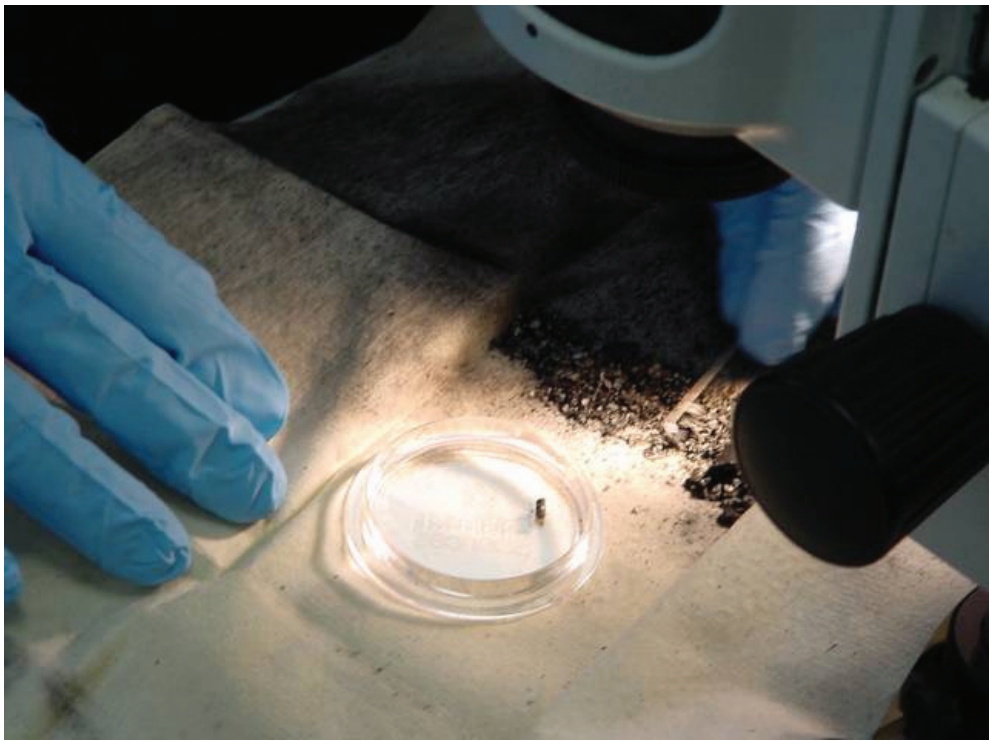


圖 5 微觀搜尋葉輪軸膠封（b）

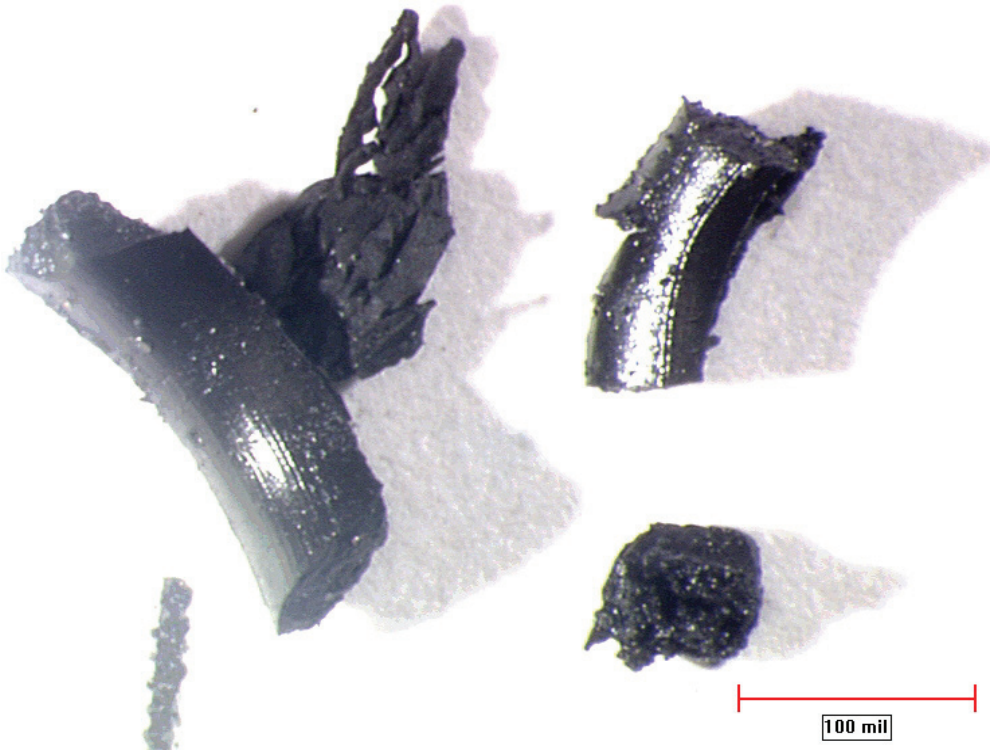


圖 6 微觀搜尋葉輪軸膠封（c）

圖 7 光譜驗證尋獲膠封

第一天檢視結果：

1. 微觀檢驗油氣分離葉輪碎片外觀及斷裂面，查無慢性成長裂紋跡象。
2. 微觀搜尋葉輪軸膠封，尋獲膠封。
3. SEM 物理特性驗證封座殘留物，發現鎂之物理反應。
4. 光譜驗證尋獲膠封與膠封規格相符。

可能原因推測：排除可能疏於安裝膠封之議題。

第二天作業情形：

2/24 日（星期二）

1. 取樣油氣分離葉輪、X 射線螢光元素成分分析。
2. SEM 物理特性檢驗油氣分離葉輪白、金、藍、黑四種碎片斷面。
3. 觀察油氣分離葉輪各碎片積碳特徵。
4. 發動機轉速與扭力於空中消失之原因。

