



**COMISIÓN DE
INVESTIGACIÓN
DE ACCIDENTES
E INCIDENTES DE
AVIACIÓN CIVIL**

Report A-045/2016

Accident involving a VELOCITY
173RG aircraft, registration
PH-FUT, in Santa Cruz de Tenerife
(Spain) on 27 December 2016



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Report

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Foreword

This report is a technical document that reflects the point of view of the Civil Aviation Accident and Incident Investigation Commission (CIAIAC) regarding the circumstances of the accident object of the investigation, and its probable causes and consequences.

In accordance with the provisions in Article 5.4.1 of Annex 13 of the International Civil Aviation Convention; and with articles 5.5 of Regulation (UE) n° 996/2010, of the European Parliament and the Council, of 20 October 2010; Article 15 of Law 21/2003 on Air Safety and articles 1., 4. and 21.2 of Regulation 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future civil aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent from their reoccurrence. The investigation is not pointed to establish blame or liability whatsoever, and it's not prejudging the possible decision taken by the judicial authorities. Therefore, and according to above norms and regulations, the investigation was carried out using procedures not necessarily subject to the guarantees and rights usually used for the evidences in a judicial process.

Consequently, any use of this report for purposes other than that of preventing future accidents may lead to erroneous conclusions or interpretations.

This report was originally issued in Spanish. This English translation is provided for information purposes only.

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Abbreviations

ATC	Air traffic control
CECOA	Airport operations center
E	Point East
FL	Flight level
ft	Feet
ft/min	Feet per minute
GCXO	ICAO code for Tenerife North airport (Spain)
h	Hours
HP	Horsepower
ILS	Instrumental landing system
kg	Kilograms
km	Kilometer(s)
km/h	Kilometers per hour
Kt	Knots
LT	Local time
m.	Meters
MHz	Megahertz(s)
min	Minutes
MTOW	Maximum takeoff weight
N	North
NM	Nautical mile
PPL	Pilot Private Licence
RWY	Runway
SE	SouthEast
SSE	South SouthEast
TWR	Tower
VFR	Visual flight rules
XOAPP	Tenerife North approach control
XOTWR	Tenerife North tower

Synopsis

Owner and Operator:	Private
Aircraft:	Velocity 173 RG, registration PH-FUT
Date and time of accident:	27 December 2016 at 12:55 LT ¹
Site of accident:	Las Teresitas beach (Santa Cruz de Tenerife, Spain)
Persons aboard:	3. 1 crew, seriously injured; 2 passengers, not injured
Type of flight:	General aviation - Private
Phase of flight:	Landing – Emergency landing
Date of approval:	25 October 2017

Summary of the accident:

On Tuesday, 27 December 2016, a Velocity 173RG aircraft, registration PH-FUT, took off from the Tenerife North Airport at 12:30, planning to fly to Essaouira (Morocco) on a visual flight plan. There were three persons aboard.

At 12:43, the pilot contacted the airport tower to report he would be returning to the airport due to problems with the aircraft. At 12:51, when it became clear he would not reach the airport, the pilot declared an emergency and landed at the beach of Las Teresitas. The pilot was seriously injured during the landing and required hospitalization. The two passengers were not injured. The aircraft sustained heavy damage.

The investigation has determined that the likely cause of the accident of aircraft PH-FUT was the loss of control of the aircraft while making the emergency landing following the fracture of the right exhaust manifold, which detached, impacting and breaking one of the propeller blades.

¹ All times in this report are local.

1. FACTUAL INFORMATION

1.1. History of the flight

On Tuesday, 27 December 2016, an amateur-built Velocity 173RG aircraft, registration PH-FUT, suffered an accident as it was making an emergency landing at the Las Teresitas beach in Santa Cruz de Tenerife.

