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**NATIONAL
TRANSPORTATION
SAFETY
COMMITTEE**

Aircraft Accident Investigation Report

**PT. ASI Pudjiastuti Aviation
Pilatus Porter PC-6 ; PK-VVQ
Melak Area , East of Kalimantan
East of Kalimantan
Republic of Indonesia**

25 April 2012



**NATIONAL TRANSPORTATION SAFETY COMMITTEE
MINISTRY OF TRANSPORTATION
REPUBLIC OF INDONESIA
2013**

This Final Report was produced by the National Transportation Safety Committee (NTSC), Ministry of Transportation 3rd Floor, 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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GLOSSARY OF ABBREVIATIONS

AD	:	Airworthiness Directive
ADAS	:	Automatic Data Acquisition System
AFM	:	Airplane Flight Manual
AGL	:	Above Ground Level
ALAR	:	Approach-and-Landing Accident Reduction
AMSL	:	Above Mean Sea Level
AOC	:	Air Operator Certificate
ATC	:	Air Traffic Control
ATPL	:	Air Transport Pilot License
ATS	:	Air Traffic Service
°C	:	Degrees Celsius
CAMP	:	Continuous Airworthiness Maintenance Program
CASO	:	Civil Aviation Safety Officer
CASR	:	Civil Aviation Safety Regulation
CPL	:	Commercial Pilot License
COM	:	Company Operation Manual
CRM	:	Cockpit Recourses Management
CSN	:	Cycles Since New
DGCA	:	Directorate General Civil Aviation
EGT	:	Exhaust Gas Temperature
FL	:	Flight Level
F/O	:	First officer or Copilot
hPa	:	Hectopascals
Hr	:	Hours
ICAO	:	International Civil Aviation Organization
IFR	:	Instrument Flight Rules
IIC	:	Investigator in Charge
Kg	:	Kilogram(s)
Km	:	Kilometer(s)
Kt	:	Knots (nm/hours)
Mm	:	Millimeter(s)
MTOW	:	Maximum Take-off Weight
NM	:	Nautical mile(s)
KNKT / NTSC	:	<i>Komite Nasional Keselamatan Transportasi</i> / National Transportation Safety Committee
PIC	:	Pilot in Command

QFE	:	Height above airport elevation (or runway threshold elevation) based on local station pressure
QNH	:	Altitude above mean sea level based on local station pressure
RESA	:	Runway End Safety Area
RPM	:	Revolution Per Minute
SCT	:	Scattered
S/N	:	Serial Number
TS/RA	:	Thunderstorm and rain
TSN	:	Time Since New
TT/TD	:	Ambient Temperature/Dew Point
UTC	:	Universal Time Coordinate
VFR	:	Visual Flight Rules
VMC	:	Visual Meteorological Conditions

INTRODUCTION

SYNOPSIS

The Pilatus Porter PC-6 aircraft operated by PT. Puji Astuti Aviation (Susi Air) registered PK-VVQ on Areal Survey Flight departed from Sepinggian-Balikpapan to Melak Area on 25 April 2012 at 0440 UTC (Universal Time Coordinate) or 1240 LT.

There were one pilot and one passenger on board, the estimate flight endurance was seven hours. At 0505 the aircraft reported leaving Balikpapan Approach.

At 0910 the aircraft was reported to Melak Radio it will be leaving the Survey Area at 0930, and the aircraft was reportedly lost contact with Melak Radio at 0930.

At 0922 a text message was sent by the passenger to his employer stating *“Run out of fuel, landing on road”*.

The Search and Rescue Bureau informed that a distress signal was detected on 1025 at the position of 00 25'.02” N 116.02'.48”E, close to the village of Muaritan.

The aircraft was in airworthy condition prior to departure. During the areal survey flight the engine was reported flamed out.

The lack of fuel transferred from auxiliary tank caused the main tank to run dry and a loss of fuel feed to the engine, that caused the engine flame out.

The aircraft failed to reach a suitable landing area. The horizontal pitch trim was set to the nearly full nose-up position and that the flaps were about half extended (16° - 18° versus 38°).

On 26 April 2012 at 0130 LT (1730 UTC) the aircraft was found substantially damaged at Muaritan – Kecamatan Tabang , Kutai Karta Negara about 50 meters from the local mining road. The pilot and the passenger were both fatally injured.

