

**FINAL**  
KNKT.11.09.19.04

# NATIONAL TRANSPORTATION SAFETY COMMITTEE

Helicopter Accident Investigation Report

**PT. Airfast Indonesia**  
**Bell 412 Helicopter; PK-OCV**  
**Lemurung area, Sumbawa, Nusa Tenggara Barat**  
**Republic of Indonesia**

**25 September 2011**



NATIONAL TRANSPORTATION SAFETY COMMITTEE  
REPUBLIC OF INDONESIA  
2014



This Final Report was produced by the National Transportation Safety Committee (NTSC), 3<sup>rd</sup> Floor Ministry of Transportation, Jalan Medan Merdeka Timur No. 5 Jakarta 10110, Indonesia.

The report is based upon the investigation carried out by the NTSC in accordance with Annex 13 to the Convention on International Civil Aviation Organization, the Indonesian Aviation Act (UU No. 1/2009) and Government Regulation (PP No. 3/2001).

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# TABLE OF CONTENTS

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<b>TABLE OF CONTENTS</b> .....	<b>i</b>
<b>TABLE OF FIGURES</b> .....	<b>iii</b>
<b>ABBREVIATIONS AND DEFINITIONS</b> .....	<b>iv</b>
<b>INTRODUCTION</b> .....	<b>v</b>
<b>1 Factual Information</b> .....	<b>1</b>
1.1 History of the Flight .....	1
1.2 Injuries to Persons .....	2
1.3 Damage to Aircraft .....	2
1.4 Other Damage .....	2
1.5 Personnel Information .....	2
1.5.1 Pilot in Command .....	2
1.6 Helicopter Information .....	3
1.6.1 General .....	3
1.6.2 Engines .....	3
1.7 Meteorological Information .....	4
1.8 Aids to Navigation .....	4
1.9 Communications .....	4
1.10 Aerodrome Information .....	4
1.11 Flight Recorders .....	4
1.12 Wreckage and Impact Information .....	4
1.12.1 General .....	4
1.12.2 Tail Rotor .....	5
1.13 Medical and Pathological Information .....	7
1.14 Fire .....	7
1.15 Survival Aspects .....	7
1.16 Tests and Research .....	7
1.17 Organizational and Management Information .....	8
1.18 Additional Information .....	8
1.18.1 External load Standard Operating Procedures for Airfast helicopter operations. Chapter 900.3 Operating Procedures .....	8
1.18.2 Refer to CASR 135.497 “Flight and Duty Time limitations” .....	8
1.19 Useful or Effective Investigation Techniques .....	8

<b>2</b>	<b>ANALYSIS.....</b>	<b>9</b>
2.1	Analysis of the events.....	9
2.2	Human Factors.....	9
<b>3</b>	<b>CONCLUSIONS.....</b>	<b>11</b>
3.1	Findings .....	11
3.2	Factors .....	11
<b>4</b>	<b>SAFETY ACTIONs AND RECOMMENDATIONs .....</b>	<b>12</b>
4.1	SAFETY ACTION .....	12
4.2	SAFETY RECOMMENDATIONS .....	12
4.2.1	Directorate General Civil Aviation .....	12
4.2.2	PT. Airfast Indonesia.....	12
<b>5</b>	<b>APPENDICES .....</b>	<b>13</b>
5.1	Pilot Duty Monthly report on September 2011 .....	13
5.2	Operation Safety Notice Bell Helicopter Textron .....	14

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## TABLE OF FIGURES

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Figure 1: PK-OCV accident site.....	5
Figure 2: Location of main wreckage and tail rotor assembly.....	5
Figure 4: Damage on the sling cable.....	6
Figure 5: The tail rotor gearbox mount .....	7

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## ABBREVIATIONS AND DEFINITIONS