The aircraft had taken off at 12:30 from the Tenerife North Airport en route to Essaouira (Morocco) on a VFR flight plan. As they were climbing, the pilot felt a vibration in the aircraft, and at 12:43 he reported to approach control that he was returning to the airport. Five minutes later, he contacted the Tenerife North tower, stating that the vibrations had increased. At 12:51, the pilot declared an emergency and informed he would be landing on the Las Teresitas beach, after which he reduced power and started the approach to said beach. Upon landing on the water, the initial contact was with the left wing, which caused the aircraft to yaw left as it continued moving before finally coming to a stop out of the water.

The occupants were treated by emergency services, though the pilot's injuries required that he be transferred to a hospital, where he was later operated on. Neither passenger was injured.

1.2. Injuries to persons

Injuries	Crew	Passengers	Total in the aircraft	Others
Fatal				
Serious	1		1	
Minor				
None		2	2	
TOTAL	1	2	3	

1.3. Damage to aircraft

The entire aircraft sustained significant damage, including the wings, fuselage, landing gear, engine and cockpit.

1.4. Other damage

There was no other damage.

1.5. Personnel information

The pilot, a 53-year old Belgian national, had a private pilot license that had been issued by Spain's National Aviation Safety Agency on 13 April 2006. He also had a class-2 medical certificate that was valid until 19 December 2017. He stated that he had approximately 1200 hours of flight time as a pilot at the time of the accident.

1.6. Aircraft information

The Velocity 173RG aircraft, registration PH-FUT and serial number F02RG-001, was an amateur-built aircraft equipped with a four-cylinder, 180-hp Lycoming IO-360-B1E engine and a three-blade wood propeller. It had a MTOW of 1089 kg. It had a special certificate of airworthiness in the amateur-built aircraft category that had been issued by the Dutch Civil Aviation Authority on 27 July 2016, which was valid until 31 July 2017.

The aircraft had been built with composite materials and had a canard configuration with a reduction-drive engine and retractable landing gear.

The owner's registration certificate at the time of the accident was issued by the Aircraft Register of the Dutch Civil Aviation Authority on 25 April 2016, although according to the aircraft logbook, it had already been entered in said registry in June 1996.

According to entries made in the aircraft logbook, it was unused between 24 July 2013 and 5 March 2016 and had 293 flight hours. The previous owner did the last annual inspection in July 2015, which consisted of a check as per the aircraft manufacturer's and engine manufacturer's schedule, according to the aircraft logbook.

After purchasing the aircraft, the last owner logged the first flight on 5 March 2016 and used it for 68 h until the accident. The propeller was replaced on 28 September 2016 and had 5 h of use. At the time of the accident, the aircraft had a total of 363.4 flight hours, as recorded in the logbook.

Figure 1 shows a photograph of the aircraft.



Figure 1. Accident aircraft

1.7. Meteorological information

According to data recorded by a weather station located 1 km away from the Las Teresitas beach, the conditions at the accident site were as follows:

Wind: Average speed of 10 km/h from the SSE

Maximum gusts of 29 km/h from the SE

Visibility: good on the surface.

Cloud cover: partly cloudy.

Temperature: around 21°C

Relative humidity: around 60%

At the Tenerife North Airport, 16 km away from the crash site, the conditions were:

METAR GCXO 271300Z 12013KT CAVOK 15/10 Q1024 NOSIG

The sky was practically clear and there were no significant weather phenomena.

12:47:50 PHFUT reports reaching point E and is transferred to XOTWR.

12:48:15 PHFUT contacts XOTWR, reports reaching point E and very strong vibrations. XOTWR instructs pilot to proceed at own discretion. Runway 12 in use. Wind 140 at 15.

12:49:10 XOTWR clears PHFUT to land, RWY 12. Wind 140 at 16, maximum 22.

12:51:03 PHFUT declares emergency at point E, some 9.3 NM away from RWY 30 threshold. Its altitude is 3900 ft. Pilot states he will land near Las Teresitas beach. XOTWR replies it will contact emergency services.

12:54:24 Last radar return recorded. The aircraft is at 1100 ft and descending, 1.6 NM away from point E.