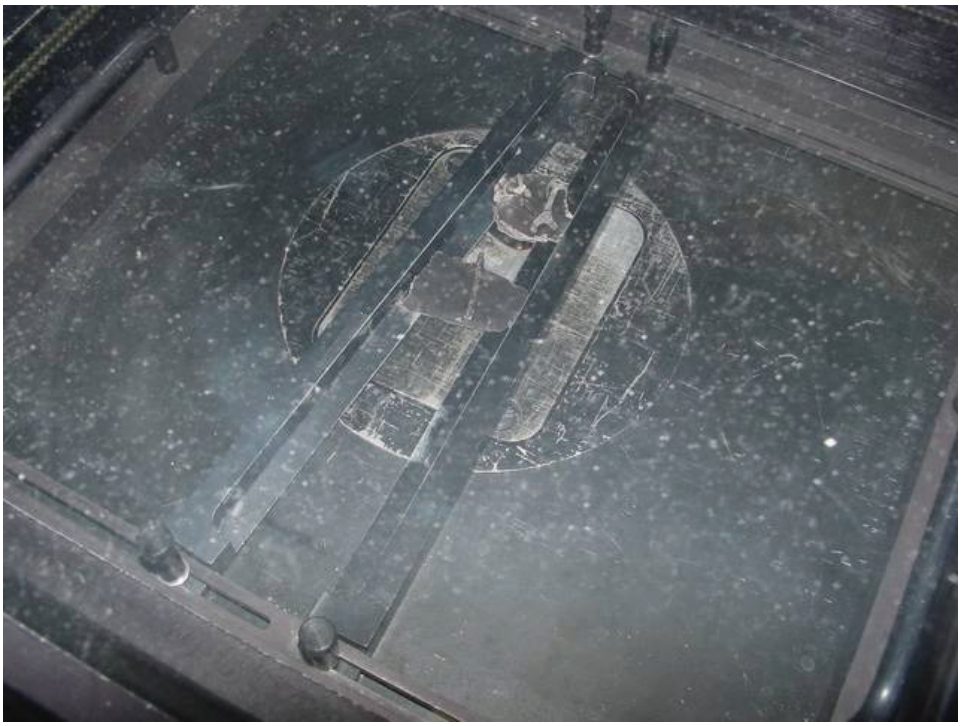


圖 8 油氣分離葉輪 X 射線螢光元素成分分析

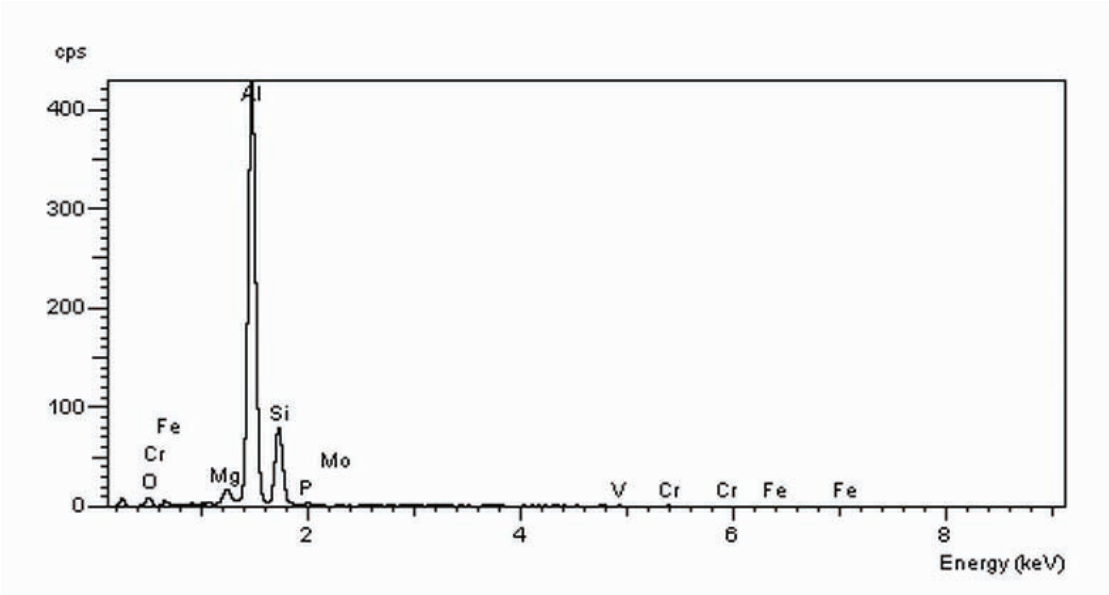


圖 9 SEM 物理特性檢驗油氣分離葉輪斷面

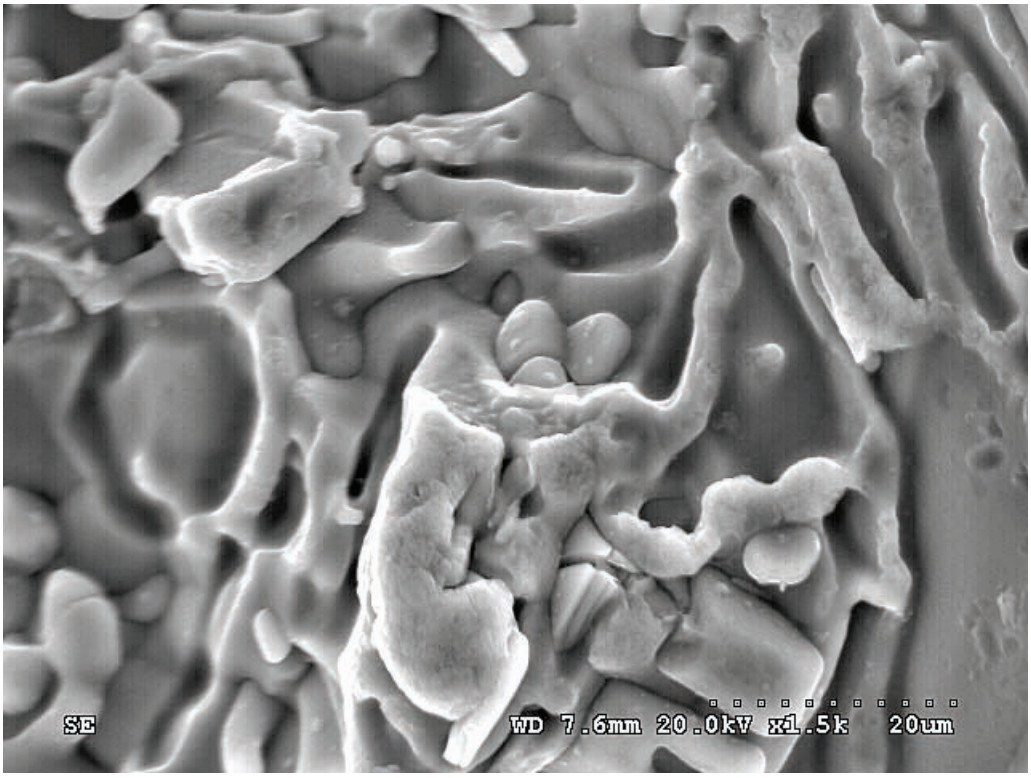


圖 10 SEM 金相檢驗油氣分離葉輪白色斷面

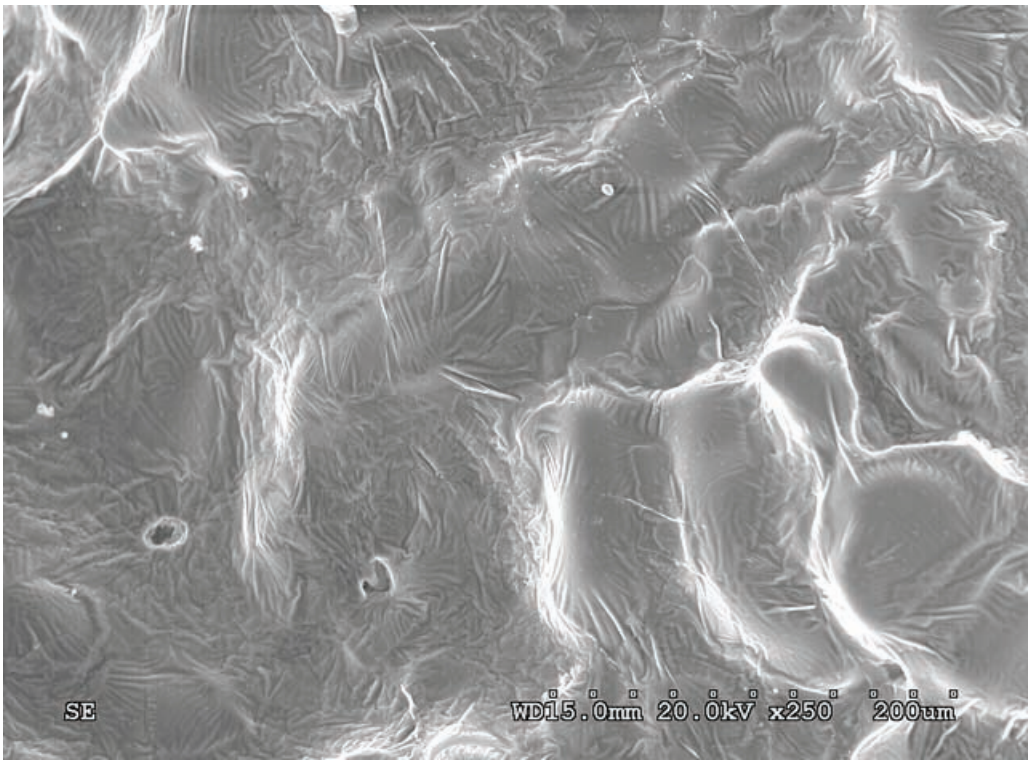


圖 11 SEM 金相檢驗油氣分離葉輪金色斷面

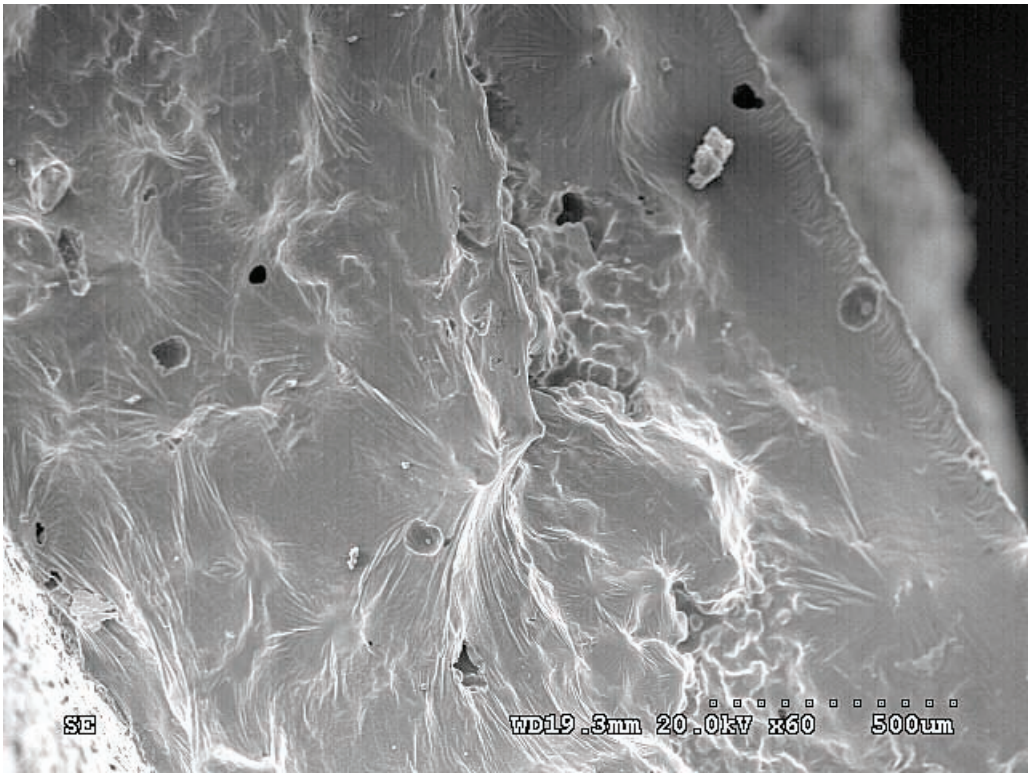


圖 12 SEM 金相檢驗油氣分離葉輪藍色斷面

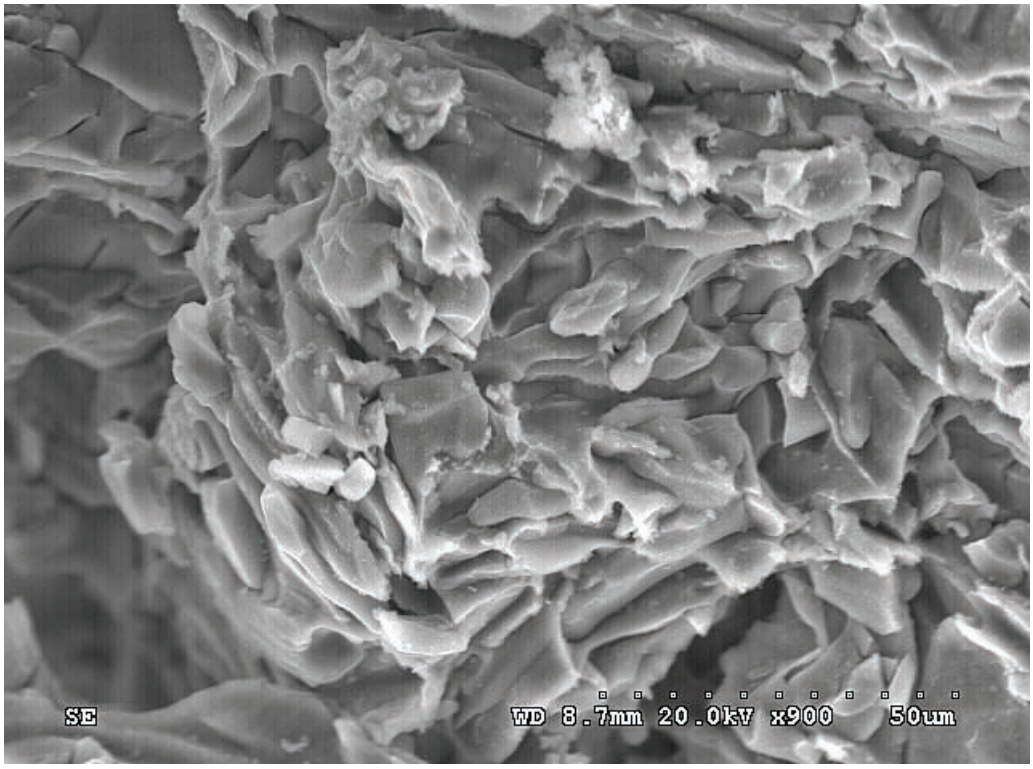


圖 13 SEM 金相檢驗油氣分離葉輪黑色斷面

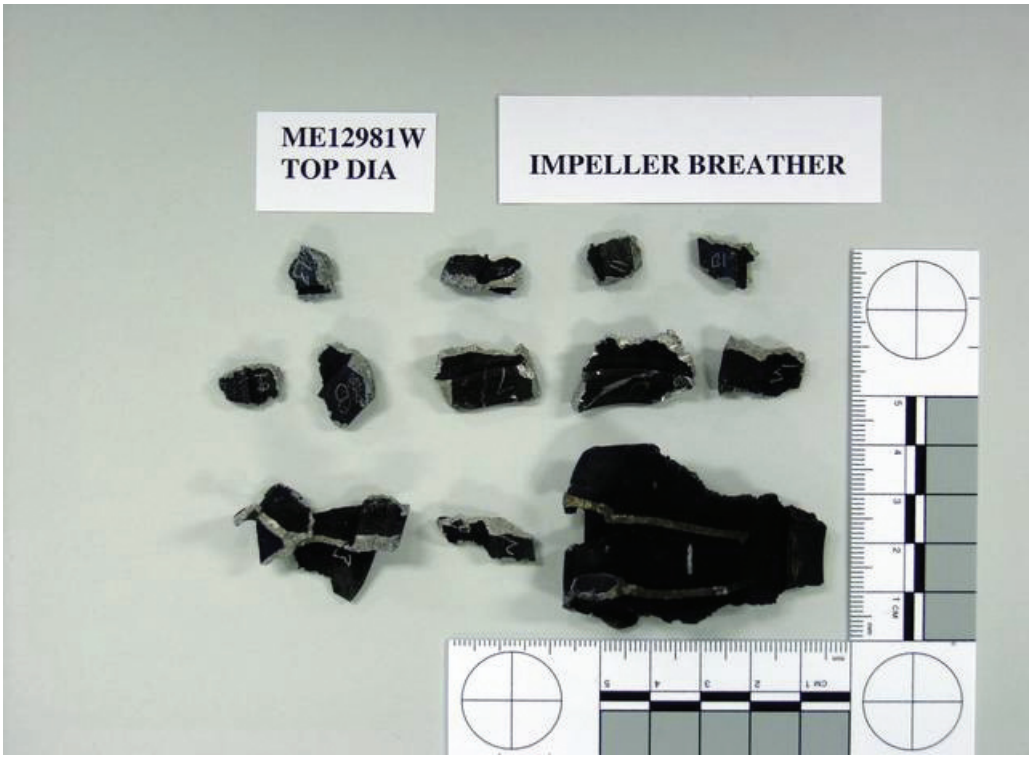


圖 14 油氣分離葉輪各碎片積碳特徵（a）

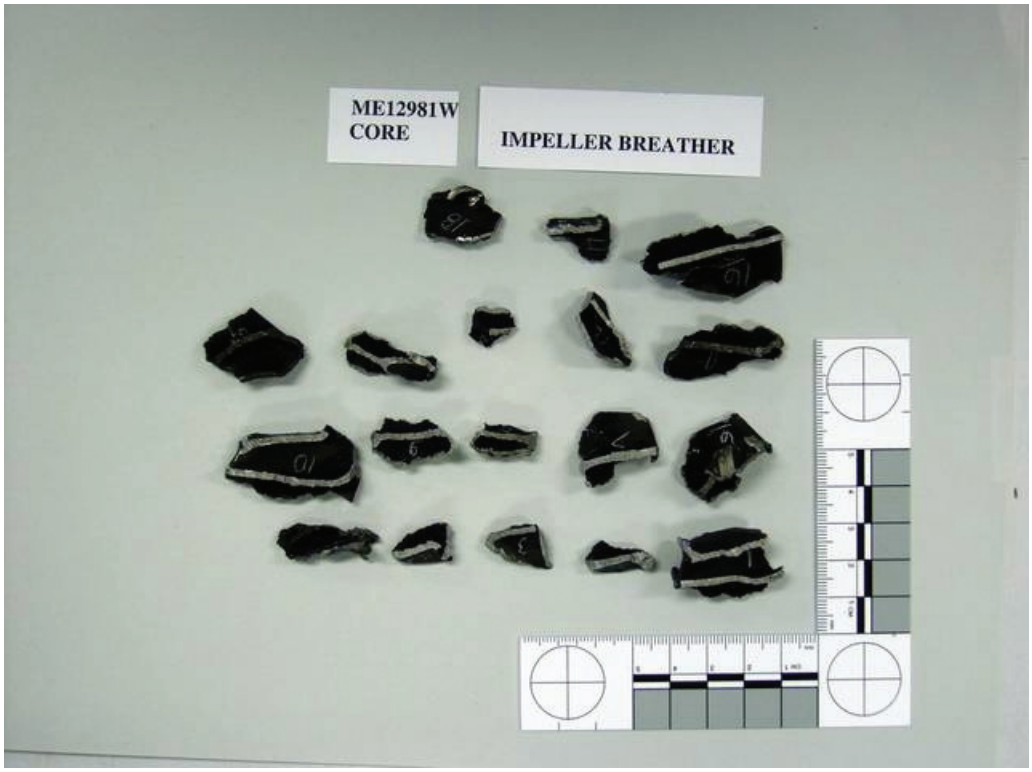


圖 15 油氣分離葉輪各碎片積碳特徵（b）

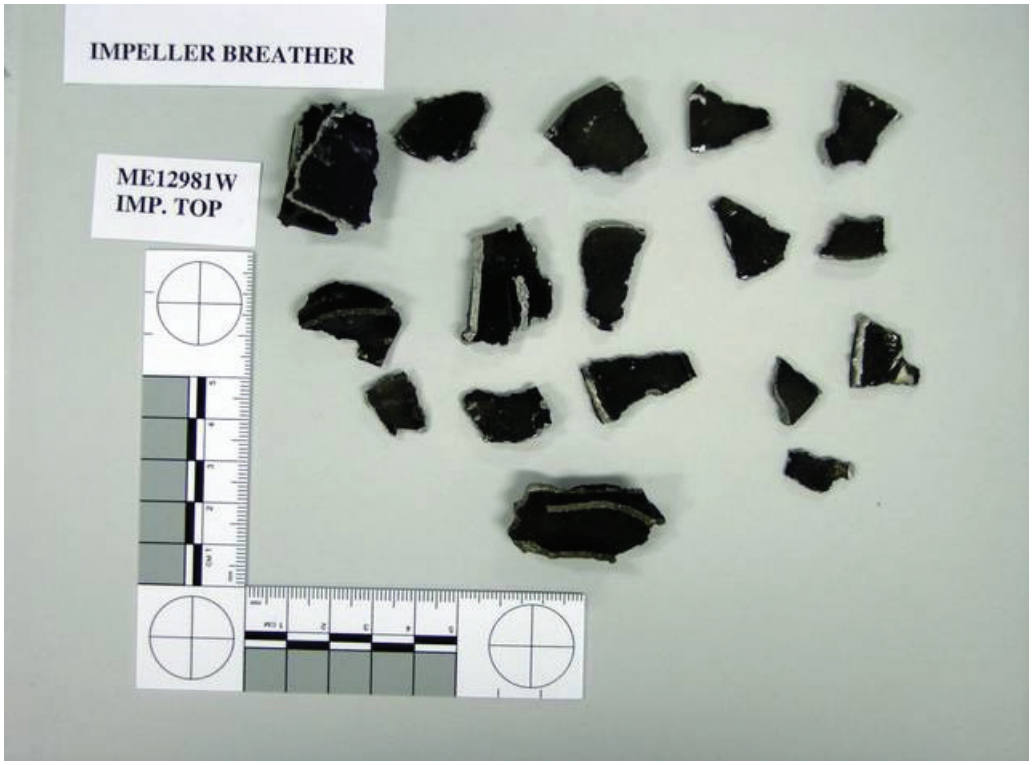


圖 16 油氣分離葉輪各碎片積碳特徵（c）

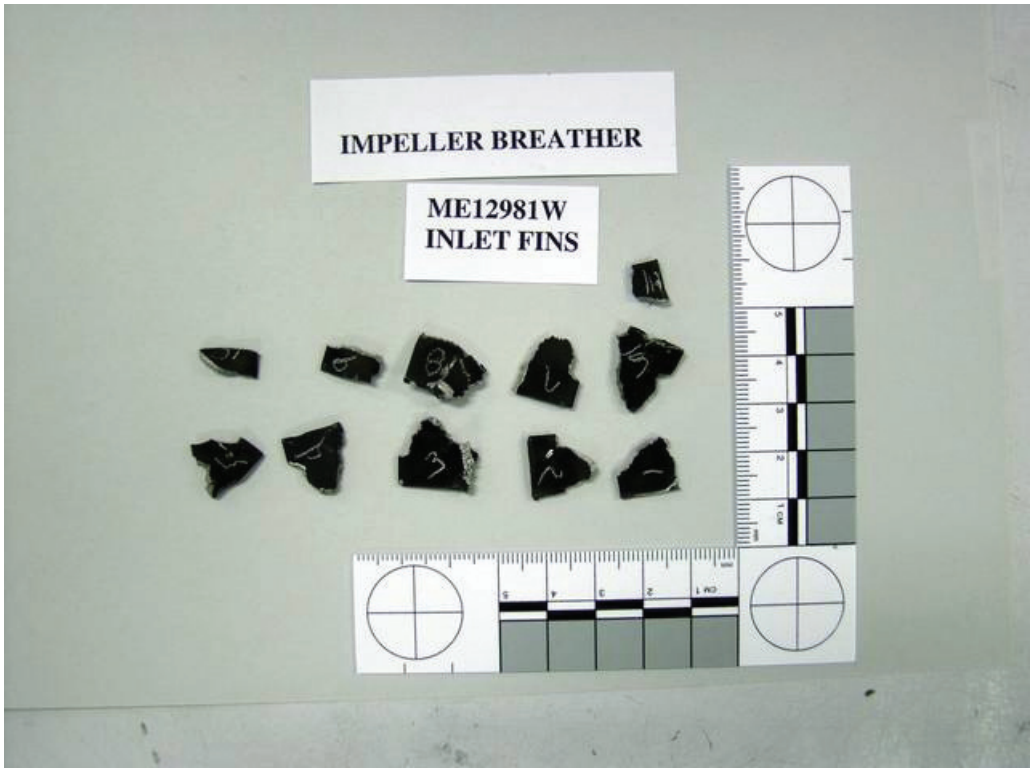


圖 17 油氣分離葉輪各碎片積碳特徵（d）

圖 18 油氣分離葉輪各碎片積碳特徵（e）

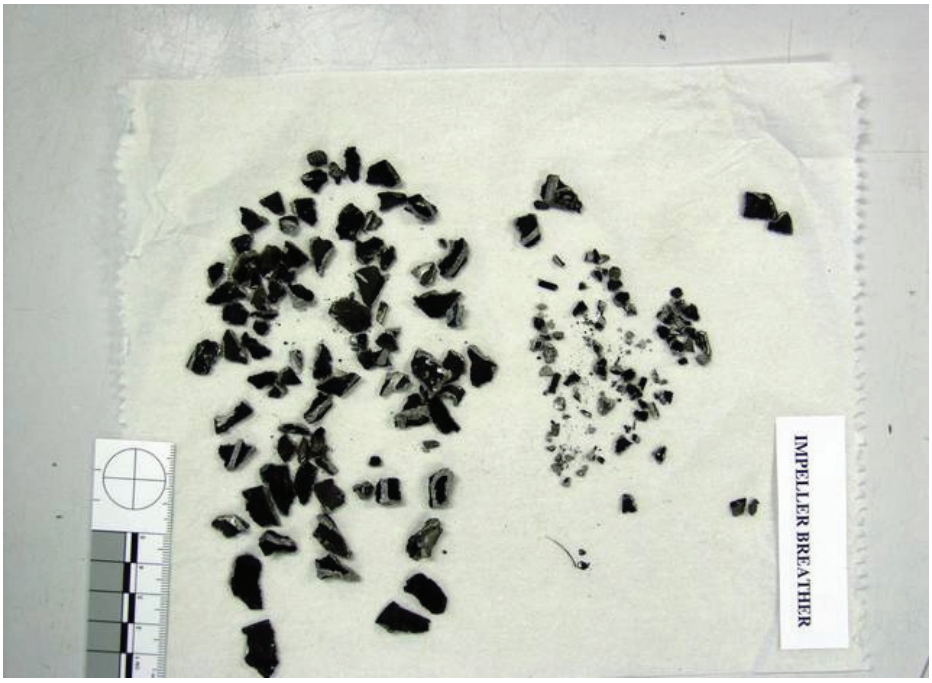


圖 19 油氣分離葉輪各碎片積碳特徵（f）

第二天檢視結果：

1. 取樣油氣分離葉輪、X 射線螢光元素成分分析，有鎂鋁反應與油氣分離葉輪規格相符。
2. SEM 物理特性檢驗油氣分離葉輪白、金、藍、黑四種碎片斷面，表面皆有晶體熔融現象，其嚴重程度依序爲金、藍、白、黑。
3. 觀察油氣分離葉輪各碎片積碳特徵，黑色積碳佈滿油氣分離葉輪內部，然裂紋多爲白色。
4. 由 FDR 資料得知，發動機轉速與扭力同時驟然消失，且飛操控制面無補償動作，判斷其轉速及扭力仍然存在，應屬電線燒毀訊號中斷之故。

可能原因推測：提出火事先發生可能。

第三天作業情形：

2/25（星期三）

1. 檢視油氣分離葉輪固定栓內牙及量測葉輪軸直徑
2. #25 前軸承外環及滾柱取樣。
3. 探漏測試燃油加熱器。

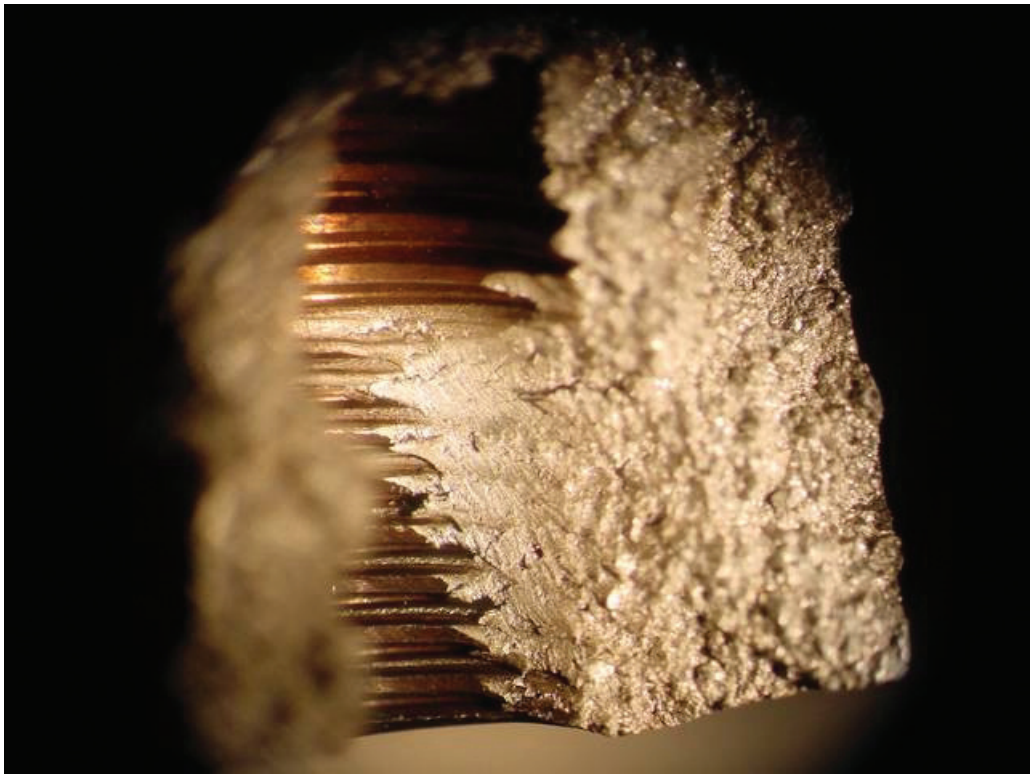


圖 20 檢視油氣分離葉輪固定栓內牙

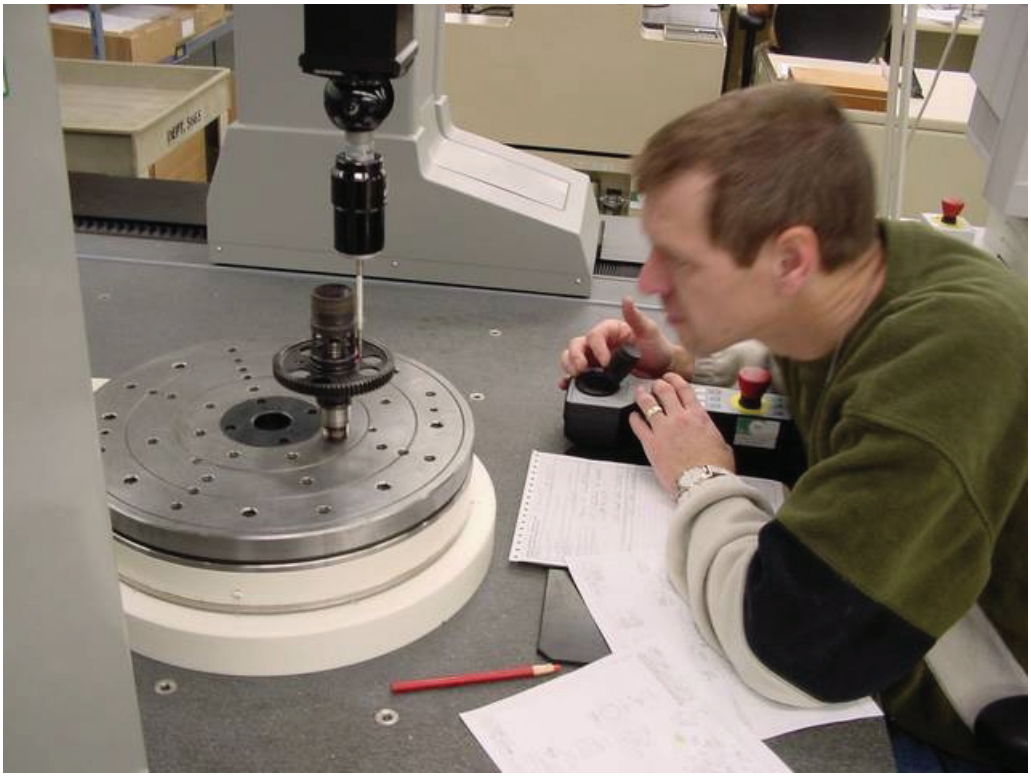


圖 21 量測葉輪軸直徑

圖 22 取樣#25 前軸承外環及滾柱

第三天檢視結果：

1. 檢視油氣分離葉輪固定栓內牙及量測葉輪軸直徑發現:葉輪體經推力及離心力拉力破壞。
2. 取樣#25 前軸承外環及滾柱完成。
3. 探漏測試燃油加熱器：狀況正常無洩漏跡象。

可能原因推測：排除油氣分離葉輪失效先發生可能

第四天作業情形：

2/26 日（星期四）

1. 取樣油氣分離葉輪軸前段、實施 X 射線螢光元素成分分析、SEM 物理特性檢驗、硬度測試。
2. #25 前軸承外環及滾柱 SEM 元素成分分析、X 射線螢光物理特性檢驗。
3. 附件齒輪箱匣內白色線形物質取樣 SEM 物理特性檢驗。
4. 證物特殊外觀攝影蒐證。

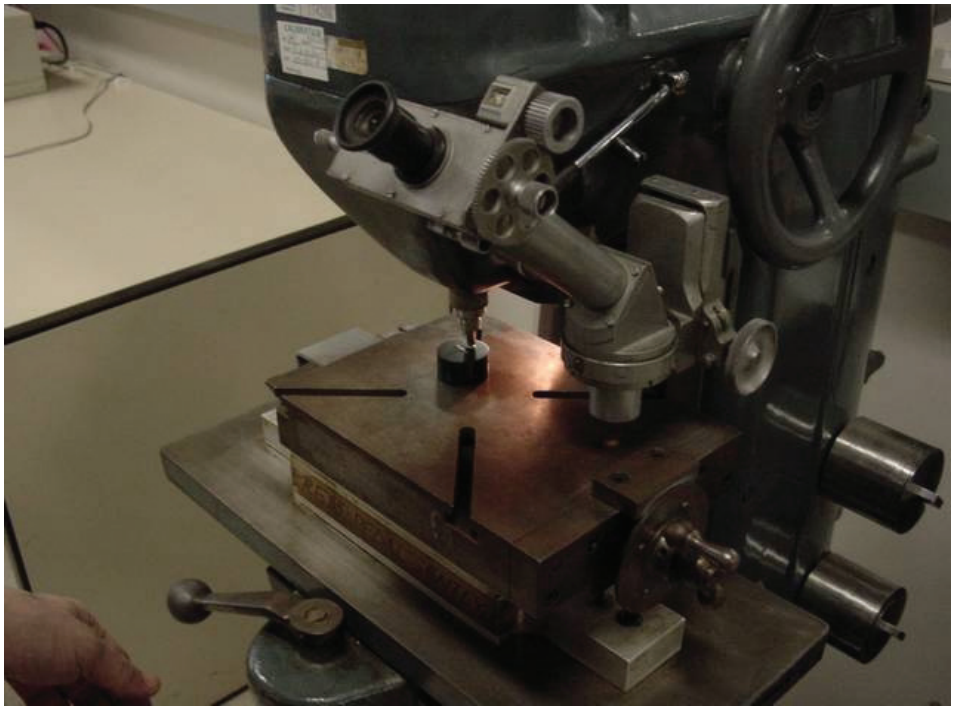


圖 23 油氣分離葉輪軸前段、實施 X 射線螢光元素成分分析、SEM 物理特性檢驗、硬度測試

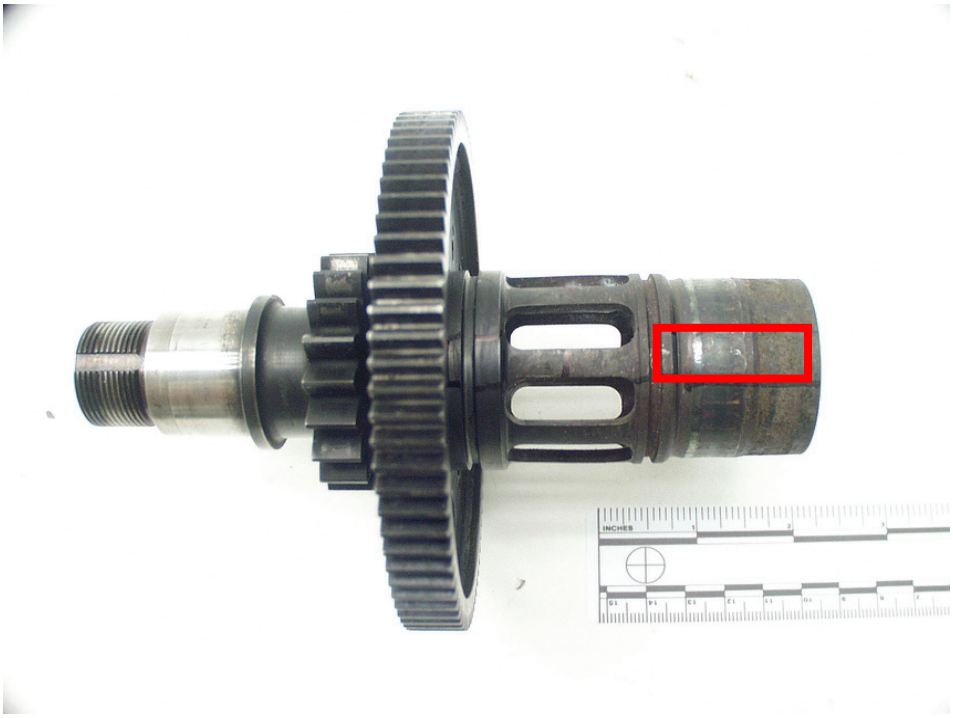


圖 24 葉輪軸前段（前）金相檢驗

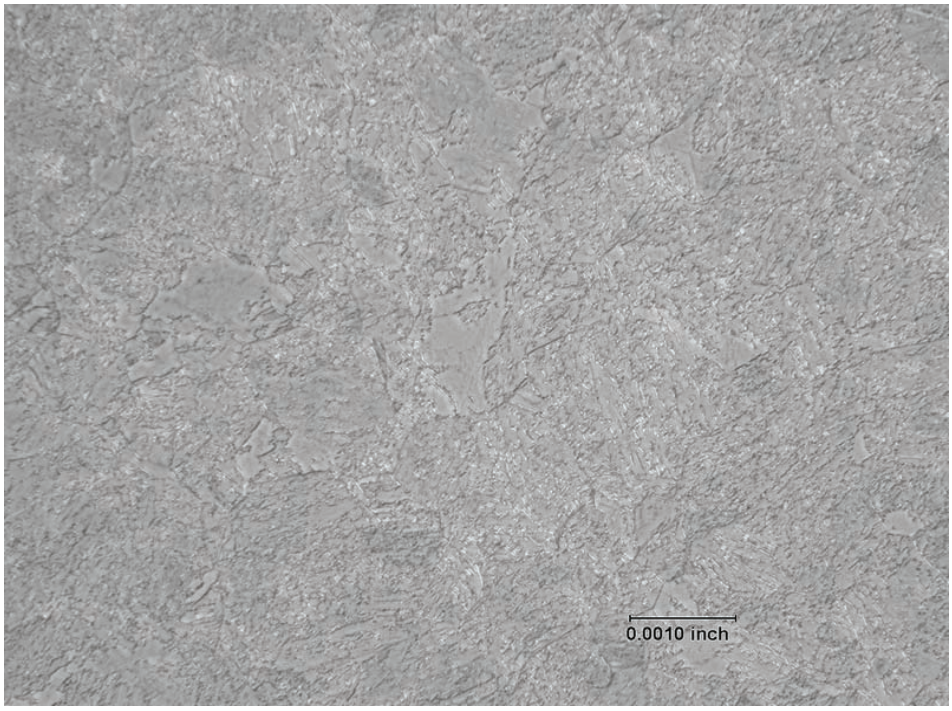


圖 25 葉輪軸前段（前）金相檢驗 28 HRC

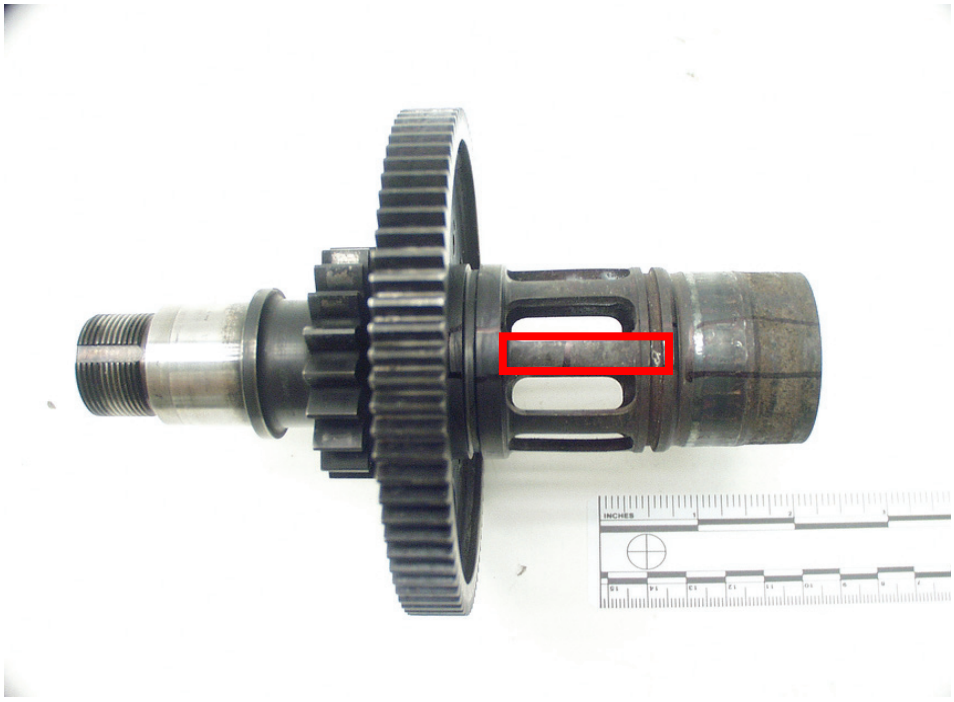


圖 26 葉輪軸前段（中）金相檢驗

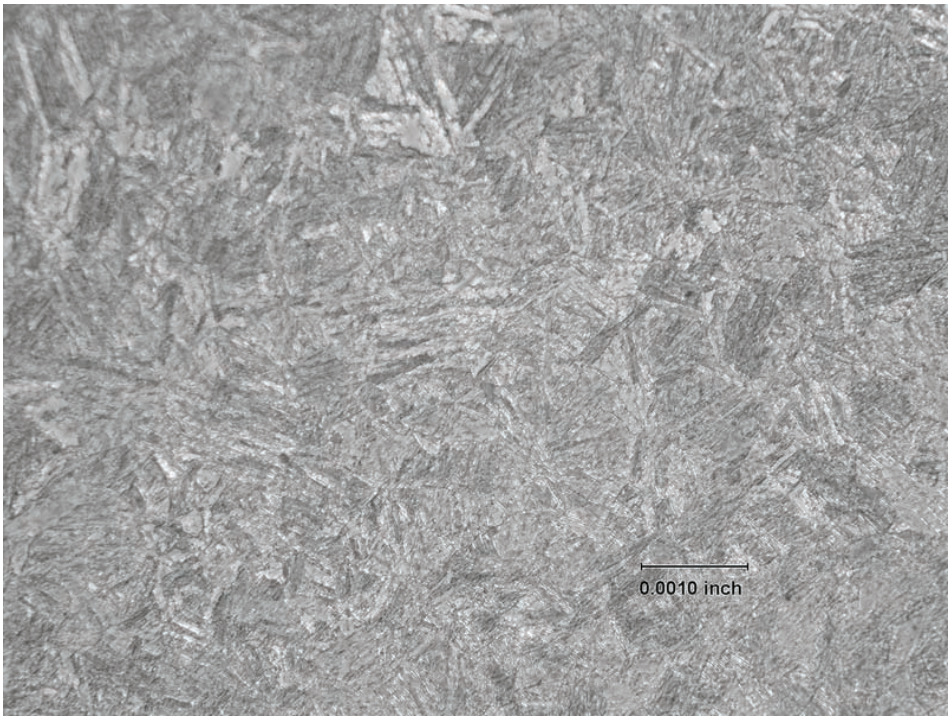


圖 27 葉輪軸前段（中）金相檢驗 38 HRC

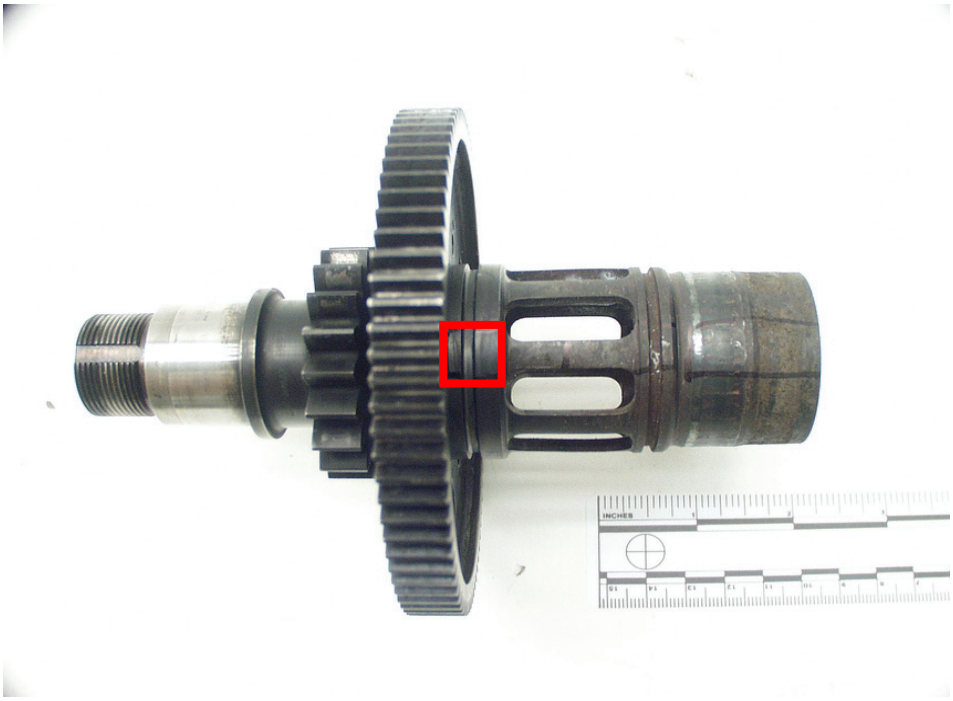


圖 28 葉輪軸前段（後）金相檢驗

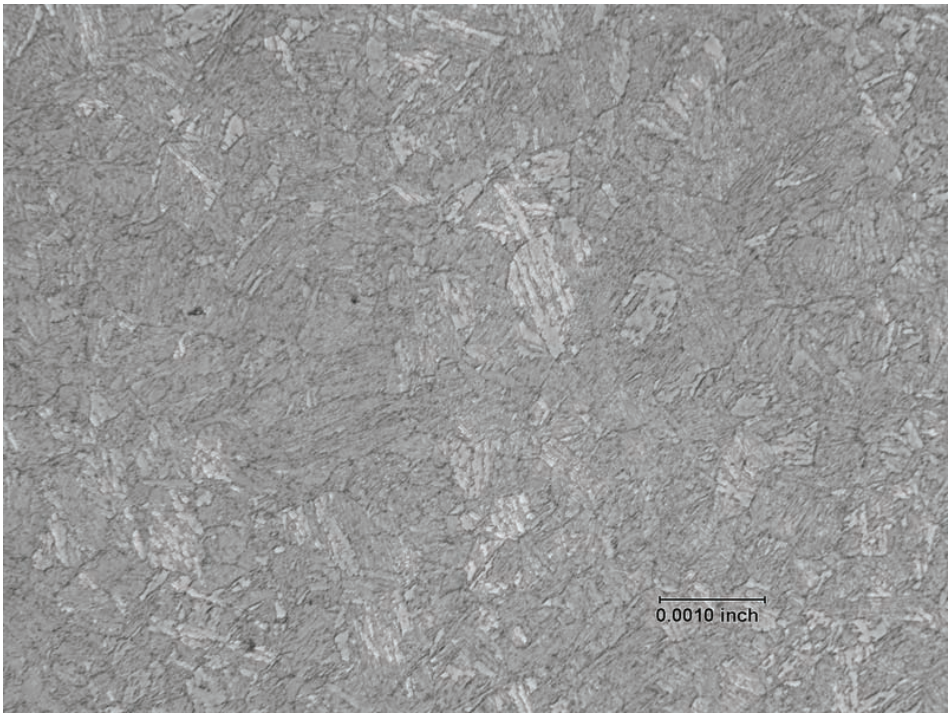


圖 29 葉輪軸前段（後）金相檢驗 24 HRC

圖 30 #25 號前軸承外環及滾柱 SEM 元素成分分析、
X 射線螢光物理特性檢驗

圖 31 附件齒輪箱匣內白色線形物質取樣 SEM 物理特性檢驗

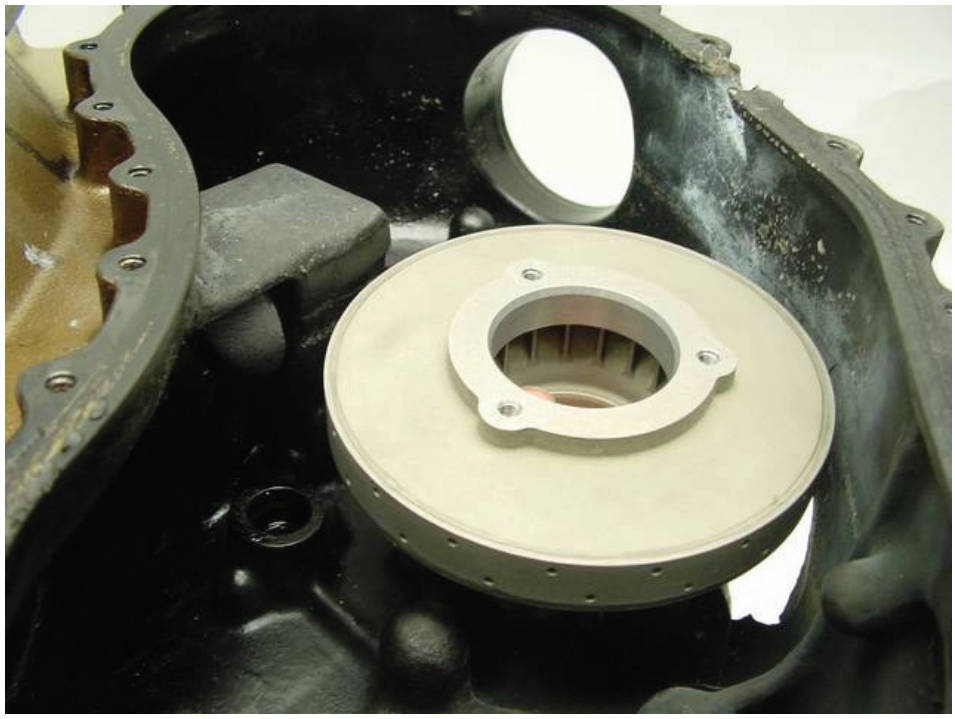


圖 32 附件齒輪箱匣內白色線形物質取樣 SEM 物理特性檢驗

第四天檢視結果：

1. 取樣油氣分離葉輪軸前段、實施 X 射線螢光元素成分分析、SEM 物理特性檢驗、硬度測試。X 射線螢光元素成分分析符合規範、SEM 物理特性檢驗有退火金相、硬度測試有降低。
2. #25 前軸承外環及滾柱 SEM 元素成分分析、X 射線螢光物理特性檢驗。SEM 元素成分分析發現外環軌道有銀覆蓋、X 射線螢光物理特性檢驗軸承外環及滾柱皆符合規範。
3. 附件齒輪箱匣內白色線形物質取樣 SEM 物理特性檢驗，爲鎂鋁金屬。
4. 證物特殊外觀攝影蒐證。