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AOC	:	Air Operator Certificate
ATPL	:	Air Transport Pilot License
BASARNAS	:	<i>Badan Search and Rescue Nasional /</i> National Search and Rescue Agency Republic of Indonesia
°C	:	Degrees Celsius
CAAC	:	Civil Aviation Administration of China
CASR	:	Civil Aviation Safety Regulation
CG	:	Centre of Gravity
CSN	:	Cycles Since New
CVR	:	Cockpit Voice Recorder
C of A	:	Certificate of Airworthiness
C of R	:	Certificate of Registration
ELT	:	Emergency Locator Transmitter
DGCA	:	Directorate General Civil Aviation
FDR	:	Flight Data Recorder
Ft	:	Feet
GPS	:	Global Positioning System
ICAO	:	International Civil Aviation Organization
IFR	:	Instrument Flight Rules
Kg	:	Kilogram(s)
Km	:	Kilometer(s)
Kn / Kt / Kts	:	Knots (nm/hours)
L/G	:	Landing Gear
NM	:	Nautical mile(s)
KNKT / NTSC	:	<i>Komite Nasional Keselamatan Transportasi /</i> National Transportation Safety Committee
P/N	:	Part Number
PTNNT	:	PT. Newmont Nusa Tenggara
S/N	:	Serial Number
SOP	:	Standard Operating Procedures
TSN	:	Time Since New
UTC	:	Universal Time Coordinate
VFR	:	Visual Flight Rules
VMC	:	Visual Meteorological Conditions
WITA/ LT	:	<i>Waktu Indonesia Tengah /</i> Indonesia Eastern Standard Time (UTC +8 hours)

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## INTRODUCTION

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### SYNOPSIS

The helicopter operated by PT. Airfast Indonesia and flow under the contract between PT. Airfast Indonesia and PT. Newmont Nusa Tenggara Mining Company, since 5 August 2011. At 25 September 2011, the helicopter was conducted an external load /sling operation with a 50 feet long external cable. The flight route was between two camps at Lemurung and Dodo. The crew consisted of one pilot and one load master.

At 0539 UTC, the helicopter took off to drop the load to Dodo and was returning to Lemurung with empty long-line hook. Approximately two minutes after the aircraft departed Dodo, the ground radio operator received a "MAYDAY MAYDAY" call on the company frequency. The Lemurung radio operator responded but no reply.

A flight with an empty long-line is not according with the SOP of PT. Airfast Indonesia.

At 0915 UTC, the signal from the helicopter's Emergency Locater Transmitter (ELT) was received on coordinate 08°54'S 117°24'E.

On 26 September 2011, at 0113 UTC, the helicopter was found at coordinate 08°54'00"S 117°23'10"E approximately at 850 meters elevation.

At 02.34 UTC a group of land search from Dodo reached the accident site.

Both occupants were fatally injured.

The tail rotor and tail rotor gearbox were not immediately located. These parts were found and recovered amidst vegetation at a rain forest several weeks after the accident about 300 meters from the accident site approximately on the flight path.

The examination of the cable (long-line) and the tail rotor blade provided evidence consistent with the tail rotor blade striking the cable. The cable strike, in turn, resulted in the tail rotor system entering an extreme out-of-balance condition, manifesting into loads that fractured the mounting bulkhead of the 90° gearbox and resulted an uncontrollable flight due to the significant shift to centre of gravity (CG).

Following this investigation the NTSC issued several safety recommendations to the Indonesia Directorate General of Civil Aviation, and PT. Airfast Indonesia.

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# 1 FACTUAL INFORMATION

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## 1.1 History of the Flight

PT. Airfast Indonesia was chartered by PT. Newmont Nusa Tenggara (PTNNT) with a helicopter Bell 412 to carry supplies required for the exploration. The operation carried supplies from Lemurung to Dodo which was a new exploration spot in Sumbawa Island, Nusa Tenggara Barat. The distance between these points is approximately 17 km. The operation of the Bell 412 was commenced at 5 August 2011.

On 25 September 2011, the helicopter Bell 412, PK-OCV took off from Benete at 0835 LT (0035 UTC) to Lemurung. Benete is the transport operation centre of the PTNNT. The helicopter conducted external load (sling) operations with 50 feet long external cable from Lemurung to Dodo. The helicopter release load supplies at Dodo without landing. On board in this flight were one pilot and one load master.

The first phase of flights was from Benete at 0035 UTC then continued with vice versa flights between Dodo - Lemurung until 0352 UTC (total time 03 hours 17 minutes) with 16 flight cycles. Then the crew had a lunch break at 0355 UTC.

At 0539 UTC, the helicopter took off to drop the load to Dodo and was returning to Lemurung with empty long-line hook. Approximately two minutes after the aircraft departed Dodo, the ground radio operator reported that received a "MAYDAY MAYDAY" call on the company frequency. The Lemurung radio operator responded but no reply.