12:54:45 XOTWR makes several calls to PHFUT with no reply.

13:07:16 CECO confirms to XOTWR that the aircraft landed on the water at the Las Teresitas beach.

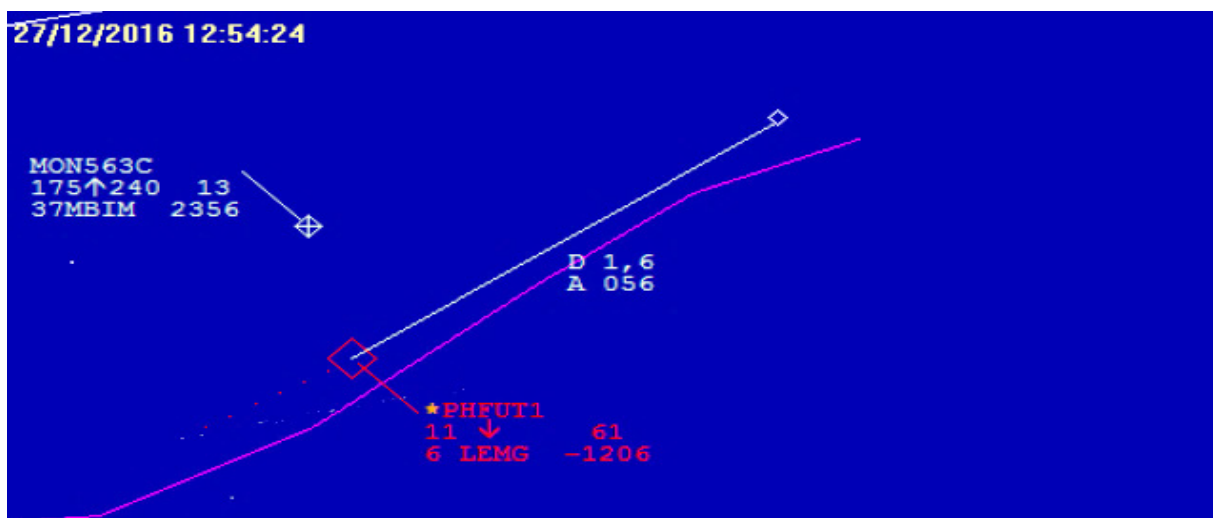


Figure 3. Last radar image of the aircraft

1.10. Aerodrome information

The Tenerife North Airport (GCXO) is located 13 km west of the city and is at an elevation of 2077 ft. It has one 3,171-m long runway in a 30/12 orientation. Both thresholds have an ILS approach.

1.11. Flight recorders

The aircraft was not equipped with a conventional flight data recorder or with a cockpit voice recorder. The relevant aeronautical regulation does not require that any type of recording device be installed on this aircraft type.

1.12. Wreckage and impact information

The aircraft made an emergency landing on the Las Teresitas beach in Santa Cruz de Tenerife, some 16 km northeast of the Tenerife North Airport.

According to the pilot's statement, he was forced to land in the water due to the presence of people on the beach. He landed in such a way that the left wing entered the water first, which made the aircraft turn counterclockwise as it continued moving before coming to a stop on the shoreline.

Figure 4 shows the aircraft's final position.



Figure 4. Aircraft after the accident

1.13. Medical and pathological information

Due to the accident, the pilot sustained several broken vertebrae and a displaced abdomen, as a result of which he was admitted to the intensive care unit and operated on. His estimated recovery time was three to six months.

1.14. Fire

There was no fire in the aircraft or surroundings.

1.15. Survival aspects

The cockpit structure was not deformed in any way that jeopardized the life of the occupants. The seat belts restrained the passengers as they were designed to. However, the pilot stated that when the emergency started, he unfastened his seat belt to turn around and check if the passenger seated behind him had correctly fastened his seat belt, and forgot to fasten his own seatbelt afterward. Because of this, he impacted the instrument panel during the landing, and as a result sustained injuries that required surgery.

