

**COMANDO DA AERONÁUTICA**  
**CENTRO DE INVESTIGAÇÃO E PREVENÇÃO DE**  
**ACIDENTES AERONÁUTICOS**



**FINAL REPORT**  
**IG - 135/CENIPA/2014**

<b>OCCURRENCE:</b>	<b>SERIOUS INCIDENT</b>
<b>AIRCRAFT:</b>	<b>PR-HRV</b>
<b>MODEL:</b>	<b>S-61N</b>
<b>DATE:</b>	<b>16AUG2014</b>



## NOTICE

*According to the Law n° 7565, dated 19 December 1986, the Aeronautical Accident Investigation and Prevention System – SIPAER – is responsible for the planning, guidance, coordination and execution of the activities of investigation and prevention of aeronautical accidents.*

*The elaboration of this Final Report was conducted taking into account the contributing factors and hypotheses raised. The report is, therefore, a technical document which reflects the result obtained by SIPAER regarding the circumstances that contributed or may have contributed to triggering this occurrence.*

*The document does not focus on quantifying the degree of contribution of the different factors, including the individual, psychosocial or organizational variables that conditioned the human performance and interacted to create a scenario favorable to the accident.*

*The exclusive objective of this work is to recommend the study and the adoption of provisions of preventative nature, and the decision as to whether they should be applied belongs to the President, Director, Chief or the one corresponding to the highest level in the hierarchy of the organization to which they are being forwarded.*

*This Report does not resort to any proof production procedure for the determination of civil or criminal liability, and is in accordance with Appendix 2, Annex 13 to the 1944 Chicago Convention, which was incorporated in the Brazilian legal system by virtue of the Decree n° 21713, dated 27 August 1946.*

*Thus, it is worth highlighting the importance of protecting the persons who provide information regarding an aeronautical accident. The utilization of this report for punitive purposes maculates the principle of “non-self-incrimination” derived from the “right to remain silent” sheltered by the Federal Constitution.*

*Consequently, the use of this report for any purpose other than that of preventing future accidents, may induce to erroneous interpretations and conclusions.*

**N.B.: This English version of the report has been written and published by the CENIPA with the intention of making it easier to be read by English speaking people. Taking into account the nuances of a foreign language, no matter how accurate this translation may be, readers are advised that the original Portuguese version is the work of reference.**

## SYNOPSIS

This is the Final Report of the 16AUG2014 serious incident with the S-61N aircraft, registration PR-HRV. The serious incident was classified as “Foreign Object Damage (FOD)”.

During the final approach for landing in a clearing, there was loss of engine power and the crew opted to perform a go-around procedure in flight. After stabilizing the aircraft, the pilot shutdown the right engine.

The aircraft had minor damages.

The pilots and all occupants were unharmed.

An Accredited Representative of the NTSB - National Transportation Safety Board, USA (State where the aircraft was manufactured) was designated for participation in the investigation.



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## GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

AGL	Above Ground Level
ANAC	(Brazil's) National Civil Aviation Agency
ATS	Air Traffic Services
CA	Airworthiness Certificate
CENIPA	Aeronautical Accident Investigation and Prevention Center
CG	Center of Gravity
CHT	Technical Qualification Certificate
CIV	Pilot's Flight Logbook
CMA	Aeronautical Medical Certificate
DCTA	Aeronautics' Science and Technology Department
FOD	Foreign Object Damage
IFR	Instrument Flight Rules
IFRH	Instrument Flight Qualification - Helicopter
LAT	Latitude
LONG	Longitude
METAR	Meteorological Aerodrome Report
PLAH	Airline Pilot - Helicopter
PPH	Private Pilot License - Helicopter Category
RBAC	Brazilian Civil Aviation Regulation
RELPREV	Prevention Report
RS	Safety Recommendation
SBUY	ICAO location designator – Porto Urucu Aerodrome
SERIPA	Regional Aeronautical Accident Investigation and Prevention Service
SIPAER	Aeronautical Accident Investigation and Prevention System
SMS	Safety Management System
TPX	Aircraft Registration Category of Non-Regular Public Air Transport
UTC	Universal Coordinated Time
VFR	Visual Flight Rules