可能原因推測：油氣分離葉輪於失效前，有熱融現象。

第五天作業情形：

2/27 日（星期五）

1. 取樣油氣分離葉輪軸後段、X 射線螢光元素成分分析、SEM 物理特性檢驗、硬度測試。
2. 證物特殊外觀攝影蒐證。

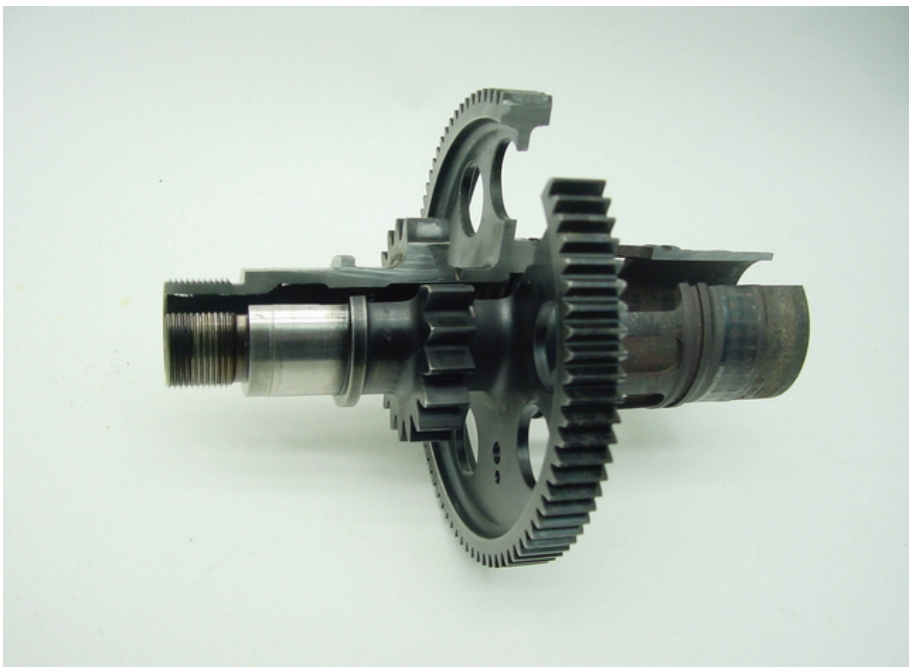


圖 33 取樣油氣分離葉輪軸後段、X 射線螢光元素成分分析、SEM 物理特性檢驗、硬度測試

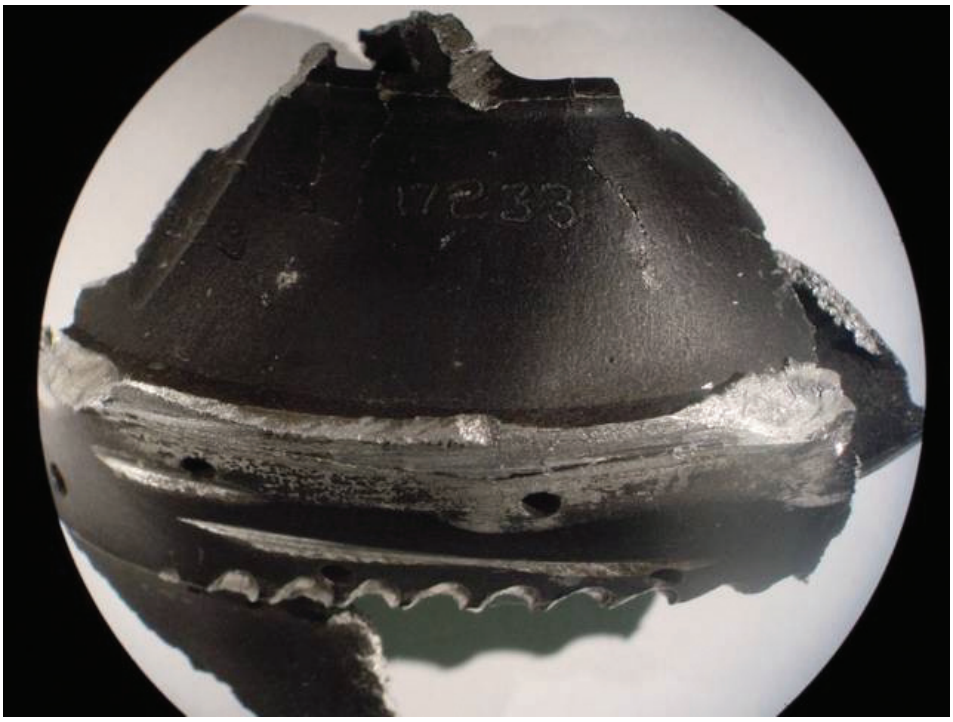


圖 34 證物特殊外觀攝影蒐證（a）

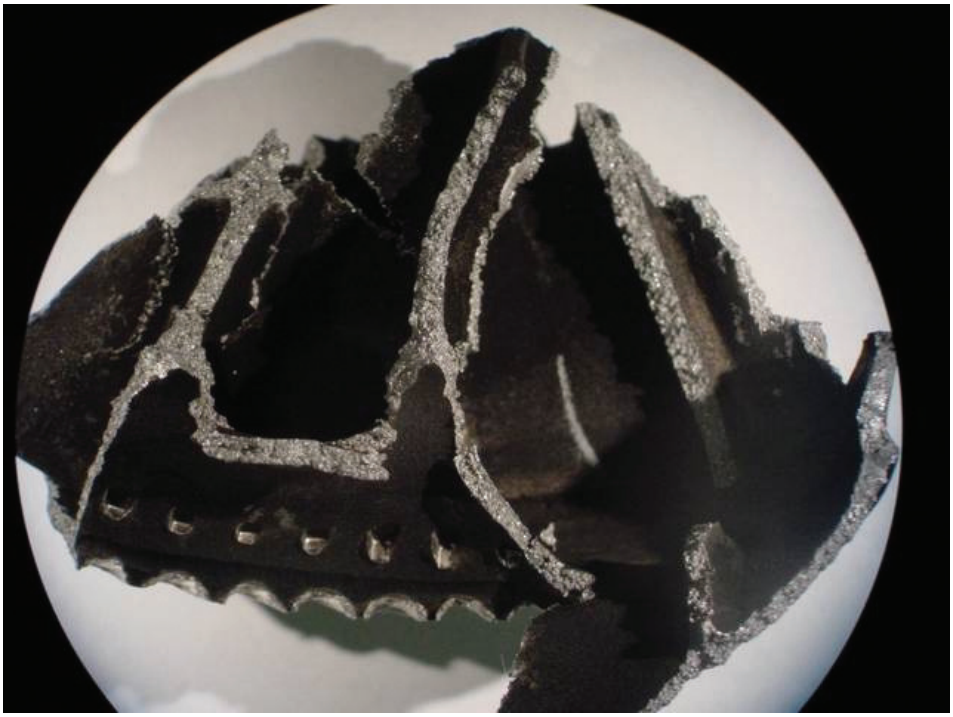


圖 35 證物特殊外觀攝影蒐證（b）

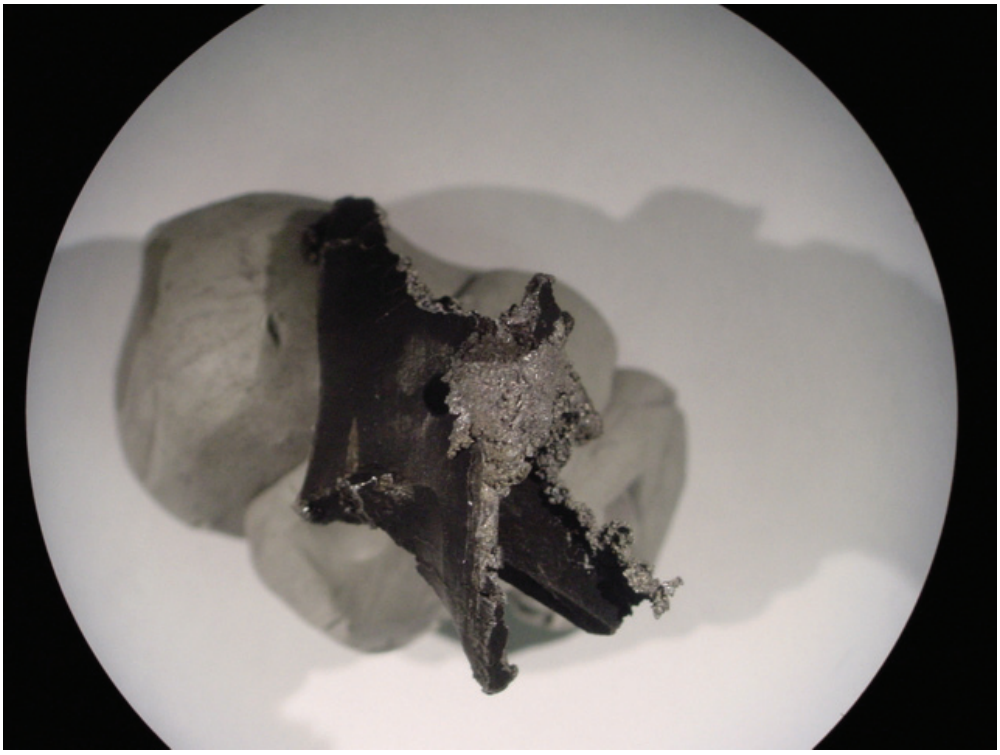


圖 36 證物特殊外觀攝影蒐證（c）

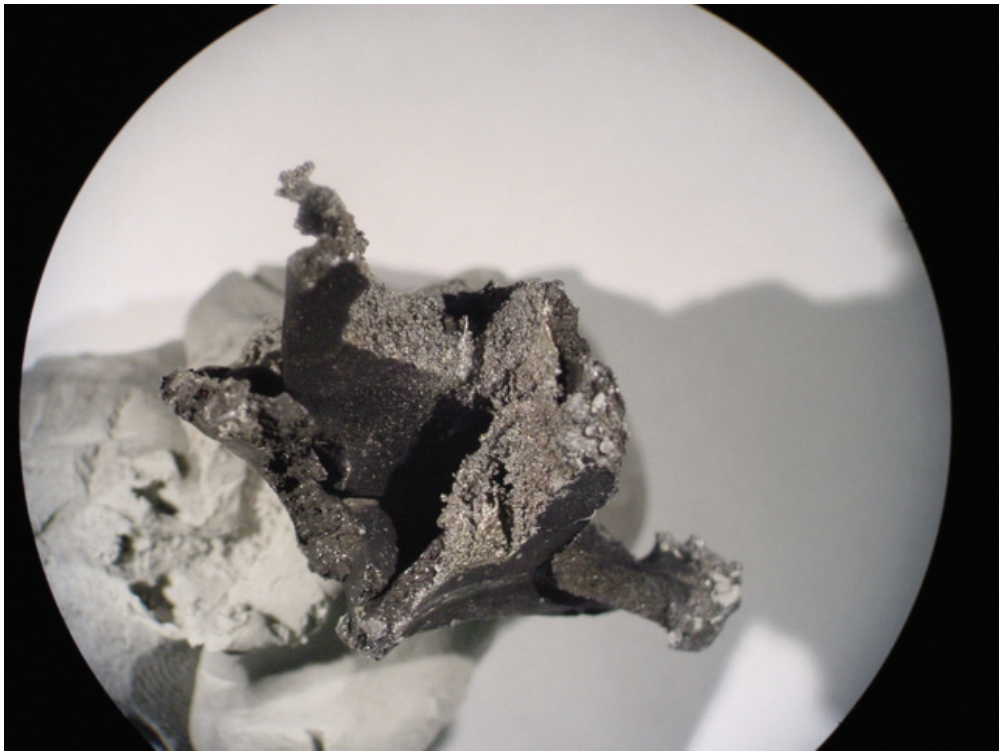


圖 37 證物特殊外觀攝影蒐證（d）

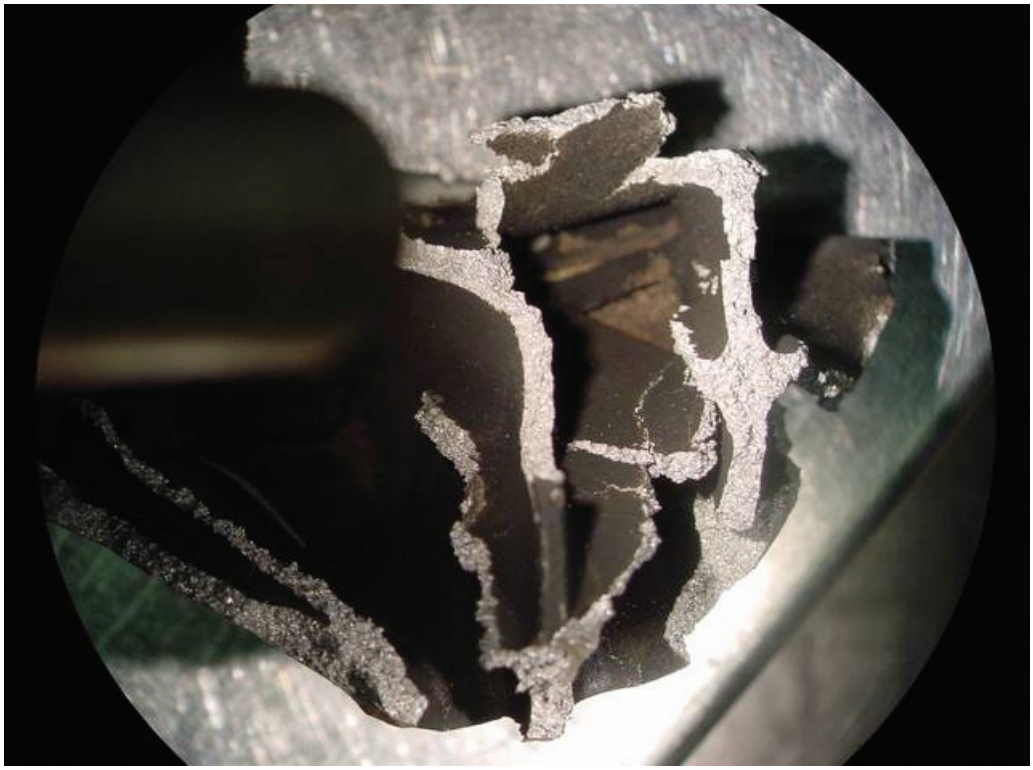


圖 38 證物特殊外觀攝影蒐證（e）

第五天檢視結果：

1. 取樣油氣分離葉輪軸後段、X 射線螢光元素成分分析、SEM 物理特性檢驗、硬度測試。X 射線螢光元素成分分析符合規範、SEM 物理特性檢驗金相正常、硬度測試正常。
2. 證物特殊外觀攝影蒐證完成。

可能原因推測：

1. 熱源發生於或進入附件齒輪箱匣。
2. 油氣分離葉輪開始熱融分解。
3. 分解之油氣分離葉輪與附件齒輪箱匣撞擊將機匣撞破。
4. 與機匣撞擊之力量使油氣分離葉輪前軸承室崩塌露出更大缺口。
5. 高速摩擦使鎂鋁機匣產生局部火焰。
6. 機匣火焰點燃機匣內滑油及油氣（滑油耗損）。

7. 燃燒之滑油及油氣噴出機匣燃燒（滑油耗損），因飛行中整流罩內冷卻空氣充足故未制動火警。
8. 飛機落地後速度驟減，發動機整流罩內冷卻空氣不足，火警制動。

附錄 5 PWC INVESTIGATION REPORT

Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company

Report No.: SE39347

Customer: Transasia Airways

Model: PW127F

Date Investigated: January 2004

Serial No.: AV0063

Time Since Last O/H: 3,715

Total Time: 9,658

Cycles Since Last Repair or O/H: 5,526

Total Cycles: 14,557

Previous O/H by: EADS Seca

Reason for Previous Shop Visit: Overhaul

Date Engine Manufactured: July 1998

Reason for Engine Removal: Engine external fire.

Major Part(s) Affected

Part No./ Serial No.	Description	Condition	Time / Cycle
1. P/N 3111368-01	Impeller Breather	Fractured	9,658 / 14,557
2. P/N 3045845-01	Rear Inlet Case (RIC)	Fractured	9,658 / 14,557
3. P/N 3111365-01	Gearshaft breather	Burnt	9,658 / 14,557

1.0 Synopsis

1.1 During final approach, a loss of oil pressure occurred followed by a loss of torque indication. The aircraft landed normally and during the landing roll the engine fire warning was activated. The aircraft taxied off the runway before the engine was shut down. The fire bottles were not discharged as visual examination by the crew revealed no fire.

1.2 Based on the transcript of the cockpit voice recorders, the sequence of event during final approach is as follows:

08:13:42	Oil pressure started to decrease
08:14:01	Oil pressure still decreasing but all other engine parameters are normal
08:14:21	Oil pressure indicates 0, other engine parameters normal
08:14:59	Same as above
08:15:16	Loss of torque indication
08:15:29	Air/ground switch activated (landing)
08:15:30	Engine Electronic Control (EEC) fault indicated in the cockpit
08:15:40	Engine fire warning
08:15:51	Aircraft exited the runway onto the taxiway
08:15:54	Engine shutoff

1.3 Ground inspection revealed fire damage around the engine and nacelle as well as a perforation on the top portion of the RIC. The engine was therefore removed and forwarded to EADS Seca for investigation and repair.

1.4 The engine maintenance records were reviewed and no unusual event was noted. The engine had a history of high oil consumption in the weeks preceding the event, which was addressed by the replacement of the AC generator garlock seal on the reduction gearbox.

2.0 Investigation

2.1 The investigation took place in the presence of the following people representing their respective organisations:

David Lee	Aviation Safety Council The Executive Yuan, R.O.C.
Kelly Wu	TransAsia Airways
Philippe Boureille	Aviation Civile France
Roger Trouve	EADS Seca
Bernard Beljambe	EADS Seca
Marc Gratton	Pratt & Whitney Canada Corp. (P&WC)

2.2 Preliminary examination of the engine revealed that the Power Turbine (PT) rotor was free to turn. The Low Pressure (LP) rotor was difficult to turn and the High Pressure (HP) was seized. The turbomachine chip detector was heavily contaminated by magnetic metallic debris (Photo No. 1). The reduction gearbox chip detector was free of any contaminants. The operator indicated that the main oil filter impending bypass indicator was found activated. A small amount of oil was drained from the engine and it showed a high viscosity and a dark brown coloration.

2.3 The engine external surfaces around the RIC exhibited evidence of fire damage and were sooty (Photos No. 2 to 4). The wiring harnesses in that region were charred including the wire leading to the NH probe, which is most likely, the cause for the loss of torque indication to the cockpit; a loss of NH signal to the EEC would cause a loss of torque indication, EEC fault and a reversion to manual control of the engine.

2.4 A large perforation was found on the top portion of the RIC immediately behind the breather carbon seal (Photo No. 5). The breather gear and its front bearing were exposed. The fire consumed the housing containing the carbon seal (Photos No. 6 & 7). Some melted remains were found lying on top of the RGB oil scavenge filter housing (Photo No. 8 & 9). A large amount of melted and re-solidified material was found on the inner surfaces of the breather tube leading to the exhaust case. This material most likely originated from the carbon seal housing and RIC.

2.5 Examination of the breather gear revealed that the breather impeller was missing (Photo No. 10).

2.6 Disassembly of the engine commenced by the hot section. The PT module was found in good condition.

2.7 Removal of the No 6 & 7 bearing housing showed distress to No. 6 bearing; all of the rollers exited the bearing cage upon disassembly (Photos No. 11 to 13). The bearing was heavily worn and significant material transfer and smearing could be seen on both races (Photo no. 14). The bearing cavity was dry indicating that a lack of lubrication is at the origin of the bearing distress. The oil transfer tubes showed light deposits of coked oil on their internal surfaces.

2.8 The LP disk and blades showed no significant distress other than rubbing of the blade tips against their shrouds. Heavy rubbing and elongation was observed on the No. 6 bearing air seal (Photo No. 15).

2.9 Close examination of the 6 & 7 bearing housing (Photo No. 16) revealed that the last chance strainer of the oil pressure inlet was completely obstructed by hardened coked oil (Photo No. 17). This explains the lack of lubrication to the No. 6 bearing.

2.10 Scoring and rubbing damage were noted on the LP blade shrouds (Photo No. 18). The rubbing was light to moderate and clear impressions of the LP blade tips were visible. This suggests that the loss of support from No. 6 bearing occurred fairly late during the sequence of event (most likely shortly before engine shutdown) and the LP disk was rotating at a low speed when the contact with the shrouds occurred.

2.11 Removal of the RIC revealed light rubbing between the LP impeller and its shroud (Photo No. 19). The inner hub of the impeller was contaminated with metallic shavings (Photo No. 20), which most likely originated from the heavily rubbed No. 6 bearing air seal; the metal debris released from the

seal would have migrated forward between the LP and PT shafts through the secondary air system (which has a normal flow from the back to the front on the engine in this cavity).

2.12 The seal stator of No. 2 bearing was also contaminated with the same debris originating from the No. 6 bearing air seal (Photo No. 21).

2.13 The HP rotor showed no significant damage; it became free to rotate after the removal of the RIC.

2.14 Removal of the oil level sight glass revealed the presence of one fragment from the breather impeller (Photo No. 22). Removal of the oil pump pack showed a large amount of pieces from the impeller (Photos No. 23 to 25). Impeller debris was also collected from the bottom of the oil tank and various cavities within the RIC.

2.15 Severe burning damage was observed on the breather carbon seal, which prevented the examination of the sealing face (Photo No. 26). Based on EADS Seca's records of the previous shop visit, the calculation of the carbon seal spacer showed no anomalies.

2.16 Removal of the sealing plug of the Accessory Gearbox (AGB) drive shaft revealed that the o'ring had been consumed by exposure to high temperatures. Only few melted small portions of the o'ring remained at the bottom of its groove (Photo No. 27).

2.17 Examination of the RIC revealed that the protective paint had been affected by exposure to high temperatures on the upper half of the case. The paint had a bubbly appearance and it showed a brownish coloration (Photo No. 28), which contrasted with the normal grey colour found on the bottom half of the case. The bubbling of the paint indicates that it was exposed to temperatures above 400°F.

2.18 The AGB case exhibited multiple cracks mostly originating at the perforated area. One of these cracks progressed across the whole width of the AGB stopping at the cover flange. The crack evolved in a "V" shape resulting in the loss of a small piece at the cover bolting flange (Photo No. 28).

2.19 The area around the perforation was deformed towards the outside of the RIC (Photo No. 29). This suggests that the perforation was caused by impact damage from debris inside the AGB. Impact damage was noted on the oil transfer tube (Photo No. 30). Some melting of the RIC was observed around the perforated area, which was mostly concentrated on the outside surface in the region of the carbon seal housing.

2.20 Soot completely covered the inside of the AGB (Photo No. 31). The bolt mounting pad for the front bearing of the impeller breather was fractured. The fracture surfaces showed evidence of overload. Much debris from the impeller breather was recovered from the different cavities in and around the AGB. Material deposits that were adhered on the inside surfaces were also recovered (Photo No. 32). An area on the inside surface of the AGB showed splattered material as seen on Location No. 2

on Photo No. 32. This material was located on the same plane as the impeller breather. The material recovered from the AGB was analysed by P&WC's Material Laboratory. The results can be found in section 3.4 of this report.

2.21 The front bearing of the impeller breather gear was found partially seized on the gear and it exhibited heavy burning and brinelling damage (Photo No. 33). Removal of the bearing from the shaft revealed heavy smearing and some wear on the rollers however the bearing was capable of rotation and the cage was not fractured (the cage was later cut to enable disassembly of the bearing). Its 3 retaining bolts were found still attached to the gears and the locking washer was found properly secured to the bolts (Photo No. 34).

2.22 Upon removal of the breather shaft, no o'rings were found in the grooves normally located under the breather impeller (Photo No. 35). Heavy burning damage was noted on the front portion of the shaft. Wear was noted on the gear teeth. The retaining bolts of the impeller were found on the gear with the helicoil inserts (normally installed on the impeller) holding them in place. The locking washers were still in their position and properly locked.

2.23 The pieces recovered from the impeller were sorted according to their approximate location on an intact impeller (Photo No. 36). Approximately 85% of the breather impeller was recovered. The complete tight fit spigot was recovered in large pieces (Photo No. 37). All these pieces along with the breather gear, front bearing and all debris were forwarded to P&WC's Material Laboratory for examination. The results are as follows:

3.0 Material Laboratory Investigation Results

3.1 Examination of the fracture surfaces of the impeller spigot fit showed overload features (Photo No. 38). No evidence of fatigue was found. Some of the surfaces appeared to be of a darker colour (dark brown versus shiny grey). This indicates that these surfaces were exposed to different environments during the distress sequence. The fracture surfaces from samples taken on both areas were examined under the Scanning Electron Microscope (SEM) and showed altered surfaces (cleavage features) which are typical of overload (Photos No. 39 & 40). Spectrographic analysis of a shiny fracture surface revealed material elements corresponding to the impeller material (Photo No. 41). The same analysis performed on a dark fracture surface showed the same material elements but with a higher concentration of carbon (Photo no. 42)

3.2 Two of the pieces from the rim of the impeller exhibited a melted aspect on the fracture surfaces as evidence by a golden blue colour (Photos No. 43 & 44). The SEM showed a smooth surface in these areas, which is typical of melting. Spectrographic analysis of these melted areas revealed the elements of the impeller base material with an oxygen peak (Photo No. 45).

3.3 Metallographic examination of the impeller breather showed a microstructure consisting of interdentritic network of silicon rich eutectic compound. There was no evidence of incipient melting (Photo No. 46). The material composition of the impeller met drawing requirements.

3.4 The particles collected from the AGB (ref. Photo no. 32) (Photo No. 47) were analysed and the results showed the following: Particle No. 1 showed high levels of aluminium and carbon (Photo No. 48). Its origin can be from the burnt carbon seal housing or breather impeller. Particle No. 2 also revealed aluminium but the location where it was found inside the AGB suggests it originated from the melted pieces of the breather impeller (Photo no. 49). Particle No. 3 consisted of magnesium alloy most likely originating from the RIC (Photo No. 50).

3.5 Some black coloured deposits were noted on a piece of the breather impeller. This deposit was identified as mostly carbon (Photo No. 51).

3.6 The front bearing of the breather gear (Photo No. 52) was examined under the microscope; the presence of material partially filling the outer race oil groove was noted (Photo No. 53). This material consisted of silver consistent with the bearing cage plating (Photo No. 54). The microstructure of the outer race and rollers showed an over tempered martensite which is consistent with exposure to high temperature (likely from the fire) (Photo No. 55). The hardness varied from 24 to 33 HRC for a minimum limit of 58 HRC. Although severe burning and mechanical damage was observed on the bearing rollers cage and outer race (Photos No. 56 & 57) (note that the cage was fractured during the disassembly of the bearing), there was no major structural damage which could suggests that this bearing was the initiating factor of engine distress. The material composition of the outer race and rollers met drawing requirements.