1.16. Tests and research

1.16.1 Inspection of the aircraft wreckage

After the accident, the aircraft was taken to a warehouse owned by the Santa Cruz city government, where it was later inspected in the presence of the owner.

It was noted that because of the impact, both wings had separated, as had part of the stabilizer. There were also fractures along the fuselage and part of the roof had detached.

The aircraft was raised on jacks and the engine was turned. The pistons were able to move without resistance. The spark plugs were also removed and all of the cylinders were verified not to have seized.

One of the two magnetos in the ignition system had been replaced by an electronic ignition module.

All three propeller blades were fractured, as shown in Figure 5.

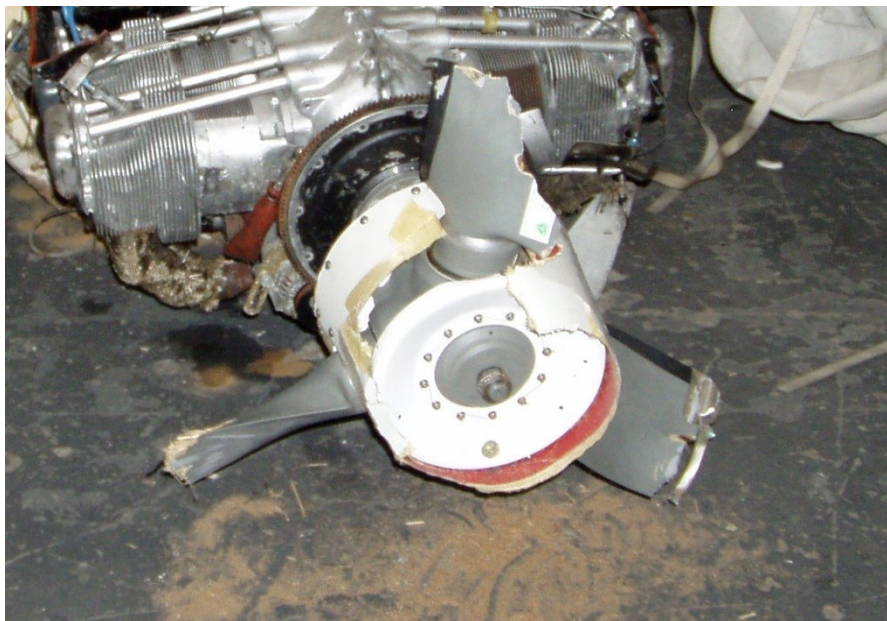


Figure 5. Propeller blades

Two of the fractured blades had damage and abrasions along their leading edge, indicating that they broke when they impacted the terrain upon landing.

The other blade exhibited a fracture perpendicular to its length and preserved part of the protective metal strip along the leading edge, as shown in Figure 6.

