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## APU fire on a Boeing 737-300 landing at Colorado Springs, April 16, 1997

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**Micro-summary:** This Boeing 737-300 had an APU fire on short final.

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**Event Date:** 1997-04-16 at 2050 MDT


**Investigative Body:** National Transportation Safety Board (NTSB), USA

**Investigative Body's Web Site:** <http://www.nts.gov/>

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1. Accident reports can be and sometimes are revised. Be sure to consult the investigative agency for the latest version before basing anything significant on content (e.g., thesis, research, etc).
  2. Readers are advised that each report is a glimpse of events at specific points in time. While broad themes permeate the causal events leading up to crashes, and we can learn from those, the specific regulatory and technological environments can and do change. ***Your company's flight operations manual is the final authority as to the safe operation of your aircraft!***
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		NTSB ID: FTW97IA160		Aircraft Registration Number: N962WP	
		Occurrence Date: 04/16/1997		Most Critical Injury: None	
		Occurrence Type: Incident		Investigated By: NTSB	
Location/Time					
Nearest City/Place COLORADO SPGS		State CO	Zip Code 80906	Local Time 2050	Time Zone MDT
Airport Proximity: On Airport		Distance From Landing Facility:		Direction From Airport:	
Aircraft Information Summary					
Aircraft Manufacturer Boeing		Model/Series 737-300		Type of Aircraft Airplane	
Sightseeing Flight: No			Air Medical Transport Flight: No		
Narrative					
<p>Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:</p> <p>On April 16, 1997, at 2050 mountain daylight time, a Boeing 737-300, N962WP, operating as Western Pacific Airlines flight 169 from Houston, Texas, to Colorado Springs, Colorado, had an auxiliary power unit (APU) fire while on final approach to land at Colorado Springs. There was no damage to the aircraft and no injuries to the 5 crew or 120 passengers. The flight was operating under 14 CFR Part 121 when the incident occurred and an IFR flight plan was filed.</p> <p>According to the pilot in command, the APU fire warning activated when on final approach approximately 200 feet above ground level. The crew performed the appropriate procedures and shortly after landing, the fire warning light extinguished. They had the fire department inspect the aircraft and follow the aircraft as it taxied to the gate where the passengers were deplaned in normal fashion.</p> <p>Inspection revealed there had been a fire in the APU which was contained in the compartment. Visible damage was limited to the exhaust gas temperature (EGT) wiring harness. The wiring harness was replaced and the APU was test run at the facilities of Triumph Air Repair, Phoenix, Arizona. In attendance were the NTSB Investigator-in-Charge, representatives of Western Pacific Airlines, Boeing Commercial Airplane Company, Triumph Air Repair, FAA, and Allied Signal, who manufactured the APU.</p> <p>Documents provided by Western Pacific Airlines provided information that the APU (Allied Signal Series 85 P/N P40108) had a total time of 25,976 hours and 351 hours since overhaul. According to maintenance records, the APU had consumed 3 quarts of oil in the preceding 167 hours of service and 2 quarts in the preceding 57 hours. The maintenance manual does not specify maximum oil consumption limits.</p> <p>The APU was visually inspected and boroscoped to determine its condition. It was then mounted in a test cell and a normal start sequence was initiated. The start proceeded in a normal fashion until the APU accelerated to approximately 35% revolutions per minute (rpm) when the start attempt was aborted due to high turbine bearing scavenge pressure and smoke in the exhaust. The normal turbine bearing scavenge pressure is a vacuum of 0 to minus 25 psi and the recorded pressure was in excess of 15 psi. Following this attempted start, the APU was removed from the test cell for inspection.</p> <p>Visual inspection provided evidence of turbine oil on all surfaces of the exhaust assembly.</p> <p>Disassembly inspection provided evidence that the carbon element of the seal assembly (P/N 693616) was scored around its circumference. Oil residue coking at the aft face of the seal provided evidence that this was the source of the oil leak which ignited in the exhaust containment area.</p> <p>The seals are on each side of an oil cavity that is scavenged by the oil pump. Witness marks provided evidence that the cavity had become pressurized from the second impeller seal surface</p>					
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National Transportation Safety Board

## FACTUAL REPORT

AVIATION

NTSB ID: FTW97IA160

Occurrence Date: 04/16/1997

Occurrence Type: Incident

## Narrative (Continued)


forcing oil across the aft turbine seal into the combustion gas path. Examination determined that the cause of the oil leak into the exhaust was from leaking oil seals P/N 3609143-4 and P/N 693616-1.


According to Triumph Air Repair, during the past year they have experienced several rejections of new seal assemblies. The seals were rejected because they would not hold sufficient vacuum during assembly or final testing.

According to Allied Signal, turbine seal leakage is a normal wear-out item on 85 series APUs. Leakage of oil in sufficient quantities to result in burning of oil outside of the APU can generally be caused only by leakage of compressed air past the forward (compressor side) turbine cavity seal. The subsequent pressurization of the turbine cavity forces oil past the aft turbine seal into the hot gas stream.

Allied Signal technicians said that seal leakage was a common problem in the 1960s, 1970s, and into the 1980s. In 1988, Allied Signal incorporated changes to both the turbine seal and seal running surface that eliminated such leakage. The seal running surface, which is applied to the shaft of the second-stage impeller, was changed from a Metco spray to Tungsten carbide. All second stage impellers processed by Allied Signal since 1988 have had the Tungsten carbide coating; however, the older style of coating was also left in the repair manual due to the difficulty for some operators to obtain the Tungsten carbide treatment.

The Western Pacific APU which had been overhauled by Triumph Air Repair used the Metco spray coating in compliance with the repair manual.