3.7 Deposits were found inside one of the o'ring grooves of the breather gear (Photo No. 58). Analysis of this debris revealed magnesium alloy, which most likely originated from the RIC (Photo No. 59). No other debris was found inside the groove to indicate the presence of the o'rings, however, amongst the debris collected at the bottom of the oil tank was pieces of what appeared to be o'rings (Photo No. 60). The shape and size was consistent with the o'rings normally installed on the breather gear. The analysis of the material confirmed that it was a fluorocarbon base similar to o'ring material.

3.8 A cross section of the breather gear was taken and the hardness measured along its whole length (Photo No. 61). The results showed that the front portion (hardness varying between 24 and 31 HRC) was generally softer than the rear portion (hardness varying between 27.5 and 39 HRC). The drawing requirement is 35 to 41 HRC. This is consistent with the shaft material having been exposed to high temperatures on the front portion. This was confirmed by the analysis of the microstructure; the region, which measured 38 HRC, showed a temper martensite conforming to drawing requirements (Photo No. 62). The region measuring 24 HRC exhibited a microstructure altered by exposure to a temperature exceeding the tempering temperature used during the manufacturing process of the gear (Photo no. 63). The material composition of the gear met drawing requirements.

3.9 The locating diameters of the impeller on the breather gear were measured (refer to Photo no. 61 for locations). The results are as follows:

	Actual (average)	Limits
Dia. No. 1:	1.76976"	1.768"- 1.770"
Dia. "F":	1.77547"	1.7745"- 1.775"
Dia. "K":	1.78451"	1.675"- 1.677"

The above measurements indicate that diameter "K" located at the front of the breather gear has suffered a permanent deformation of at least 0.0075". This deformation was most likely caused by exposure to high temperatures.

3.10 The fuel heater and fuel cooled oil cooler were both pressure tested for the presence of internal or external leaks. No leaks were found on either parts.

4.0 Discussion

4.1 The evidence shows that a fire occurred around the breather carbon seal region. In normal operating conditions this region is sealed from the surrounding nacelle and only open to the atmosphere at the end of the breather pipe in the engine exhaust. Therefore, the temperature around the carbon seal during operation should be in the vicinity of the oil temperature. The oil flash point is approximately 475°F. A mix of oil and air (which would be expected around the impeller breather area) will not affect the oil flash point temperature. At this temperature, the oil will only ignite if a spark occurs (ignition source). The investigation did not reveal such ignition source. The oil auto ignition temperature is approximately 740°F. The breather carbon seal is normally cooled by oil, which is being distributed on the adjacent bearing. Should an interruption of oil cooling occur, the rubbing between the carbon seal and breather gear could result in the temperature in the region reaching the oil auto ignition point, at which time a fire could start. A blockage of the oil inlet strainer of the 6 & 7 bearing housing could contribute to raising the temperature inside the AGB, as the reduced lubrication of the 6 & 7 bearings would raise the temperature in that cavity which would then be transferred to the AGB via the vent tube.

4.2 A fire in this region would expose the breather gear to very high temperatures causing a rapid increase in the locating diameter of the impeller breather (confirmed by the measurement taken on dia. "K"). This rapid increase in diameter could cause the fracture of the front portion of the breather impeller (in overload). Some pieces of the rear portion of the impeller (bolting flange area) could have remained in place (as suggested by the different colouration of the fracture surfaces and the small melted portions of the impeller). This would have caused a severe unbalance (suggested by the brinelling observed on the breather gear bearings) leading to the final fracture of the impeller. The released fragments of the fractured impeller would have caused the perforation of the RIC.

5.0 Conclusions

5.1 The engine distress was most likely initiated by a fire in the region of the impeller breather carbon seal. The fire most probably migrated inside the breather gear, causing a raise in temperature resulting in the sudden increase of the breather impeller locating diameter. This resulted in the fracture of the breather impeller in overload.

5.2 Released impeller debris caused the puncture of the rear inlet case.

5.3 The initiating cause for the fire is most probably resulting from the oil in the carbon seal region having reached the temperature of auto ignition. The reason for the oil having reached this level of temperature could not be ascertained.

5.4 The remaining damage is secondary to the initiation of the fire. The distress observed on the No. 6 bearing was caused by a lack of lubrication, which resulted from the obstruction by coked oil of the last chance strainer at the oil pressure inlet of the No. 6 & 7 bearing housing. The coked oil was most likely caused by the increase of oil temperature following the initiation of the fire.

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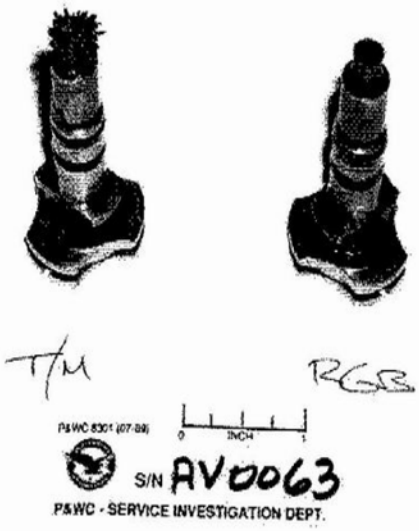

Photo No. 1
Chip detectors

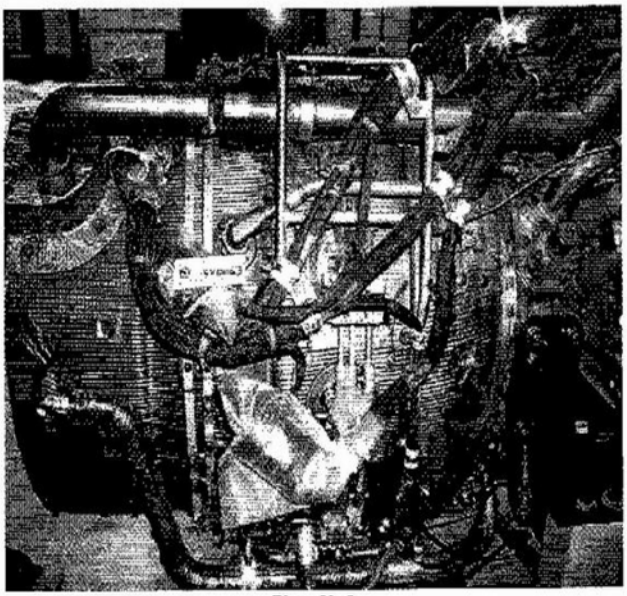

Photo No.2
Engine right hand side

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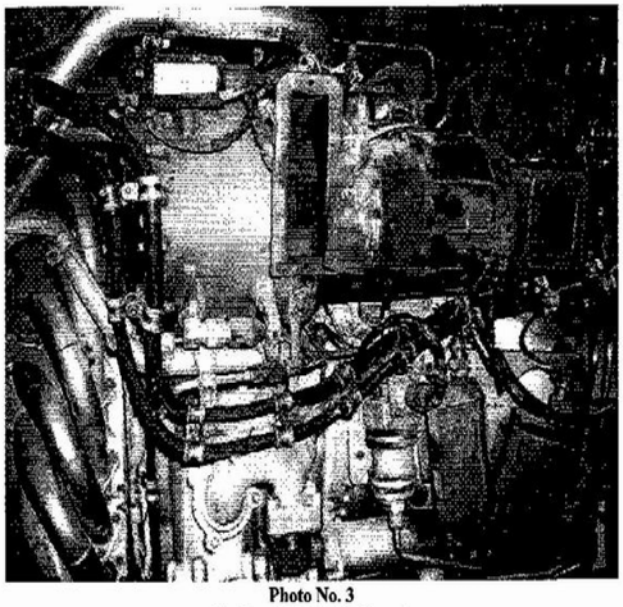

Photo No. 3
Engine right side (RIC area)

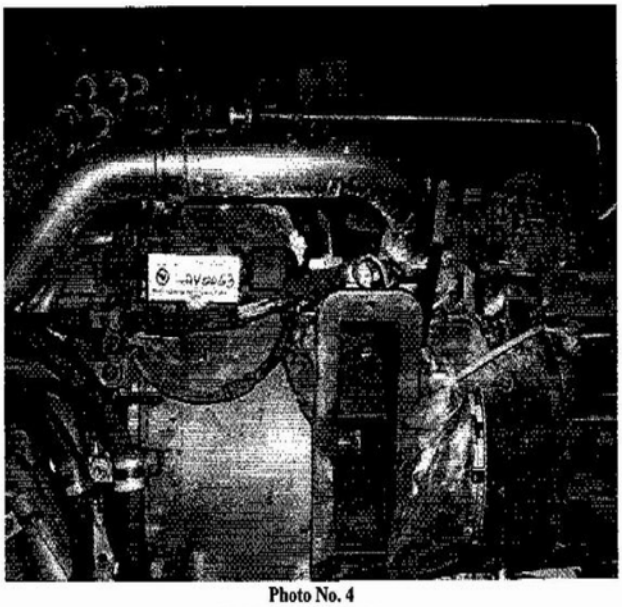

Photo No. 4
Starter / breather pipe area

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Photo No. 5
Breather pipe area

Photo No. 6
Breather carbon seal area

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Photo No. 7
Breather gear (pipe removed)

Photo No. 8
Debris found on top of the RGB oil scavenge filter housing

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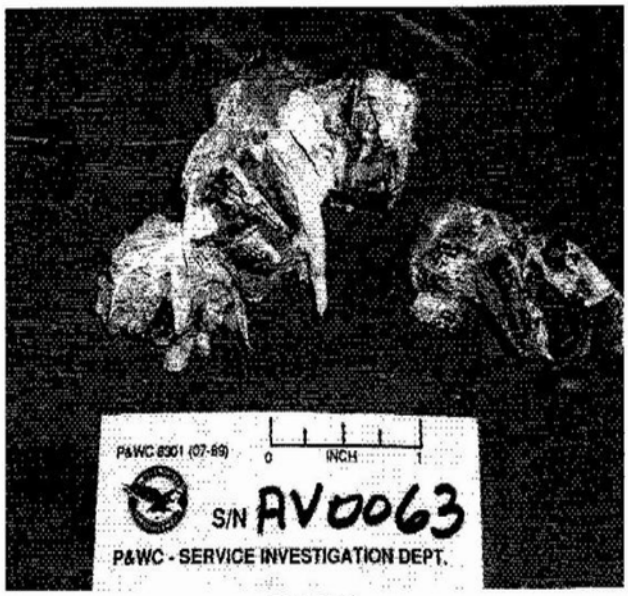

Photo No. 9
Melted carbon seal housing remains

Photo No. 10
Breather gear and bearing

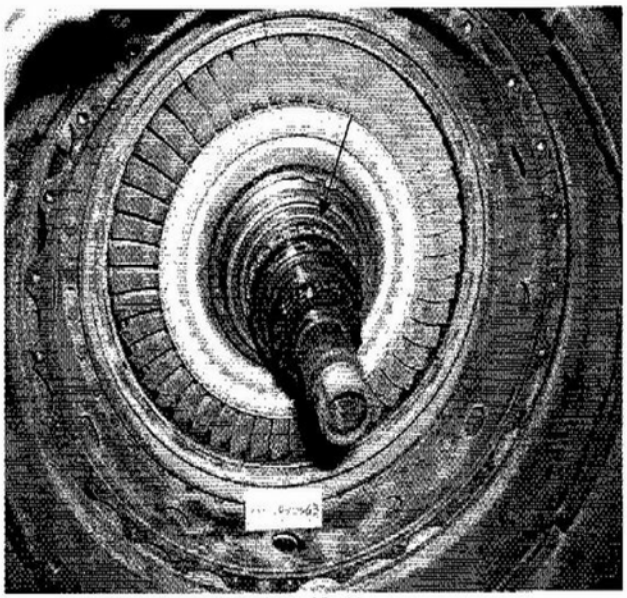

Photo No. 11
LP disk and No. 6 bearing

Photo No. 12
No. 6 bearing

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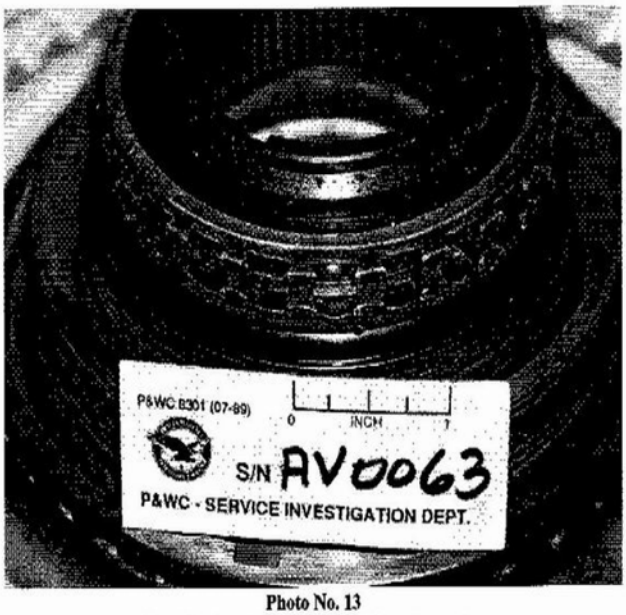

Photo No. 13
No. 6 bearing (LP disk removed from the engine

Photo No. 14
No. 6 bearing outer race

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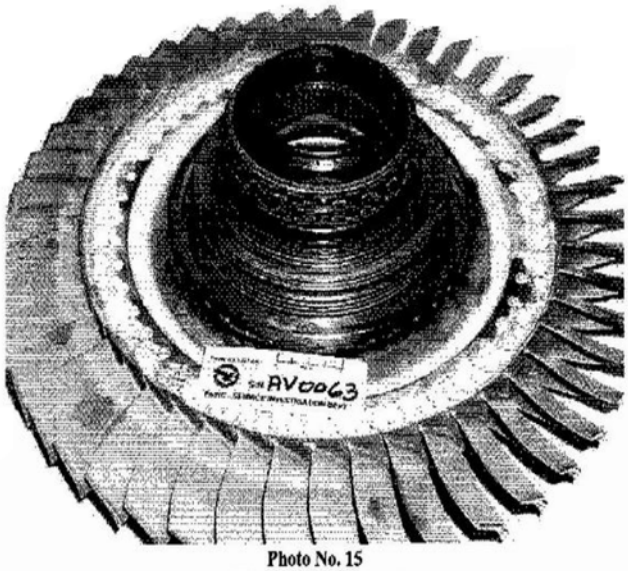

Photo No. 15
LP disk, bearing and seal

Photo No. 16
6 & 7 bearing housing and oil inlet

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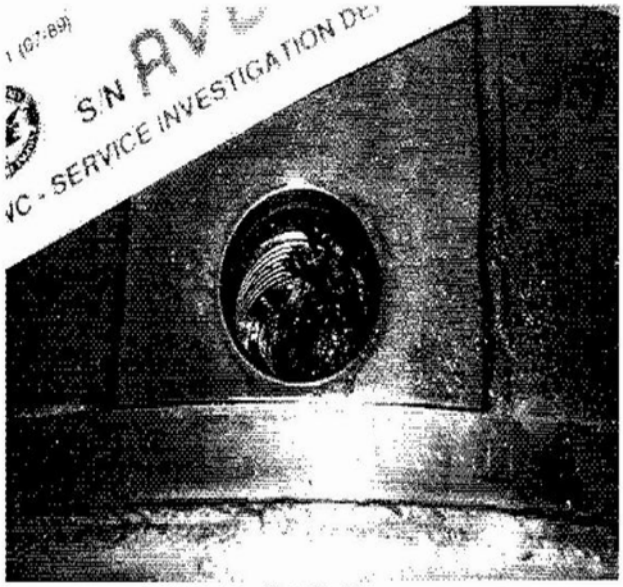

Photo No. 17
Coked oil on the inlet strainer

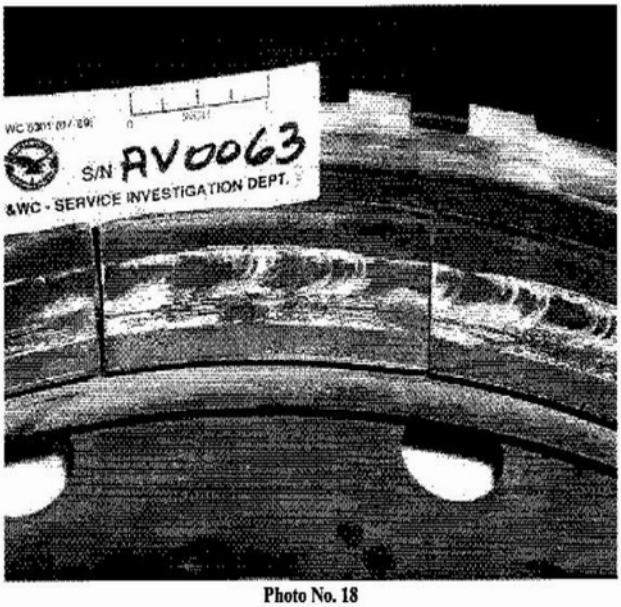

Photo No. 18
LP blade shrouds

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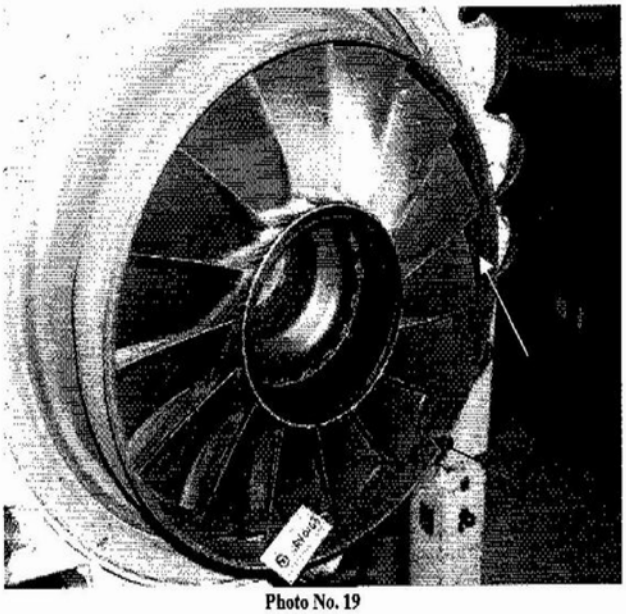

Photo No. 19
LP impeller

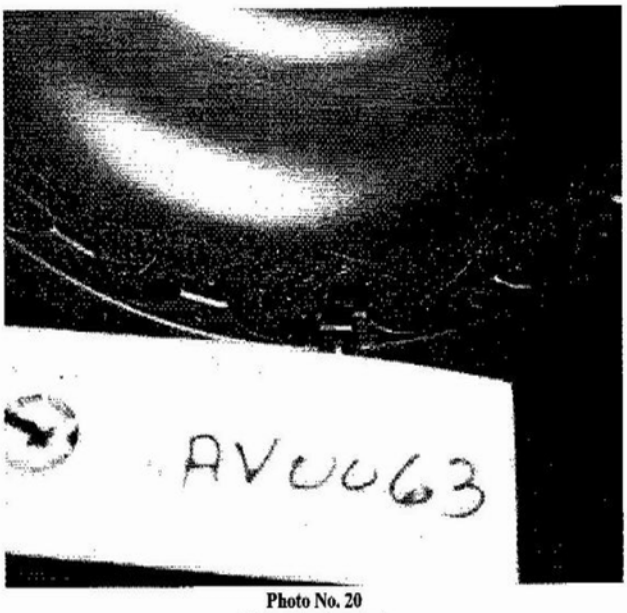

Photo No. 20
LP impeller inner hub

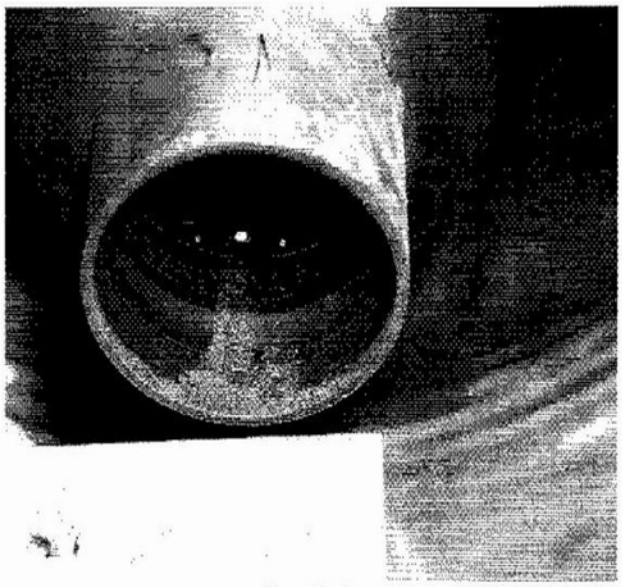

Photo No. 21
No. 2 bearing air seal stator

Photo No. 22
Oil level sight glass cavity

Service Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company

Report No.: SE39347

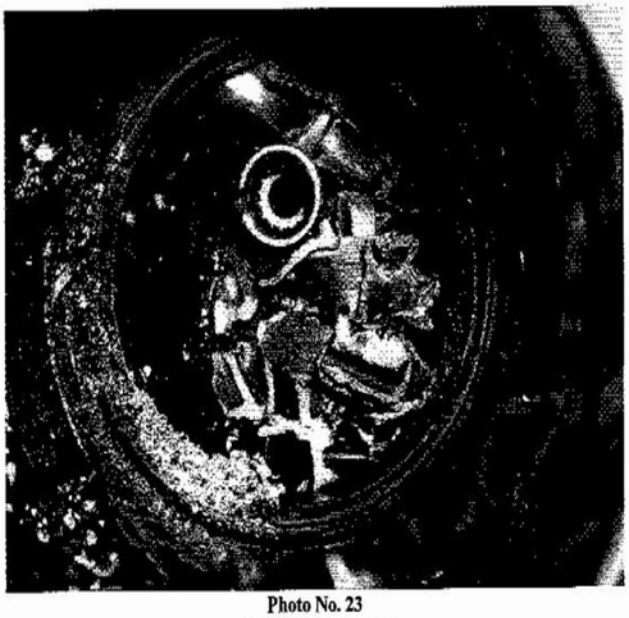

Photo No. 23
Oil pump pack cavity

Photo No. 24
Debris recovered from the oil pump pack cavity

Photo No. 25
Debris on top of the oil pump pack

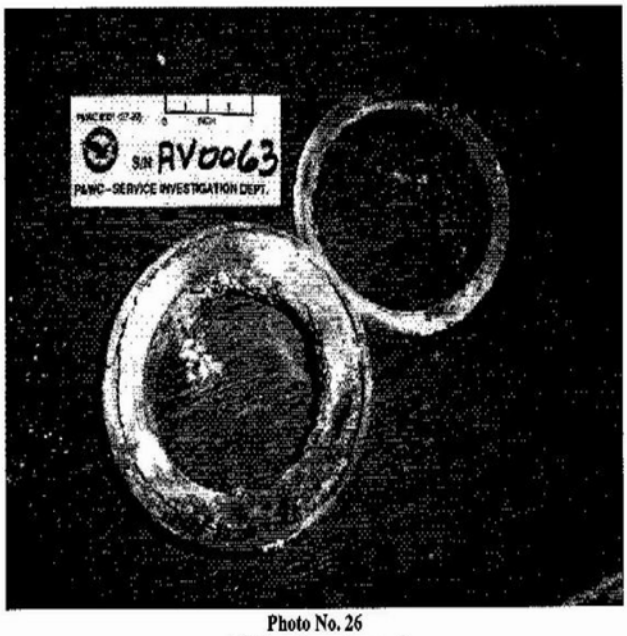

Photo No. 26
AGB breather carbon seal

Service Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company
Report No.: SE39347

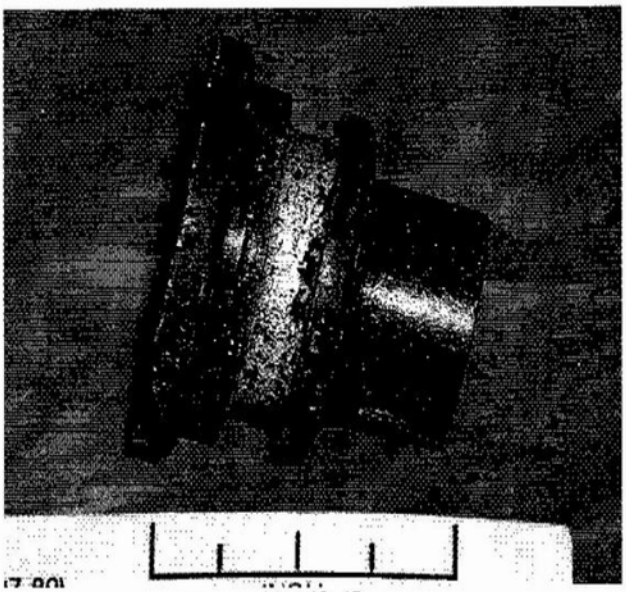

Photo No. 27
AGB drive shaft plug

Photo No. 28
Paint damage and crack with missing piece adjacent to the AGB cover bolting flange

Service Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company
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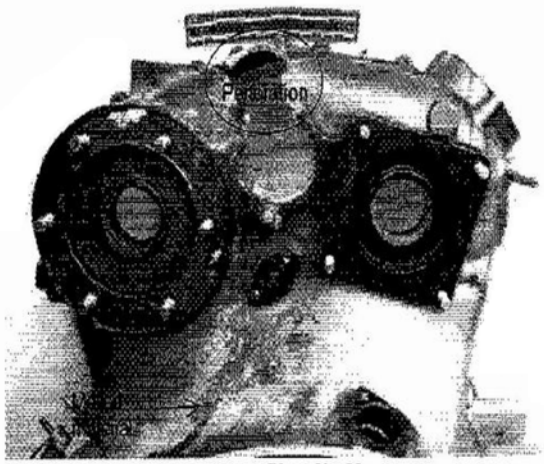

Photo No. 29
Perforation of the RIC

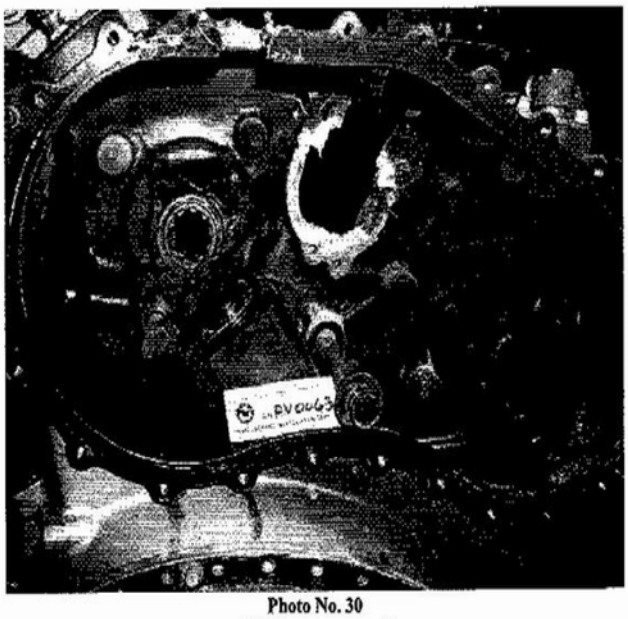

Photo No. 30
AGB (cover removed)

