



Safety Investigation Report

ACCIDENT TO PIPER PA-38-112 REGISTERED OO-MSG AT BETTINCOURT ON 3 MAY 2011

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FOREWORD

This report is a technical document that reflects the views of the investigation team on the circumstances that led to the accident.

In accordance with Annex 13 of the Convention on International Civil Aviation, it is not the purpose of aircraft accident investigation to apportion blame or liability. The sole objective of the investigation and the Final Report is the determination of the causes, and define recommendations in order to prevent future accidents and incidents.

In particular, Article 16 of the EU regulation EU 996/2010 stipulates that the safety recommendations made in this report do not constitute any suspicion of guilt or responsibility in the accident.

Unless otherwise indicated, recommendations in this report are addressed to the Regulatory Authorities of the State having responsibility for the matters with which the recommendation is concerned. It is for those Authorities to decide what action is taken.

The investigation was conducted by Henri Metillon and Sam Laureys
The report was verified by Luc Blendeman

NOTE:

For the purpose of this report, time will be indicated in UTC, unless otherwise specified.



SYNOPSIS

Date and hour of the accident: 03 May 2011, 12:25 UTC

Aircraft: Piper PA-38-112

Accident location: The airplane crashed in a field near the village of Bettincourt at 7 kilometers east of the city of Waremmme and 9 kilometers south of EBST.
(N 50° 42,950' - E 5°13,793').
Airspace status: Class G, below EBLG
TMA (TMA: 2500ft => 4500ft)

Aircraft owner: Koninklijke Vliegclub De Wouw SZW.

Type of flight: Training Flight

Persons on board: Two

Abstract:

The airplane took off from Sint-Truiden Airfield (EBST) at 12.00 for training exercises.

At 12.25, the airplane flew above the fields in the neighbourhood of Bettincourt located near the city of Waremmme.

Two witnesses saw the airplane approaching, one recalled hearing the engine sputtering.

Both saw the airplane diving vertically and colliding with the ground. One of the two witnesses also reported having seen the airplane spinning.

The airplane collided with the ground at high speed, killing both occupants.

1 Factual information.

1.1 History of flight.

The airplane took off for the second time that day from St Truiden airfield (EBST) around 12:00 UTC for a local training flight with a student pilot and an instructor on board. The airplane had been completely refueled just before the fatal flight.

The first flight of the day had been done with the same crew in the same airplane starting from EBST at 9:45 UTC.

Reportedly, the purpose of both training flights was to make stall exercises, flapless in the morning and with the flaps extended in the afternoon.

During the fatal flight, the first radar echo of OO-MSG appeared at an altitude of 1200ft on 12:02 and showed that the airplane was steering to the south. The airplane was climbing.

Shortly after, OO-MSG went toward the north and continued to climb for 5 minutes up to 1900ft MSL.

The airplane reached 1900 ft when it was close to EBST airfield and immediately after, turned 180° to the left.

From that time the radar track showed several courses north to south and reversed, staying generally at an altitude of around 1900 ft.

At the end of the flight, two witnesses saw the airplane approaching, one recalled hearing the engine making a sputtering noise.

Both saw the airplane suddenly diving at high angle and colliding with the ground.

One of the two witnesses also reported having seen the airplane not only diving but also turning.

The two occupants died instantly.

1.2 Injuries to persons.

Injuries	Pilot	Passenger	Others	Total
Fatal	2	0	0	2
Serious	0	0	0	0
Minor	0	0	0	0
None	0	0	0	0
Total	2	0	0	2

1.3 Damage to aircraft.

The airplane was totally destroyed.