At 0545 UTC (1345 LT), Lemurung radio operator informed the situation to the Benete radio operator, Dodo radio operator and Sumbawa Besar Tower controller. After received this information, the rapid response team of PTNNT was activated.

At 0655 UTC, a Cessna Caravan and at 0700 UTC a Bolkow helicopter were departed from Benete for search operation. At 0900 UTC, the search operation on that day was stopped.

At 0915 UTC, the signal from the helicopter's Emergency Locator Transmitter (ELT) was received on coordinate 08°54'S 117°24'E.

On 26 September 2011, at 1925 UTC (0325 LT), a group of land search consist of 17 personnel departed from Dodo to the coordinate of the emergency beacon.

At 2225 UTC, the Cessna Caravan initiated the search operation from Benete and followed by the Bolkow.

At 0113 UTC, the helicopter was found at coordinate 08°54'00"S 117°23'10"E approximately at 850 meters elevation.

At 02.34 UTC, the land search team arrived at the accident site.

The crews were fatally injured.



## 1.2 Injuries to Persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	1	1	2	-
Serious	-	-	-	-
Minor/None	-	-	-	Not applicable
TOTAL	1	1	2	-

## 1.3 Damage to Aircraft

The aircraft was destroyed.

## 1.4 Other Damage

There was no other damage to property and/or the environment.

## 1.5 Personnel Information

### 1.5.1 Pilot in Command

Gender	: Male
Age	: 50 years
Nationality	: Indonesia
Year of joining company	: 1993
License	: ATPL (Helicopter)
Date of issue	: 31 December 2002
Aircraft type rating	: Bell 412; Bell 212; Sikorsky 58T; Bell 204; Bell 206; Bell 407
Medical certificate	: First Class
Last of medical examination	: 15 July 2011
Validity of medical certificate	: 15 January 2012
Medical limitation	: The holder shall wear lenses that correct for distant vision and possess glasses that correct for near vision
Last proficiency check (Bell 407)	: 10 August 2010
Last proficiency check (Bell 412)	: 15 September 2011
<b>Flying experience</b>	
Total hours	: 8,853 hours 03 minutes
Total on type	: 1,544 hours 04 minutes
Total external load	: 2,900 hours
Last 90 days	: 72 hours 34 minutes
Last 30 days	: 09 hours 54 Minutes

Last 7 days : 07 hours 54 minutes  
Last 24 hours : 4 hour 54 minutes  
This flight : 3 hours 19 minutes

## **1.6 Helicopter Information**

### **1.6.1 General**

Registration Mark : **PK-OCV**  
Manufacturer : Indonesia Aerospace (previously PT Nurtanio)  
Country of Manufacturer : Indonesia  
Type/ Model : Bell 412 SP  
Serial Number : 34019  
Year of manufacture : 1992  
Certificate of Airworthiness  
Issued : 19 February 2011  
Validity : 18 February 2012  
Category : Transport  
Limitations : None  
Certificate of Registration  
Registration Number : 2202  
Issued : 05 May 2011  
Validity : 04 May 2014  
Time Since New : 7,883;9 hours  
(time when the aircraft was released in the morning of the accident day)  
Cycles Since New : 13,032 cycles  
(cycles when the aircraft was released in the morning of the accident day)  
Last Major Check : 11 June 2011 (3000 hours inspection)  
Last Minor Check : 23 September 2011 (25 hours and 100 hours inspection)

### **1.6.2 Engines**

Manufacturer : Pratt & Whitney Canada  
Type/Model : PT6T-3B  
Serial Number-1 engine : CP-PS-62923  
▪ Time Since New : 7,593.4 hours  
▪ Cycles Since New : 8,752 cycles

Serial Number-2 engine : CP-PS-62924

- Time Since New : 7,593.4 hours
- Cycles Since New : 8,752 cycles

## **1.7 Meteorological Information**

The weather condition at Lemurung and Dodo were reported fine. The weather along the route could not be determined.

## **1.8 Aids to Navigation**

The helicopter were equipped with a Global Positioning System (GPS) Garmin 165 with Part number 011-00106-00 and the Radio altimeter P/N 622-3201-001.

## **1.9 Communications**

The communication between the pilot and radio operator at Lemurung was performed in VHF radio and was normal.