During the process of investigation PT. ASI Pujiastuti Aviation had issued and implemented the corrective safety action related to this accident, and the Directorate General Civil Aviation eg. Directorate Airworthiness and Aircraft Operation had taken a special audit PT. Pujiastuti Aviation through to the organisation; such as maintenance, operation and safety departement.

1 FACTUAL INFORMATION

1.1 History of the Flight

The Pilatus Porter PC-6 aircraft operated by PT. Puji Astuti Aviation (Susi Air) registered PK-VVQ on Areal Survey Flight, departed from Sepinggan-Balikpapan to Melak Area on 25 April 2012 at 0440 UTC (Universal Time Coordinate) or 1240 LT.

There were one pilot and one passenger on board, the estimate flight endurance was seven hours. At 0505 the aircraft reported leaving Balikpapan Approach.

At 0910 the aircraft was reported to Melak Radio on radial 060 at the altitude of 3,500 feet, and that it would be leaving Survey after a further twenty minutes.

Melak Radio reported that the aircraft lost contact at 0930.

At 0922 a text message was sent by the passenger to his employer stating *“Run out of fuel, landing on road”*.

The Search and Rescue Bureau informed that a distress signal was detected on 1025 at the position of 00 25'.02” N 116.02'.48”E.

On 26 April 2012 at 1730 UTC the aircraft was found in Muaritan – Kecamatan Tabang, Kutai Karta Negara at the position 00 25'.03” N 116.01'.55”E.

The aircraft was substantially damaged, the pilot and the passenger were fatally injured.



Figure 1: The accident site



Figure 2: Accident Location Data from Flight Following Monitor

1.2 Injuries to Persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	1	1	2	-
Serious	-	-	-	-
Minor/Non	-	-	-	-
TOTAL	1	1	2	-

1.3 Damage to Aircraft

The nose section was severely damaged, the left wing was partially detached from the fuselage, the left underwing fuel tank was detached, the left wing flap torsion tube was broken, the left wing leading edge was dented, the left wing wrinkled, the right wing tip was broken, the right underwing fuel tank was torn, the propeller blades were feathered and bent, and the passenger seat was detached.

1.4 Other Damage

No other damage reported on this accident.

1.5 Personnel Information

1.5.1 Pilot in Command

Gender : Male
Date of birth : 11 June 1984
Nationality : South African
License : CPL
Date of issue : 06 June 2011
Valid to : 30 April 2013
Aircraft type rating : SEL (Single Engine Land)
Medical certificate : First Class
Date of medical : 30 January 2012
Valid to : 30 July 2012

Last proficiency check	:	5 April 2012
Total hours	:	1,912 hours 4 minutes
This make and model	:	81 hour 4 minutes
Last 90 days	:	120 hours 1 minute
Last 30 days	:	70 hour 5 minutes
Last 24 hours	:	5 hours (<i>estimate</i>)
This flight	:	5 hours (<i>estimate</i>)

1.6 Aircraft Information

1.6.1 General

Aircraft Registration	:	PK-VVQ
Country of Manufacturer	:	Switzerland
Manufacturer	:	Pilatus Aircraft Ltd
Type/ Model	:	Pilatus PC-6/ B2-H4 Turbo Porter
Serial Number	:	965
Year of Manufacture	:	2009
Certificate of Airworthiness validity	:	2639 valid until 30 July 2012
Certificate of Registration	:	2639 valid until 29 October 2013
Total flying hours since manufacture	:	2397,9
Total cycle since new	:	3466

1.6.2 Engines

Engine type	:	Turbo Propeller
Manufacturer	:	Pratt &Whitney Canada
Model	:	PT 6A-27
Engine Serial Number	:	PCE-PG0387
Time Since New (TSN)	:	2397,9

The engine was reported flamed out during flight, the propeller was feathered and with no evidence of rotation at impact



Figure 3: Propeller was on feather

1.6.3 Weight and Balance

No evidence of a completed weight and balance calculation before the flight was found.