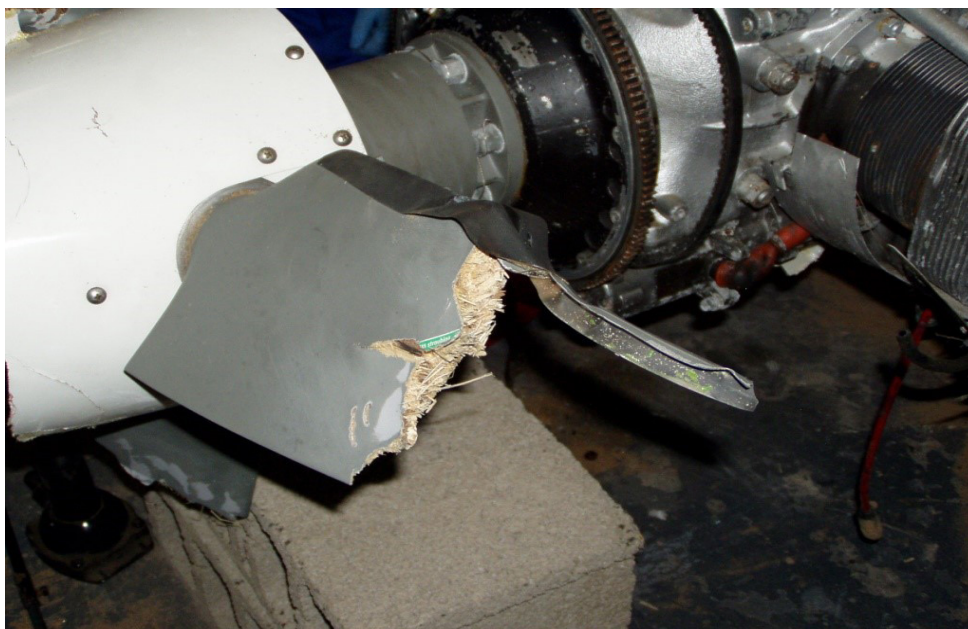


Figure 6. Blade broken under bending load

Part of the engine cowl was burned and melted, as were the electrical wire harnesses located in the engine compartment.

It was also noted that the air intake had been modified and moved to the top of the aircraft. The owner stated that this had been done in order to better cool the engine by directing the air flow directly on top of the cylinders. The intake had initially been located at the bottom of the aircraft.

The intake and exhaust lines for the cylinders were wrapped in thermal tape held in place with wires, as shown in Figure 7. This modification had been made to prevent the high temperatures in these lines from burning the inside of the engine cowl.

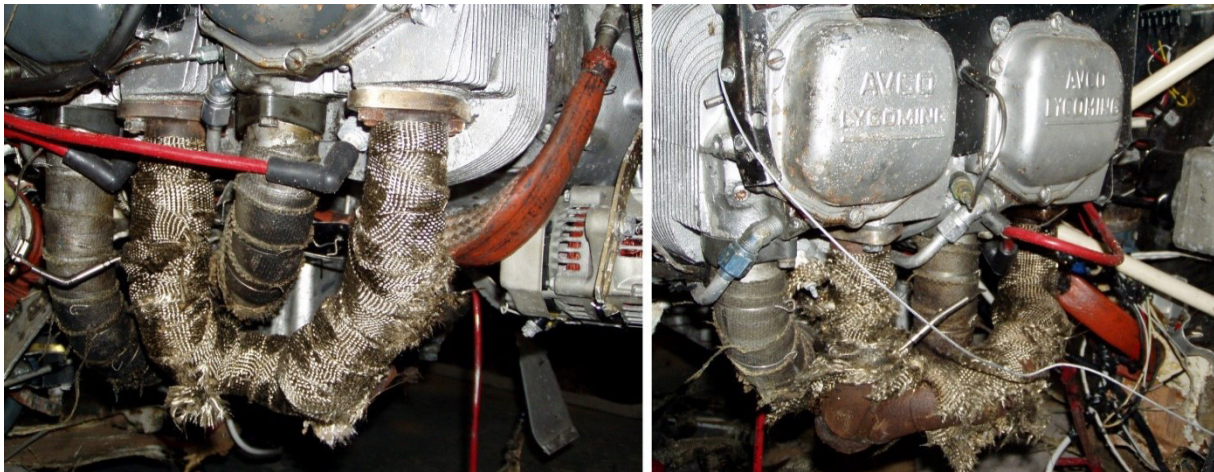


Figure 7. Cylinder intake and exhaust manifolds

According to the information provided, the owner had modified the original exhaust system, removing the silencer and attaching metal tubes to each of the exhaust manifolds to route the exhaust gases. These tubes were clamped in place. Both extension tubes that had been installed were lost in the accident and could not be located. The left manifold was whole. Its intake was fractured, probably by the impact sustained on landing. There was a segment missing from the right manifold, which had broken off at a welded joint, as shown in Figure 8.

