# NATIONAL TRANSPORTATION SAFETY BOARD South Central Region Office Arlington, Texas

#### September 26, 2007<sup>1</sup>

# MAINTENANCE RECORDS GROUP CHAIRMAN'S FACTUAL REPORT

#### **DFW05MA230**

# A. <u>ACCIDENT</u>

Location: 24 miles southeast of Sabine Pass, Texas, Gulf of Mexico (GOM)

Date: September 6, 2005

Time: 1605 Central Daylight Time (CDT)

Aircraft: Sikorsky S-76A

### B. <u>MAINTENANCE RECORDS GROUP</u>

Chairperson:	Frank McGill
	National Transportation Safety Board
	Arlington, Texas

- Member: Brian Gallagher Federal Aviation Administration Houston, Texas
- Member: Michael A. Weber Rolls-Royce Indianapolis, Indiana
- Member: Albert Tatyrek Houston Helicopter Houston, Texas

### C. <u>SUMMARY</u>

On September 6, 2005, at approximately 1650 Central Daylight Time (CDT), a Sikorsky S-76A, N90421, owned by Houston Helicopters, Inc., crashed into the Gulf of Mexico (GOM) approximately 24 miles southeast of Sabine Pass, Texas. Both pilots and 10 passengers were able to egress before the helicopter submerged. Seven passengers sustained minor injuries and three passengers and both crewmembers sustained serious injuries. Visual meteorological conditions prevailed for the 14 Code of Federal Regulations

<sup>&</sup>lt;sup>1</sup> Original report was finished December 7, 2005. Updated information was added and the report was dated August 22, 2007. A technical review was held and the time since new for engine number 2 was updated to reflect information that Houston Helicopter provided, so the date for the final report is September 26, 2007.

(CFR) part 135 on-demand air taxi flight. The flight departed from a recently installed offshore platform "Bob Keller", located approximately 100 miles southeast of Sabine Pass, within the High Island-A 346 (HI-A 346) GOM grid. The reported departure was approximately 1545 CDT and the intended destination was Sabine Pass.

On September 10, 2005 the Maintenance Records Group met at the Houston Helicopters headquarters located in its maintenance hanger in Pearland, Texas to begin the field investigation of the accident. The Maintenance Records Group completed the field examination of the records on September 13, 2005.

# D. **DETAILS OF THE INVESTIGATION**

	Engine Position 1 (Left Side)	Engine Position 2 (Right Side)
Serial Number (SN)	CAE 890215 S	CAE 895539 S
Time Since New (TSN)	7017.2 hours	3937.4 hours
Date of Installation on	April 18, 2003	January 22, 1999
N90421		
Time Since Installation	585.6	1603.4
(TSI)		

### 1. ENGINES: ROLLS ROYCE ALLISON 250-C30S

### ENGINE NUMBER 1(Left side) and COMPONENTS

Component	P/N	S/N	Date installed,	Time Since	Total Time
			Time at Install	Overhaul(TSO)	(TT)
			(hours)	(hours)	(hours)
Model 250-C30	23005290	CAE890215 S	April 18, 2003,	585.6	7602.8
			7017.2		
Gearbox	23005652	CAG 90498	April 18, 2003,	5042.0	5042.0
			4558		
Compressor	23052270	CAC 90500	April 18, 2003,	873.2	5004.2
			4418.6		
Impeller	23030976	LP93583	April 18, 2003,	2863.2	2863.2
			2277.6		
Turbine	23031925	CAT 90176	April 18, 2003,	862.1	7095.1
			6509.5		
1 <sup>st</sup> stage wheel	23053299	X 512151	April 18, 2003,	861.2	861.2
			6741.6		
2 <sup>nd</sup> stage wheel	23032280	X 503775	April 18, 2003,	861.2	861.2
			275.6		
3 <sup>rd</sup> stage wheel	6898663	HX 69386	April 18, 2003,	2839.2	2839.2
			4253.6		
4 <sup>th</sup> stage wheel	6892764	HX 56182	April 18, 2003,	2839.2	2839.2
			2253.6		

PT Governor	23007874	23273	July 14, 2003, UNK	500.2	500.2
Fuel Control	23059932	331739	July 14, 2003, UNK	959.6	959.6
Fuel Pump	6896810	T-0342	July 14, 2003, UNK	500.2	500.2
Fuel Nozzle	6899001	AG-55422	July 14, 2003, 1434.0	1934.2.3	1934.2
Bleed Valve	23005366	FF 34558	January 14, 2003, 1434.0	1934.2	1934.2

### COMPONENT REMOVAL REASON PRIOR TO LAST INSTALLATION

Gearbox: December 19, 2002, time: 4,458.7 hours, reason for removal: complied with (C/W) 3,500 hour inspection: changed number 3 and 4 bearing plus numerous airworthiness directive (AD) compliance.