It was determined that the aircraft was within the allowable weight and balance envelope at the beginning of the flight and at the time of the accident, refer to calculation of weight and balance based on aircraft manual. (see table 1 & 2)

Pilatus PC6 Porter PK-VVQ Weight and Balance

Description	Weight (kg)	Arm (m)	Moment	CG % MAC
Empty Weight	1427	3,35	4776,2	18,3%
Oil	13	0,97	12,6	
External tanks	59	3,40	200,6	
Pilot + pax	70	3,05	213,5	
Station 2	65	3,85	250,3	
Station 3	80	4,57	365,6	
Station 4	100	5,28	528,0	
Zero Fuel Weight (ZFW) max=2400kg	1814	3,50	6346,7	26,2%
Fuel (Internal, full=518.5kg)	518,5	3,93	2037,7	
Fuel (External, full=392kg)	392	3,40	1332,8	
Take-off Weight (TOW) max=2800kg	2724,5	3,57	9717,2	29,8%
Fuel used (Internal)	518,5	3,93	2037,7	
Fuel used (External)	0	3,40	0,0	
Landing Weight max=2660kg	2206	3,48	7679,5	25,3%

<i>Fuel to be burned to be under max landing weight (MLW) from internal tanks</i>				
TOW-MLW (2660kg)	64,5	3,93	253,5	
Max Landing Weight (MLW)	2660	3,56	9463,7	29,4%
Fuel to be burned (US Gal):		21,1		

Mean Aerodynamic Chord (MAC) = 1.9m

C of G limits at 1450kg: 11% to 38%

C of G limits at 2800kg: 32% to 38%

Table 1: External tank full/ not be used

Pilatus PC6 Porter PK-VVQ Weight and Balance

Description	Weight (kg)	Arm (m)	Moment	CG % MAC
Empty Weight	1427	3,35	4776,2	18,3%
Oil	13	0,97	12,6	
External tanks	59	3,40	200,6	
Pilot + pax	70	3,05	213,5	
Station 2	65	3,85	250,3	
Station 3	80	4,57	365,6	
Station 4	100	5,28	528,0	
Zero Fuel Weight (ZFW) max=2400kg	1814	3,50	6346,7	26,2%
Fuel (Internal, full=518.5kg)	518,5	3,93	2037,7	
Fuel (External, full=392kg)	392	3,40	1332,8	
Take-off Weight (TOW) max=2800kg	2724,5	3,57	9717,2	29,8%
Fuel used (Internal)	375	3,93	1473,8	
Fuel used (External)	392	3,40	1332,8	
Landing Weight max=2660kg	1957,5	3,53	6910,7	27,9%

<i>Fuel to be burned to be under max landing weight (MLW) from internal tanks</i>				
TOW-MLW (2660kg)	64,5	3,93	253,5	
Max Landing Weight (MLW)	2660	3,56	9463,7	29,4%
Fuel to be burned (US Gal):		21,1		

Mean Aerodynamic Chord (MAC) = 1.9m

C of G limits at 1450kg: 11% to 38%

C of G limits at 2800kg: 32% to 38%

Table 2: External tank empty

1.7 Meteorological Information

There is no weather reporting station near the accident site, so no officially reported weather is available. However, the survey flight required clear flight conditions (no rain and cloud) at and below the survey flight altitude. Thus it can be assumed that good VMC conditions existed at the time.

1.8 Aids to Navigation

Not relevant to this accident.

1.9 Communications

Not relevant to this accident

1.10 Aerodrome Information

Not relevant to this accident

1.11 Flight Recorders

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

1.12 Wreckage and Impact Information

At impact, the aircraft was in a descending right turn. The impact site had a slope of about 40 degrees. The aircraft impacted with an approximately 25 degrees nose down attitude, resulting in a impact angle of 65 degrees relative to the ground (Figure 4). There was no evidence of continued forward motion of the aircraft after the initial impact.



Figure 4: The aircraft impacted with an approximately 25 degrees

The nose section was severely damaged, , the right wing tip was broken, the right underwing fuel tank was torn, the propeller blades were feathered and bent, and the passenger seat was detached.

The left wing was partially detached from the fuselage, the left underwing fuel tank was detached, the left wing flap torsion tube was broken, the left wing leading edge was dented, the left wing wrinkled. The quantity of fuel in the left underwing fuel tank was full.

The right wing was wrinckled rearward and the tip was broken, and the right underwing fuel tank was torn at the skin around the attachment to the wing, and the quantity of fuel was full.

Both of main fuel tanks were empty, with no evidence of fuel leak and smell at the site. The collector fuel tank in the rear fuselage was empty and about ½ litre of fuel was found in the drain sump.

The main landing gear collapsed rearward, and the propeller blade was feathered on impact with the ground without any scratch impact damage.

The accident site is located about fifty meters from the local mining road (Figure 1 and 2).

1.13 The Medical and Pathological Information

The pilot and passenger were fatally injured.