At 0541 UTC, the Lemurung radio operator received a "MAYDAY MAYDAY" call from the pilot. The Lemurung radio operator responded but no reply.

## **1.10 Aerodrome Information**

Not related to this accident.

## **1.11 Flight Recorders**

The aircraft was not equipped with a flight data recorder or cockpit voice recorder. Neither recorder was required by current Indonesian aviation regulations.

## **1.12 Wreckage and Impact Information**

### **1.12.1 General**

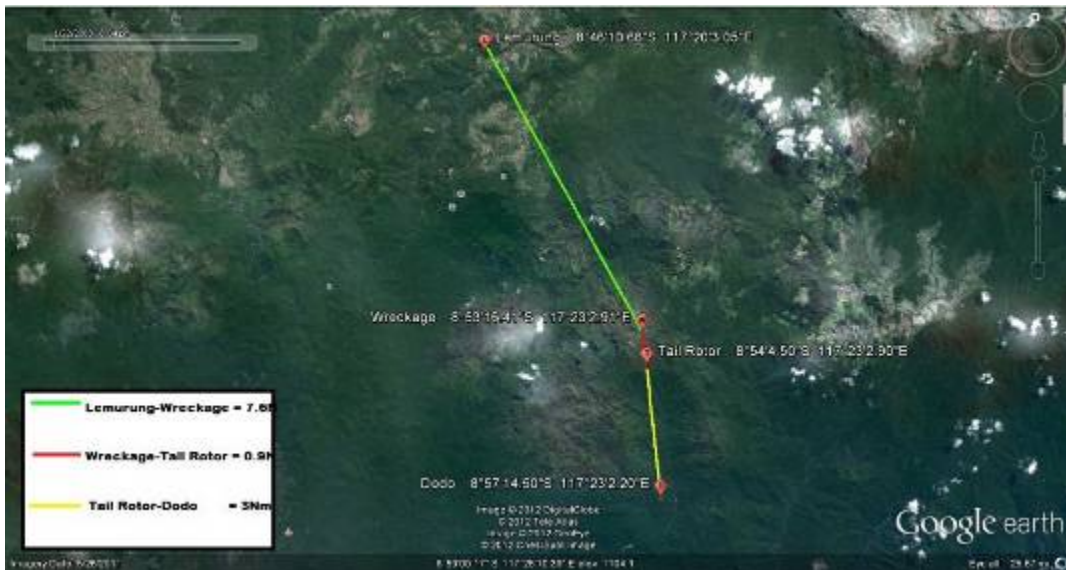
The wreckage was found at a coordinate 08°54'00"S 117°23'10" E at an elevation of approximately at 850 meters. Most of the wreckage was found in a relatively confined space at the bottom of a dry, narrow, river bed.

The tail rotor and tail rotor gearbox were not immediately located. These parts were found and recovered amidst vegetation at a rain forest several weeks after the accident about 300 meters from the accident site approximately on the flight path (Figures 1 and 2).



Figure 1: PK-OCV accident site

The main rotor blade damage indicated that the blades were being driven at a very low energy level at the time of impact.



Map courtesy of Google Earth

Figure 2: Location of main wreckage and tail rotor assembly

### 1.12.2 Tail Rotor

Several parts of the helicopter were recovered for further examination. The items recovered were the complete tail boom, the intermediate gearbox, vertical fin, tail rotor gearbox assembly, main rotor blades, main driveshaft, main transmission and the hoist assembly with 50 feet long steel cable. There were 1 ea guarded hook and shackle attached to the end of the sling with total weight of 12.5 pounds.

The examination of the wreckage was performed by NTSC investigators and aircraft manufacturer team on 8 and 9 October 2012 at Airfast hangar Halim Perdanakusuma Jakarta.

Both tail rotor blades were fractured approximately 8 inches from the outboard tips. Only one tail rotor blade tip was recovered. An examination of the cable (long-line) and the tail rotor blade provided evidence that the cable had struck the tail rotor blade while the blade was being driven (Figure 3). The evidence confirmed that the cable struck the tail rotor and fractured the blade.