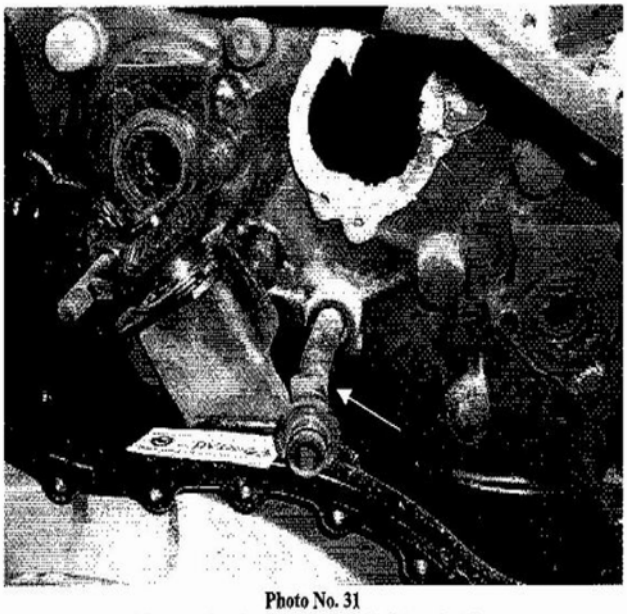

Photo No. 31
Close-up showing bent (impacted) oil transfer tube

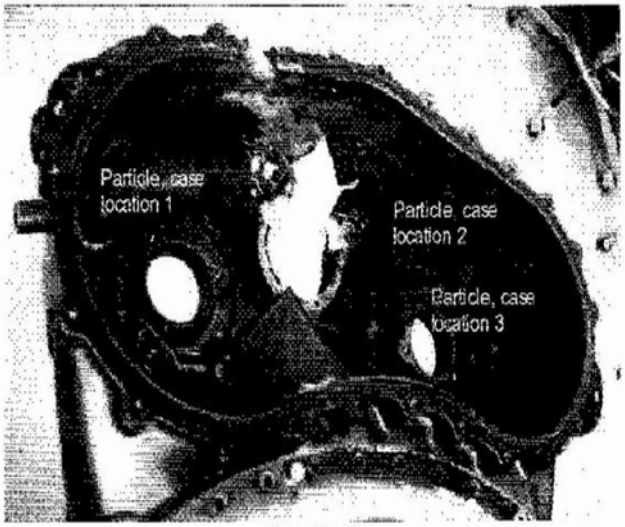

Photo No. 32
Location of the recovered particles

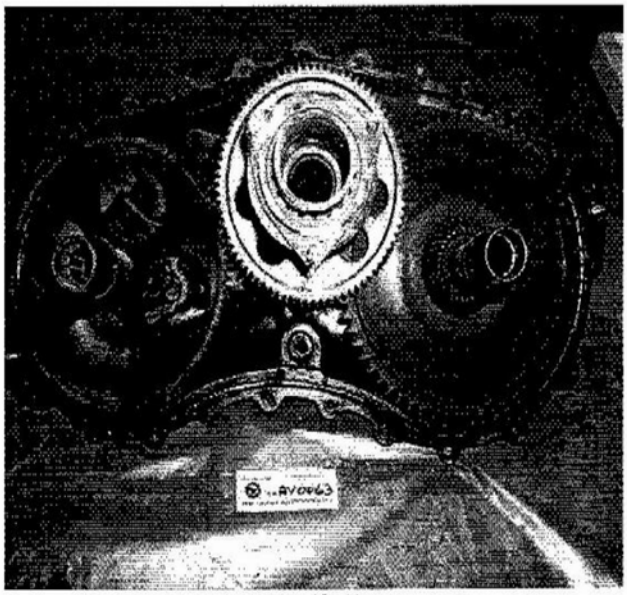

Photo No. 33
AGB gears

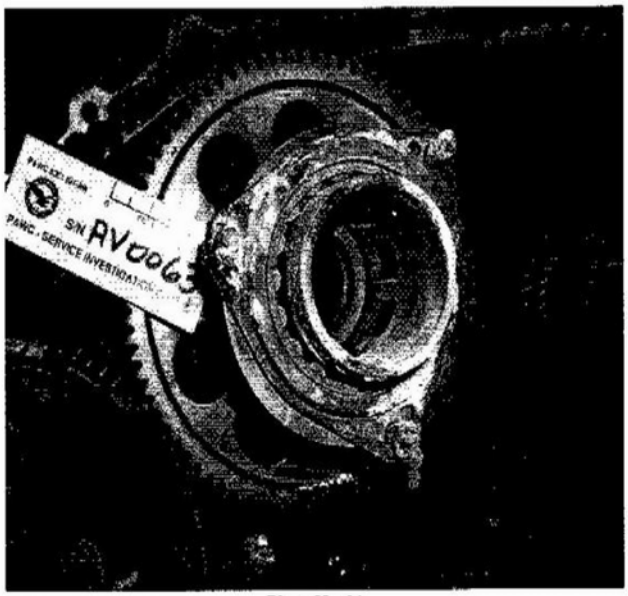

Photo No. 34
Impeller breather gear and front bearing

Service Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company
Report No.: SE39347

Photo No. 35
Breather gear showing the absence of o'ring

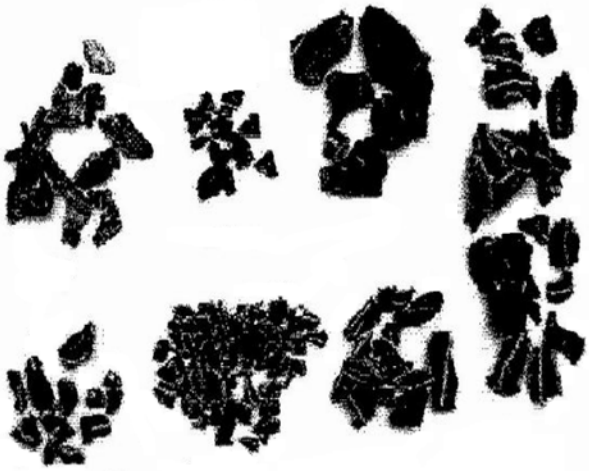

Photo No. 36
Recovered pieces of the impeller breather

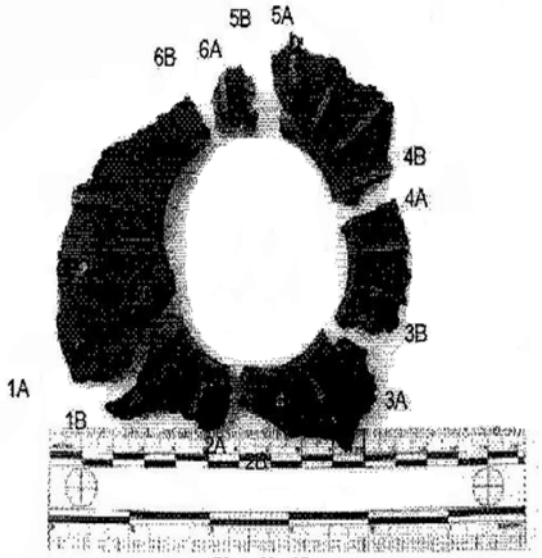

Photo No. 37
Impeller spigot fit

Service Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company

Report No.: SE39347

Photo No. 38
Impeller spigot fit fracture surfaces

Service Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company

Report No.: SE39347

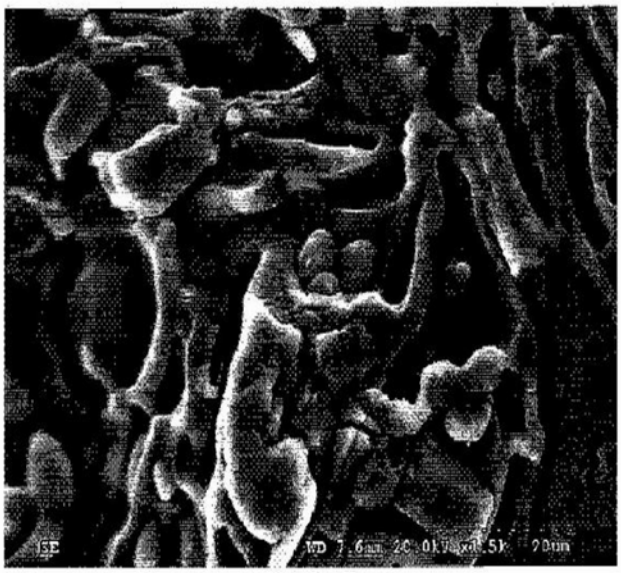

Photo No. 39
SEM examination of a shiny region

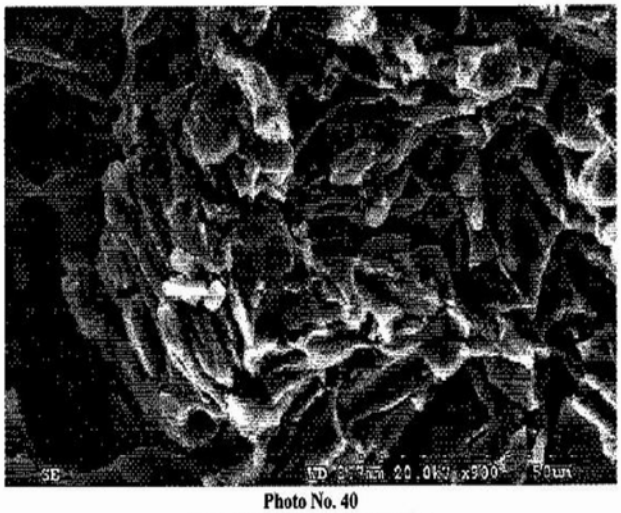

Photo No. 40
SEM examination of a dark region

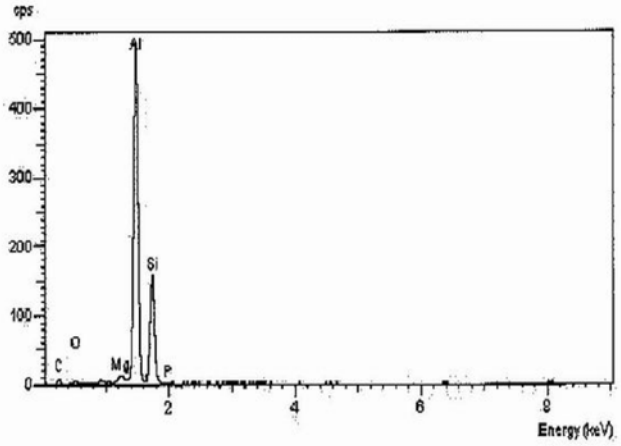

Photo No. 41
Spectrographic analysis of a shiny surface

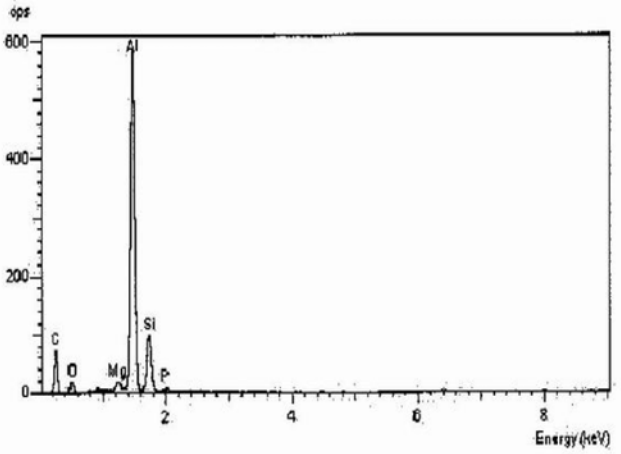

Photo No. 42
Spectrographic analysis of a dark surface

Service Investigation

Engine / Component Investigation Report

P&WC 1075 (03-04)

Pratt & Whitney Canada
A United Technologies Company

Report No.: SE39347

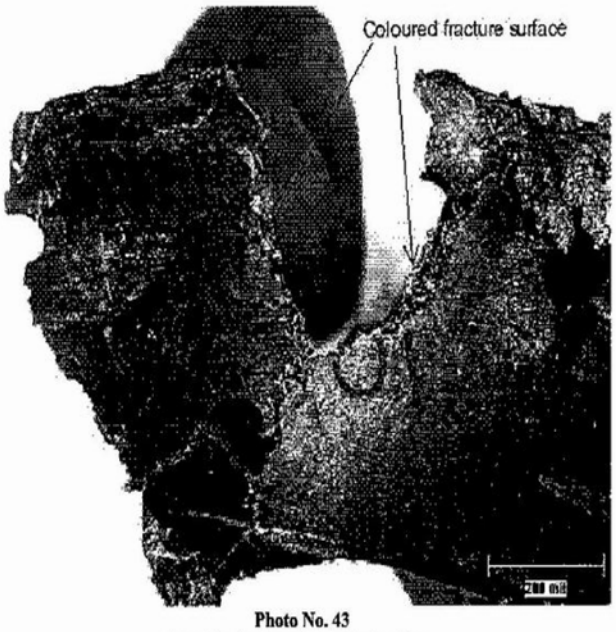

Photo No. 43
Impeller rim showing melted surfaces

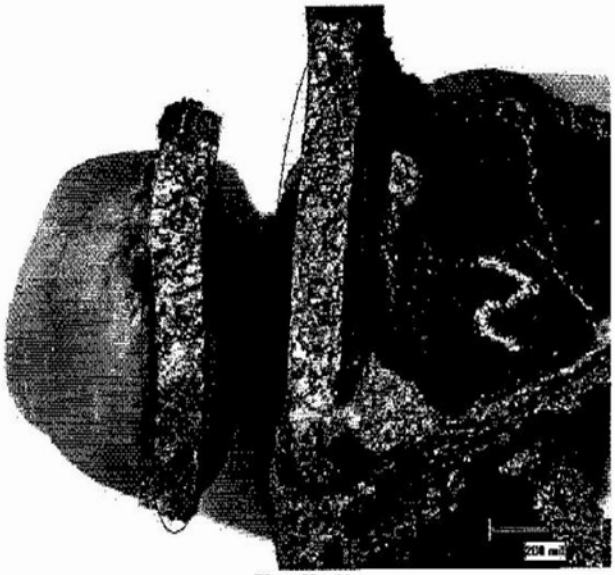

Photo No. 44
Discoloured fracture surfaces

This document is subject to the restriction contained on Page 1

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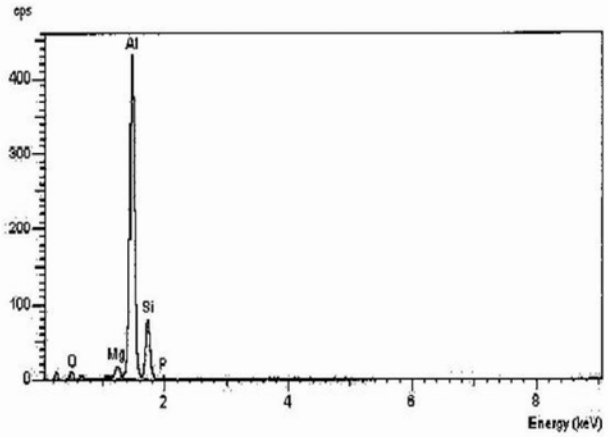

Photo No. 45
Spectrographic analysis of a melted surface

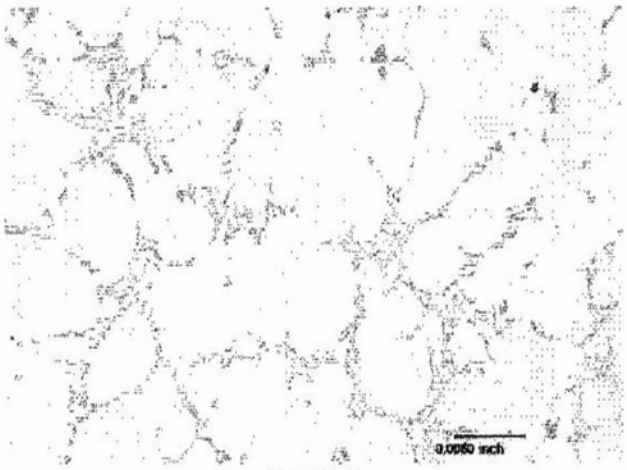

Photo No. 46
Impeller microstructure

Service Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company

Report No.: SE39347

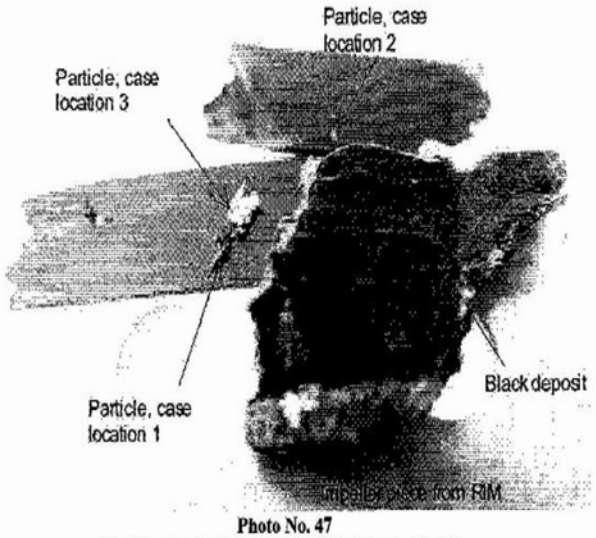

Photo No. 47
Debris collected inside the AGB (ref. Photo No. 32)

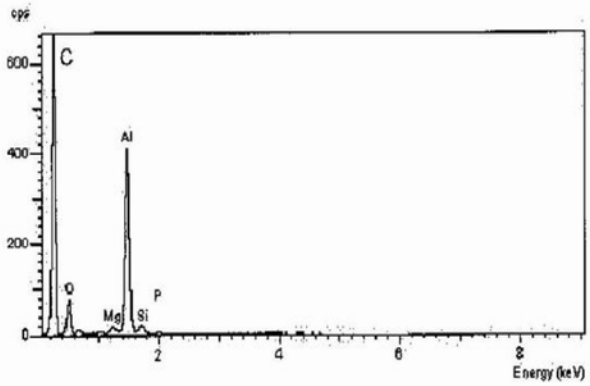

Photo No. 48
Analysis of the debris collected at location No. 1

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Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company
Report No.: SE39347

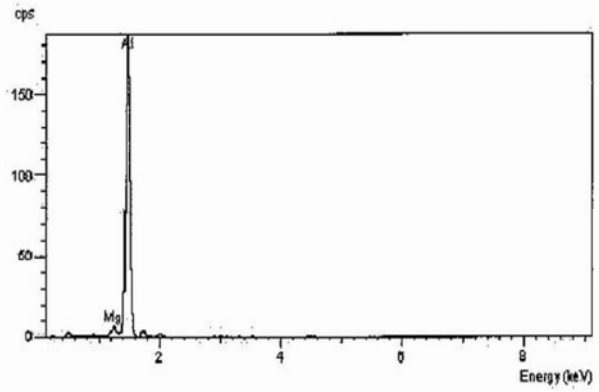

Photo No. 49
Analysis of the debris collected at location No. 2

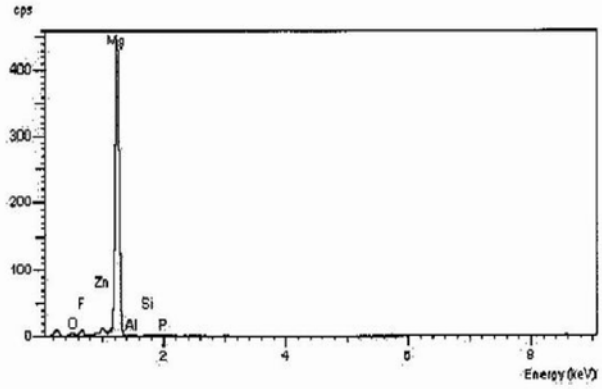

Photo No. 50
Analysis of the debris collected at location No. 3

Service Investigation

Engine / Component Investigation Report

P&WC 1076 (03-04)

Pratt & Whitney Canada

A United Technologies Company

Report No.: SE39347

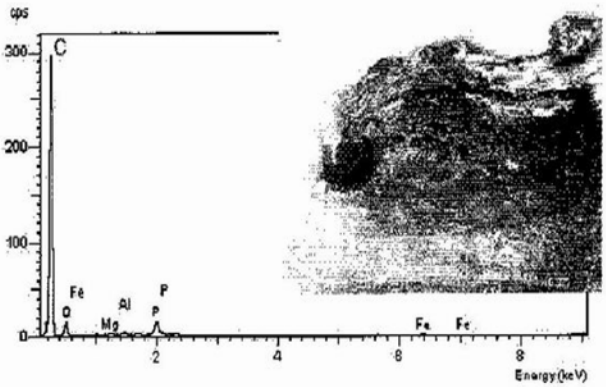

Photo No. 51
Composition of the black deposit on the piece of impeller breather

Photo No. 52
Front bearing of the impeller breather

Service Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company
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Photo No. 53
Bearing outer race showing material deposit

Service Investigation

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P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company

Report No.: SE39347

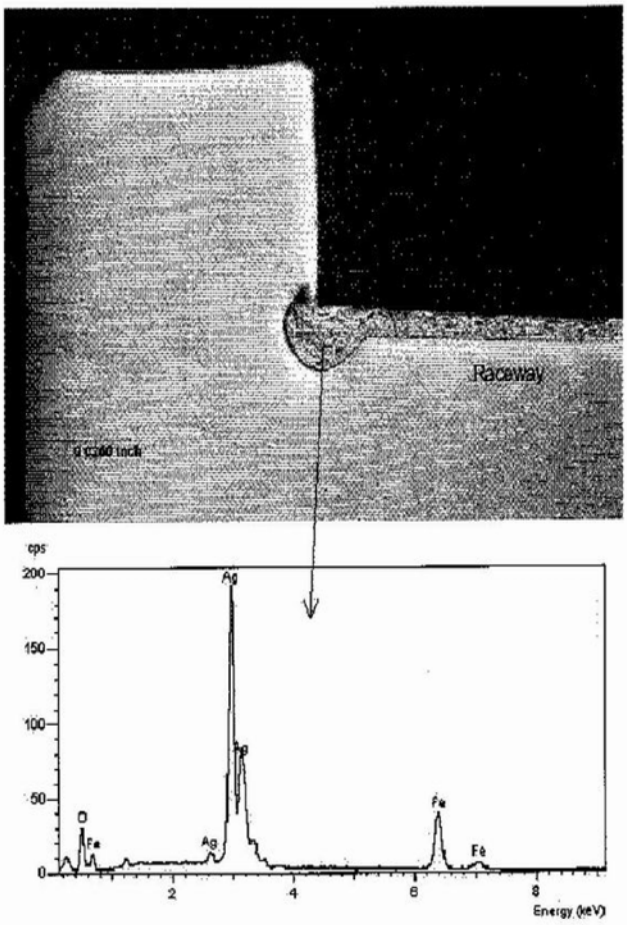

Photo No. 54
Analysis of the material found on the outer race

Service Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company

Report No.: SE39347

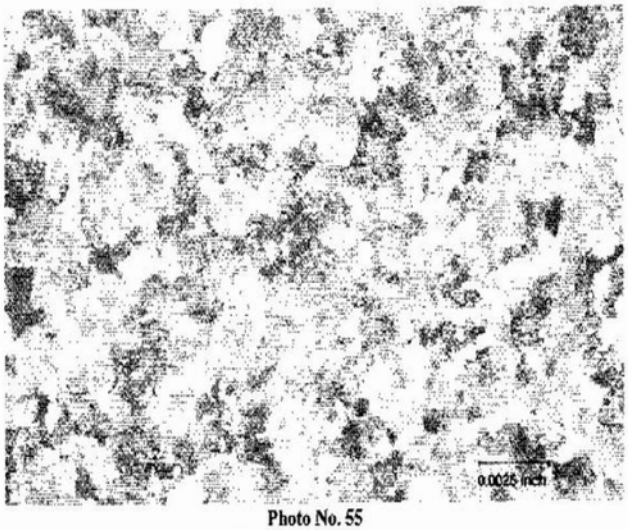

Photo No. 55
Bearing microstructure

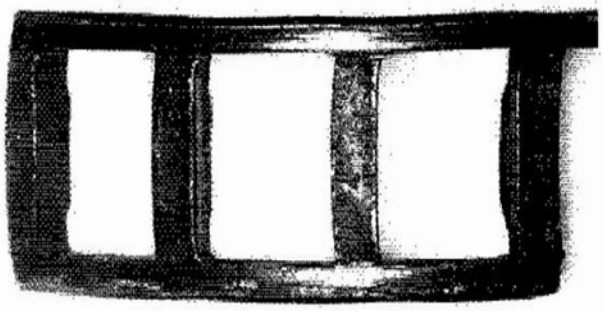

Photo no. 56
Bearing cage

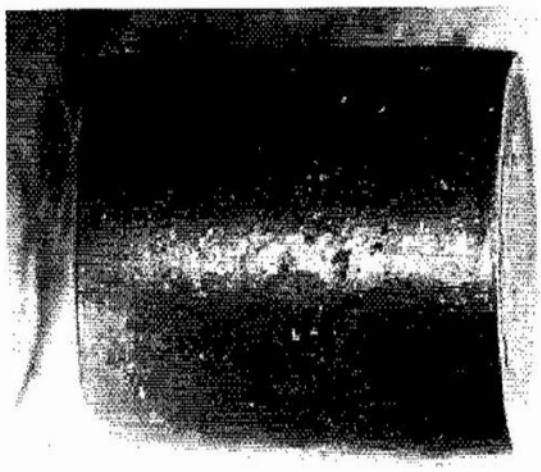

Photo no. 57
Typical bearing roller

Service Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company
Report No.: SE39347

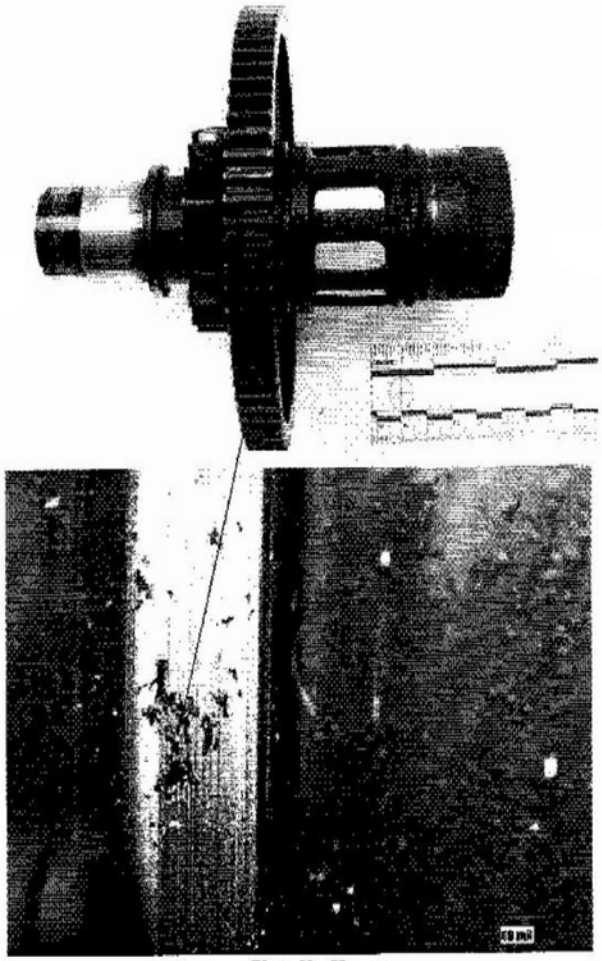

Photo No. 58
Breather gear and o'ring grove

Service Investigation
Engine / Component Investigation Report
P&WC 1076 (03-04)

Pratt & Whitney Canada
A United Technologies Company

Report No.: SE39347

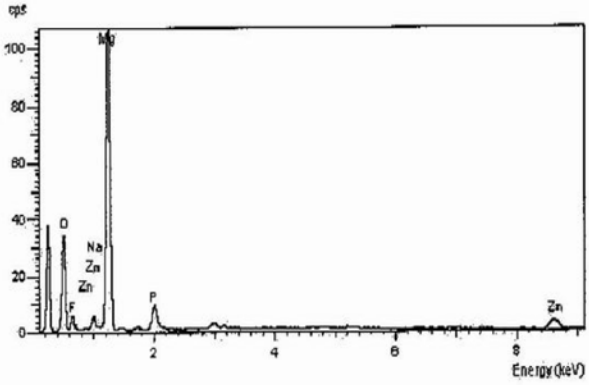

Photo No. 59
Analysis of the debris found inside the o'ring groove

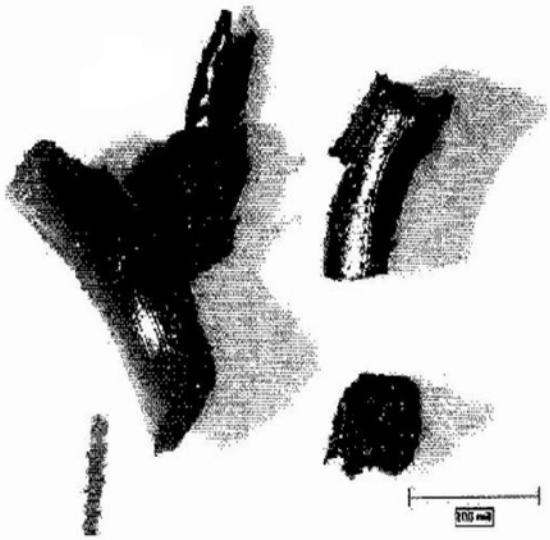

Photo No. 60
Pieces of o'ring collected from the bottom of the oil tank

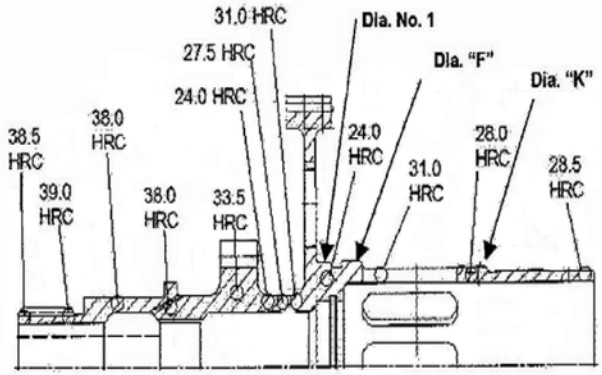

Photo No. 61
Hardness measurements taken along the breather gear

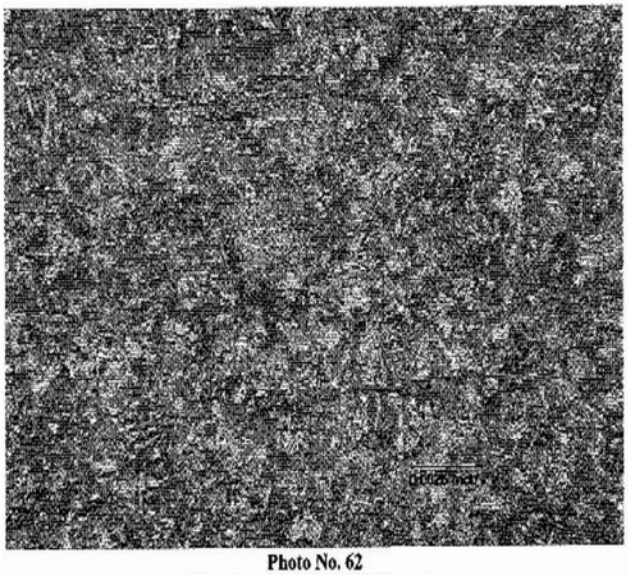

Photo No. 62
Microstructure in the 38 HRC region

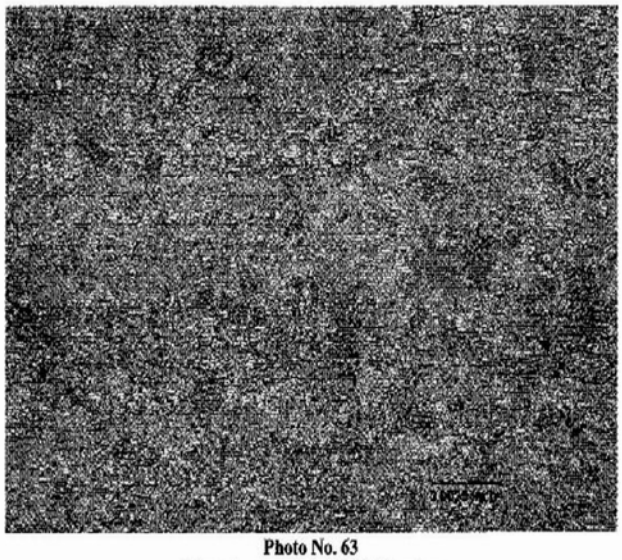

Photo No. 63
Microstructure in the 24 HRC region

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附錄 6 ENGINE INSPECTION REPORT

E.A.S.A.
S.E.C.A.
POWER PLANT ICBS

DMOR300 / DMOS300

DATE 06/04/2004
TIME 14:41:22

PAGE 1

ENGINE INSPECTION RECORD

NO : 073/DQ/PI/04
PW 127F S/N : AV0063
PURCHASE ORDER : TBA

RECIPIENTS : CUSTOMER - PRODUCT LINE - WORKFILE - MANUFACTURER.