1.14 Fire

There was no evidence of pre or post impact fire.

1.15 Survival Aspects

It was an un-survivable accident.

1.16 Tests and Research

Not relevant for this investigation.

1.17 Organisational and Management Information

Aircraft Owner : PT. ASI Pudjiastuti Aviation (Susi Air)
Aircraft Operator : PT. ASI Pudjiastuti Aviation (Susi Air)
Address : Jalan Merdeka 12, West Java, Indonesia .
Air Operator Certificate Number : AOC/135-028

PT. ASI Puji Astuti Aviation is holder of Air Operator Certificate number 135-028 and is authorized to conduct “On Demand Airplane Operation”, carriage of passengers or cargo in scheduled operation domestic and international to neighbouring countries. PT. ASI Puji Astuti Aviation is authorized to conduct aerial survey flight domestically and internationally.

The investigation did not find SOP for conducting survey flights, and the training program covering all aspects for new survey pilots.

1.18 Additional Information

1.18.1 Aircraft System

1.18.1.1 Fuel System General

- The fuel system of the Pilatus Porter. PC-6 mainly consists of two main wing fuel tank, each tank has a capacity of approximately 85 US gallons (321 liters), two access panels and a filler port are located on the upper surface of each tank, and a float actuated fuel quantity transmitter is mounted on the inboard rib of each tank.
- The inboard section of each tank is vented through a common vent on top of the fuselage.
- A fuel collector tank with an integral auxiliary fuel pump is installed in the fuselage. Fuel passes through a fuel shut – off to the engine driven fuel pump.
- Fuel from the main tanks flows by gravity through 2 lines (one each at front and rear of the tank) to the collector tank. Water in the fuel is allowed to drain from a line in the bottom of the collector tank. A drain valve is installed in the bottom of the collector tank.
- This specific aircraft had two under wing (auxiliary) fuel tanks on pylons, each holding 63 US gallons (239 liters).
- The auxiliary fuel pump is electrically driven to feed the fuel from the collector tank to the engine.
- To transfer fuel from each under wing auxiliary fuel tanks to the main tank an electrical pump (powered by the generator as electrical source) is used.
- An emergency electric pump powered by battery electrical power, that could be used when the normal (generator) electrical power was gone or in battery mode can be activated by switching the system into the “emergency” mode.
- The transfer of fuel from the under wing auxiliary tank to the main tank should be performed when the main tanks are less than three quarter but not less than a half full
- The switching of the auxiliary fuel control switch has three positions “ OFF, ON and Start”



Figure 5: Auxiliary fuel control

- There are 4 annunciator lights associated with the auxiliary fuel system (2 for each side). The GREEN “LF Pump” and “RF Pump” illuminate during pump operation when fuel is transferred. The AMBER “Fuel Flow” annunciators illuminate when the pumps auto-stop (when either no fuel remains in the auxiliary tanks or the main tanks are near full).

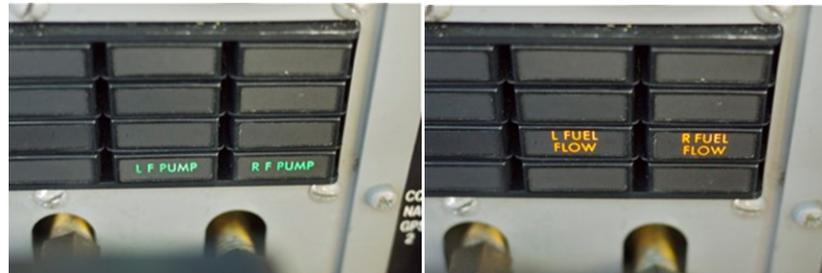


Figure 6: There were no fuel low levels warning lights or annunciators installed on the aircraft.

1.18.1.2 Fuel System Inspection

- The aircraft's fuel and electric system had been inspected by the Aircraft Manufacture Expert supported by Operator persons and lead by the NTSC IIC at the contract storage facility rented to store the wreckage. The purpose of the inspection was to determine the fuel system function before the aircraft's engine flame out. To accomplish this in a systematic manner the following test plan was proposed.
- Visually inspect the (auxiliary system transfer) fuel pumps in the wings and inside the collector tank. Determine that the installation is proper. Photograph all pumps, electric wiring and fuel fittings. Inspect the engine driven high flow fuel pump.
- Inspect the instrument panel annunciator lights. Determine if they could be tested. Photograph the lights.
- Inspect the switches in the cockpit that control the fuel system and the transfer of fuel from the external auxiliary tanks to the main wing internal fuel tanks.