Figure 3: Tail rotor blade tip showing evidence of contact with cable



Figure 4: Damage on the sling cable

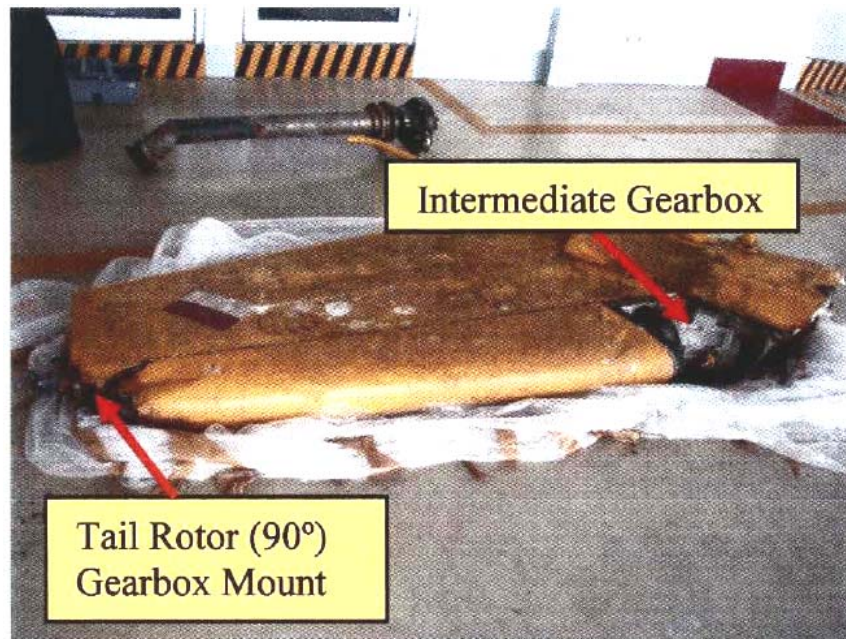


Figure 5: The tail rotor gearbox mount

The main transmission damage was consistent with impact damage. The main transmission input and output drives could not be rotated, however a further examination determined that the transmission was full of water and had significant corrosion internally. The chip detectors and the filters were removed and visually examined and found free of any metal chips or residue.

The tail boom, intermediate gearbox, vertical fin and main driveshaft were examined and all damage was determined to be a result of impact and not contributing to this accident. The vertical fin 90° gearbox mounting bulkhead consistent with overload fractures.

### **1.13 Medical and Pathological Information**

No medical or pathological investigations were conducted as a result of this occurrence.

### **1.14 Fire**

There was no evidence of fire in-flight or after the aircraft impacted terrain.

### **1.15 Survival Aspects**

PK-OCV was equipped with Artex Emergency Locator Transmitter (ELT) C406-2HM part number 455-5012(525) and serial number 02045. At 0915 UTC, the ELT transmitted a signal that was received by BASARNAS (Indonesian National Search and Rescue) and an aircraft that was flying near the accident site.

Due to the magnitude of the impact forces, the accident was considered to be not survivable.

### **1.16 Tests and Research**

No test and research performed following this accident.



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## **2 ANALYSIS**

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The analysis will discuss factors associated with tail rotor blades contacted with the sling cable, procedures, and Human Factors.

### **2.1 Analysis of the events**

The wreckage examination found evidences of the tail rotor blades coming into contact with the steel long-line cable, while being driven with significant energy. The evidences were found on the steel cable of the long-line assembly, coupled with the marks on the separated sections of the tail rotor blades.

The cable strike, in turn, resulted in the tail rotor system entering an extreme out-of-balance condition, manifesting into loads that fractured the mounting bulkhead of the 90° gearbox.

As the bulkhead fractured, the tail rotor assembly and gearbox separated from the helicopter, resulting in uncontrollable flight due to the significant center of gravity (CG) shift.

The main rotor blade damage indicated that the blades were being driven at a very low energy level at the time of impact.

The damage to the main rotor blades indicated that the engine and main rotor power subsequently reduced to a low energy state prior to making contact with the trees/terrain.

Although the main rotor blades sustained some damage, the majority of the damage to the tail boom was crushing damage, as a result of the subsequent terrain impact.

All damage examined was consistent with what would be expected from an accident involving a slow (below normal operating rpm) turning main rotor and higher than normal vertical impact.

Through there was no evidence to support it (i.e. no vegetation embedded in the cable or hook and release system), the cable getting into the rotor system, as result of it rebounding from the tree canopy strike cannot be ruled out. However, the ultimate cause of this accident was the result of the long-line cable making contact with the tail rotor.