## 1. FACTUAL INFORMATION.

Aircraft	<b>Model:</b> S-61N	<b>Operator:</b> OMNI Air Taxi Ltd.
	<b>Registration:</b> PR-HRV	
	<b>Manufacturer:</b> SIKORSKY AIRCRAFT	
Occurrence	<b>Date/time:</b> 16AUG2014/1157 UTC	<b>Type(s):</b> Foreign Object Damage (FOD)
	<b>Location:</b> Porto Hélio Base	
	<b>Lat.</b> 04°44'48"S <b>Long.</b> 065°15'13"W	<b>Subtype(s):</b>
	<b>Municipality – State:</b> Coari - AM	

### 1.1 History of the flight.

The aircraft took off from Porto Urucu (SBUY), AM, to Porto Hélio Base, AM, at 1150 (UTC), to perform a personnel transportation flight with two pilots and eleven passengers on board.

During the final approach for landing, the crew verified the loss of power of the right engine. The commander made a go-around procedure in flight and shutdown the engine, returning to Porto Urucu in a single engine condition, where he landed without major problems.

### 1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	-	-	-
Minor	-	-	-
None	2	11	-

### 1.3 Damage to the aircraft.

Damage was restricted to the right engine.

### 1.4 Other damage.

Nil.

### 1.5 Personnel information.

#### 1.5.1 Crew's flight experience.

	Hours Flown	
	Pilot	Copilot
Total	10.942:00	5.000:00
Total in the last 30 days	58:30	54:12
Total in the last 24 hours	06:35	06:35
In this type of aircraft	3.162:50	1.127:50
In this type in the last 30 days	58:30	54:12
In this type in the last 24 hours	06:35	06:35

**N.B.:** The Data on flown hours were obtained from the operator.

#### 1.5.2 Personnel training.

The pilot took the Private Pilot course - Helicopter (PPH) at *Escola SKYLAB*, in 1994.

The co-pilot took the Private Pilot course - Helicopter (PPH) at *Escola SKYLAB*, in 1998.

### **1.5.3 Category of licenses and validity of certificates.**

The pilot had the license of Airline Pilot - Helicopter (PLHA) and had valid aircraft technical qualification in S-61 and Instrument Flight Qualification - Helicopter.

The co-pilot had the license of Airline Pilot - Helicopter (PLHA) and had valid aircraft technical qualification in S-61 and Instrument Flight Qualification - Helicopter.

### **1.5.4 Qualification and flight experience.**

The pilots were qualified and had experience on this kind of flight.

### **1.5.5 Validity of medical certificate.**

The pilots had valid Aeronautical Medical Certificate (CMA).

### **1.6 Aircraft information.**

The aircraft, serial number 61762, was manufactured by Sikorsky Aircraft in 1977 and was registered in the category of Non-Regulated Public Air Service (TPX).

The aircraft had a valid Airworthiness Certificate (CA).

The airframe and engine logbooks records were up-to-date.

The last inspection of the aircraft, the "150 hours" type, was carried out on 01AUG2014 by a shop approved by the ANAC, having flown 40 hours after the inspection.

### **1.7 Meteorological information.**

The conditions were favorable for the visual flight.

### **1.8 Aids to navigation.**

Nil.

### **1.9 Communications.**

Nil.

### **1.10 Aerodrome information.**

The occurrence took place outside the Aerodrome.

### **1.11 Flight recorders.**

Neither required nor installed.

### **1.12 Wreckage and impact information.**

Nil.

### **1.13 Medical and pathological information.**

#### **1.13.1 Medical aspects.**

Nil.

#### **1.13.2 Ergonomic information.**

Nil.

#### **1.13.3 Psychological aspects.**

Nil.

### **1.14 Fire.**

There was no fire.

### 1.15 Survival aspects.

Nil.

### 1.16 Tests and research.

During the initial action, the right engine Serial Number 285-240RC that was installed on the aircraft was collected for testing at the Vector Aerospace Company in Canada.

During the opening, it was observed in detail that all ten stages of the rotary compressor were damaged, as well as the blades of the first and second stages of the power turbine, which consequently caused the torque drop observed by the pilots at the time of the occurrence.

The result of the examination indicated that the damage was caused by foreign object ingestion (FO), although the part of the screen-fixing screw was not found, which was presumed to have been ingested by the engine.

In the same way, the remaining part of the engine air intake screen-fixing screw (ROD CLAMP PN 61088-20222-130) was collected for laboratory testing at the DCTA.