Figure 8. Left and right exhaust manifolds



Figure 8. Left and right exhaust manifolds

An inspection of the right manifold revealed different colors in the fracture area, indicative of a gradual fracture due to material wear, and not a sudden fracture at the moment of impact during the accident.

1.16.2. *Statement from the pilot*

The pilot and owner of the aircraft stated that on the day of the accident, they were flying to Morocco, where they planned to spend three days. They were climbing, cleared to FL085, and at 3500 ft he felt a slight vibration, so he decided to turn around and return to the Tenerife North Airport. He reported this to control. Upon reaching point ECO for Tenerife, he heard a loud sound and again contacted ATC to inform he would not make it to the airport and was going to land on the beach. ATC replied they were sending help immediately.

After this, he unfastened his seatbelt to make sure the passenger seated behind him had fastened his correctly. He forgot to refasten his own belt after turning around. He then noticed what smelled like burning plastic and he turned the engine off. The vibration diminished. As he descended toward the beach, he saw a lot of people there, so instead of landing straight in he decided to turn right and land on the water. He descended at 80 kt and the left wingtip touched the water first, which made the aircraft yaw left before eventually stopping on the sand, perpendicular to the shoreline. Since he was not wearing his seat belt, he impacted the control panel during the landing.

He did not know what could have caused the initial vibration. He stated that the subsequent vibration, which was much stronger, was caused by a part that detached from the engine and then broke one of the propeller blades. The photographs later revealed that the propeller spinner had been torn off. He stated that the other propeller blades must have broken during the landing.

He also stated that he maintained the aircraft himself, since it was an amateur-built aircraft, meaning he was not required to contract a maintenance service. He also refueled it using automotive fuel. He received his PPL in Spain and had about 1200 flight hours. He had purchased the aircraft used approximately one year earlier.

1.16.3 *Aircraft's exhaust system*

The kit manufacturer was asked about the original exhaust system for the aircraft and engine models involved in the accident. The manufacturer replied that different exhaust configurations made of steel had been used over the years, and that its standing recommendation was to fasten the last segment of the exhaust with a cable so it does not impact the propeller if it breaks off. The manufacturer also stated that the main drawback of applying thermal tape to the exhaust is that it would conceal any cracks that may form.

In the case of the accident aircraft, since it was lost in the accident and no information other than that provided verbally was available, it is not known exactly how the owner had set up the exhaust system. The way the exhaust modification was set up did not prevent that parts of the broken exhaust impacted the propeller.

1.16.4 *Dutch regulation on amateur-built aircraft*

Point 1 of Article 7 of the Order on Amateur-Built Aircraft, approved by the Dutch Transportation Ministry on 22 November 2012, states that any modifications to an amateur-built aircraft must be approved by the Ministry, meaning that the original designer of the kit must approve the design. The modification can also not have any impact on the noise.

1.17 Organizational and management information

Not applicable.

1.18. Additional information

Not applicable.

1.19. Useful or effective investigation techniques

Not applicable.

2. ANALYSIS

2.1. *Handling of the emergency*

The aircraft took off from the Tenerife North Airport at approximately 12:30. After taking off, the pilot contacted approach control and turned to the northeast. Some 12 minutes later, the radar track showed how the aircraft turned left. Immediately afterward the pilot again contacted approach to report he was returning to the airport, without stating a reason. He was then transferred to the TWR and at 12:48:15, the pilot reported very strong vibrations in the airplane, after which he was authorized to proceed at his own discretion. At 12:51:03, he declared an emergency some 9 NM away from the airport, and he reduced power due to the vibrations. When he realized he was not high enough to return to the airport, he reported he would be making an emergency landing near the Las Teresitas beach. Figure 3 shows how at 12:54:24, when the last radar image was available, the aircraft was at 1100 ft after the pilot cut the throttle, with a descent rate of 1206 ft/min. In his statement, the pilot also reported smelling smoke. This was due to the exhaust gases once the right manifold broke. The burn marks identified in the engine compartment, specifically on the inside of the engine cowl and in the wire harnesses, indicate that if he had continued flying, the engine would have caught fire. Thus, the decision to reduce power and make an immediate emergency landing was the pilot's only option.