There were 1 ea guarded hook and shackle attached to the end of the sling with total weight of 12.5 pounds. In order to the Company's External Load SOP chapter 900.3 (as stated in the 1.18.1), carriage of dummy load is not relevant, rather the minimum weight requirement on the end of long line cable must be met. The hook can be flown empty as long as the hook itself weight at least 25 pounds.

### **2.2 Human Factors**

The first phase of flights was from Benete at 0035 UTC then continued with return flights between Dodo - Lemurung until 0352 UTC (total time 03 hours 17 minutes) with 16 flight cycles. Then the crew had a lunch break at 0355 UTC.

At 0539 UTC, the helicopter took off to drop the load to Dodo and returned to Lemurung while the accident took place.

The total flight time was 3 hours 19 minutes with total duty time less than five hours.

According to the part 135.497 the maximum flight hours for helicopter engaged in external load or multi landing operations with flight crew one/two is 5 hours and



maximum duty time is 12 hours.

Based on the pilot activity report recorded that the pilot had performed several duties in several area with different time zone (Jakarta, Papua, Sumbawa) since 12 September until the accident day on 25 September, and had one day off on 17 September 2011.

The pilot started operation at Benete area since 23 September and on 24 September the pilot performed 5.1 flight hours.

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## **3 CONCLUSIONS**

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### **3.1 Findings**

- a. The helicopter was airworthy prior to the accident.
- b. The pilot was qualified to operate Bell 412.
- c. The pilot had valid license and medical certificate.
- d. The helicopter was being operated within the approved weight and balance limitations.
- e. During the accident flight, the helicopter carried empty long line hook.
- f. The first phase of flight took 3 hours 17 minutes and performed 16 flight cycles.
- g. The second phase after lunch break, the flight was 16 minutes.
- h. The wreckage examination found evidences of the tail rotor blades had come into contact with the sling cable.
- i. The pilot had performed several duties in several areas with different time zone since 12 September until the accident day on 25 September, and one day off on 17 September 2011.
- j. On 24 September the pilot performed 5.1 flight hours.

### **3.2 Factors<sup>1</sup>**

The tail rotor blades had come into contact with the sling cable, in turn, the tail rotor system entering an extreme out-of-balance condition, manifesting into separation of the tail rotor gear box and resulted in an uncontrollable flight.

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<sup>1</sup> “Factors” is defined as events that might cause the occurrence. In the case that the event did not occur then the accident might not happen or result in a less severe occurrence.

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## **4 SAFETY ACTIONS AND RECOMMENDATIONS**

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### **4.1 SAFETY ACTION**

At the time of issuing this final investigation report, the National Transportation Safety Committee had not been informed of any safety actions resulting from this occurrence.

### **4.2 SAFETY RECOMMENDATIONS**

The examination on the factual data and the associate findings which might have contributed to this accident were the procedures and pilot fatigue. These conditions maybe exist to the other pilots.

The National Transportation Safety Committee issued safety recommendations addressed to:

#### **4.2.1 Directorate General Civil Aviation**

To review the quality system in conducting safety oversight to the operator:

- a. In conduct operational procedures.
- b. In monitor pilots duty to ensure acceptable fatigue level.

#### **4.2.2 PT. Airfast Indonesia**

The investigation found that the dummy load did not attach and the workload induced to the pilot may result to fatigue, as such NTSC recommend:

- a. To ensure pilot compliances to the procedures as such during safety oversight, line check and proficiency check.
- b. To monitor the pilots duty to ensure acceptable fatigue level.