Photograph the switches.

- Determine how much of the systems can be functionally checked without disassembly.
- Develop a test plan for each testing event.

The test result was as follows:

The fuel system was inspected and found to operate normally. All airframe pumps (auxiliary fuel system and collector boost pump) delivered fuel. All fuel switches operated properly. The fuel indication floats in both wings functioned properly.

The remaining fuel at the collector tank was clear fuel (non-contaminated (Fig 7), and the engine fuel filter element was clean see (Fig 8), the fuel pump drive gear was normal. see (Fig 9),



Figure 7: Remaining fuel at collector tank



Figure 8: Engine fuel Filter.



Figure 9: Spline Gear shaft

1.18.1.3 Flight Control system

The Aircraft Manufacturer expert determined that the pitch trim was set to the nearly full nose-up position (see Figure 10) and that the flaps were about half extended ($16^{\circ} - 18^{\circ}$ versus 38°). (See Figure 11)



Figure 10: Actuator Horizontal Trim Tab



Figure 11 : Flap position.

1.18.2 Operation

The fuel transfer procedure was available on the flight manual on board the aircraft.

Fuel Transfer Normal Procedure

1. Fuel quantity Indicator – CHECK
When the integral tank are less the three quarter but not less than a half of full
2. LH Pump & RH Pump switch - START then ON
Check L F PUMP and R F PUMP advisory light illuminate.
When L Fuel FLOW & R Fuel FLOW caution lights illuminate:
3. L H PUMP and R H PUMP switch - OFF
Check L FUEL FLOW and R FUEL FLOW caution light and L FUEL PUMP and R FUEL PUMP advisory lights off.
4. FUEL QTY indicator - CHECK

Note: The fuel transfer rate is 98.4 Ltrs/21.6 Imp-Gal per pump per hour, depending on pump installed.

Emergency Procedure

1. Fuel quantity Indicator – CHECK
When the integral tank are less the three quarter but not less than a half of full:
2. EMERGENCY switch - EMERG
Check L F PUMP and R F PUMP advisory light illuminate.
3. FUEL QTY indicator - MONITOR

When FUEL QTY indicator full or fuel transfer is complete :

4. EMERGENCY switch - NORMAL
Check L F PUMP and R F PUMP advisory light off.

Force landing procedure

Referred the Aircraft Flight Manual the force landing procedure was as follow:

FORCED LANDING (Engine Inoperative)

1. Prop control lever FEATHER
2. Fuel System Valve CLOSE
3. Flaps TO
4. Turn to nearest airfield and glide for range
5. Speed 80 KIAS
6. Harness (Crew and Pax) TIGHT
7. Radio EMER-CALL
8. When Landing assured:
9. Flaps LD
10. Battery OFF
11. Speed 70 KIAS

1.18.3 Human Factors

- The pilot had less than 100 hours on the aircraft type, and the accident flight was only his 3rd survey flight. He had not received formal survey flight training.
- Other pilots reported that the initial transition to survey flying was causing elevated stress in the first two weeks on the job. The pilot was at the beginning of that phase.
- Pilots who flew with the same survey operator reported that he was very demanding towards the pilot to fly the survey lines with high precision.

1.19 Useful or Effective Investigation Techniques

The investigation is being conducted in accordance with the NTSC approved policies and procedures, and in accordance with the standards and recommended practices of Annex 13 to the Chicago Convention.

2 ANALYSIS

The aircraft was in airworthy condition prior to departure, during an aerial survey flight the engine flamed out.

The lack of fuel transferred from external auxiliary tanks to the main tank caused the main tank to run dry and caused a loss of fuel feed to the engine, which caused the engine flame out.

The survey flight altitude was between 1500 to 2500 feet above ground. Due to this relatively low altitude, it was difficult to find a suitable emergency landing area. The pilot apparently selected a mining road as the landing area, but failed to reach it.