Turbine: February 11, 2002, time 6,233.9 hours, reason for removal: turbine overhaul.

Compressor: January 11, 2002, time 4,143.0 hours, reason for removal: compressor repair due to compressor stalling.

Power Transfer Governor: November 16, 2001, TSO: 0.0 hours, reason for removal: overhaul.

Fuel Pump: February 13, 1992, TSO 0.0 hours, reason for removal: overhaul.

Fuel Control Unit: January 24, 1997, TSO: 0.0 hours, reason for removal: UNK.

Fuel Nozzle: December 19, 1997, TSO: 0.0 hours, reason for removal: UNK.

Bleed Valve: December 5, 2001, TSO: 701.7 hours, TT: UNK, reason for removal: conversion.

<u>Engine CAE – 890215 S</u> was manufactured on September 28, 1979 and was shipped to Airwork service division removed in October 20, 1980 because of the lease agreement (engine TT: 458.9 hours).

Engine installed in aircraft S/N: 760032 by Airwork on July 18, 1981, TT: 458.9 hours.

Engine was again removed on September 28, 1981 at Total Time 551.3 hours due to a termination of lease

On October 26, 1981 engine was installed on aircraft S/N: 760098 by keystone. On same day engine was removed due to low power. TT: 551.3

On April 16, 1982 Atlantic AVN installed engine on aircraft S/N 760074, engine was again removed on the same day for metal contamination.

On July 12, 1982, engine was installed at Dome Petroleum on aircraft S/N 760039, engine TT: 551.3 hours.

On July 7, 1983, engine TT: 1496.5 hours, engine was removed due to termination of lease.

On November 1, 1983, engine was overhauled by SAL, engine TT: 1496.5 hours.

On November 8, 1983. engine was reinstalled on aircraft S/N 760039, engine TSO: 0.0 hours, and engine TT: 1496.5 hours.

On November 28, 1984, engine was removed due to a compressor stall, TSO: 635.2 hours and engine TT: 2131.7 hours.

On April 9, 1985, engine was installed on aircraft S/N: 760039, which was owned by Dome Petroleum, TT: 2131.7 hours.

On November 9, 1987, engine TT: 3296.4 hours, engine was removed due to metal in oil.

On January 8, 1988, engine was installed on aircraft S/N: 760041 by Houston Helicopters, TT: 3296.4 hours, TSO: 1164.7 hours.

On August 24, 1989, helicopter TT: 4195.5 hours, for "HHI Conversion for N90421", TSO: 2063.8 hours, engine was installed on N90421, aircraft TT: 6448.2 hours and engine TT: 4195.5 hours.

On November 22, 1991, engine was removed for compressor inspection, engine TT: 5187.7 hours.

On July 18, 1994, Houston Helicopters reinstalled engine on N90421, aircraft TT: 7723.2 hours, engine TT: 5187.7 hours.

On March 10, 1997, engine was removed to comply with service bulletin CEB-72-3176, engine TT: 5582.8 hours.

On August 2, 1997, engine was installed on N5009M, Engine TT: 5582.8 hours.

On December 2, 2001, engine was removed for unknown reasons, engine TT: 6741.6 hours.

On February 28, 2002, engine was installed on N90421, TT: 6741.6 hours.

On December 21, 2002, Engine Gear box was replaced by Houston Helicopters, engine TT: 6906.3 hours.

On April 15, 2003, engine was removed due to low oil pressure, TT: 7017.2 hours.

On April 18, 2003, engine was again installed on N90421, aircraft TT: 10,076.2 hours, engine TT: 7017.2 hours.