## 5 APPENDICES

### 5.1 Pilot Duty Monthly report on September 2011

**AIRFAST INDONESIA**  
**OPERATIONS DEPARTMENT**

CREW / STAFF DUTY MONTHLY REPORT

Name : ██████████

Month : September'11

Position : Pilot R/W

Date	Location	Flight Duty Time	Working Time	Standby Time	Ops Leave	Sick Leave	Annual Leave	Remarks
1	HOME							
2	OFFICE		8					
3	HOME							
4	HOME							
5	OFFICE		8					
6	OFFICE		8					
7	OFFICE		8					
8	OFFICE		8					
9	OFFICE							
10	HOME							
11	HOME							
12	OFFICE							
13	REC.CRM	0	7					AT MTC
14	TRAVEL	0	12					JKT-TIM
15	TIM	1	7					Prof cx by Capt.DP
16	TRAVEL	0	8					TIM-DJJ-DEK
17	DEKAI							
18	DEKAI	1.8	7.2					
19	DEKAI	4	5					
20	DEKAI	4.7	4.3					
21	TRAVEL	0	8					DEK-DJJ-UPG-SUB
22	TRAVEL	0	8					SUB-AMI-BNT
23	BENETE	0	8					Induction with NNT
24	BENETE	5.1	2.9					
25	BENETE	3.5	4.5					
26								
27								
28								
29								
30								
31								
	<b>TOTAL</b>	20.10	121.90	-	-	-	-	

**Note:**

1. Flight Duty Time: The period when a person is assigned as member of flight crew of an aircraft, calculated as the total elapsed period from the time crewmember is required to report for duty, to the time that crewmember has completed all official duties with respect to a flight or series of flights and is released for an official crew rest. For the purpose of calculation, it shall be commenced 60 or 90 minutes (for 8-737 operations) prior to the scheduled flight departure time and finished 30 minutes after actual flight arrival time.
2. Working Time: The period when a person is assigned to accomplish non flying duty, calculated as the total elapsed period from the time the person commences the duty, to the time the person has completed the duty.
3. Standby Time: The period when a person is assigned, but not required to report, for duty as crew member of an aircraft scheduled on standby for a flight at any given time, calculated as the total elapsed period from the time the person commences the duty, to the time the person has completed the duty.
4. All time shall be inserted in decimal format.
5. Ops leave, Sick leave, Annual leave: Just put "1" for each date you take.

## 5.2 Operation Safety Notice Bell Helicopter Textron

### **Bell Helicopter** **TEXTRON**

Bell Helicopter Textron Inc.  
A Subsidiary of Textron Inc.

Post Office Box 482  
Fort Worth, Texas 76101  
(817) 280-2011

# OPERATIONS SAFETY NOTICE

5 NOVEMBER 1981

OSN 412-81-1

TO: ALL OWNERS AND OPERATORS OF 412 HELICOPTERS  
SUBJECT: MAIN TRANSMISSION BEVEL GEAR TOOTH DAMAGE

THE INVESTIGATION OF A RECENT FATAL ACCIDENT INVOLVING A UH-1N MILITARY HELICOPTER REVEALED THERE WERE 8 TEETH MISSING FROM THE MAIN BEVEL GEAR IN THE MAIN TRANSMISSION. THERE WAS ALSO EVIDENCE OF ROTOR BRAKE PINION "STRIKE MARKS" ON THE COAST SIDE OF THE MAIN BEVEL GEAR.

TWENTY MINUTES PRIOR TO THE ACCIDENT THE PILOT REPORTED AN UNUSUAL NOISE FROM THE AREA OF THE MAIN TRANSMISSION. HE ALSO REPORTED HIGH OIL TEMPERATURE AND LOSS OF OIL PRESSURE.

THE PURPOSE OF THIS OSN IS TO RE-EMPHASIZE MANDATORY PROCEDURES AND TO CAUTION OPERATORS TO:

1. ADHERE TO THE FLIGHT MANUAL WITH REGARD TO THE OPERATION OF THE ROTOR BRAKE. (REFERENCE 412 FLIGHT MANUAL, SECTION 1, OPERATING LIMITATIONS).
2. REFER TO THE PT6-3/18 MAINTENANCE MANUAL, REV. 8, PART 2, SECTION 6, "TESTING" PROCEDURES IF NONENGAGEMENT/MISENGAGEMENT OF A CLUTCH IS ENCOUNTERED DURING ENGINE START.

3. PERFORM THE CONDITIONAL INSPECTIONS AS STATED IN THE 412 MAINTENANCE MANUAL, CHAPTER 5. THESE ARE INSPECTIONS OF THE MAIN INPUT BEVEL GEAR AND REDUCTION GEARBOX CLUTCH IN THE EVENT OF NON-ENGAGEMENT/MISENGAGEMENT/INFLIGHT SLIPPAGE OF THE REDUCTION GEARBOX CLUTCH.