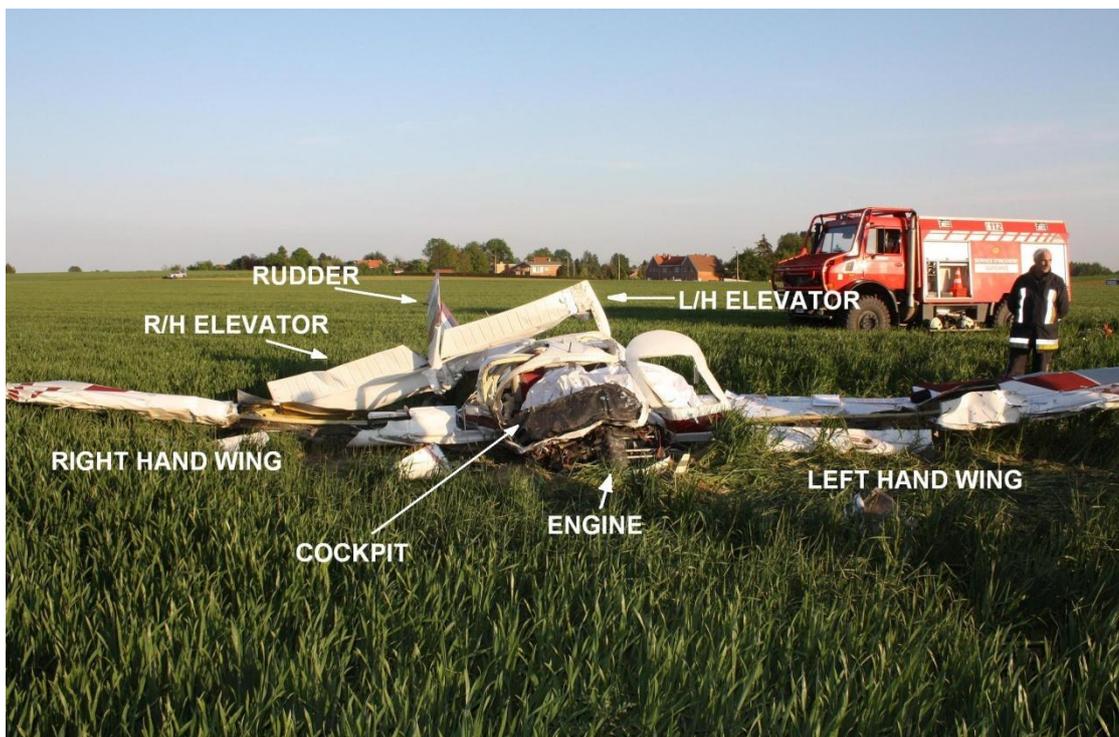


Figure 1

1.4 Other damage.

There was minor damage to the cultivated field.

1.5 Personnel information.

Student Pilot:

Sex: Male
Age: 40 years old
Nationality: Belgian
License: Student Pilot License Aeroplanes issued on 19 December 2008. Valid until 19 December 2013.
Medical Certificate: Class 2 Certificate. Issued on 14 October 2010. Valid until 21 November 2012.

Experience:

The student pilot began learning to fly on 23 October 2008 in a flight school located in EBZH airfield operating Cessna 152 airplane.

From this date to 19 October 2010 he flew regularly with the same instructor in the same type of airplane.

Each training flight was recorded on a numbered sheet after the flight. Those sheets described the type of exercise that was done and, if necessary, some remarks of the instructor. The fatal flight should have been numbered 70.

The formal total flight hours experience is unknown but should be around 70 hours corresponding to 70 lessons.

The student pilot made 61 training flights on Cessna 152 airplanes.

After the flight exercise number 53 (Cessna 152) dated 6 August 2010 the instructor reported that “Stalls during climbing turns” must be repeated.

Next flight exercise, number 54, dated 10 August 2010, the instructor reported:

Stall in climbing turn: - Reduce angle of attack first
 - Stop rotation with opposite rudder

Later, at the end of the flight exercise number 58 (Cessna 152) dated 9 September 2010, the instructor reported again that the student pilot needed additional training for “Stalls during climbing turns”.

In January 2011, the student pilot decided to follow his instructor in his move to another flight school (Registered Facility) located in the EBST airfield and operating essentially Piper PA-38-112.

On 19 and 26 January 2011 he made two training flights on Cessna 150 belonging to the new flight school before switching to PA-38-112.

The student pilot made a first "Introduction Flight" with a Piper PA-38-112 on 2 February 2010 (Training flight number 63).

When the accident occurred, the student pilot had complied with a total of 69 flights from which 59 flights on Cessna 152, 1 flight on Cessna 172, 2 flights on Cessna 150 and 7 flights on Piper PA 38-112 airplanes.

