



Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Aviation Occurrence Report – 200603333

Final

**Ditching
980 km north-east of Hilo, Hawaii, USA
Piper PA-44-180 Seminole, VH-CZE
9 June 2006**



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Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office location: 15 Mort Street, Canberra City, Australian Capital Territory
Telephone: 1800 621 372; from overseas + 61 2 6274 6130
Accident and incident notification: 1800 011 034 (24 hrs)
Facsimile: 02 6274 6474; from overseas + 61 2 6274 6474
E-mail: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

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ISBN and formal report title: see 'Document retrieval information' on page iii.

DOCUMENT RETRIEVAL INFORMATION

Report No.	Publication date	No. of pages	ISBN
200603333	17 May 2007	13	978-1-921164-77-4

Publication title

Ditching, 980 km north-east of Hilo, Hawaii, USA, Piper PA-44-180 Seminole, VH-CZE, 9 June 2006

Prepared by

Australian Transport Safety Bureau
PO Box 967, Civic Square ACT 2608 Australia
www.atsb.gov.au

Reference No.

May2007/DOTARS 50238

Abstract

At 1323 Coordinated Universal Time (UTC) (0623 US Pacific Daylight Saving Time), on 9 June 2006, a Piper PA-44-180 Seminole aircraft, registered VH-CZE, departed Santa Barbara, California, USA, for Hilo, Hawaii. The aircraft was one of two Seminoles that were being ferried in-company to Australia under the instrument flight rules. At about 2050 UTC, the pilot in command advised US Air Traffic Services that the left engine had failed and that the aircraft would have to be ditched as the aircraft was 7 hrs from Hilo but only had 5 hrs of fuel endurance remaining. At about 0145 UTC, the aircraft ditched 980 km north-east of Hilo. The pilot and co-pilot exited the aircraft uninjured and were rescued by a nearby ship. The aircraft sank and was not recovered.

The pilot reported that more fuel was being drawn from the ferry fuel tank than was expected. In addition, a 5 cm x 1 cm scorch mark could be seen just above the landing gear observation mirror on the left inboard engine cowl. Following discussions with the pilot of the accompanying Seminole, the pilot decided to shut down the left engine. Prior to ditching, the pilot restarted the left engine to prevent an asymmetric situation on touchdown.

As a result of this occurrence, the aircraft operator has advised the Australian Transport Safety Bureau that:

- In conjunction with their US maintenance provider, they were continuing inquiries with respect to the interaction of the ferry fuel tank system and the fuel selector positions fitted to the aircraft and system management.
 - They intended to change the ferry flight procedures to use more fuel from the aircraft wing fuel tanks and then periodically top-up those tanks from the ferry fuel tank, using the aircraft fuel contents gauges as a guide.
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THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal Bureau within the Australian Government Department of Transport and Regional Services. ATSB investigations are independent of regulatory, operator or other external bodies.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations. Accordingly, the ATSB also conducts investigations and studies of the transport system to identify underlying factors and trends that have the potential to adversely affect safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and, where applicable, relevant international agreements. The object of a safety investigation is to determine the circumstances in order to prevent other similar events. The results of these determinations form the basis for safety action, including recommendations where necessary. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations.

It is not the object of an investigation to determine blame or liability. However, it should be recognised that an investigation report must include factual material of sufficient weight to support the analysis and findings. That material will at times contain information reflecting on the performance of individuals and organisations, and how their actions may have contributed to the outcomes of the matter under investigation. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. While the Bureau issues recommendations to regulatory authorities, industry, or other agencies in order to address safety issues, its preference is for organisations to make safety enhancements during the course of an investigation. The Bureau prefers to report positive safety action in its final reports rather than making formal recommendations. Recommendations may be issued in conjunction with ATSB reports or independently. A safety issue may lead to a number of similar recommendations, each issued to a different agency.

The ATSB does not have the resources to carry out a full cost-benefit analysis of each safety recommendation. The cost of a recommendation must be balanced against its benefits to safety, and transport safety involves the whole community. Such analysis is a matter for the body to which the recommendation is addressed (for example, the relevant regulatory authority in aviation, marine or rail in consultation with the industry).

REPORTED INFORMATION

The report presented below was prepared principally from information supplied to the Bureau.