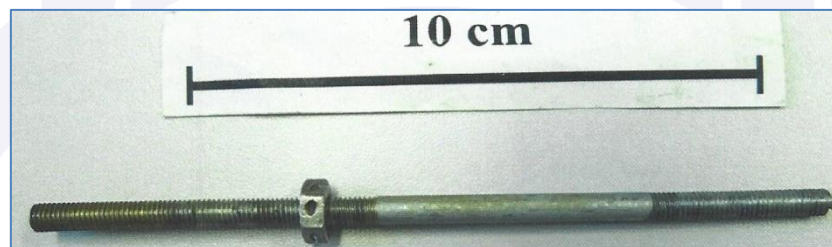


Figure 1 - Screen fixing screw.

Two types of examinations were performed by the DCTA: preliminarily, a stereoscopic analysis; and as an additional examination, an analysis by scanning electron microscopy was also performed. Both pointed out as a result that the screw fracture occurred due to fatigue by alternating bending stress.

Improper mounting of the engine air intake screen (Rod Clamp Rigging), which caused cracks (Figure 2) on the screw thread and its consequent rupture possibly caused the alternating bending.

The last installation on that screen occurred 15 (fifteen) days before the event, during the 150 hour inspection. After that installation, the aircraft flew approximately 40 hours; however, it was not possible to establish how long the cracks began to occur.

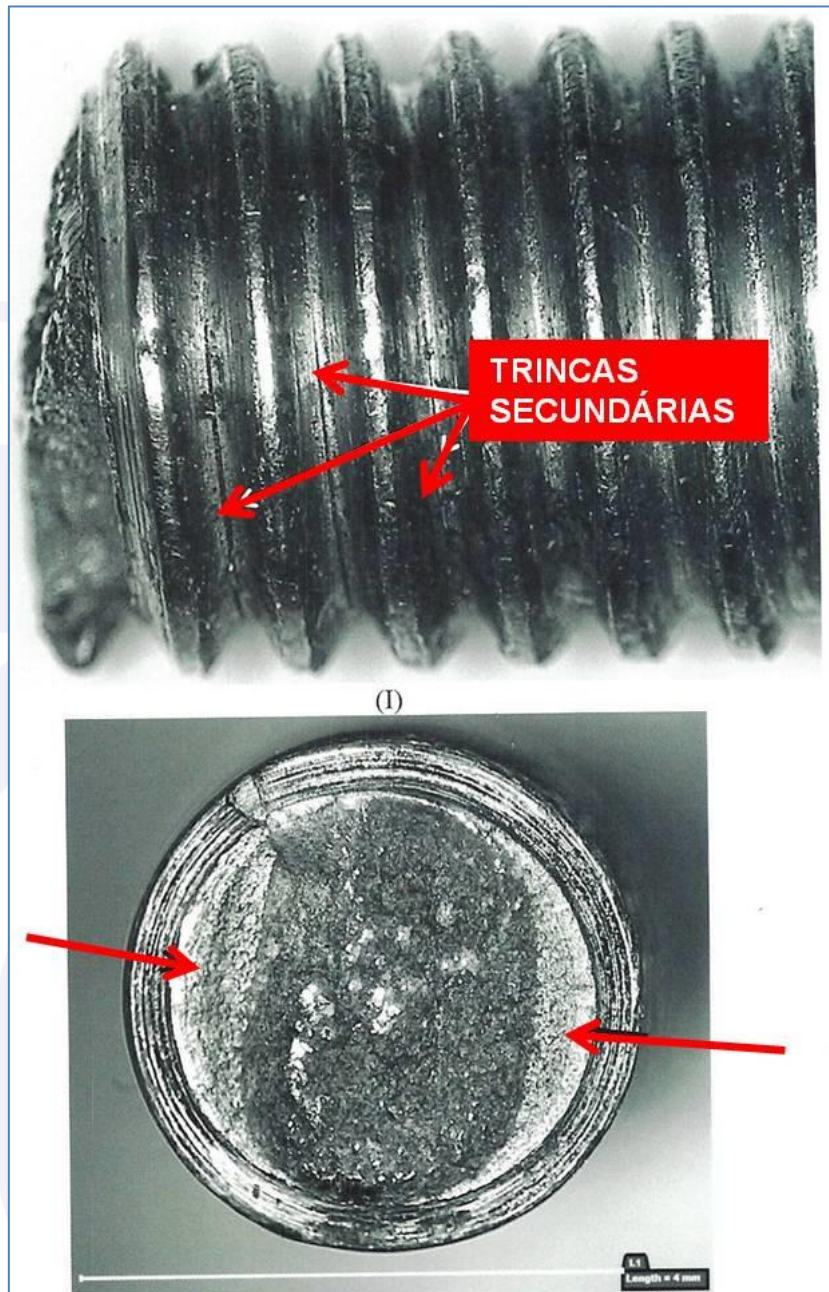


Figure 2 - Cracks in the screw thread.