# ENGINE NUMBER 2 (Right side) and COMPONENTS

Component	P/N	S/N	Date installed, Time at Install (hours)	TSO (hours)	TT (hours)
Model 250-C30	23005280	CAE 895539 S	July 2, 2004, 3598.6	3929.4	3929.4
Gearbox	23005652	CAG 90220	July 2, 2004, 7534.9	5733.8	7865.7
Compressor	2305163	CAC 91583	July 23, 1998, 1995.2	1934.2	3929.4
Impeller	23030976	LP- 69941	January 22, 1999, 1995.2	3929.4	3929.4
Turbine	23035128	CAT- 97823	July 23, 1998, 1995.2	1934.2	3929.4
1 <sup>st</sup> stage wheel	23053299	X- 140454	July 7, 1998, UNK	1934.2	1934.2
2 <sup>nd</sup> stage wheel	23032280	X- 127050	January 22, 1999, 0.0	1934.2	1934.2
3 <sup>rd</sup> stage wheel	6898663	HX-69456	January 22, 1999, 1995.2	3929.4	3929.4
4 <sup>th</sup> stage wheel	6892764	HX -56401	January 22, 1999, 1995.2	3929.4	3929.4
PT Governor	23065125	21861	March 20, 2000, UNK	1811.0	1811.0
Fuel Control	23065146	326257	March 21, 2000, UNK	1811.0	1811.0
Fuel Pump	6896810	T 0036	July 28, 2000, 562.6	2178.4	2178.4
Fuel Nozzle	6899001	0171	July 14, 2003, 276.2	776.4	776.4
Bleed Valve	23073353	FF-26303	June 24, 2004, UNK	333.4	333.4

#### COMPONENT REMOVAL REASON PRIOR TO LAST INSTALLATION

Gearbox: February 17, 2002, time: 7169.3 hours, reason for removal: 3500-hour inspection: changed number 3 and 4 bearing plus AD compliance.

Turbine: April 16, 1998, time: 1995.2 hours, reason for removal: overhaul.

Compressor: April 16, 1998, time: 1995.2 hours, reason for removal: compressor inspection.

Power Transfer Governor: November 5, 1998, TSO: 0.0 hours, reason for removal: timed out.

Fuel Control Unit: February 2, 2000, TSO:0.0 hours, TSN: UNK reason for removal: timed out.

Fuel Pump: September 4, 1996, TSO:0.0 hours, TSN: UNK reason for removal: hard time.

Fuel Nozzle: overhaul date: July 7, 1998, TSN: UNK, TSO: 0.0 hours, reason for removal: hard time.

Bleed Valve: overhaul date: June 26, 2004, TSO: 0.0, TSN: UNK, reason for removal: hard time.

<u>Engine CAE-895539 S</u> was manufactured on January 22, 1991 and was shipped to Bell Helicopter in Fort Worth, Texas on April 9, 1991. Bell Helicopter installed the engine on aircraft S/N 51474.

On April 16, 1998, engine was removed for turbine overhaul with 1995.2 hours.

On October 12, 1998, Houston Helicopter installed the engine on aircraft S/N 760041.

On October 16, 1998, engine was removed from aircraft S/N 76004, due to a report of the engine emitting smoke. Current time was 1995.2 hours.

On January 22, 1999, the engine was installed on an aircraft S/N 760039; current time was 1995.2 hours.

On July 2, 2004, Houston Helicopter removed engine due to report of engine producing low power; engine TT: 3598.6 hours.

On July 2, 2004, Houston Helicopters replaced gearbox, engine TT: 3598.6 hours, work was performed by Southern Rotorcraft USA on April 14, 2004.

On July 2, 2004, reinstalled engine on aircraft S/N 760039; aircraft TT: 10,331.0 hours, engine TT: 3598.6

### 2. MINIMUM EQUIPMENT LIST

The Federal Aviation Administration (FAA) approved Revision 2 (dated February 11, 2004) of the Sikorsky S-76A, B, C models. Master minimum Equipment List (MMEL) for Houston Helicopters was dated February 11, 2004.

There were no deferrals listed on the last maintenance log sheet, which was dated September 2, 2005.

From September 2, 2000, until the date of accident, no log sheets were available. These logs were aboard the helicopter, and have not yet been recovered.

#### 3. WEIGHT AND BALANCE

Houston Helicopters Part 135 Maintenance Manual, chapter 7, dated January 1, 2005, section 2, "Aircraft specific weight and balance requirements", requires all Houston Helicopters Inc. multi-engine aircraft shall be weighed every thirty-six (36) calendar months.

N90421 was weighed on March 10, 2003, with the empty weight of 6,734 pounds, arm 254.72 inches.

#### 4. AIRCRAFT STATUS REPORT

Times are based on records of September 2, 2005.

Aircraft total hours: 10,661.8 hours.

Engine Position One (left side) was installed at 10,076.2 hours.