PRODUCTION SIGNATURE	INSPECTION SIGNATURE	AUTHORITIES SIGNATURE
NAME :	NAME :	NAME :
VISA :	VISA :	VISA :
DATE : 8/04/03	DATE : 26/06/04 | 109H	DATE :

SECA JAR 145 0925

1. DIRECTION GENERALE DE L'AVIATION CIVILE FRANCE	2. **AUTHORIZED RELEASED CERTIFICATE** *Certificat libératoire autorisé* **JAA FORM ONE**	3. Form Tracking Number *Numéro d'identification du certificat* *B-002758 .*
4. EADS SECA	**EADS SECA** AEROPORT DU BOURGET ZONE NORD - B.P. 132 - 93352 LE BOURGET CEDEX	5. Work Order, Contract, Invoice *Bon de Commande / contrat / Facture* ***4010243***

6. Item	7. Description	8. Part Number	9. Eligibility* *Destination*	10. Qty *Qté*	11. Serial/batch no *N° Série/Lot*	12. Status/Work *Etat / Travaux*
1	**Engine complete assembly PW127F**	**3047600**	**Not Applicable**	**1**	**AV0063**	**Overhauled**

13. Remarks/ *Remarques* . . *The detail of the works performed is described in the engine inspection record Nr* **073/DQ/PI/04**

OVERHAUL OF TM MODULE AND TEST.

TSN: 9658 TSO: 0 CSN: 14557 CSO: 0

caution: turbomachine module mated/tested with reduction gearbox module sn:AV0063

Documentation: **CIR 3043515 Rev:11 – –** - - - - - - - - - - - -

Limited life parts must normally be accompanied by maintenance history including life used. *Les pièces à durée de vie limitée doivent être accompagnées de leur historique d'entretien précisant la durée de vie utilisée.*

14. Certifies that the items identified above were manufactured in conformity to
Il est certifié que les éléments identifiés ci-dessus ont été fabriqués en conformité avec

☐ approved design data and are in condition for safe operation
des données approuvées et sont en état de fonctionner en sécurité

☐ non-approved design data specified in block 13
des données non approuvées identifiées en case 13

19. ☒ JAR 145-50 Release to service
Approbation pour remise en service selon JAR 145-50

☐ Other regulation specified in block 13
Autre réglementation précisée en case 13

Certifies that unless otherwise specified in block 13, the work identified in block 12 and described in block 13 was accomplished in accordance with JAR-145 and in respect to that work, the items are considered ready for release to service
Il est certifié que, sauf autrement spécifié en case 13, les travaux identifiés en case 12 et décrits en case 13, ont été exécutés conformément au règlement JAR-145 et qu'en regard de ces travaux les pièces sont considérées prêtes à la remise en

15. Authorized signature : *Signature autorisée*	16. Approval/Authorisation Number *Numéro d'agrément / d'autorisation*	20. Authorized Signature : *Signature autorisée*	21 Certificate / Approval Ref. Number *Numéro de certificat / d'agrément*
		SECA 0925	**F-019**
17. Name / *Nom*	**18.** Date	**22. Name / *Nom*** **Alain CRASNIER**	**23. Date (d/m/y) (j/m/a)** **06-avril-2004**

Jaa Form One-Issue 4 (*Edition 4*)

USER/INSTALLER RESPONSIBILITIES

* Installer must cross-check eligibility with applicable technical data
* *L'installateur doit vérifier la destination précise au moyen des données techniques pertinentes*

1- It is important to understand that the existence of this document alone does not automatically constitute authority to install the part / component assembly.
Il est important de comprendre que l'existence de ce seul document ne suffit pas pour permettre automatiquement l'installation de la pièce / du composant / de l'ensemble

2- Where the user / installer works in accordance with the national regulations of an Airworthiness Authority different than the Airworthiness Authority of the country specified in Block 1 it is essential that the user / installer ensures that his / her Airworthiness Authority accepts parts / components / assemblies from the Airworthiness Authority of the country specified in block 1.
Quand l'utilisateur/installateur travaille selon la réglementation nationale d'une autorité de navigabilité différente de l'autorité de navigabilité mentionnée dans la case 1, il est essentiel que l'utilisateur /installateur s'assure que son autorité de navigabilité accepte les pièces/composants/ensembles libérés par l'autorité de navigabilité mentionnée dans la case 1.

3- Statement in Block 14 and 19 do not constitute installation certification. In all cases aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user / installer before the aircraft may be flown.
Les mentions figurant dans les cases 14 et 19 ne constituent pas des certifications de l'installation des pièces. Dans tous les cas les documents d'entretien de l'aéronef doivent contenir une certification de l'installation des pièces par l'utilisateur/installateur selon sa réglementation national avant que l'aeronef ne soit remis en vol.

1. DIRECTION GENERALE DE L'AVIATION CIVILE FRANCE	2. **AUTHORIZED RELEASED CERTIFICATE** *Certificat libératoire autorisé* **JAA FORM ONE**	3. Form Tracking Number *Numéro d'identification du certificat* B-002758 . -
4. EADS SECA AEROPORT DU BOURGET ZONE NORD - B.P. 132 - 93352 LE BOURGET CEDEX		5. Work Order, Contract, Invoice *Bon de Commande / contrat / Facture* 4010243

6. Item	7. Description	8. Part Number	9. Eligibility* *Destination*	10. Qty *Qté*	11. Serial/batch no *N° Série/Lot*	12. Status/Work *Etat / Travaux*
1	**Engine complete assembly PW127F**	3047600	**Not Applicable**	1	AV0063	**Overhauled**

13. Remarks/ *Remarques* . . *The detail of the works performed is described in the engine inspection record Nr* **073/DQ/PI/04**

OVERHAUL OF TM MODULE AND TEST.

TSN: 9658 TSO: 0 CSN: 14557 CSO: 0

caution: turbomachine module mated/tested with reduction gearbox module sn:AV0063

Documentation: **CIR 3043515 Rev:11** – – - - - - - - - - - - - -

Limited life parts must normally be accompanied by maintenance history including life used. *Les pièces à durée de vie limitée doivent être accompagnées de leur historique d'entretien précisant la durée de vie utilisée.*

14. Certifies that the items identified above were manufactured in conformity to
Il est certifié que les éléments identifiés ci-dessus ont été fabriqués en conformité avec

☐ approved design data and are in condition for safe operation
des données approuvées et sont en état de fonctionner en sécurité

☐ non-approved design data specified in block 13
des données non approuvées identifiées en case 13

19. ☒ JAR 145-50 Release to service
Approbation pour remise en service selon JAR 145-50

☐ Other regulation specified in block 13
Autre réglementation précisée en case 13

Certifies that unless otherwise specified in block 13, the work identified in block 12 and described in block 13 was accomplished in accordance with JAR-145 and in respect to that work, the items are considered ready for release to service
Il est certifié que, sauf autrement specifié en case 13, les travaux identifiés en case 12 et décrits en case 13, ont été exécutés conformément au règlement JAR-145 et qu'en regard de ces travaux les pièces sont considérées prêtes à la remise en

15. Authorized signature : *Signature autorisée*	16. Approval/Authorisation Number *Numéro d'agrément / d'autorisation*	20. Authorized Signature : *Signature autorisée* SECA 0925	21 Certificate / Approval Ref. Number *Numéro de certificat / d'agrément* F-019
17. Name / *Nom*	18. Date	22. Name / *Nom* Alain CRASNIER	23. Date (d/m/y) (j/m/a) 06-avril-2004

Jaa Form One-Issue 4 *(Edition 4*

USER/INSTALLER RESPONSIBILITIES

* Installer must cross-check eligibility with applicable technical data
* *L'installateur doit vérifier la destination précise au moyen des données techniques pertinentes*

1- It is important to understand that the existence of this document alone does not automatically constitute authority to install the part / component assembly.
Il est important de comprendre que l'existence de ce seul document ne suffit pas pour permettre automatiquement l'installation de la pièce / du composant / de l'ensemble

2- Where the user / installer works in accordance with the national regulations of an Airworthiness Authority different than the Airworthiness Authority of the country specified in Block 1 it is essential that the user / installer ensures that his / her Airworthiness Authority accepts parts / components / assemblies from the Airworthiness Authority of the country specified in block 1.
Quand l'utilisateur/installateur travaille selon la réglementation nationale d'une autorité de navigabilité différente de l'autorité de navigabilité mentionnée dans la case 1, il est essentiel que l'utilisateur /installateur s'assure que son autorité de navigabilité accepte les pièces/composants/ensembles libérés par l'autorité de navigabilité mentionnée dans la case 1.

3- Statement in Block 14 and 19 do not constitute installation certification. In all cases aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user / installer before the aircraft may be flown.
Les mentions figurant dans les cases 14 et 19 ne constituent pas des certifications de l'installation des pièces. Dans tous les cas les documents d'entretien de l'aéronef doivent contenir une certification de l'installation des pièces par l'utilisateur/installateur selon sa réglementation national avant que l'aeronef ne soit remis en vol.

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GENERAL INFORMATION PAGE 2

MANUFACTURER : PRATT ET WHITNEY TYPE : PW 127F SERIAL NUMBER : AV0063

CUSTOMER : TRANSASIA AIRWAYS PURCHASE ORDER : TBA WO : 4010243

AC MODEL : LOCATION :

DATE OF REMOVAL: 13/01/2004 INSPECTION REQD.: JAA

REASON FOR REMOVAL :
HSI + LCF PARTS

WORKS PERFORMED FROM 09/01/2004 TO 06/04/2004
OVERHAUL OF TURBOMACHINERY ,REPAIR OF REDUCTION GEARBOX MODULE AND TEST

DOCUMENTS :
&3043515 R. 11 CLEANING, INSPECTION AND REPAIR MANUALS (CIR

COMMENTS :
CAUTION:TURBOMACHINE MODULE SN :AV0063 MATED/TESTED WITH
REDUCTION GEARBOX SN:AV0063 (WO:4020016 SEE REPORT INSPECTION
N°081/DQ/PI/04 FOR DETAIL OF WORK PERFORMED

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WO/ : 40X0243
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IDENTIFICATION OF MODULES COMPOSING THE ENGINE
AT DELIVERY

PC-E		
	S/N	AV0063
	P/N	3047600
	B/S	918
REDUCTION GEARBOX		
	S/N	AV0005
	P/N	3039380
	B/S	918
	TSN	11113
	TSO	5124
TURBOMACHINE		
	S/N	AV0063
	P/N	3047500
	B/S	918
	TSN	9658
	TSO	0
	CSN	14557
	CSO	0

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S/N : AV0063

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IDENTIFICATION OF MODULES COMPOSING THE ENGINE
AT ARRIVAL

PC-E		
	S/N	AV0063
	P/N	3047600
	B/S	918
REDUCTION GEARBOX		
	S/N	AV0005
	P/N	3039380
	B/S	918
	TSN	11113
	TSO	5124
TURBOMACHINE		
	S/N	AV0063
	P/N	3047500
	B/S	918
	TSN	9658
	TSO	3715
	CSN	14557
	CSO	5526

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MODIFICATIONS EMBODIED DURING WORKS

BS NUMBER	REV	AD/CN NUMBER	REV	NOMENCLATURE / COMMENTS	CUSTOMER STANDARDS
BS20003	12			OPERATING TIME BETWEEN INSPECTION/RESTORATION AND HOT SECTION - INSPECTION/INSTRUCTION --------TRANSFERRED TO MAINTENANCE MANUALS--------	
BS21269	3			ELECTRICAL WIRING HARNESS SLEEVES - INSTALLATION OF	X
BS21527	5			GROUND COIL INSERTS- INTRODUCTION OF	R
BS21620	2			HIGH-PRESSURE-TURBINE VANE-RING-SEGMENTS AND COOLING-AIR-NOZZLE ASSEMBLY-MODIFICATION/ REPLACEMENT OF	R
BS21623	0			TURBINE-INTERSTAGE-CASE-ASSEMBLY FLANGE- REPLACEMENT OF	
BS21628	0			RGB-SCAVENGE-PUMP IDLER-SHAFT - MODIFICATION/ REPLACEMENT OF	R
BS21632	1			ELECTRICAL WIRING HARNESS-REPLACEMENT OF	
BS21665	0			N°5 BEARING HOUSING COVER RETAINING BOLTS REPLACEMENT OF.	X
BS21675	1			PROTECTIVE CAP AND PLUG - REPLACEMENT OF.	R

X:CUSTOMER STANDARD R:CUSTOMER REQUEST

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MODIFICATIONS EMBODIED DURING WORKS

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BS NUMBER	REV	AD/CN NUMBER	REV	NOMENCLATURE / COMMENTS	CUSTOMER STANDARDS
BS21679	2			INTERCOMPRESSOR CASE DRAIN TUBE - REPLACEMENT/ MODIFICATION OF.	X
BS21680	1			FLUOROCARBON PREFORMED PACKING - REPLACEMENT OF	
BS21683	1			HIGH PRESSURE TURBINE STUB SHAFT-REPLACEMENT.	X
BS21691	1			TURBOPROP ENGINE INTERCOMPRESSOR CASE INSERTS - REPLACEMENT OF	X

I HEREBY CERTIFY THAT THE ABOVE MODIFICATIONS HAVE BEEN EMBODIED IN THIS ENGINE
AUTHORIZED INSPECTOR :
DATE : 06/04/2004

SECA
0925

X:CUSTOMER STANDARD R:CUSTOMER REQUEST

S.E.C.A DMOR318 / DMOS318

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MODIFICATIONS NOT INCORPORATED

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BS NUMBER	REASONS	CUSTOMER STANDARDS	COMMENTS
BS21087	NA	X	PART SENT TO CUSTOMER THE 29/01/2004
BS21100	NC	X	POST SB21519
BS21328	NC	X	ENGINE PRE SB21214
BS21447	PM	X	
BS21467	NC	R	ENGINE POST SB 21554
BS21588	NC	X	ENGINE POST SB 21652
BS21596	NC	R	PART POST SB 21605
BS21598	NC	X	PART POST SB 21605
BS21607	NR		
BS21630	NC	R	Q.E.C
BS21651	NC	X	SEE SB21652
BS21657	NC		Q.E.C
BS21658	NC		ENGINE POST SB 21652
BS21664	NC	R	ENGINE PRE SB 21607
BS21669	NC	X	PART POST SB 21562: 3244871-6
BS21699	NC		BY ENGINE S/N
BS21702	NA		PART SENT TO CUSTOMER THE 29/01/2004
SIL PW100-001	NC		ENGINE POST SB 21419
SIL PW100-077	NC		ENGINE PRE SB 21607
SIL PW100-079	NC	X	ENGINE ON OVERHAUL
SIL PW100-092	NC		ENGINE ON HSI

NC = NOT CONCERNED ,NA = NO ACCESS ,PM = PART MISSING ,NR = NOT REQUEST CUSTOMER , RP = REFUSED BY CUSTOMER ALOUD THAT PROPOSED SEC
A
, X=CUSTOMER STANDARD , R= CUSTOMER REQUEST

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MODIFICATIONS PREVIOUSLY INCORPORATED

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BS NUMBER	CUSTOMER STANDARD	COMMENTS
BS21175	X	
BS21178	X	
BS21311	X	
BS21316	X	
BS21367	X	
BS21383	X	
BS21445	X	PART POST SB 21519: 10839F
BS21472	X	
BS21476	X	
BS21513	X	
BS21516	X	
BS21521	X	
BS21541	X	
BS21554	X	
BS21562	X	
BS21572	X	
BS21603	X	
BS21618	X	
BS21621	X	
BS21652	X	

X=CUSTOMER STANDARD , R=CUSTOMER REQUEST

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AIRWORTHINESS DIRECTIVES

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AD/CN NUMBER	REV	NOMMENCLATURE / COMMENTS	PREVIOUSLY INCORPORATED	EMBODIED DURING WORKS
AD 2003-16-04	0	STEWART WARNER FUEL HEATER REPLACEMENT COMMENTS : CONTROL JAA	NC	
AD 97-17-05	0	GAS GENERATOR DRAIN PORTS. INSPECTION OF THE PLUG AND DRAIN PORT IAW THE SB STANDARD OF THE ENGINE COMMENTS : CONTROL JAA	NC	
AD 98-14-02	0	PREVENT ENGINE FUEL LEAKS COMMENTS : CONTROL JAA	NC	
CF-2000-34 CN 2001-031-IMP	0 0	STEWART WARNER FUEL HEATER S/N 10718 REPLACEMENT. REMOVAL OF ALL FUEL HEATER PRE SB 21100 I.A.W. THIS C.F. BEFORE 31 AUGUST 2002. COMMENTS : PART POST SB 21519: 10839F	NC	
CF-2002-34 CN 2002-428	0 0	FOR ENGINES NOT MODIFIED IAW SB 21562,WITHIN 400 FLIGT HOURS OR AT THE NEXT AIRCRAFT "A" CHECK, INSPECT THE MFCU IAW PWC SB 21669 COMMENTS : PART POST SB 21562: 3244871-6	NC	

I HEREBY CERTIFY THAT THE ABOVE AIRWORTHINESS DIRECTIVES HAVE BEEN INCORPORATED OR FOUND EMBODIED IN THIS ENGINE
AUTHORIZED INSPECTOR :
DATE : le 06/04/2004 SECA 0925

NC = NOT CONCERNED, PM = PART MISSING

NO. : 073/DQ/PI/04
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AIRWORTHINESS DIRECTIVES

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AD/CN NUMBER	REV	NOMMENCLATURE / COMMENTS	PREVIOUSLY INCORPORATED	EMBODIED DURING WORKS
CN 2001-031-IMP CF-2000-34	0 0	REMPLACEMENT DES RECHAUFFEURS CARBURANT STEWART WARNER REF 10718. DEPOSER TOUS LES RECHAUFFEURS CARBURANT PRE SB PWC 21100 SUIVANT INSTRUCTIONS DE CETTE CN AVANT LE 31 AOUT 2002. COMMENTS : PART POST SB 21519: 10839F	NC	
CN 2002-428 AD CF-2002-34 CF-2002-34	0 0 0	INSPECTION/MODIFICATION DU RéGULATEUR DE CARBURANT (MFCU HONEYWELL) SELON AD CF-2002-34 COMMENTS : PART POST SB 21562: 3244871-6	NC	
CN 97-002 AD 98-14-02 CF 96-22	0 0 0	CIRCUIT CARBURANT. APPLICATION BS 21077R7,BS 21373 R3 ET BS 21364R1 OU REVISIONS ULTERIEUR	X	

I HEREBY CERTIFY THAT THE ABOVE AIRWORTHINESS DIRECTIVES HAVE BEEN INCORPORATED OR FOUND EMBODIED IN THIS ENGINE
AUTHORIZED INSPECTOR :
DATE : 6/04/2004

SECA 0925

NC = NOT CONCERNED, PM = PART MISSING

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 11

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 720110				
WIRING HARNESS ASSEMBLY P/N=3116050-06 S/N=AA10419 P/N VENDOR =---	INSULATING SLEEVES AND CONNECTORS BURNT COMMENTS : REPLACED SB 21632 AND SB 21269 EMBODIED	P/N=3116050-07 S/N=AA22705	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 12

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 720120				
IGNITION CABLE ASSEMBLY P/N=3117291-01 S/N=---	CERAMIC INSULATION TIP BROKEN. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3117291-01 S/N=---	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 13

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 720140				
FUEL FILTER ELEMENT P/N=3038454	EACH TIME REPLACED. COMMENTS : REPLACED	P/N=3038454 S/N=N/A	N	1
FUEL PUMP P/N=3120249-01 S/N=5811 P/N VENDOR =5009982D 5009981D	COMMENTS : DELIVERY WITH ENGINE SN:AV0002 BY CUSTOMER'S REQUEST	P/N=PART MISSING S/N=PART MISSING P/N VENDOR =PART MISSING		1
HYDROMECHANICAL FUEL CONTROL P/N=3117178-04 S/N=C38349V P/N VENDOR =3244871-6	COMMENTS : DELIVERY WITH ENGINE SN:AV0002 BY CUSTOMER'S REQUEST	P/N=PART MISSING S/N=PART MISSING P/N VENDOR =PART MISSING		1
FUEL HEATER P/N=3120075-02 S/N=WA11363 P/N VENDOR =10839F	SEND TO PWC FOR INVESTIGATION COMMENTS : REPLACED	P/N=3120075-02 S/N=WA20107	N	1
FLOW DIVIDER AND DUMP VALVE P/N=3118511-01 S/N=0157 P/N VENDOR =---	COMMENTS : OVERHAULED	P/N=3118511-01 S/N=0157 P/N VENDOR =---	S	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 14

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
ONE FUEL MANIFOLD SET P/N=--- S/N=--- P/N VENDOR =---	COMMENTS : TESTED AND REPAIRED SB 21535 CKECKED	P/N=--- S/N=--- P/N VENDOR =---		1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

S.E.C.A DMOR325 / DMOS325

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 15

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 720150				
MAIN PRESSURE PUMP HOUSING ASSY P/N=3045885-01	CIRCUMFERENCIAL SCRATCH COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3045885-01 S/N=---	N	1
PRESSURE PUMP COVER ASSEMBLY P/N=3112903-01	SCORED COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3112903-01 S/N=---	N	1
RGB SCAVENGE PUMP IDLER SHAFT P/N=3104290-03	COMMENTS : MODIFIED PER SB 21628	P/N=3104290 08	S	1
PRESSURE RELIEF VALVE P/N=3022873	EXCESSIVE WEAR COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3022873 S/N=---	N	1
INTERCOMPRESSOR CASE DRAIN TUBE (SB21679) P/N=3039878	COMMENTS : REPLACED PER SB 21679	P/N=3057603-01 S/N=---	N	1
FUEL COOLED OIL COOLER P/N=3118263-01 S/N=WA8875 P/N VENDOR =10845B	COMMENTS : SEND TO PW-C FOR INVESTIGATION	P/N=PART MISSING S/N=PART MISSING P/N VENDOR =PART MISSING		1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

S.E.C.A DMOR325 / DMOS325

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 16

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
PROPELLER OVERSPEED GOVERNOR P/N=--- S/N=11902727 P/N VENDOR =66503-8210-091A	FOLLOWING OIL CONTAMINATION FLUSH OR REFURBISHING ACCESSORY COMMENTS : SEND TO PW-C FOR INVESTIGATION	P/N=PART MISSING S/N=PART MISSING P/N VENDOR =PART MISSING		1
PROPELLER CONTROL HYDRAULIC PUMP P/N=--- S/N=11482686 P/N VENDOR =66503-8210-092A	FOLLWING OIL CONTAMINATION FLUSH OR REFURBISHING ACCESSORY COMMENTS : SEND TO PW-C FOR INVESTIGATION	P/N=PART MISSING S/N=PART MISSING P/N VENDOR =PART MISSING		1
PRESSURE DIFFERENTIAL INDICATOR P/N=3034338	COMMENTS : TESTED	P/N=3034338		1
OIL PRESSURE DIFFERENTIAL INDICATOR P/N=3034338	COMMENTS : TESTED	P/N=3034338		1
OIL FILTER ELEMENT (POST-SB20673) P/N=00FAA-PMA 11-11065	EACH TIME REPLACED. COMMENTS : REPLACED	P/N=3112895-01 S/N=---	N	1
RGB OIL FILTER ELEMENT P/N=UNREADABLE	EACH TIME REPLACED. COMMENTS : REPLACED	P/N=3036376 S/N=---	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

S.E.C.A DMOR325 / DMOS325

NO. : 073/DQ/PI/04
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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 17

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 720160				
NO.1 TORQUE MONITOR SENSOR P/N=3116499-2 S/N=CH1226 P/N VENDOR =---	COMMENTS : OVERHAULED	P/N=3116499-2 S/N=CH1226 P/N VENDOR =---	S	1
NO.2 TORQUE MONITOR SENSOR P/N=3116499-02 S/N=CH1325 P/N VENDOR =---	COMMENTS : OVERHAULED	P/N=3116499-02 S/N=CH1325 P/N VENDOR =---	S	1
NP PULSE PICKUP PROBE P/N=3039242 S/N=CH14558 P/N VENDOR =---	COMMENTS : OVERHAULED	P/N=3039242 S/N=CH14558 P/N VENDOR =---	S	1
T1.8 INLET AIR TEMPERATURE SENSOR P/N=3034652 S/N=CH4056 P/N VENDOR =---	COMMENTS : OVERHAULED	P/N=3034652 S/N=CH4056 P/N VENDOR =---	S	1
NH1 PULSE PICKUP PROBE P/N=3039242 S/N=CH15973 P/N VENDOR =---	DEFECTIVE INSULATION COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3039242 S/N=CH19116	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

S.E.C.A DMOR325 / DMOS325

NO. : 073/DQ/PI/04
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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 18

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
NH2 PULSE PICKUP PROBE P/N=3039242 S/N=CH16067 P/N VENDOR =---	DEFECTIVE INSULATION COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3039242 S/N=CH19140	N	1
NL PULSE PICKUP PROBE P/N=3033509 S/N=CH6393 P/N VENDOR =---	COMMENTS : OVERHAULED	P/N=3033509 S/N=CH6393 P/N VENDOR =---	S	1
THERMOCOUPLE NO.3 P/N=29217 S/N=97068493	ELECTRICAL TEST BEYOND COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3058293-01 S/N=EM062141	N	1
THERMOCOUPLE NO.4 P/N=29217 S/N=UNREADABLE	ELECTRICAL TEST BEYOND COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3058293-01 S/N=EM062164	N	1
THERMOCOUPLE NO.5 P/N=3119254-01 S/N=EM8084103	DEFECTIVE INSULATION COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3058293-01 S/N=EM062234	N	1
THERMOCOUPLE NO.8 P/N=29217 S/N=97068478	ELECTRICAL TEST BEYOND COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3058293-01 S/N=EM062193	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