History of the flight

At 1323 Coordinated Universal Time (UTC) ¹ (0623 US Pacific Daylight Saving Time), on 9 June 2006, a Piper PA-44-180 Seminole aircraft, registered VH-CZE, departed Santa Barbara, California, USA, for Hilo, Hawaii. The aircraft was one of two Seminoles that were being ferried in-company to Australia under the instrument flight rules. At about 2050, the pilot in command advised US Air Traffic Services (ATS) that the left engine had failed and that the aircraft would have to be ditched, as the aircraft was 7 hrs from Hilo but only had 5 hrs of fuel endurance remaining. At about 0145, the aircraft ditched 980 km north-east of Hilo (figures 1 and 2). The pilot and co-pilot exited the aircraft uninjured and were rescued by a nearby ship. The aircraft sank and was not recovered.

Figure 1: Ditching location



¹ The 24-hour clock is used in this report to describe the time of day as particular events occurred. As the ditching took place in international waters, Coordinated Universal Time (UTC) has been used.

Figure 2: Ditching location



(Image from US Navy aircraft)

Sequence of events

Information provided by the US Federal Aviation Administration (FAA), the US National Transportation Safety Board and the pilot indicated the following sequence of events:

Approximate time (UTC)	Event
1323	VH-CZE took off from Santa Barbara, USA.
2050	The pilot advised US ATS that the aircraft would have to be ditched due to failure of the left engine.
2110	The pilot advised US ATS that there were 2 persons on board, 5 hrs of fuel endurance remaining and that they were attempting to lean the right engine to increase range.
2120	US Coast Guard notified by FAA.
2140	US ATS recommended to the pilot to reverse course towards the US mainland coastline to obtain more favourable winds and to ditch closer to available rescue resources.
2140	US authorities obtained information on sea conditions at the probable ditching point and the alternate point if a course reversal was

	made. Water temperature was 72 degrees F and 62 degrees F if a course reversal was made. Seas were calm at 3 to 5 ft in either direction. Winds at 5,000 ft were estimated to be from the east at 13 to 16 kts.
2145	US ATS relayed all pertinent information to the pilot.
2205	The pilot advised US ATS that they would continue towards Hilo.
0015	US Navy and Coast Guard aircraft intercepted and reported that they were in radio communications with CZE.
0056	The US aircraft vectored and accompanied CZE toward a surface ship which was in range.
0145	CZE ditched next to the surface ship.
0153	The US aircraft relayed to US authorities that CZE had successfully ditched and that the two occupants were safely aboard the surface ship with no injuries.

Operational information

The pilot held a commercial pilot (aeroplane) licence, a command multi-engine instrument rating and had accumulated a total aeronautical experience of approximately 5,635 flying hrs, including 150 hrs on the aircraft type and about 85 hrs in the last 30 days. The copilot held a private pilot (aeroplane) licence, a night visual flight rules rating and had accumulated a total aeronautical experience of approximately 250 flying hrs, about 15 hrs on the aircraft type and about 25 hrs in the last 30 days.

The ferry flight was authorised by a Civil Aviation Safety Authority (CASA) *Special Flight Permit*, which permitted a 30 percent increase in the maximum gross take-off weight. The CASA permit was subject to a number of conditions including (but not limited to):

- conduct of a maintenance inspection prior to the ferry flight
- fitment and use of a ferry fuel system
- carriage of essential crew only.

Flight in US airspace was authorised by an FAA *Non-US Civil Aircraft Special Flight Authorization*. The FAA authorisation was subject to a number of conditions including (but not limited to):

- ...Fuselage fuel should be used as early as practical in flight...
- ...The excess weight is limited to additional fuel, fuel carrying tanks, and navigational equipment required for the flight...

- ...Prior to departure from the Continental United States, the aircraft shall be inspected by an FAA inspector unless otherwise authorized in writing by this office...

The aircraft was manufactured in 2005, had accumulated about 800 hrs total time in service and was fitted with a ferry fuel tank system in accordance with the CASA *Special Flight Permit*. The distance from Santa Barbara to Hilo was 2,060 NM. The pilot reported that the planned flight duration was approximately 14 hrs and the aircraft was not fitted with an auto-pilot. Accordingly, the aircraft was crewed with two pilots. The aircraft was inspected prior to departure in accordance with US and CASA requirements.

Ferry fuel tank system

The ferry fuel tank system fitted in the aircraft cabin was designed to be a '...top-up...' fuel system. It consisted of a 568 litre (150 US GAL) flexible fuel bladder, hose and pump assembly, which fed fuel directly to the left aircraft wing nacelle tank via a fitting in the fuel filler cap and was designed and approved under a Civil Aviation Regulation (CAR) 35 delegation. The system was designed to deliver fuel to the left aircraft fuel tank without interrupting the flow of fuel to the engines and could be transferred to the right wing fuel tank via the aircraft's fuel crossfeed system. The ferry fuel tank was designed to be installed behind the pilots' seats, with the fuel pump switch and ferry tank fuel ON/OFF valve located within easy reach of the pilot. There was no fuel quantity gauge fitted to the ferry tank and neither the aircraft nor ferry tank was fitted with a fuel flow gauge.