### 1.17 Organizational and management information.

The company operated two S61 model aircraft since August 2009, with the helicopter involved in the event coming into operation in August 2014. External cargo transport constituted the most part of the operation and the use of the S61 helicopters, which flew a monthly average of 120 hours each.

To that end, the company had a hangar in Urucu with supplies and maintenance personnel. The staff consisted of a supervisor, an inspector, three engine mechanics, an avionics mechanic, and a structural mechanic. All of them worked under the 14-day leave, after 14 days worked.

Regarding the training of pilots, in addition to the normal qualification to operate the equipment, these were also qualified in operation with external cargo, being requalified each year, both in the equipment and in the operation with external load.

Each 14 days, meetings were held with the pilots, maintenance staff and cargo masters, during the exchange of operations personnel, where the main issues were addressed, such as some specific conduct or Prevention Report (RELPREV).

Normally, every three months, a Safety Meeting was held with the base staff, where the main facts at the base, the most significant RELPREV and a Safety Management System (SMS / SEGVVO) audit were discussed.

In addition, the base had a schedule of lectures focused on work and flight safety. As a result, a program was implemented, which aimed to increase the level of attention of the personnel and improve the mentality of work safety, emphasizing subjects such as the use of Personal Protective Equipment (PPE) and flight safety, in a generic way.

These audits were recorded and a follow-up was carried out to verify their correctness.

In parallel to these company actions, Petrobrás (contractor) audited the aircraft, crews and the base, on average every 20 days, to verify the maintenance performed, the training given and the flight safety mentality.

The company workshop was approved to perform maintenance in accordance with the rules of the Brazilian Civil Aviation Regulation 145 (RBAC 145).

### 1.18 Operational information.

The aircraft was within the weight and balance parameters specified by the manufacturer.

The company performed the type of operation for more than six years in that area, and the contractor had coordinated the flight planning the previous day.

Pilots involved in the occurrence, besides being qualified in that type of aircraft, also operated in this area for more than six years and were trained annually in simulator emergencies.

The procedures provided in checklist and previously trained in flight simulator predicted that, in the event of loss of power and variations in engine parameters, as presented in the occurrence, the engine shutdown and landing should be performed as soon as practicable.

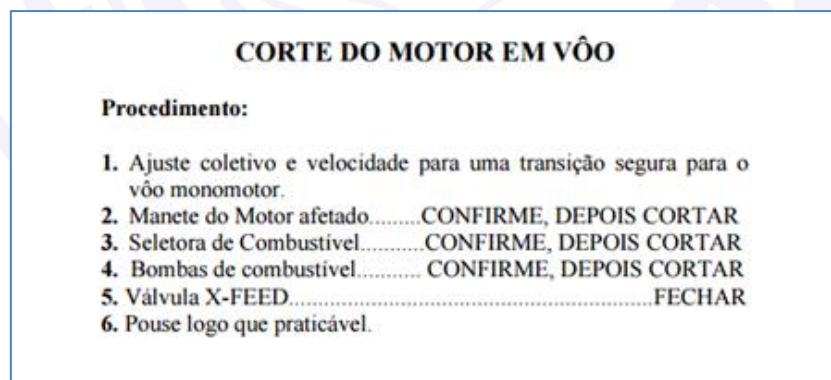


Figure 3 - Procedure for shutting down the engine in flight.

As reported, the return to Porto Urucu was presented as a safer landing alternative for the single-engine condition.

**Pouse logo que praticável** A duração do vôo e o local do pouso são de escolha do piloto. Não é recomendado prolongar o vôo além da área de pouso homologada mais próxima.

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Figure 4 - Definition of landing as soon as practicable.

The company's mechanic performed the pre-flight of the aircraft and nothing abnormal was reported.

#### 1.19 Additional information.

Nil.

#### 1.20 Useful or effective investigation techniques.

Nil.