Power Transfer Governor records time of 500.2 hours, Canadian authorized release certificate (24-0078) indicates TSN is unknown.

Main rotor hub part number not recorded correctly. However, it should be P/N 050.

Main Rotor gearbox was upgraded, but not clear of the correct part number (76351-09500-043 or 044).

#### 5. AIRWORTHINESS DIRECTIVES (AD) SUMMARY

Houston Helicopters record of ADs on N90421 was reviewed. The list was compared to the FAA compliance list, which included airframe, engines, and appliances. All ADs issued for Sikorsky S-76 helicopters, regardless of when they were issued that required recurring inspections or actions were also reviewed, including terminating actions. No anomalies were noted.

#### 6. FAA FORM 337 MAJOR REPAIR AND ALTERATION

Maintenance records for major repairs and Supplemental Type Certificates (STCs) that were given to Maintenance Records group by Houston Helicopters were reviewed, and no discrepancies were noted.

The last FAA 337 was approved on March 9, 2005. Houston Helicopters installed a static inverter SPC.60(A). The equipment was originally installed by Air Logistics, and approved by a type certificate on May 25, 1993.

#### 7. OPERATIONS SPECIFICATIONS

Houston Helicopters, Inc., 3506 Lockheed, Pearland, Texas, 77581, Certificate Number: YHHA237T, effective date September 24, 1990 was reviewed by the Maintenance Records group. The certificate holder is authorized to conduct on-demand Part 135 operations. The D085 aircraft listing of these specifications, effective date September 9, 2005 (N90421 removed), lists five Bell 206-B helicopters, seven Bell 206-L1 helicopters, two Bell 206-L3 helicopters, three Bell 212 helicopters, one Bell 407 helicopter, and one Sikorsky S-76A helicopter (total 19 helicopters).

Houston Helicopters, Inc., 3506 Lockheed, Pearland, Texas, 77581, Certificate Number: GURR498E, effective date October 19, 1967, reissued October 28, 2004, was reviewed the Maintenance Records group. The certificate holder is authorized to conduct operations as a Part 145 Domestic Repair Station, with the following ratings:

### **Limited Radio**

#### **Limited Accessories**

Limited Airframe (Bell 206 all series, 212 all series, 407, and Sikorsky S-76-A helicopters)

Limited Powerplant (250C2D, 250C20B, 250C28, 250C28B, 250C30, 250C30P, 250C30S, 250C47, and Pratt and Whitney PT6T-3 engines)

**Limited Emergency Equipment** (models KSE-35L8 and FV-35E life vests, models 1400 and 1900 life rafts, and float bags including pop out floats from the manufacturers of SMR, Goodyear, and Air Cruisers).

Houston Helicopters, Inc., 3506 Lockheed, Pearland, Texas, 77581, Certificate Number: GURG498E, effective date September 12, 1966, reissued October 18, 1989, was reviewed the Maintenance Records group. The certificate holder is authorized to conduct Part 137 commercial agricultural aircraft operations.

Houston Helicopters, Inc., 3506 Lockheed, Pearland, Texas, 77581, Certificate Number: GURL498E, effective date February 28, 1999, was reviewed the Maintenance Records group. The certificate holder is authorized to conduct Part 133 rotorcraft external load operations, with class A, B, and C external load combinations for Bell 206-

B, Bell 206-L1, Bell 206-L3, and Bell 212 helicopter, and external load combinations for Sikorsky S-76 helicopters.

# 8. ENGINE TREND CHECK ANALYSIS

Definition: The trend check analysis provides the operator a method to check engine performance. The analysis also allows the operator to effectively predict preventive maintenance, and to schedule maintenance actions.

The most recent trend check was performed on July 18, 2005, log sheet 01369: engine one indicated +3, engine two indicated +1.

July 10, 2005, log sheet 01367: engine one indicated +3, engine two indicated +1

July 8, 2005, log sheet 01366: engine one indicated +3, engine two indicated +1

June 14,2005, log sheet 01365: engine one indicated +4, engine two indicated -1

June 9, 2005, log sheet01362: engine one indicated +4.5, engine two indicated +.5

June 8, 2005, log sheet 01361: engine one indicated +3, engine two indicated +0

# 9. TYPE CERTIFICATE DATA SHEET

Federal Aviation Administration, Type Certificate Data Sheet, number H1NE (revision 19) for Sikorsky S-76A helicopters was reviewed for compliance conditions and limitations. No discrepancies were noted.