FLIGHT OPERATIONS PERSONNEL SHOULD BE MADE AWARE OF THE SERIOUSNESS OF TORSIONAL OVERLOADS, PARTICULARLY ON ROTOR BRAKE EQUIPPED HELICOPTERS, AND THE RESULTANT INSPECTION REQUIREMENTS IN THE 412 MAINTENANCE MANUAL (SEE 3 ABOVE). FLIGHT OPERATIONS PERSONNEL SHOULD ALSO BE INSTRUCTED THAT IN THE EVENT UNUSUAL NOISES ARE HEARD COMING FROM THE AREA OF THE TRANSMISSION, FLIGHT OPERATIONS SHOULD BE TERMINATED AS SOON AS POSSIBLE AND THE CAUSE INVESTIGATED AND CORRECTED BEFORE FURTHER FLIGHT.

# Bell Helicopter **TEXTRON**

Bell Helicopter Textron Inc.  
A Subsidiary of Textron Inc.

Post Office Box 482  
Fort Worth, Texas 76101  
(817) 280-2011

## OPERATIONS SAFETY NOTICE

MARCH 23, 1989  
REV. "A"  
APRIL 6, 1989

OSN 204-89-11  
OSN 205-89-16  
OSN 212-89-18  
OSN 214-89-8  
OSN 412-89-11

"A"

TO: ALL MODEL 204/205/212/412 OPERATORS/OWNERS  
SUBJECT: FAILURE OF MAIN TRANSMISSION SPIRAL BEVEL GEAR

ON 14 MARCH 1989, THE PILOT OF A MODEL 212 HEARD AN OCCASIONAL AND UNUSUAL NOISE COMING FROM THE TRANSMISSION AREA. THE HELICOPTER RETURNED TO BASE WITH THE NOISE MORE NOTICEABLE ON REDUCTION OF POWER AND COAST DOWN. NO CHIP DETECTOR LIGHTS WERE REPORTED. THE TRANSMISSION CONFIGURATION WAS A P/N 212-040-001-123 WITH 6996.15 HOURS SINCE NEW AND 74.15 HOURS SINCE LAST OVERHAUL.

THE TRANSMISSION INTERNAL FILTER WAS CHECKED AND SLIGHT CONTAMINATION WAS EVIDENT. THE OIL PUMP FILTER SCREEN WAS REMOVED AND FOUND CLEAN, BUT ON INSERTION OF A FINGER THROUGH THE OIL PUMP SCREEN PORT, TWO LARGE PIECES OF GEAR TOOTH MATERIAL WERE FOUND. THE ROTOR BRAKE QUILL WAS REMOVED AND IT WAS NOTED THAT TWO TEETH HAD FRACTURED FROM THE SPIRAL BEVEL GEAR.

PAGE 2 OF 2

THE SPIRAL BEVEL GEAR P/N 204-040-701-103, WITH 74.15 HOURS SINCE NEW WAS RECEIVED BY BELL THE AFTERNOON OF 20 MARCH 1989. IN ADDITION, RECEIVED THE MAIN INPUT PINION, P/N 204-040-700-001 WITH AN ESTIMATED 4054 HOURS, AND ROTOR BRAKE GEAR P/N 204-040-301-001 WITH AN ESTIMATED 5980 HOURS.

METALLURGICAL ANALYSIS REVEALED A LOW ALLOY METALLIC INCLUSION AT THE SURFACE OF THE TWO TEETH WHICH HAD FRACTURED FROM THE GEAR. INVESTIGATION IS CONTINUING TO DETERMINE THE SOURCE OF THE LOW ALLOY MATERIAL.

"A"

THE MODEL 214B/B-1 IS ADDED TO THIS OSN FOR THE MATERIAL USED FOR THE SPIRAL BEVEL GEAR P/N 214-040-037-101, WAS MACHINED FROM THE IDENTICAL FORGING LOT.

"A"

FLIGHT AND MAINTENANCE PERSONNEL SHOULD THOROUGHLY INVESTIGATE ANY UNUSUAL NOISES HEARD IN THE AREA OF THE TRANSMISSION. IF AN UNUSUAL TRANSMISSION NOISE IS HEARD IN FLIGHT, TERMINATE THE FLIGHT AS SOON AS POSSIBLE. INVESTIGATE TO DETERMINE THE CAUSE, AND CORRECT BEFORE CONTINUING OPERATIONS.