## 2. ANALYSIS.

It was a passenger transport flight from Porto Urucu Petroleum Base to Porto Hélio Base, with two pilots and eleven passengers.

During the final approach for landing at the destination clearing, when cruising about 200 ft. (AGL), the crew reported having noticed abnormal noise and verified right engine power loss (Parameters - Torque 0%, Ng 55% (idle) and T5 above the 930 ° C limit).

Immediately, the commander chose to perform a go-around procedure in flight. After stabilizing the aircraft, the crew shutdown the engine.

The return to the locality of Porto Urucu occurred with the aircraft in a single-engine flight condition, and a landing was performed at threshold 27, around 1210 (UTC).

The company carried out this type of operation for more than six years in the area, and the contractor coordinated the flight planning the previous day.

The pilots involved in the occurrence, besides being qualified in that type of aircraft, also operated in the area for more than six years and had training in simulator emergencies.

The company's mechanic performed the pre-flight of the aircraft, and nothing unusual was reported.

The aircraft was within the limits of weight and center of gravity (CG) specified by the manufacturer.

During the investigation, the engine was collected and sent for examinations at the Vector Aerospace Company in Canada, whose result pointed out that the damages that led to the loss of power observed by the pilots were associated with foreign object ingestion, although the part of the screen-fixing screw that had been ingested by the engine was not found.

The remaining part of the engine air intake screen attachment screw was sent for laboratory examinations at the DCTA.

Stereoscopic analysis and analysis by scanning electron microscopy indicated that the screw fracture occurred due to fatigue by alternating bending stress.

It was not possible to verify exactly the cause of the cracks that originated the alternating bending failure in the screw. In this way, the following possibilities for the failure occurred: out of specification torque, incorrect braking or inadequate inspection of the screws.

The last installation of that screen occurred 15 days before the incident, during the inspection of 150 hours, and after that installation, the aircraft had flown approximately 40 hours.

### 3. CONCLUSIONS.

#### 3.1 Facts.

- a) the pilots had valid Aeronautical Medical Certificates (CMA);
- b) the pilots had valid Technical Qualification Certificates (CHT);
- c) the pilots were qualified and had experience in that kind of flight;
- d) the aircraft had valid Airworthiness Certificate (CA);
- e) the aircraft was within the weight and balance parameters;
- f) the airframe and engine logbooks records were up-to-date;
- g) the aircraft took off from Porto Urucu to Porto Hélio with eleven passengers;
- h) during approach for landing, there was a failure of the right engine;
- i) the pilot performed a go-around procedure in flight and shutdown the failing engine;
- j) the aircraft returned to Porto Urucu in single-engine condition;
- k) the engine failure was caused due to foreign object ingestion (fixing screw);
- l) screw rupture occurred due to alternating bending stress fatigue;
- m) landing was carried out without major problems;
- n) the damage was restricted to the right engine; and
- o) the pilots and occupants were unharmed.

#### 3.2 Contributing factors.

- **Aircraft maintenance – undetermined.**

It is possible that during the last inspection of the engine air intake screen, there may have been some failure related to braking, torque, or inspection of the screen-fixing screws.

### 4. SAFETY RECOMMENDATION.

*A measure of preventative/corrective nature issued by a SIPAER Investigation Authority or by a SIPAER-Link within respective area of jurisdiction, aimed at eliminating or mitigating the risk brought about by either a latent condition or an active failure. It results from the investigation of an aeronautical occurrence or from a preventative action, and shall never be used for purposes of blame presumption or apportion of civil, criminal, or administrative liability.*

*In consonance with the Law n°7565/1986, recommendations are made solely for the benefit of the air activity operational safety, and shall be treated as established in the NSCA 3-13 “Protocols for the Investigation of Civil Aviation Aeronautical Occurrences conducted by the Brazilian State”.*

**Recommendations issued at the publication of this report:**

None.

**5. CORRECTIVE OR PREVENTATIVE ACTION ALREADY TAKEN.**

- The Company's maintenance and engineering department has determined that a Maintenance Inspector check the torque on all air intake screens of the fleet's helicopter engines in order to ensure a safe continuity of the operation.

- The Company's maintenance and engineering department has issued an Engineering Order changing the braking method of the screw for securing the air inlet screens of the fleet's helicopter engines to ensure a safe continuity of the operation.

On April 05<sup>th</sup>, 2018.