Type Certificate Data Sheet, number E1GL (revision 22) for series 250-C28, 250-C30, 250-C40, 250-C47, and 250C30R engines was reviewed for compliance conditions and limitations. No discrepancies were noted

### 10. MAINTENANCE LOGBOOK

Maintenance log sheets were reviewed from May 1, 2003 to September 2, 2005.

Log sheet 01380 on September 2, 2005: The 25-hour and 50-hour inspections were completed.

Log sheet 01379 on September 1, 2005: Added 1-quart oil to each engine. Note, an additional quart of oil added to number 1 engine after 1.5-hour flight. Replaced number 1 engine starter/generator because of Garlock seal and o-ring.

Log sheet 01374 on August 28, 2005: Number 2 engine starter/generator removed for overhaul, with aircraft TT: 10,634.7 hours.

Log sheet 01365 on June 14, 2005: Aircraft power setting is slow to recover. Adjusted collective transducer to within plus/minus 1 volt.

### 11. FLOAT and FLOAT BOTTLE INSPECTION

Work order 0101, dated February 18, 2005, aircraft TT 10,565.0 hours:

- 1. Float bottle replacement: right main float bottle due retirement. Bottle was replaced with new bottle P/N: 13269-1, S/N: 4566.
- 2. Left main float bottle due for retirement Replaced with new bottle P/N: 13269-1, S/N: 4564.

Work order 0109, dated March 22, 2005, aircraft TT 10,574.6 hours:

- 1. 12-month inspection completed.
- 2. Left main float bag found unserviceable: removed and installed with new airbag, P/N: D2676-109, S/N: 2347.

### 12. COCKPIT VOICE RECORDER (CVR)

The aircraft was installed with a CVR unit. This unit was manufactured by Universal Navigation Corporation, model number CVR-30, and was a solid state recorder. It should be noted that on page 7, part 1.11, a Underwater Locater Beacon (ULB) was installed. This beacon is a Dukane Model DK 120 Underwater Acoustic Beacon. It is located at the end of the recorder unit, and radiates a pulsed signal upon activation by its water sensitive switch. The beacon unit pulsed at 37.5 KHZ. Inspection of the CVR is required every 12 months, which was last performed July 2, 2005. Battery has a 6-year inspection, and was last inspected on July 7, 2001. The CVR manual calls for a 6-month inspection of the unit and battery.

### 13. FLIGHT LOGBOOK ON DAY OF ACCIDENT

Houston Helicopters provided a daily worksheet from the company administration department with a proposed flight plan for the final day's work schedule, which included:

The aircraft departed Pearland, Texas at 0645, with an estimate of 8 hours flying for September 6, 2005; however, there is no record of actual flying time.

#### 14. MAINTENANCE CHECKS

25-Hour Inspection	<u>Date:</u> January 1, 2005	<u>TT (hours):</u> 10,653.8
50-Hour Inspection	September 2, 2005	10,653.8
100-Hour Inspection	March 22, 2005	10,574.6
150-Hour Inspection	March 22, 2005	10,574.6
500-Hour Inspection	January 12, 2004	10,285.0
900-Hour Inspection	July 21, 2003	10,181.7

1250-Hour Inspection	August 8, 2003	10,188.2
1500-Hour Inspection	January 10, 2001	9,222.7

# **15. LIFE LIMITS OF PARTS**

Gas Producer-1 Wheel = 2,025 hours Gas Producer-2 Wheel = 2,025 hours Impeller = 12,500 hours PT-3 = 4,550 hours PT-4 = 4,550 hours Turbine = 2000 hours Fuel Pump = 3000 hours Fuel Control = 2500 hours Power Turbine Governor = 2000 hours Fuel Nozzle = 2000 hours Compressor Bleed Valve = 1500 hours

16. Service Difficulty Report (SDR)

One SDR was recorded for the helicopter, and this was on September 12, 2002: During a preflight inspection, the main rotor blade was found to be debonding at station 57, and 75 through 77. There was a small void, 1.25 inches, at station 78 and 25. There was a small crack on top of the blade at station 187. 5.

# **17. COMPANY HISTORY**

Houston Helicopters was formed in 1962, flying a Bell 47, with the aircraft being used for spraying rice fields. During the oil boom and the beginning of offshore oil platforms, the company began to expand. The company fleet includes: Bell 206B, Bell 206L-1 and 206L-3, Bell 212, and Sikorsky S-76 helicopters.

Frank McGill Maintenance Records Group Chairman