2.2. *Landing*

As he approached the beach and saw all the people on the sand, the pilot decided to land on the water, parallel to the shoreline, so he turned right to get into position. According to his statement, the left wing contacted the water first, which made the airplane yaw sharply to the left, modifying the trajectory of the airplane, which continued moving until it came to a stop out of the water. The pilot was injured when he impacted the control panel. As the pilot stated, he had released his seatbelt so as to be able to turn around and make sure that the passenger behind him had his seatbelt correctly fastened. He then forgot to refasten his own seatbelt.

2.3. *Fracture of the exhaust manifold*

It is probable that the small vibrations felt initially were caused because when the right exhaust manifold fractured, the final portion of said manifold, along with the tube that was clamped to it, were only being held in place by the thermal tape covering them. Once the tape broke, the assembly detached, striking and breaking one of the propeller blades. This is when the much stronger vibrations

began, as did the smell of smoke, since the gases produced by the combustion in two of the cylinders began to accumulate in the engine compartment.

As for the fracture of the right exhaust manifold, the fact that it was wrapped in thermal tape would have contributed to raising its temperature. The tape would also trap in moisture, thus promoting the corrosion of any parts in contact with the moisture. The tape around the tubes would also have concealed any potential cracks or fractures during visual inspections.

When the fracture area was inspected, it was noted that it had different colors, indicative of gradual wear of the material, wear that was aided by the thermal tape.

The information provided also indicated that the last segment of the tubes had not been secured, as recommended by the kit manufacturer, to keep them from impacting the propeller in the event that they broke off.

Another factor that may have contributed to the accident was the condition of the manifolds at the time when the aircraft was purchased. According to the entries in the aircraft logbook, it was not used in the approximately two years and seven months before it was purchased. The condition of the exhaust system could have been affected, depending on how it was stored during this period, since according to the entries made by the last owner, the aircraft only flew an additional 68 hours before the manifold fractured, causing the accident. It is not known if the exhaust system had been replaced by the previous owner at some point, or how many hours of use it had when it was purchased by the last owner.

3. CONCLUSIONS

3.1. Findings

- The documentation for the aircraft and pilot was valid and in force at the time of the accident.
- The aircraft had been purchased used approximately one year before the accident.
- A series of changes had been made to the aircraft, including the modification of the exhaust system made by the new owner, who removed the silencer and attached metal exhaust tubes to each of the exhaust manifolds, held in place with clamps. The recommendation of the kit manufacturer to fasten the last segment of the exhaust with a cable to prevent it from impacting the propeller if it breaks off, was not followed.
- Some ten minutes after taking off, the pilot felt a vibration, so he contacted ATC to report he was returning to the airport.
- A short time later, the vibration grew stronger and the pilot smelled a burning odor, so he contacted ATC once more and declared an emergency, stating he would make an emergency landing on the beach.
- The pilot unfastened his seatbelt to make sure that the passenger seated behind him had his seatbelt correctly fastened. The pilot forgot to refasten his own seatbelt.
- Upon seeing people on the beach, the pilot decided to land on the water instead of on the sand.
- During the landing, he lost control of the aircraft, which continued moving as it yawed left, eventually coming to a stop out of the water.
- The pilot was seriously injured during the accident. The two passengers were not injured.

3.2. Causes

The likely cause of the accident was the loss of control of the aircraft during the emergency landing following the fracture of the right exhaust manifold, which struck and broke one of the propeller blades in flight. Contributing to this fracture was the modification made to the exhaust system on the aircraft, which involved wrapping the manifolds with thermal tape, as well as the probable bad condition of the manifolds when the aircraft was purchased. Another contributing factor was

the failure to follow the manufacturer's recommendations concerning the fastening of the exhaust.

4. SAFETY RECOMMENDATIONS

No recommendations are issued.