The ferry fuel system was designed to be turned on in the cruise phase of flight after one hour of flight. Fuel transfer was to cease when the left wing tank had reached no more than 95 percent of its capacity. The ferry fuel system operating instructions contained the following warning:

WARNING!

DO NOT FILL LEFT HAND WING TANK ABOVE
MAXIMUM QUANTITY INDICATED ON FUEL GAUGE.

FUEL TRANSFERRED IN EXCESS OF WING TANK CAPACITY
WILL BE VENTED OVERBOARD!

The pilot reported that after takeoff, they climbed to 6,000 ft then turned on the ferry fuel tank system. The flight continued for 6 hrs without incident and there was no smell of fuel in the aircraft. The other Seminole aircraft flying in-company with CZE was fitted with the same ferry fuel tank system, had the same fuel quantity on departure from the US and was reported to have landed at Hilo with over 3 hrs fuel endurance remaining.

As CZE sank in deep water, examination of the ferry fuel tank system could not be conducted. The operator advised that their investigations, in conjunction with their US maintenance provider, were continuing with respect to the interaction of the ferry fuel tank system and the fuel selector positions fitted to newer Piper aircraft and management of the system.

Left engine malfunction

The pilot reported that more fuel was being drawn from the ferry fuel tank than was expected. In addition, a 5 cm x 1 cm scorch mark which had ‘...melted through the aluminium...’ could be seen just above the landing gear observation mirror on the left inboard engine cowl. The pilot reported that there were no indications of fire. Following discussions with the pilot of the accompanying Seminole, the pilot decided to shut down the left engine and lean the right engine for maximum range. At top-of-descent to the ditching location, the pilot restarted the left engine to prevent an asymmetric situation on touchdown. As CZE sank in deep water, the nature of the reported scorch mark could not be determined.

Survival information

When advised of the occurrence, US ATS had suggested to the crew that they turn back towards the US mainland to obtain more favourable winds and to ditch closer to available rescue resources. ATS predicted that, had they turned around, the water temperature would be about 17 degrees C (62 degrees F). However, continuing on would result in ditching in water with a temperature of 23 degrees C (74 degrees F). The crew elected to continue toward Hilo. A US Coast Guard C-130 Hercules aircraft and a US Navy P-3 Orion aircraft intercepted CZE and accompanied it for the last hour. The sea state was reported to be calm at 3 to 5 ft.

The US Coast Guard aircraft dropped a flare path indicating the prevailing wind direction adjacent to the ship. On impact with the water, part of the nose section detached from the aircraft. The aircraft sank within 4 minutes. The pilot reported that survival equipment carried on the aircraft included life-vests for each of the two pilots, two individual life-rafts, four strobe lights, a registered emergency beacon and a ‘ditching bag’ for documentation. However, the ditching bag was lost when the aircraft sank. The crew of the US Coast Guard C-130 reported to US ATS the successful ditching next to a surface ship. The crew vacated the aircraft, inflated a life raft and life vests and were picked up by a small boat from the surface ship.

ANALYSIS

As the aircraft could not be recovered, the reason for the fuel loss cannot be conclusively established. However, from the available information, it is likely that the left aircraft fuel tank was being overfilled by the ferry fuel system and was venting fuel overboard. It is possible that an over-fuelling situation could have developed from one or more of the following factors:

- commencement of fuel transfer from the ferry fuel tank prior to the one hour of flight that would have been in accordance with the ferry fuel system operating instructions
- the aircraft fuel selector position not being in accordance with the aircraft manufacturer's documentation
- a malfunction of the aircraft fuel selector
- a malfunction of the aircraft fuel cross-feed system
- in-flight management of the fuel transfer rate by not deselecting the ferry fuel tank when the left aircraft wing tank indicated being 95 percent full, in accordance with the ferry fuel system operating instructions.

The nature and significance of the scorch mark on the left inboard cowl could not be determined.

SAFETY ACTION

As a result of this occurrence, the aircraft operator has advised the Australian Transport Safety Bureau that:

- In conjunction with their US maintenance provider, they were continuing inquiries with respect to the interaction of the ferry fuel tank system and the fuel selector positions fitted to the aircraft, and system management.
- They intended to change the ferry flight procedures to use more fuel from the aircraft wing fuel tanks and then periodically top-up those tanks from the ferry fuel tank, using the aircraft fuel contents gauges as a guide.