- Both main fuel tanks were empty and no evidence of post-accident fuel leak and smell at the site.
- The external auxiliary fuel tanks were both full.
- The inspection of the fuel system found that the fuel system was fully operational, all airframe boost pumps delivered fuel. All fuel switches operated properly, and the fuel pumps floats in both wings functioned properly.
- The intended survey flight time was about six hours which would require the use of both the main and auxiliary fuel carried. The actual flight time from departure in Balikpapan until the accident was approximately 4 hours and 40 minutes, consistent with the amount of fuel available in the main tanks (at an average hourly fuel consumption of 37 gallons).
- When the integral tank are less than three quarters but not less than a half of full; the transfer fuel process should be performed by the **Fuel Transfer Normal Procedure** and if it fails the Emergency procedure should be performed by switching “EMERG” to by passing all relays to operate the both transfer boost pumps.

The lack of fuel transferred from auxiliary tanks to the main tank caused the loss of fuel feed to the engine, and caused the engine flame out.

- The accident site located about fifty meters from the local mining road.
- The combination of aircraft attitude and impact angle caused the aircraft to be stopped in a very short distance. The deceleration from flight speed (50 – 60 knots) to zero happened in less than 2 meters distance, resulting in very high impact forces. This made the accident un-survivable.
- The combination of inexperience of the pilot related to survey flying, fatigue and the highly demanding survey operator probably caused the pilot to fixate on the survey flight execution and lose awareness of his fuel situation; as a

consequence he failed to transfer fuel from the auxiliary tanks to the main tanks, as required.

3 CONCLUSIONS

3.1 Finding

- The engine flamed out.
- The main fuel tanks were empty
- The auxiliary fuel tanks contained full fuel.
- The Normal Fuel transfer system and the EMERGENCY fuel Transfer system were available and serviceable on the aircraft.
- The fuel system was checked after the accident and operated normally.
- The propeller was feathered and no evidence of rotating at impact.
- The pitch trim was set to the nearly full nose-up position and that the flaps were about half extended (16° – 18° versus 38°).
- There was no SOP available for conducting survey flights, and the training program covering all aspects for new survey pilots.
- The pilot shoulder harness was not used.

3.2 Causes

The engine flamed out caused by lack of fuel supply from main fuel tank to the engine. The pilot likely fixated on the survey flight execution and lost awareness of his fuel situation. The transferring of fuel from the auxiliary tank was not performed during the flight as required. The combination of inexperience of the pilot related to survey flying, fatigue and the highly demanding survey operator contributed to this sequence of events.

4 SAFETY ACTION

At the time of issuing of this Accident Investigation Report, the National Transportation Safety Committee had been informed that the safety actions resulting from this accident had been taken by related parties as follows:

4.1 Directorate General Civil Aviation, CQ. Directorate Airworthiness and Aircraft Operation

The special audit was performed to check the operation and airworthiness process in complying the regulation refer to DKUPPU letter No. 2047/DKUPPU/STD/V/2012

4.2 PT. ASI Pujiastuti Aviation

Referred to PT. ASI Pujiastuti Aviation letter dated Jakarta, 6th August 2012 related to the NTSC immediate recommendation of the PT. ASI Pujiastuti aircraft accident, as safety action the company has developed an approved specific SOP for conducting survey flights, which includes:

- Survey preparation and individual site risk analysis
- Survey execution procedures and limitations
- Limitations in flight and duty times for survey flights
- Specific safety instruction on the use of harnesses and other safety equipment
- Fuel management procedures
- A comprehensive training program covering all aspects for new survey pilots

With this new survey SOP, defined training, and the technical result of the fuel system investigation, it is expected to resume use of the auxiliary fuel tanks.

Looking into the future, Susi Air intends to study more aspects of forced landings (emergencies like landings after engine failures, precautionary off-airport landings) including survival aspects and pilot decision-making.

5 SAFETY RECOMMENDATIONS

As a result of this accident investigation, the National Transportation Safety Committee issued recommendation to address safety issues identified in this report, as follow:

5.1 Recommendation to Directorate General of Civil Aviation

The National Transportation Safety Committee recommends that Directorate General of Civil Aviation should review the Operator Operation Specification as specially the AOC 135 holder that have a special operation such as Survey Flight, aerial Manuring to have an approved specific SOP for conducting such flights, which includes:

- Survey/Manuring preparation and individual site risk analysis
- Survey/Manuring execution procedures and limitations
- Limitations in flight and duty times for flights
- Specific safety instruction on the use of harnesses and other safety equipment
- Fuel management procedures
- A comprehensive training program covering all aspects for new pilots

5.2 Recommendation to Pilatus Aircraft Ltd.

It is recommended to develop a low fuel warning system for all PC6 aircraft that can be installed on new aircraft and retrofitted to existing aircraft.