NO. : 073/DQ/PI/04
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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 19

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 721000				
PROPELLER SHAFT P/N=01R3045522-01 S/N=A0000AW9	CLEARNCE WHITH BULL-GEAR BEYOND LIMIT COMMENTS : REPAIRABLE/ REPAIRED	P/N=01R3045522-01 S/N=A0000AW9	S	1
PROPELLER SHAFT OIL SEAL RUNNER P/N=3110472-02	SCRORE ON SEALING DIA IN BEYOND LIMIT COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3110472-02 S/N=---	N	1
SECOND-STAGE REDUCTION SPUR GEARSHAFT (BULL GEAR P/N=3116635-01 S/N=31D322	COMMENTS : REPAIRABLE/ REPAIRED	P/N=3116635-01 S/N=31D322	S	1
SECOND-STAGE REDUCTION SPUR GEARSHAFT RH (PINION P/N=3116742-01 S/N=34E949	IMPACT ON GEAR TEETH NO REPAIR. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3116742-01 S/N=56E618	N	1
SECOND-STAGE REDUCTION SPUR GEARSHAFT LH (PINION P/N=3116741-01 S/N=27D611	DAMAGE ON GEAR TEETH IN BEYOND LIMIT. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3116741-01 S/N=64E720	N	1
NO.13D ROLLER BEARING P/N=3111930-01 S/N=FC56545	MARKS ON ROLLERS ON OUTER RACE COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3037213 S/N=FC121922	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

S.E.C.A DMOR325 / DMOS325

NO : 073/DQ/PI/04
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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 20

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
NO.14G ROLLER BEARING P/N=3111930-01 S/N=FC113189	MARKS ON ROLLERS ON OUTER RACE. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3037213 S/N=FC131462	N	1
REDUCTION GEARBOX INPUT SHAFT P/N=3052896-01 S/N=A0010N4L	SPALLING COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3052896-01 S/N=75A249	N	1
REAR HOUSING (PRE AND POST SB21341) P/N=3116104-02 S/N=1K109	SLEEVE "15"DAMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3116104-02 S/N=1K109		1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 722000				
FRONT INLET CASE P/N=3044325-01 S/N=OSU003	LOSS OF COATING & DAMAGED INSERT. COMMENTS : REPAIRABLE/ REPAIRED	P/N=3044325-01 S/N=OSU003	S	1
OIL PUMP DRIVE BEVEL GEAR P/N=3109331-01 S/N=A000XX4D	EXCESSIVE WEAR IN BEYOND LIMIT. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3109331-01 S/N=77E956	N	1
ACCESSORY GEARBOX DRIVE SHAFT P/N=3100989-01 S/N=D124	SENT TO PWC FOR INVESTIGATION. COMMENTS : REPLACED	P/N=3100989-01 S/N=---	N	1
ACCESSORY DRIVE SPUR GEAR P/N=3107245-01 S/N=---	SPALLING COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3107245-01 S/N=---	N	1
ACCESSORY DRIVE BEVEL GEAR P/N=3109330-01 S/N=A001331T	EXCESSIVE WEAR IN BEYOND LIMIT. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3109330-01 S/N=77E806	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0}

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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
NO.27 BALL BEARING P/N=3101371-01 S/N=FA9808638	NON-DEMOUNTABLE BEARING SCRAPPED BY OIL PRESSURE LOSS CRITERIAS SENT PWC FOR INVESTIGATION COMMENTS : REPLACED	P/N=3036907 S/N=FA0319939	N	1
NO.26 REAR BALL BEARING P/N=3101371-01 S/N=FA9808636	NON-DEMOUNTABLE BEARING SCRAPPED BY OIL PRESSURE LOSS CRITERIAS COMMENTS : REPLACED	P/N=3036907 S/N=FA0319938	N	1
CENTRIFUGAL BREATHER IMPELLER (POST SB20768) P/N=3111368-01	DESINTEGRATED. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3111368-01 S/N=FN0783A	N	1
ACCESSORY DRIVE SPUR GEARSHAFT (POST SB20768) P/N=3111365-01 S/N=---	SENT TO PWC FOR INVESTIGATION. COMMENTS : REPLACED	P/N=3111365-01 S/N=---	N	1
ACCESSORY DRIVE SHAFT OIL SEAL RUNNER P/N=3107037-01	LAPPING OF THE FACE"A" COMMENTS : REPAIRABLE/ REPAIRED	P/N=3107037-01	S	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
NO.25 REAR BALL BEARING P/N=3101371-01 S/N=FA9808136	NON-DEMOUNTABLE BEARING SCRAPPED BY OIL PRESSURE LOSS CRITERIAS COMMENTS : REPLACED	P/N=3036906 S/N=FA0125963	N	1
NO.24 FRONT ROLLER BEARING P/N=3112368-01 S/N=FA0123216	NON-DEMOUNTABLE BEARING SCRAPPED BY OIL PRESSURE LOSS CRITERIAS COMMENTS : REPLACED	P/N=3037278 S/N=FA0323627	N	1
NO.24 REAR ROLLER BEARING P/N=3112368-01 S/N=FA9517338	NON-DEMOUNTABLE BEARING SCRAPPED BY OIL PRESSURE LOSS CRITERIAS COMMENTS : REPLACED	P/N=3037278 S/N=FA0323604	N	1
NO.26 FRONT ROLLER BEARING P/N=3112368-01 S/N=FA9810048	NON-DEMOUNTABLE BEARING SCRAPPED BY OIL PRESSURE LOSS CRITERIAS COMMENTS : REPLACED	P/N=3037278 S/N=FA0323634	N	1
NO.25 FRONT ROLLER BEARING P/N=3103579-01 S/N=FA128425	NON-DEMOUNTABLE BEARING SCRAPPED BY OIL PRESSURE LOSS CRITERIAS SENT PWC FOR INVESTIGATION COMMENTS : REPLACED	P/N=3103579-01 S/N=FA0316266	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 4

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
STARTER GENERATOR DRIVE SPUR GEARSHAFT P/N=3110690-01 S/N=1-366	SENT TO PWC FOR INVESTIGATION. COMMENTS : REPLACED	P/N=3110690-01 S/N=---	N	1
COUPLING SHAFT P/N=3101835-01 S/N=A000FWL	SPALLING COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3101835-01 S/N=84E881	N	1
REAR INLET CASE P/N=3045846-01 S/N=PWCCOINI453	SEND TO PWC FOR INVESTIGATION COMMENTS : REPLACED	P/N=3045846-01 S/N=---	N	1
ACCESSORY GEARBOX COVER P/N=3111381-03 S/N=7812AM	COVER BROKEN ON UPPER BOLTING FLANGE AREA. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3111381-03 S/N=---	N	1
NO.2 BEARING HOUSING (PRE/POST SB21524) P/N=3044258-01 S/N=---	DIMENSION UNDER LIMIT COMMENTS : REPAIRABLE / EXCHANGED	P/N=3044258-01 S/N=---	S	1
SHAFT COUPLING STOP (POST SB20768) P/N=3111364-01	SENT TO PWC FOR INVESTIGATION. COMMENTS : REPLACED	P/N=3111364-01 S/N=---	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

S.E.C.A DMOR325 / DMOS325

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 5

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
BREATHER ADAPTERS ASSY P/N=3104617-01	DESINTEGRATED. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3104617-01 S/N=---	N	1
SEAL CARRIER (POST SB20776) P/N=3113096-01	SCRAPPED COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3113096-01 S/N=---	N	1
FUEL PUMP DRIVE OIL NOZZLE P/N=3106428-01	NOZZLE TWISTED ON MIDDLE AREA. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3106428-01 S/N=---	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 723100				
NO. 28 FRONT ROLLER BEARING P/N=3107496-01 S/N=FC109371	NON-DEMOUNTABLE BEARING SCRAPPED BY OIL PRESSURE LOSS CRITERIAS COMMENTS : REPLACED	P/N=3032625 S/N=FC132864	N	1
NO. 29 LOWER ROLLER BEARING P/N=3107493-01 S/N=FC110040	NON-DEMOUNTABLE BEARING SCRAPPED BY OIL PRESSURE LOSS CRITERIAS COMMENTS : REPLACED	P/N=3032625 S/N=FC132850	N	1
NO. 28 REAR BALL BEARING P/N=3101393-01 S/N=FA9808861	NON-DEMOUNTABLE BEARING SCRAPPED BY OIL PRESSURE LOSS CRITERIAS COMMENTS : REPLACED	P/N=3036906 S/N=FA0212335	N	1
ACCESSORY GEARBOX HORIZONTAL BEVEL GEARSHAFT P/N=3106258-01 S/N=A000B2B	LOSS OF COATING ON GEAR TEETH COMMENTS : REPAIRABLE/ REPAIRED	P/N=3106258-01 S/N=A000B2B	S	1
NO. 30 BALL BEARING P/N=3106684-01 S/N=FA9808933	NON-DEMOUNTABLE BEARING SCRAPPED BY OIL PRESSURE LOSS CRITERIAS COMMENTS : REPLACED	P/N=3038447 S/N=FA0318623	N	1

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NO'. : 073/DQ/PI/04
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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SPIRAL BEVEL GEAR P/N=3111969-01 S/N=A0000DRH	LOSS OF COATING ON GEAR TEETH COMMENTS : REPAIRABLE/ REPAIRED	P/N=3111969-01 S/N=A0000DRH	S	1
NO.3 BALL BEARING P/N=3112489-01 S/N=FC73158	SCRAPPED BY OIL SYSTEM CONTAMINATION CRITERIAS COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3112489-01 S/N=FC130372	N	1
NO.3 BEARING AIR SEAL (POST SB21026) P/N=3115113-01	DIMENSION UNDER LIMIT COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3115113-01 S/N=---	N	1
LP IMPELLER HOUSING P/N=3117936-01 S/N=A000101P	LOSS OF COATING COMMENTS : REPAIRABLE/ REPAIRED	P/N=3117936-01 S/N=A000101P	S	1
LP IMPELLER P/N=3039487 S/N=3H093	REMAINING TIME TOO LOW CUSTOMER'S REQUEST COMMENTS : REPLACED	P/N=3039487 S/N=A001EBLW	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
NO.4 BALL BEARING P/N=3111618-01 S/N=BB9511909	SCRAPED BY OIL SYSTEM CONTAMINATION CRITERIAS COMMENTS : REPLACED	P/N=3040444 S/N=BB0034398	N	1
NO.5 ROLLER BEARING P/N=3121706-01 S/N=FC111351	SCRAPED BY OIL SYSTEM CONTAMINATION CRITERIAS COMMENTS : REPLACED	P/N=3121706-01 S/N=FC133900	N	1
HP IMPELLER P/N=3043293 S/N=A00136NN	COMMENTS : REPLACEMENT SEAL AIR	P/N=3043293 S/N=A00136NN	S	1
NO.5 BEARING AIR AND OIL SEAL P/N=3121089-01	DIMENSION UNDER LIMIT COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3121089-01 S/N=---	N	1
NO.4 BEARING AIR SEAL P/N=3103324-01	DIMENSION UNDER LIMIT COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3103324-01 S/N=---	N	1
PISTON RING (POST SB20325, SB20392, SB20607) P/N=3120355-01	DAMAGED COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3120355-01 S/N=---	N	1

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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
AIR PRESSURE VALVE P/N=3108485-01	SLEEVE DAMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3108485-01	S	1
VALVE INNER SPRING P/N=3014953	DAMAGED COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3014953 S/N=---	N	1
VALVE OUTER SPRING P/N=3033715	EXCESSIVE FRETTING WEAR ON SPIRAL. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3033715 S/N=---	N	1
INTERCOMPRESSOR CASE P/N=3117373-01 S/N=9K407	COMMENTS : MODIFIED PER SB 21691	P/N=3059148-01 S/N=9K407	S	1
TRANSFER TUBE P/N=3107314-01	EXCESSIVE FRETTING WEAR ON SEALING DIAMETER AND ON TIP. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3107314-01 S/N=---	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 724100				
GAS GENERATOR CASE P/N=3122944-01 S/N=7K952	TWO CRACKS ON FIRESEAL SUPPORT RING UP TO 30.MM AND 50.00MM LONG.CRACKS ON AIR PRESSURE PASSAGE & ON N°5 BRG HSG. COMMENTS : REPAIRABLE / EXCHANGED	P/N=3122944-01 S/N=2K232	S	1
OIL NOZZLE STRAINER ELEMENT ASSY	REPLACEMENT ON EACH ACCESS. COMMENTS : REPLACED SB 21621 EMBODIED	P/N=3053993-01	N	2
HP IMPELLER HOUSING (POST SB20890) P/N=3114308-01 S/N=UNREADABLE	LOSS OF COATING COMMENTS : REPAIRABLE/ REPAIRED	P/N=3114308-01 S/N=UNREADABLE	S	1
IMPELLER SPACER (POST SB20798) P/N=3103576-01	LOSS OF COATING COMMENTS : REPAIRABLE/ REPAIRED	P/N=3103576-01	S	1
HP IMPELLER SEAL HOUSING	LOSS OF MATERIAL ON AIR SEAL DIAMETERS. COMMENTS : REPAIRABLE / EXCHANGED	P/N=3119967-01 S/N=---	S	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
NO.5 BEARING HOUSING STATOR AIR SEAL(POST SB2121 P/N=3116829-01 S/N=---	LOSS OF MTERIAL ON AIR SEAL DIAMETER AND EXCESSIVE FRETTING WEAR ON FACE "D" COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3116829-01 S/N=---	N	1
COMBUSTION CHAMBER OUTER LINER P/N=3052959-01 S/N=8L364	MULTIPLE CONVERGING CRACKS WITH LOSS OF MATERIAL ON DUAL COOLING RINGS COMMENTS : REPAIRABLE / EXCHANGED	P/N=3052959-01 PWC S/N=8D110	S	1
COMBUSTION CHAMBER INNER LINER ASSEMBLY P/N=3048934-01 S/N=4M535	MULTIPLE CRACKS ON COOLING RINGS WITH LOSS OF MATERIAL COMMENTS : REPAIRABLE / EXCHANGED	P/N=3048934-01 S/N=9K576	S	1
VANE RING FRONT INNER SUPPORT HOUSING P/N=3119966-01 S/N=---	LOSS OF MATERIAL ON SEAL DIAMETERS. COMMENTS : REPAIRABLE / EXCHANGED	P/N=3119966-01 S/N=4-51-1	S	1
NO.5 BEARING HOUSING COVER (POST SB21211) P/N=3117450-01 S/N=---	COCKEFIED OIL BLOCKED INTO HSG COVER COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3117450-01 S/N=---	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
HP VANE RING SEGMENT P/N=3040841CL0290 S/N=D0826	REPEATED CONVERGING CRACKS ON AIRFOIL SURFACES COMMENTS : NOT REPAIRABLE/ REPLACED SB 21620 EMBODIED	P/N=3045731CL0290 S/N=---	N	1
HP VANE RING SEGMENT P/N=3040841CL0290 S/N=C2595	REPEATED CONVERGING CRACKS ON AIRFOIL SURFACES COMMENTS : NOT REPAIRABLE/ REPLACED SB 21620 EMBODIED	P/N=3045731CL0290 S/N=---	N	1
HP VANE RING SEGMENT P/N=3040841CL0290 S/N=C1623	OPPOSITE CONVERGING CRACKS ON AIRFOIL SURFACES COMMENTS : NOT REPAIRABLE/ REPLACED SB 21620 EMBODIED	P/N=3045731CL0290 S/N=---	N	1
HP VANE RING SEGMENT P/N=3045731CL0265 S/N=D3576	COVERGING CRACKS WITH MISSING MATERIAL ON AIRFOIL SURFACE COMMENTS : NOT REPAIRABLE/ REPLACED SB 21620 EMBODIED	P/N=3045731CL0290 S/N=---	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

NO. : 0,7,3/DQ/PI/04
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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
HP VANE RING SEGMENT P/N=3045731CL0290 S/N=D1471	CONVERGING CRACKS WITH MISSING MATERIAL ON INNER & OUTER-SHROUD AND ON TRAILING EDGE COMMENTS : NOT REPAIRABLE/ REPLACED SB 21620 EMBODIED	P/N=3045731CL0290 S/N=---	N	1
HP VANE RING SEGMENT P/N=3045731CL0290 S/N=D1708	CONVERGING CRACKS ON AIRFOIL SURFACES. COMMENTS : NOT REPAIRABLE/ REPLACED SB 21620 EMBODIED	P/N=3045731CL0265 S/N=---	N	1
HP VANE RING SEGMENT P/N=3045731CL0265 S/N=UNREADABLE	CONVERGING CRACKS WITH MISSING MATERIAL ON INNER SHROUD T.E LIPS GO THROUGH FILLET RADII COMMENTS : NOT REPAIRABLE/ REPLACED SB 21620 EMBODIED	P/N=3045731CL0265 S/N=---	N	1
HP VANE RING SEGMENT P/N=3040841CL0265 S/N=C4295	OPPOSITE CONVERGING CRACKS ON AIRFOIL SURFACES COMMENTS : NOT REPAIRABLE/ REPLACED SB 21620 EMBODIED	P/N=3045731CL0290 S/N=---	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

NO. : 073/DQ/PI/04
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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
INSULATION BLANKET SEGMENT P/N=3106988-01	DAMMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3106988-01	S	1
INSULATION BLANKET SEGMENT P/N=--- S/N=---	DAMMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=--- S/N=---	S	1
INSULATION BLANKET SEGMENT P/N=3107008-01	DAMMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3107008-01	S	1
INSULATION BLANKET SEGMENT P/N=3112098-01	DAMMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3112098-01	S	1
INSULATION BLANKET SEGMENT P/N=3112097-01	DAMMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3112097-01	S	1
INSULATION BLANKET SEGMENT P/N=3118454-01	DAMMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3118454-01	S	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

S.E.C.A DMOR325 / DMOS325

NO : '073/DQ/PI/04
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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
INSULATION BLANKET RETAINER P/N=--- S/N=---	TWISTED COMMENTS : REPAIRABLE/ REPAIRED	P/N=--- S/N=---	S	1
INSULATION BLANKET RETAINER P/N=3115682-01	CRACKED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3115682-01	S	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

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REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 725100				
HP TURBINE REAR COVER (POST SB21085) P/N=3039639 S/N=A000149X	REMAINING TIME TOO LOW CUSTOMER'S REQUEST COMMENTS : REPLACED	P/N=3039639 S/N=A001EWBC	N	1
HP TURBINE DISK P/N=3041511 S/N=A00012NE	REMAINING TIME TOO LOW CUSTOMER'S REQUEST COMMENTS : REPLACED	P/N=3041511 S/N=A001EB4N	N	1
HP TURBINE BLADES P/N=3115601-01	MATERIAL DEPOSIT ON FIR TREE AREA BEYOND LIMIT COMMENTS : REPLACED (QTY:38) SEE "HPT BLADES HISTORY CARD" DGT N°247 ATTACHED FOR LIST OF P/N AND S/N	P/N=3115601-01	N	38
TURBINE STUBSHAFT P/N=3044552-01 S/N=54A050	DIMENSION UNDER LIMIT COMMENTS : NOT REPAIRABLE/ REPLACED SB 21683 EMBODIED	P/N=3056281-01 S/N=78A461	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

NO : 073/DQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

DATE 06/04/2004
TIME 14:41:24

FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 37

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SHOULDER TEE BOLT	EACH TIME REPLACED. COMMENTS : REPLACED	P/N=3119838-02	N	5
HP TURBINE SHROUD SEGMENTS	CRACKS AND WEAR OVER LIMITS COMMENTS : NOT REPAIRABLE/ REPLACED PN:3055476 CL08 (QTY:14 TSN:0)	P/N=3055476 CL08	N	14

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

NO. , : 073/DQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 38

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 725200				
LP TURBINE DISK P/N=3039412 S/N=A0000Y99	REPLACEMENT,REMAINING LIFE TOO LOW. COMMENTS : REPLACED	P/N=3039412 S/N=A001DX29	N	1
LP TURBINE BLADES	29 BLADES CRACKED AND 18 BLADES WITH MINOR GALLING ON TIP WITHIN LIMIT COMMENTS : NOT REPAIRABLE/ REPLACED (QTY:30) SEE" LP BLADE HISTORY" CARD" DGT N°286 ATTACHED FOR LIST OF P/N AND S/N	P/N=3118882-01 P/N=3118882-01	N S	29 1
LP TURBINE SEAL HOUSING P/N=3051009-01 S/N=5K665	EXCESSIVE WEAR ON SEALING DIAMETER COMMENTS : REPAIRABLE / EXCHANGED	P/N=3051009-01 S/N=SE190104	S	1
LP TURBINE SHROUD SEGMENTS P/N=3039593CL13	CUSTOMER REQUEST COMMENTS : NOT REPAIRABLE/ REPLACED (QTY:14) PN:3039593 CL15 (QTY:14 TSN:0)	P/N=3039593 CL15	N	14

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

NO. : 073/DQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 39

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
LP TURBINE STATOR AND SEAL ASSEMBLY P/N=3055632CL02 S/N=1N473	CRACKS WITH MISSING MATERIAL & HOT EROSION ON LEADING EDGE + CRACKS ON TRAILING EDGE COMMENTS : REPAIRABLE / EXCHANGED	P/N=3055632CL02 S/N=8M028	S	1
LP STATOR FRONT METAL SEAL RING P/N=3118182-01 S/N=---	EXCESSIVE FRETTING WEAR ON SEALING FACE AND ON OUTER DIAMETER. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3118182-01 S/N=---	N	1
NO.6 ROLLER BEARING P/N=3107849-01 S/N=FC71477	SCRAPED BY OIL SYSTEM CONTAMINATION CRITERIAS COMMENTS : REPLACED	P/N=3041176 S/N=FC134387		1
NO.6 BEARING ROTOR AIR SEAL ASSEMBLY(POST SB2101 P/N=3115590-01 S/N=---	KNIFE EDGES COLLAPSED ON SMALLER AND ON LARGER DIAMETERS. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3115590-01 S/N=---	N	1
NO.6 BEARING ROTOR NUT (POST SB21020) P/N=3115907-01 S/N=---	DIMENSION UNDER LIMIT COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3115907-01 S/N=---	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

S.E.C.A DMOR325 / DMOS325

NO : 073/DQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 40

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SECTION: 725300				
POWER TURBINE STUBSHAFT P/N=3105421-01 S/N=44A551	PARALLELISM BEYOND LIMIT COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3105421-01 S/N=60A496	N	1
PT ROTOR AIR SEAL P/N=3106225-01 S/N=---	DIMENSION UNDER LIMIT COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3106225-01 S/N=---	N	1
INTERTURBINE AIR SEAL P/N=3121494-01 S/N=---	DIMENSION UNDER LIMIT COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3121494-01 S/N=---	N	1
TURBINE INTERSTAGE CASE P/N=3052885-01 S/N=AVB40414	DIMENSION UNDER LIMIT COMMENTS : REPAIRABLE / EXCHANGED SB 21623 EMBODIED	P/N=01R3052885-01 S/N=ATI203899	S	1
INTERSTAGE CASE METAL SEAL RING P/N=3118184-01	EXCESSIVE FRETTING WEAR ON SEALING FACE. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3118184-01 S/N=---	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

S.E.C.A DMOR325 / DMOS325

NO : 073/DQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 41

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
NO.6 AND 7 BEARING HOUSING P/N=3111633-01 S/N=---	DIMENSION UNDER LIMIT COMMENTS : REPAIRABLE / EXCHANGED	P/N=3111633-01 S/N=3-70-8	S	1
NO.6 AND 7 BEARING HOUSING SEAL (POST SB21148) P/N=3116992-01 S/N=---	AIR SEAL DIAMETERS DEEPLY SCORED. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3116992-01 S/N=FN0602	N	1
HOUSING SEAL METAL SEAL RING P/N=3106419-01	EXCESSIVE FRETTING WEAR ON SEALING FACE. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3106419-01 S/N=---	N	1
PT STATOR RETAINING UPPER RING P/N=3051005-01	EXCESSIVE FRETTING WEAR ON LOCATING SLOTS COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3051005-01 S/N=---	N	1
PT STATOR RETAINING LOWER RING P/N=3051006-01	EXCESSIVE FRETTING WEAR ON LOCATING SLOTS COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3051006-01 S/N=---	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

S.E.C.A DMOR325 / DMOS325

NO : 073/DQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 42

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
FIRST STAGE PT STATOR ASSEMBLY P/N=3045073 S/N=1P234	CRACK AND DISTORTION ON TRAILING EDGE COMMENTS : REPAIRABLE / EXCHANGED	P/N=3045073 S/N=2D348	S	1
PT STATOR METAL SEAL RING P/N=3118445-01 S/N=---	EXCESSIVE FRETTING WEAR ON SEALING FACE AND ON OUTER DIAMETER. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3118445-01 S/N=---	N	1
SECOND-STAGE PT STATOR ASSEMBLY (A7) P/N=3055714CL03 S/N=9N799	MULTIPLE CRACKS ON INNER RING > 6,35MM LONG COMMENTS : REPAIRABLE / EXCHANGED	P/N=3055714CL03 S/N=2P617	S	1
TEE-HEAD BOLTS	LOSS OF COATING COMMENTS : REPAIRABLE/ REPAIRED	P/N=3104751-01	S	10
NO.6 AND 7 BEARING TRANSFER TUBES P/N=3111243-01	2 EXCESSIVE CORROSION 1 LOSS OF COATING COMMENTS : REPAIRABLE/ REPAIRED (QTY:1) NOT REPAIRABLE/ REPLACED (QTY:2)	REPAIRED: P/N=3111243-01 REPLACED: P/N=3111243-01	S N	1 2

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

NO : 073/DQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 43

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
SEALING TUBES	EXCESSIVE FRETTING WEAR ON SEALING DIAMETERS. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3106825-01	N	3
SEALING TUBE	EXCESSIVE FRETTING WEAR ON SEALING DIAMETERS COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3104870-01	N	2
NO.1 BALL BEARING P/N=3111620-01 S/N=BB984540	SCRAPPED BY OIL SYSTEM CONTAMINATION CRITERIAS COMMENTS : REPLACED	P/N=3037233 S/N=BB0031756	N	1
NO.2 ROLLER BEARING P/N=3107845-01 S/N=FC43461	SCRAPPED BY OIL SYSTEM CONTAMINATION CRITERIAS COMMENTS : REPLACED	P/N=3036767 S/N=FC132099	N	1
NO.7 ROLLER BEARING P/N=3107850-01 S/N=BB987303	SCRAPED BY OIL SYSTEM CONTAMINATION CRITERIAS COMMENTS : REPLACED	P/N=3037235 S/N=BB0030927	N	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

NO. : 073/DQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 44

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
LABYRINTH SEAL (POST SB20965) P/N=3113747-02 S/N=---	DIMENSION UNDER LIMIT COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3113747-02 S/N=---	N	1
TURBINE SUPPORT CASE P/N=3055582-01 S/N=7F679	SHANKNUTS AND THREADS SONDE T6 DAMMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3055582-01 S/N=7F679	S	1
TURBINE EXHAUST DUCT P/N=3116840-01 S/N=---	MULTIPLE NON-CONVERGING CRACKS COMMENTS : REPAIRABLE / EXCHANGED	P/N=3116840-01 S/N=SEA98A0057	S	1
MISCELLANEOUS STRAINER ELEMENTS P/N=3106403-01	RIPPED COMMENTS : NOT REPAIRABLE/ REPLACED	P/N 3106403-01	N	1
MISCELLANEOUS STRAINER ELEMENTS P/N=3106403-01	MESH LIFT OFF FROM STRAINER BOBY. COMMENTS : NOT REPAIRABLE/ REPLACED	P/N=3106403-01 S/N=---	N	1
POSITIVE BUS-BAR P/N=3112208-01 S/N=NR03594	LOSS OF COATING COMMENTS : REPAIRABLE/ REPAIRED	P/N=3112208-01 S/N=NR03594	S	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