 <b>National Transportation Safety Board</b> <b>FACTUAL REPORT</b> <b>AVIATION</b>		NTSB ID: FTW97IA160			
		Occurrence Date: 04/16/1997			
		Occurrence Type: Incident			
<b>Landing Facility/Approach Information</b>					
Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
COLORADO SPRINGS	COS	6184 Ft. MSL	17L	13500	150
Runway Surface Type: Concrete					
Runway Surface Condition: Dry					
Type Instrument Approach: Visual					
VFR Approach/Landing: Full Stop; Straight-in					
<b>Aircraft Information</b>					
Aircraft Manufacturer		Model/Series		Serial Number	
Boeing		737-300		23748	
Airworthiness Certificate(s): Transport					
Landing Gear Type: Retractable - Tricycle					
Homebuilt Aircraft? No	Number of Seats: 145	Certified Max Gross Wt.	138500 LBS	Number of Engines: 2	
Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:		
Turbo Fan	GE	CFM56-3-B2	22000 LBS		
- Aircraft Inspection Information					
Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time		
Continuous Airworthiness	04/1997	14 Hours	25952 Hours		
- Emergency Locator Transmitter (ELT) Information					
ELT Installed?	ELT Operated?	ELT Aided in Locating Accident Site?			
<b>Owner/Operator Information</b>					
Registered Aircraft Owner		Street Address			
WILMINGTON TRUST COMPANY		1105 N. MARKET STREET			
		City	State	Zip Code	
		WILMINGTON	DE	19890	
Operator of Aircraft		Street Address			
WESTERN PACIFIC		2864 S, CIRCLE DR., SUITE1100			
		City	State	Zip Code	
		COLO SPGS	CO	80906	
Operator Does Business As:			Operator Designator Code: W8PA		
- Type of U.S. Certificate(s) Held:					
Air Carrier Operating Certificate(s): Flag Carrier/Domestic					
Operating Certificate:			Operator Certificate:		
Regulation Flight Conducted Under: Part 121: Air Carrier					
Type of Flight Operation Conducted: Scheduled; Domestic; Passenger Only					

 <p><b>National Transportation Safety Board</b> <b>FACTUAL REPORT</b> <b>AVIATION</b></p>	NTSB ID: FTW971A160
	Occurrence Date: 04/16/1997
	Occurrence Type: Incident

**First Pilot Information**

Name On File	City On File	State On File	Date of Birth On File	Age 53
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Sex: U	Seat Occupied: Left	Principal Profession: Civilian Pilot	Certificate Number: On File
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Certificate(s): Airline Transport

Airplane Rating(s): Multi-engine Land

Rotorcraft/Glider/LTA: None

Instrument Rating(s): Airplane

Instructor Rating(s): None

Type Rating/Endorsement for Accident/Incident Aircraft? Yes	Current Biennial Flight Review?
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Medical Cert.: Class 1	Medical Cert. Status: Valid Medical--w/ waivers/lim.	Date of Last Medical Exam: 04/1997
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- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Multi-Engine	Night	Instrument		Rotorcraft	Glider	Lighter Than Air
						Actual	Simulated			
Total Time	12018	4322	1769	10249	1784	1250	269			
Pilot In Command(PIC)	9769	2793	1673	8139	1600	996	269			
Instructor										
Last 90 Days	155	155		155	33	3	4			
Last 30 Days	91	91		91	26	1				
Last 24 Hours	6	6		6	5					

Seatbelt Used? Yes	Shoulder Harness Used? Yes	Toxicology Performed? No	Second Pilot? Yes
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**Flight Plan/Itinerary**

Type of Flight Plan Filed: IFR

Departure Point HOUSTON	State TX	Airport Identifier IAH	Departure Time 1940	Time Zone CDT
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Destination Same as Accident/Incident Location	State	Airport Identifier COS	
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Type of Clearance: IFR

Type of Airspace: Class B

**Weather Information**

Source of Briefing:  
Company; National Weather Service

Method of Briefing:

 <p><b>National Transportation Safety Board</b> <b>FACTUAL REPORT</b> <b>AVIATION</b></p>	NTSB ID: FTW971A160
	Occurrence Date: 04/16/1997
	Occurrence Type: Incident

<b>Weather Information</b>					
WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
COS	2050	MDT	6184 Ft. MSL	1 NM	170 Deg. Mag.
Sky/Lowest Cloud Condition: Clear			0 Ft. AGL	Condition of Light: Night/Dark	
Lowest Ceiling: None		0 Ft. AGL	Visibility: 10	SM	Altimeter: 30.00 "Hg
Temperature: 11 °C	Dew Point: -4 °C	Wind Direction: 160		Density Altitude: 7500 Ft.	
Wind Speed: 8	Gusts:	Weather Conditions at Accident Site: Visual Conditions			
Visibility (RVR): 0 Ft.	Visibility (RVV) 0	SM	Intensity of Precipitation: Unknown		
Restrictions to Visibility: None					
Type of Precipitation: None					

<b>Accident Information</b>		
Aircraft Damage: None	Aircraft Fire: In-flight	Aircraft Explosion: None

Classification: U.S. Registered/U.S. Soil					
- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot				1	1
Second Pilot				1	1
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants				3	3
Other Crew					
Passengers				120	120
- TOTAL ABOARD -				125	125
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	125	125

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National Transportation Safety Board

**FACTUAL REPORT**

**AVIATION**



NTSB ID: FTW97IA160

Occurrence Date: 04/16/1997

Occurrence Type: Incident

Administrative Information

Investigator-In-Charge (IIC)

NORMAN F. WIEMEYER

Additional Persons Participating in This Accident/Incident Investigation:

RON NORTON  
FAA FSDO  
DENVER, CO 80249