From 9 September 2010 (exercise number 58) to the date of the accident none of the 11 training exercise reports mentioned a specific training for "Stalls during climbing turns".

The morning of the accident, the student pilot and the instructor made a first training flight from 9:45 to 10:49. No training flight sheet was recorded yet for this flight.

Reportedly, the program of the fatal day was to attempt stall training with flaps retracted in the morning and with flaps extended in the afternoon.

Instructor Pilot:

Sex: Male
Age: 63 years old
Nationality: Belgian
Licenses: Private Pilot License delivered on 06 January 1987.
Commercial Pilot License Aeroplanes issued on 27 April 2004. This license was valid until 29 October 2014.
Ratings SEP(Land) and IR(A) valid until 31 October 2010.
The flight Instructor rating (A) was first issued on 10 May 1993 and was valid until 31 May 2011.
The last Proficiency Check was done on 11 April 2011 using a Piper PA 38 airplane but the pilot license had not yet been updated.
The English rating was valid until 21 October 2012.

Medical Certificate: Class 1 Certificate Issued on 8 April 2011. This Certificate was valid until 29 October 2011.

Experience:
The pilot had a total flight experience on Single Engine Piston Airplane of 4379 hours from which 3325 hours as instructor pilot.

He had a large experience of instructional flights mostly using Cessna 152 airplane. From 10 January 2008 to 26 January 2011, he made 738 flights from which around 700 flights were instructional flights.

Following the last pilot log book beginning on 10 January 2008, the pilot flew on Piper PA-38-112 the first time on 7 February 2011 and had accumulated the day of the accident 28 flight hours on this type of airplane. His experience on Piper PA-38-112 before 10 January 2008 is unknown.

The following table shows the last pilot log book pilot experience beginning on 10 January 2008 to the date of the accident.

Cessna 152	550
Cessna 172	80
Piper PA 28	56
Piper PA-38-112	25
Cessna 182	9
Cessna 150	7
Morane Saulnier 885	2
Cessna 177	1

On 11 April 2011, the instructor pilot had passed a proficiency check for the renewal of his Flight Instructor Rating. This flight check had been done using OO-MSG Piper PA-38-112.

With the exception of the proficiency check dated 11 April 2011 all the flights performed on Piper PA-38-112 from the first flight dated 7 February 2011 to the date of the accident were instructional flights.

1.6 Aircraft information.

General information about the airplane design

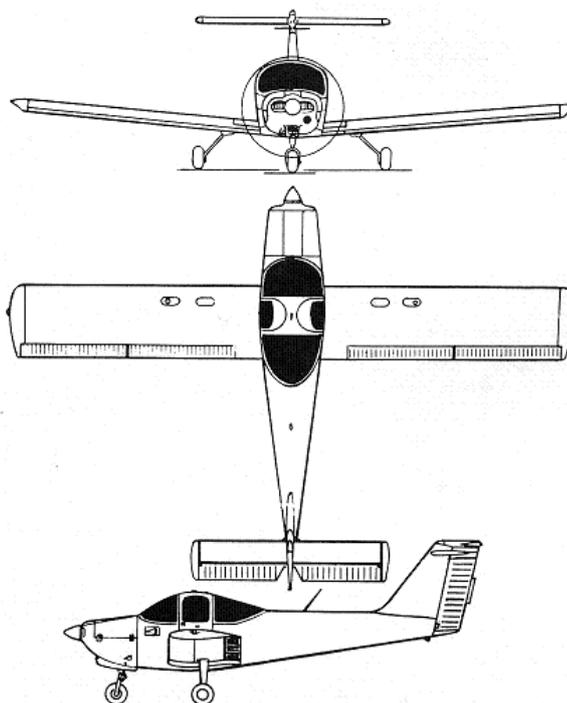
The Piper PA-38-112 Tomahawk is a two-seat, fixed tricycle gear general aviation airplane, originally designed for flight training, touring and personal use.

The airplane has a sheet metal construction that incorporates low wings and a "T-Tail" design in which the horizontal surfaces (tail plane and elevators) are mounted to the top of the vertical stabilizer.

The Tomahawk was Piper's attempt at creating an affordable two-place trainer.