NO' , : 073/DQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

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FINDINGS DURING INSPECTION AND CORRECTIVE ACTIONS PAGE 45

REMOVED PARTS NOMENCLATURE - P/N - S/N	FINDINGS / COMMENTS	INSTALLED PARTS P/N - S/N	STT	QTY
NEGATIVE BUS-BAR P/N=01R3112210-01 S/N=000869	LOSS OF COATING COMMENTS : REPAIRABLE/ REPAIRED	P/N=01R3112210-01 S/N=000869	S	1
INSULATION BLANKET SEGMENT (POST SB21172) P/N=3117658-01 S/N=---	DAMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3117658-01 S/N=---	S	1
INSULATION BLANKET SEGMENT (POST SB21172) P/N=3117656-01 S/N=---	DAMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3117656-01 S/N=---	S	1
INSULATION BLANKET SEGMENT (POST SB21172) P/N=3117655-01 S/N=---	DAMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3117655-01 S/N=---	S	1
INSULATION BLANKET SEGMENT P/N=3108017-01 S/N=---	DAMAGED COMMENTS : REPAIRABLE/ REPAIRED	P/N=3108017-01 S/N=---	S	1
INSULATION BLANKET P/N=--- S/N=---	CRACKED COMMENTS : REPAIRABLE/ REPAIRED	P/N=--- S/N=---	S	1

STT : STATUS OF THE PART --- N = NEW , S = SERVICEABLE (EXCEPT SPECIFIED, REPLACED SERVICEABLE PARTS ARE TSO = 0)

NO : 073/DQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

DATE 06/04/2004
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LIFE LIMITED PARTS ON DELIVERY

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NOMENCLATURE - P/N - S/N		FCF	LIFE LIMIT	CSN OR TSN	REMAIN.	UNIT.
LP IMPELLER		1,00	15000	0	15000	CYCLES
INSTALLED PN=3039487	SN=A001EBLW					
HP IMPELLER		1,00	15000	5526	9474	CYCLES
INSTALLED PN=3043293	SN=A00136NN					
HP TURBINE FRONT COVER		1,15	15000	6355	8645	CYCLES
INSTALLED PN=3039640	SN=A0011489					
HP TURBINE REAR COVER (POST SB21085)		1,00	15000	0	15000	CYCLES
INSTALLED PN=3039639	SN=A001EWBC					
HP TURBINE DISK		1,00	15000	0	15000	CYCLES
INSTALLED PN=3041511	SN=A001EB4N					
HP TURBINE BLADES		1,00	14000	0	14000	CYCLES
INSTALLED PN=3115601-01						
INTERSTAGE AIR SEAL (POST SB21015)		1,25	15000	6908	8092	CYCLES
INSTALLED PN=3039172	SN=72B043					
LP TURBINE DISK		1,00	15000	0	15000	CYCLES
INSTALLED PN=3039412	SN=A001DX29					
FIRST-STAGE PT DISK		1,00	30000	14557	15443	CYCLES
INSTALLED PN=3038513	SN=A0000FE7					
SECOND-STAGE PT DISK		1,00	30000	14557	15443	CYCLES
INSTALLED PN=3033914	SN=A00010D1					

AUTHORIZED INSPECTOR :
DATE : le 06/04/2004

SECA
0925

(NC= NOT CONCERNED)

S.E.C.A DMOR335 / DMOS335

NO : 073/EQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

DATE 06/04/2004
TIME 14:41:32

LIST OF ACCESSORIES
AT DELIVERY

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NOMENCLATURE	INSTALLED	TSN	TSO	UNIT.
WIRING HARNESS ASSEMBLY	P/N=3116050-07 S/N=AA22705	0		HOURS
AUTOFEATHER CONTROL UNIT	P/N=3118091-01 S/N=MM1761 P/N VENDOR=30048-0000-18	9658		HOURS
ELECTRONIC ENGINE CONTROL	P/N=--- S/N=C94020021 P/N VENDOR=810800-1-003 L3/6			
IGNITION EXCITER	P/N=3039609 S/N=NN98203505 P/N VENDOR=9049400-1B	9658		HOURS
IGNITION EXCITER	P/N=3039609 S/N=NN98203506 P/N VENDOR=9049400-1B	9658		HOURS
BLEED VALVE	P/N=PART MISSING S/N=PART MISSING P/N VENDOR=PART MISSING			
FUEL PUMP	P/N=PART MISSING S/N=PART MISSING P/N VENDOR=PART MISSING			

{NC=NOT CONCERNED}

S.E.C.A DMOR335 / DMOS335

NO : 073/DQ/PI/04
NO : 4010243
TYPE : PW 127F
S/N : AV0063

DATE 06/04/2004
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LIST OF ACCESSORIES
AT DELIVERY

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NOMENCLATURE	INSTALLED	TSN	TSO	UNIT.
HYDROMECHANICAL FUEL CONTROL	P/N=PART MISSING S/N=PART MISSING P/N VENDOR=PART MISSING			
FUEL HEATER	P/N=3120075-02 S/N=WA20107	0		HOURS
FLOW DIVIDER AND DUMP VALVE	P/N=3118511-01 S/N=0157 P/N VENDOR=---	14348	0	HOURS
ONE FUEL MANIFOLD SET	P/N=--- S/N=--- P/N VENDOR=---		288	HOURS
FUEL COOLED OIL COOLER	P/N=PART MISSING S/N=PART MISSING P/N VENDOR=PART MISSING			
PROPELLER OVERSPEED GOVERNOR	P/N=PART MISSING S/N=PART MISSING P/N VENDOR=PART MISSING			
PROPELLER CONTROL HYDRAULIC PUMP	P/N=PART MISSING S/N=PART MISSING P/N VENDOR=PART MISSING			
NO.1 TORQUE MONITOR SENSOR	P/N=3116499-2 S/N=CH1226		0	HOURS

(NC=NOT CONCERNED)

NO : 073/DQ/PI/04
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LIST OF ACCESSORIES
AT DELIVERY

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NOMENCLATURE	INSTALLED	TSN	TSO	UNIT.
NO.2 TORQUE MONITOR SENSOR	P/N=3116499-02 S/N=CH1325			
NP PULSE PICKUP PROBE	P/N=3039242 S/N=CH14558		0	HOURS
T1.8 INLET AIR TEMPERATURE SENSOR	P/N=3034652 S/N=CH4056	9658	0	HOURS
NH1 PULSE PICKUP PROBE	P/N=3039242 S/N=CH19116	0		HOURS
NH2 PULSE PICKUP PROBE	P/N=3039242 S/N=CH19140	0		HOURS
NL PULSE PICKUP PROBE	P/N=3033509 S/N=CH6393		0	HOURS

AUTHORIZED INSPECTOR :
DATE : 6/04/2004

SECA
0925

(NC=NOT CONCERNED)

NO : 073/DQ/PI/04
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DETAIL OF WORKS PERFORMED
OVERHAUL OF TURBOMACHINE MODULE SN:AV0063
COMPLETE DISASSEMBLY, CLEANING, NDT, DETAIL PART INSPECTION,
ALL NECESSARY PARTS REPAIRED OR REPLACED, BALANCING,
****
REPAIR OF REDUCTION GEARBOX MODULE SN:AV0005
DISASSEMBLY, CLEANING, NDT, PART INSPECTION AS NECCESSARY,
ALL NECESSARY PARTS REPAIRED OR REPLACED,
****
ASSEMBLY, FINAL TEST RUN WITH RGB SN:AV0063
AND PRESERVATION
MODIFICATIONS EMBODIEMENT
****
ON-CONDITION MAINTENANCE PROGRAM OF PW-C PERFORMED I.A.W
MM:3037332 REV:29 TASK :05-20-00
BENCH TEST OF L.R.U PERFORMED

NO : 073/DQ/PI/04
WO : 4010243
TYPE : PW 127F
S/N : AV0063

DATE 06/04/2004
TIME 14.41.22

SUMMARY

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1-IDADRUNP01I - RUN COMPLETED, RC = 0

OFF

EADS SECA	PROCES VERBAL D'ESSAIS AU BANC (TEST SHEET) PW 100 Series Pré-SB 21633	PV : 72.99.85 INDICE : M DATE : 28/07/2003 PAGE : 1 / 1

DOCUMENT REFERENCE (Manual P.N.) : **OHM 303 7333 Rév 19 du 18/04/2003**

TYPE DE MOTEUR (Engine Type) : **PW127F**

N° GAZ GENERATOR (Gaz Generator SN) : AV0063

N° O.E. (W.O.) : 4010243

N° R.G.B (RGB SN) : AV0063

TYPE D'HUILE (Oil type) : BPTO 2380

DATE D'ESSAI (Test date) : 05/04/2004

Résultats corrigés à P. Baro (Corrected data at Baro Press.) : **29.92 In/Hg**

Résultats corrigés à T2 (Corrected data at T2) : **15** °C

CRITERES DE REFERENCE (Acceptance Criteria) : Overhaul T M

A4 NOZZLE : 8.36 **A5 NOZZLE** : 15.13 **A6 NOZZLE** : 34.69

PARAMETRE (parameter)	CRITERES D'ACCEPTATION (acceptance limits)		RESULTATS (corrected data)	UNITES (units)
	Mini	Maxi		
SHP / DEL RTH			2750	SHP
NH / RTH	32400	33100	32745	RPM
NL / RTH	26900	27700	27188	RPM
T6T / TH		715	690	°C
WF / DEL RTH		1333	1319	Lbs / Hr
NH / NL RATIO	1.182		1.204	

TRIM T° 6					
P/N	: ST3114-40		VALEUR	: 80.4	Ω
TORQUE TRIM					
EEC - Q1 (R1)	: 6260	EEC - Q2B (R3)	: 13800	EEC - Q2G(R4)	: 3830
AFU CL	: 32 24				
			BLEED ORIFICE P/N	:	

DATE DE STOCKAGE DU CIRCUIT CARBURANT (Preservation date) : 05/04/2004

TEMPS D'ESSAI (Test time) : 1.45 Hr.Mn

EXECUTANT (Test performer) : LUCE / CAYTAN

VISA DU CONTROLE (Quality Control) : EEC 1023

BUREAU TECHNIQUE SERVICE PW	EADS SECA SOGERMA SERVICES	D.G.T. 247 D	Identification N° ATA Process/Indice
			Page : 1 / 1

Révisé par : BOURGOIS	Visa :	Vérifié par : SALOMONE	Visa :	Date : 05/11/03

DOCUMENT GESTION TECHNIQUE

H.P.T. BLADES HISTORY CARD

MODEL: PW127 F	SERIAL: AV0063	TOTAL TIME SINCE NEW: 9658	TOTAL CYCLES SINCE NEW: 14557	MAINTENANCE MANUAL: 3037332 R30
DATE: 23-Mar-2004	WORK ORDER : 4010243	WORK: OVERHAUL		

	Part Number	Serial Number	Total Cycles	Remaining Cycles	Maximum Life	Remarks
1	3115601-01	HMH44862	0	14000	14000	
2	3115601-01	HMH59339	0	14000	14000	
3	3115601-01	HMH59386	0	14000	14000	
4	3115601-01	HMH59431	0	14000	14000	
5	3115601-01	HMH60238	0	14000	14000	
6	3115601-01	HMH60411	0	14000	14000	
7	3115601-01	HMH61442	0	14000	14000	
8	3115601-01	HMH61453	0	14000	14000	
9	3115601-01	HMH61553	0	14000	14000	
10	3115601-01	HMH61635	0	14000	14000	
11	3115601-01	HMH63314	0	14000	14000	
12	3115601-01	HMH63325	0	14000	14000	
13	3115601-01	HMH63327	0	14000	14000	
14	3115601-01	HMH63398	0	14000	14000	
15	3115601-01	HMH63505	0	14000	14000	
16	3115601-01	HMH63522	0	14000	14000	
17	3115601-01	HMH63553	0	14000	14000	
18	3115601-01	HMH63562	0	14000	14000	
19	3115601-01	HMH64136	0	14000	14000	
20	3115601-01	HMH64208	0	14000	14000	
21	3115601-01	HMH64224	0	14000	14000	
22	3115601-01	HMH64247	0	14000	14000	
23	3115601-01	HMH66098	0	14000	14000	
24	3115601-01	HMH66153	0	14000	14000	
25	3115601-01	HMH66163	0	14000	14000	
26	3115601-01	HMH66624	0	14000	14000	
27	3115601-01	HMH66627	0	14000	14000	
28	3115601-01	HMH68998	0	14000	14000	
29	3115601-01	HMH69032	0	14000	14000	
30	3115601-01	HMH70153	0	14000	14000	
31	3115601-01	HMH70417	0	14000	14000	
32	3115601-01	HMH70647	0	14000	14000	
33	3115601-01	HMH70652	0	14000	14000	
34	3115601-01	HMH71122	0	14000	14000	
35	3115601-01	HMH71163	0	14000	14000	
36	3115601-01	HMH83146	0	14000	14000	
37	3115601-01	HMH84434	0	14000	14000	
38	3115601-01	HMH85006	0	14000	14000	

BUREAU TECHNIQUE SERVICE PW	EADS SECA SOGERMA SERVICES	D.G.T. 286 D	Identification N° ATA Process/Indice
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Révisé par : BOURGOIS	Visa :	Vérifié par : SALOMONE	Visa :	Date : 05/11/03

DOCUMENT GESTION TECHNIQUE

L.P.T. BLADES HISTORY CARD

MODEL: PW127 F	SERIAL: AV0063	TOTAL TIME SINCE 9658	TOTAL CYCLES SINCE NEW: 14557	
DATE : 23 Mar 2004	WORK ORDER: 4010243	WORK: OVERHAUL		

	Part Number	Serial Number	T.T.S.N		Part Number	Serial Number	T.T.S.N
1	3118882-01	HM1L187	9509	28	3118882-01	HMH49423	0
2	3118882-01	HM14B830	9658	29	3118882-01	HMH49425	0
3	3118882-01	HM14B850	9658	30	3118882-01	HMH49430	0
4	3118882-01	HM14B892	9658	31	3118882-01	HMH49431	0
5	3118882-01	HM14C045	9658	32	3118882-01	HMH49434	0
6	3118882-01	HM14C133	9658	33	3118882-01	HMH49436	0
7	3118882-01	HM14C169	9658	34	3118882-01	HMH49681	0
8	3118882-01	HM14C186	9658	35	3118882-01	HMH49682	0
9	3118882-01	HM14C230	9658	36	3118882-01	HMH49690	0
10	3118882-01	HM14C244	9658	37	3118882-01	HMH49703	0
11	3118882-01	HM14C402	9658	38	3118882-01	HMH51754	0
12	3118882-01	HM14C699	9658	39	3118882-01	HMH53679	0
13	3118882-01	HM14C817	9658	40	3118882-01	HMH53680	0
14	3118882-01	HM14C862	9658	41	3118882-01	HMH53687	0
15	3118882-01	HM14C880	9658	42	3118882-01	HMH53700	0
16	3118882-01	HM14C901	9658	43	3118882-01	HMH53703	0
17	3118882-01	HM14C946	9658	44	3118882-01	HMH53704	0
18	3118882-01	HM14C967	9658	45	3118882-01	HMH53706	0
19	3118882-01	HMH49246	0	46	3118882-01	HMH53923	0
20	3118882-01	HMH49348	0	47	3118882-01	HMH53938	0
21	3118882-01	HMH49384	0				
22	3118882-01	HMH49394	0				
23	3118882-01	HMH49398	0				
24	3118882-01	HMH49400	0				
25	3118882-01	HMH49402	0				
26	3118882-01	HMH49405	0				
27	3118882-01	HMH49414	0				

DIRECTION DES OPERATIONS SERVICE METHODES DOCUMENTATION	EADS SECA SOGERMA SERVICES	PR 7200251 Sans	Identification N° ATA Process/Indice
		DGT 305	Page : 1 / 13

Révisé par : B.Allignol	Visa :	Vérifié par : J.P. SALOMONE	Visa :	Date :04/09/2003

PROTOCOLE

Document de référence : Maintenance Manual : 3037332_____Rev : 30_

ON CONDITION MAINTENANCE PROGRAM ELIGIBILITY

REQUIREMENTS FOR ENGINES IN SERVICE PW100 SERIES

CLIENT : TNA _____

S/N : AV0063 _____ **OE :** 4010243 _____

Nota : La signature de l'exécutant en vis-à-vis d'une opération atteste de l'exécution complète de la procédure de montage correspondante telle que décrite dans le manuel et les documents associés

Abréviations	Contrôle Final par Délégation de contrôle
ONC : Opérateur non certifié (en formation O.J.T) OC : Opérateur certifié DC : Délégation de contrôle	Tampon et date 6.04.2008 SECA 1961

PR	Identification
7200251	N° ATA
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DATE / NAME / OR DATE / STAMP

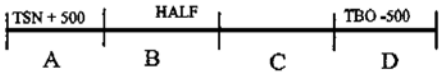
OPERATOR NOT CERTIFIED	OPERATOR CERTIFIED

TECHNICAL OFFICE INFORMATION

TSN	TSO	HALF TBO INTERVAL
9658	3715	4000

(TSN or TSO) – HALF TBO INTERVAL = - 285

ONC | SECA T D 1686 | OC



CONDITION "A" ☐

500 HOURS MAXIMUM SINCE NEW OR OVERHAUL: NO SPECIAL INSPECTION REQUIRED.

CONDITION "B" ■

SPECIAL INSPECTIONS AND CONTROL NECESSARY (CHECKS) FOR ANY ENGINES BETWEEN 500 HOURS AND HALF OF THE OVERHAUL LIFE.

CONDITION "C" ☐

SPECIAL INSPECTIONS AND CONTROL NECESSARY (CHECKS) FOR ANY ENGINES WHICH OVER HALF THE APPROVED ENGINE OVERHAUL LIFE A MINIMUM OF 500 HOURS REMAINING TILL APPROUVED ENGINE OVERHAUL LIFE.

CONDITION "D" ☐

SPECIAL INSPECTIONS AND CONTROL NECESSARY (CHECKS) FOR ANY ENGINES WHICH LESS THAN 500 HOURS REMAINING TO APPROUVED ENGINE OVERHAUL LIFE.

Cocher la case suivant la condition à exécuter.

PR	Identification
7200251	N° ATA
Sans	Process/Indice

DATE / NAME / OR DATE / STAMP

OPERATOR NOT CERTIFIED | **OPERATOR CERTIFIED**

CONDITION "B"

Special inspections and control necessary (checks) for any engines between 500 hours and half of the overhaul life .

Number of hours = 3715 Hours

(Inform by the technical office)

ONC | SECA T D 1686 OC

1. BOROSCOPE INSPECTION OF LOW PRESSURE (LP) IMPELLER
(Ref 72-00-00 Inspection/check)

(2) Inspection Through the Air Intake Duct

Observation : L.P. IMPELLER REPLACED O.V.H.
REMAINING TIME TOO LOW.

(3) Inspection Through the Rear Inlet Case

Observation :

(4) Inspection Through the Diffuser Exit Duct

ONC | 1005 OC

Observation :

2. CHIP ~~DETECTOR~~ COLLECTORS FUNCTIONAL CHECK
(Ref 72-01-50 Inspection/check)

(1) Functional Check

ONC | 1005 OC

PR 7200251 Sans — Identification N° ATA Process/Indice

DATE / NAME / OR DATE / STAMP

OPERATOR NOT CERTIFIED | OPERATOR CERTIFIED

3. OIL FILTER INSPECTION AND PATCH CHECK

(Ref 72-01-50 Inspection/check)

(1) Patch-making Procedure

Debris found : (YES) NO

ONC SECA 1005 OC

4. SPECTOGRAPHIC ANALYSIS OF ANY DEBRIS FOUND WHEN CARRYING OUT STEPS 2 AND 3

(Ref 72-01-50 Inspection/check)

Send of analyze: (YES) NO

ONC SECA 1005 OC

5. FUEL FILTERS INSPECT/CLEAN

(Ref 72-01-40 Inspection/check)

Debris found : YES (NO)

Cleanable filters : (YES) NO

Change of filters : (YES) NO

Filters Serviceable : YES (NO) OVH

ONC SECA 1005 OC

PR 7200251 Sans

Identification
N° ATA
Process/Indice

DATE / NAME / OR DATE / STAMP

OPERATOR NOT CERTIFIED	OPERATOR CERTIFIED

6. T.6 SYSTEM CHECK
(Ref 72-01-60 Inspection/check)

Connect test leads to stubs identified as A and B

Resistance value = ohms

Switch test leads to opposite studs to reverse polarity (lead installed to A, install on B , install on B and lead installed on B, install on A)

Resistance value = ohms

ONC | SECA 1961 OC

7. POWER ASSURANCE OR TEST CELL
(Ref 72-00-00 Adjustment/Test)
Engine is followed by E.C.T.M (Engine Condition Trend Monitoring)

Value ITT/T6 690 °C
(Inform by the technical office)

ONC | SECA T D 1025 A OC

The engine is not followed by E.C.T.M (Engine Condition Trend Monitoring)

Value ITT/T6 °C
(Inform by the technical office)

ONC | SECA 1961 OC

8. ENGINE EXTERNAL INSPECTION CORENING

Corrosion on the Reduction gearbox

Corrosion found : YES NO

ONC | SECA 1005 OC

Corrosion on the Front Inlet case

Corrosion found : YES NO

ONC | SECA 1005 OC

Corrosion on the Rear Inlet case

Corrosion found : YES NO

ONC | SECA 1005 OC

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			OPERATOR NOT CERTIFIED	OPERATOR CERTIFIED
The condition of the oil-to-fuel heater coating				
Serviceable :	YES	NO	ONC	OC SECA 1005 — SEND TO PWC FOR INVESTIGATIO
The Fuel Lines				
Serviceable :	YES	NO	ONC	OC SECA 1005
The Oil Lines				
Serviceable :	YES	NO	ONC	OC SECA 1005
LP Diffuser ducts				
Serviceable :	YES	NO	ONC	OC SECA 1005
The Bleed Air lines				
Serviceable :	YES	NO	ONC	OC SECA 1005
The condition and retention of all accessories including the EEC, TSCU, Ignition and Wiring Harness etc.				
Observation :				
- WIRING HARNESS. SCRAPPED				
- 1 IGNITION CABLE. SCRAPPED.				
Serviceable :	YES	NO	ONC	OC SECA 1005

PR 7200251 Sans — Identification N° ATA Process/Indice

DATE / NAME / OR DATE / STAMP

OPERATOR NOT CERTIFIED | OPERATOR CERTIFIED

9. DETAILED INSPECTION OF FUEL NOZZLES
(Ref 72-01-40 Inspection/check)

Nota : Inspection not required if fuel nozzles have been changed or inspected within the previous 1000 flight hours.

N°	P/N	S/N	Serviceable		
1	3045667	F2816	YES	NO	
2	3038105	618A2476	YES	NO	After repair
3	3038105	000A078	YES	NO	
4	3045667	F2825	YES	NO	
5	3045778-01	A13162	YES	NO	
6	3045778-01	A15922	YES	NO	
7	3045668	A12415	YES	NO	
8	3045786-01	NPK0460	YES	NO	
9	3045668	A13786	YES	NO	
10	3045668	A7316	YES	NO	
11	3045668	A9328	YES	NO	
12	3045767	F1684	YES	NO	
13	3045668	A9957	YES	NO	ONC
14	3045772	1NM00096	YES	NO	SECA 1005 OC

PR 7200251 Sans — Identification N° ATA Process/Indice

DATE / NAME / OR DATE / STAMP

OPERATOR NOT CERTIFIED | OPERATOR CERTIFIED

10. INSPECTION OF IGNITERS
(Ref 72-01-20 Inspection/check)

N°	P/N	S/N	Serviceable			
1			YES	NO	ONC	SECA 1005 OC
2			YES	NO		

CONDITION "C"

Special inspections and control necessary (checks) for any engines which over half the approved engine overhaul life a minimum of 500 hours remaining till approuved engine overhaul life..

Number of hours = Hours

(Inform by the technical office)

SECA T D 2050 ONC OC

1. BOROSCOPE INSPECTION OF LOW PRESSURE (LP) IMPELLER

(Ref 72-00-00 Inspection/check)

(2) Inspection Through the Air Intake Duct

Observation :

(3) Inspection Through the Rear Inlet Case

Observation :

(4) Inspection Through the Diffuser Exit Duct

Observation :

ONC OC

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DATE / NAME / OR DATE / STAMP

OPERATOR NOT CERTIFIED — OPERATOR CERTIFIED

2. CHIP DETECTOR FUNCTIONAL CHECK

(Ref 72-01-50 Inspection/check)

(1) Functional Check — ONC | OC

3. OIL FILTER INSPECTION AND PATCH CHECK

(Ref 72-01-50 Inspection/check)

(1) Patch-making Procedure

Debris found : YES NO — ONC | OC

4. SPECTOGRAPHIC ANALYSIS OF ANY DEBRIS FOUND WHEN CARRYING OUT STEPS 2 AND 3

(Ref 72-01-50 Inspection/check)

Send of analyze: YES NO — ONC | OC

5. FUEL FILTERS INSPECT/CLEAN

(Ref 72-01-40 Inspection/check)

Debris found : YES NO

Cleanable filters : YES NO

Change of filters : YES NO

Filters Serviceable : YES NO — ONC | OC

PR 7200251 Sans — Identification N° ATA Process/Indice

DATE / NAME / OR DATE / STAMP

	OPERATOR NOT CERTIFIED	OPERATOR CERTIFIED
6. .6 SYSTEM CHECK (Ref 72-01-60 Inspection/check)		
Connect test leads to stubs identified as A and B Resistance value = ohms Switch test leads to opposite studs to reverse polarity (lead installed to A, install on B , install on B and lead installed on B, install on A) Resistance value = ohms		ONC / OC
7. POWER ASSURANCE OR TEST CELL (Ref 72-00-00 Adjustment/Test) Engine is followed by E.C.T.M (Engine Condition Trend Monitoring) Value ITT/T6 °C (Inform by the technical office)		ONC / OC
The engine is not followed by E.C.T.M (Engine Condition Trend Monitoring) Value ITT/T6 °C (Inform by the technical office)		ONC / OC
8. ENGINE EXTERNAL INSPECTION CORENING Corrosion on the Reduction gearbox Corrosion found : YES NO		ONC / OC
Corrosion on the Front Inlet case Corrosion found : YES NO		ONC / OC
Corrosion on the Rear Inlet case Corrosion found : YES NO		ONC / OC

SECA T D 2050

PR
7200251
Sans

Identification
N° ATA
Process/Indice

DATE / NAME / OR DATE / STAMP

OPERATOR NOT CERTIFIED **OPERATOR CERTIFIED**

9. DETAILED INSPECTION OF FUEL NOZZLES

(Ref 72-01-40 Inspection/check)

Nota : Inspection not required if fuel nozzles have been changed or inspected within the previous 1000 flight hours.

N°	P/N	S/N	Serviceable	
1			YES	NO
2			YES	NO
3			YES	NO
4			YES	NO
5			YES	NO
6			YES	NO
7			YES	NO
8			YES	NO
9			YES	NO
10			YES	NO
11			YES	NO
12			YES	NO
13			YES	NO
14			YES	NO

ONC | OC

PR	Identification
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Sans	Process/Indice

DATE / NAME / OR DATE / STAMP

OPERATOR NOT CERTIFIED **OPERATOR CERTIFIED**

10. INSPECTION OF IGNITERS

(Ref 72-01-20 Inspection/check)

N°	P/N	S/N	Serviceable			
1			YES	NO		
2			YES	NO	ONC	OC

11. HOT SECTION INSPECTION (HSI)

(Ref 72-03-00 Inspection/check)

Nota : Hot Section Inspection unless it can be demonstrated that ECTM (Engine Condition Trend monitoring) has been accurately carried out and no unacceptable performance deterioration has been observed or the time since a Hot Section Inspection was carried out is less than half the approved engine overhaul life..

12. BOROSCOPE INSPECTION OF THE ACCESSORY GEARBOX

A visual or borescope check of the towershaft bevel gears

ONC	OC

Observation :

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DATE / NAME / OR DATE / STAMP

OPERATOR NOT CERTIFIED | OPERATOR CERTIFIED

13. BOROSCOPE INSPECTION OF THE HIGH PRESSURE TURBINE VANES, BLADES AND COMBUSTION CHAMBER

(Ref 72-00-00 Inspection/check)

Borescope check of the high pressure turbine vanes — ONC | OC

Observation :

Borescope check of blades. — ONC | OC

Observation :

Borescope check of the combustion chamber. — ONC | OC

Observation :

N C

CONDITION "D"

Special inspections and control necessary (checks) for any engines which less than 500 hours remaining to approved engine overhaul life.

Engine is not eligible for on-condition program until completion of overhaul. — ONC | OC

Number of hours = Hours

(Inform by the technical office)

SECA T D 2050

國家圖書館出版品預行編目資料

飛航事故調查報告 : 中華民國 92 年 12 月 25 日,復興航空公司 GE006 班機, ATR72-212A 型機,國籍標誌及登記號碼 B-22805, 於松山機場落地滾行時發動機失火／行政院飛航安全委員會編著. -- 初版. -- 臺北市 : 飛安委員會, 民 94
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飛航事故調查報告

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