Aviation Investigation Final Report

Location:	LEXINGTON, Kentucky	**Incident Number:**	NYC00IA159
Date & Time:	June 9, 2000, 14:00 Local	**Registration:**	N914AE
Aircraft:	British Aerospace BAE JETSTREAM 3201	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	13 None
Flight Conducted Under:	Part 121: Air carrier - Scheduled		

Analysis

While on approach to airport, the flightcrew experienced a total failure of the left engine, followed by a fire in the left engine. The flightcrew secured the engine, extinguished the fire, and made and uneventful landing. Review of the failed engine revealed that the bull gear had separated into several pieced. Metallurgical examination of the bull gear teeth root revealed beachmarks, consistent with fatigue. Further examination revealed non-uniform wear of the bull gear teeth and high speed pinion gearshaft teeth. The non-uniform wear was consistent of a misalignment between the bull gear and high speed pinion shaft.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: A misalignment between the bull gear and high speed pinion gearshaft, which resulted in fatigue and a subsequent failure of the bull gear.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: DESCENT

Findings
1. (C) REDUCTION GEAR ASSY,REDUCTION GEAR - OTHER

2. REDUCTION GEAR ASSY,REDUCTION GEAR - FATIGUE
3. REDUCTION GEAR ASSY,REDUCTION GEAR - FAILURE,TOTAL

Factual Information

On June 9, 2000, about 1400 Eastern Daylight Time, a British Aerospace BAE Jetstream 3201, N914AE, sustained minor damage during a descent to Blue Grass Airport (LEX), Lexington, Kentucky. The airplane was operated by CCAir doing business as US Airways Express, as flight 5224. The 2 pilots and 11 passengers were not injured. Visual meteorological conditions prevailed for the flight that originated from Charlotte/Douglas International Airport, Charlotte, North Carolina. An instrument flight rules flight plan was filed for the air carrier flight conducted under 14 CFR part 121.

According to the captain, the airplane was about 20 miles south of LEX, descending from 11,000 feet to 6,000 feet. During the descent, about 10,000 feet, the fire warning system activated for the left engine, and the flightcrew experienced a severe left yaw. The captain discharged one fire extinguisher, and secured the left engine.

The flight proceeded to LEX and made an uneventful landing. Examination of the left engine by a Federal Aviation Administration (FAA) inspector revealed two "fist size" holes in the accessory case.

The engine, a Honeywell TPE 331-12UHR-702H, was examined by a Powerplants Group, headed by a Safety Board Aerospace Engineer. Representatives from the airplane manufacturer, engine manufacturer, and FAA, participated in the group.

According to the Powerplants Group Factual Report, there were "five exit holes" in the reduction gearbox housing. Examination of the bull gear (PN 3107161-1, SN 98P27305), also known as the splined spur gearshaft, revealed that approximately 1/3 of the outer rim had separated from the gear. The outer rim had fractured into several pieces, five of which were recovered.

The pieces were examined at the Honeywell Material's Laboratory under the supervision of a FAA inspector. The examination revealed beachmark fracture surfaces near the gear teeth root, consistent with fatigue. Additionally, non-uniform wear was observed on the aft portion of the gear teeth face, and the aft portion of the high speed pinion gearshaft teeth. The non-uniform wear was consistent with a misalignment between the bull gear and the high speed pinion gearshaft.

Since the most recent bull gear configuration, there have been eight reported TPE331-12 engine failures involving bull gear PN 3107161-1. After the incident, on November 6, 2000, Honeywell issued three service bulletins. The service bulletins instructed operators to replace the existing bull gears with a newer production model. Operators were also instructed to replace the high speed pinion gear shaft, and provided information to improve inspections of

the gears within the reduction gearbox.

Prior to this incident, Honeywell Service Bulletin SB TPE331-12UHR-702H recommended a spectrometric oil analysis program (SOAP) inspection every 450 hours since new or after an oil change, and then every subsequent 205 hours. The inspection was intended to detect small metal particles in oil, indicative of an impending failure.

Although this particular engine had a SOAP inspection on June 6, 2000, Honeywell issued another service bulletin to reduce the interval between SOAP inspections from 450 hours to 50 hours. The change was made in an attempt to increase the probability of identifying impending bull gear failures.

Pilot Information

Certificate:	Airline transport	**Age:**	39,Male
Airplane Rating(s):	Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	February 18, 2000
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	5000 hours (Total, all aircraft), 1000 hours (Total, this make and model), 3000 hours (Pilot In Command, all aircraft), 290 hours (Last 90 days, all aircraft), 85 hours (Last 30 days, all aircraft), 15 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	British Aerospace	**Registration:**	N914AE
Model/Series:	BAE JETSTREAM 3201 BAE JETSTR	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	914
Landing Gear Type:	Retractable - Tricycle	**Seats:**	21
Date/Type of Last Inspection:	June 2, 2000 Continuous airworthiness	**Certified Max Gross Wt.:**	16204 lbs
Time Since Last Inspection:	11 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	13171 Hrs	**Engine Manufacturer:**	Honeywell
ELT:	Installed, not activated	**Engine Model/Series:**	TPE33112UHR
Registered Owner:	CCAIR	**Rated Power:**	1020 Horsepower
Operator:		**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:	US AIRWAYS EXPRESS	**Operator Designator Code:**	CDL

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	LEX ,979 ft msl	**Distance from Accident Site:**	
Observation Time:	13:54 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	11 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	220°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	31°C / 15°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	CHARLOTTE , NC (CLT)	**Type of Flight Plan Filed:**	IFR
Destination:	(LEX)	**Type of Clearance:**	IFR
Departure Time:	12:30 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	BLUE GRASS AIRPORT LEX	**Runway Surface Type:**	Asphalt
Airport Elevation:	979 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	22	**IFR Approach:**	None
Runway Length/Width:	7003 ft / 150 ft	**VFR Approach/Landing:**	Straight-in

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Minor
Passenger Injuries:	11 None	**Aircraft Fire:**	In-flight
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	13 None	**Latitude, Longitude:**	38.069896,-84.58052(est)

Administrative Information

Investigator In Charge (IIC):	Gretz, Robert
Additional Participating Persons:	JEFF JENNINGS; LOUISVILLE , KY PETER BAKER; PHOENIX , AZ DICK CALLAHAN; HERNDON , VA
Original Publish Date:	May 8, 2001
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this incident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=49402