Reportedly, before designing the aircraft, Piper widely surveyed flight instructors for their input into the design.

Instructors requested a more spinnable aircraft for training purposes, since other two-place trainers such as the Cessna 150 and 152 were designed to spontaneously fly out of a spin. The Tomahawk's NASA GA(W)-1 Whitcomb airfoil addresses this requirement by making specific pilot input necessary in recovering from spins, thus allowing pilots to develop proficiency in dealing with spin recovery.



General characteristics

- Crew: 2
- Length: 23 ft 1¼ in (7.04 m)
- Wingspan: 34 ft 0 in (10.36 m)
- Height: 9 ft 0¾ in (2.76 m)
- Wing area: 124.7 ft² (11.59 m²)
- Airfoil: NASA GAW-1
- Standard Empty weight: 1,128 lb (512 kg)
- Max takeoff weight: 1,670 lb (757 kg)

Performance

- Never exceed speed: 159 mph (138 knots)
- Maximum speed: 126 mph (109 knots) at sea level
- Cruise speed: 115 mph (100 knots) at 10,500 ft (65%)
- Stall speed: 56.5 mph (49 knots) (IAS), flaps down
- Range: 539 miles (468 NM) at 10,500 ft (65%)
- Service ceiling: 13,000 ft
- Rate of climb (SL): 718 ft/min

Airframe:

- Manufacturer: PIPER
- Type: PA 38-112
- Serial number: 38-79A1113
- Built year: 1979
- Total flight hours: 7614:24 hours

Engine:

- Manufacturer: LYCOMING
- Type: O-235-L2C
- Serial number: RL-18022-15
- Total flight hours: 5655:47 hours
- Total flight hours O/H: 385:49 hours
- Engine O/H date: July 2009

Propeller:

- Manufacturer: SENSENICH
- Type: 72CK-0-56
- Serial number: K-6272
- Total flight hours: Unknown
- Total flight hours O/H: 1228:03

Certificate of registration: Belgian CAA delivered
"Inschrijvingsbewijs" N°4606 issued
on 13 June 1996.

Certificate of airworthiness: EASA Form 25 issued 20 August
2007.

Airworthiness Review Certificate: EASA Form 15A issued on 19
august 2010. Valid until 18 August
2011.

Belgian CAA authorized Flights: The airplane was technically fit for
the following operations: Private
Aviation, Training and Vulgarization.

Owner: Koninklijke Vliegclub De Wouw VZW

Continuing Airworthiness:

A maintenance program (ref: AMP/OO-MSG/ Revision 01) was approved
by BCAA on 20 July 2010.

Maintenance:

The last maintenance tasks performed on OO-MSG, as recorded, were:

- “100 FH” maintenance had been performed on 25 October 2010 at 7520 ACTT.
- “50 FH” maintenance had been performed on 8 April 2011 at 7572 ACTT.

During the last 50h maintenance, the elevator trim springs (PN: 763-965c) were replaced by new and FAA AD 1976-07-12 Ignition switch test was complied with.

No hold item was reported but a remark on the “Certificate of Release to Service” reminded that the transponder annual test was due end of the month.

The maintenance tasks were performed by the French Part-145.A. Maintenance Organisation “GEMS”, holding approval number FR.145.569.

Incidents and observations

On the day before the accident, the following remark was mentioned by another pilot in the “Airframe Log Book”:

<i>Continuous low fuel pressure; Intercom failure</i>

Equipment:

The airplane was equipped with an ELT “Kannad ME406” and a Mode S Transponder “Filser TRT800A”.

Weight and Balance:

	Date	Empty weight (lbs)	Empty weight CG	Useful load
Last Weighting	11 July 2006	1207 lbs (548 kgs)	74,3 inches from the datum	463 lbs (210,2 kgs)
Transponder change	10 September 2007	1204,7 lbs (546,9 kgs)	74,3 inches from the datum	465,3 lbs (211,2 kgs)
ELT installation	11 March 2009	1207, 1 lbs (548 kgs)	74,44 inches from the datum	462,9 lbs (210,2 kgs)

Pilot’s Operating Handbook and checklists:

The “Pilot’s Operating Handbook” PN 761658 was found in the wreckage.

Two checklists were also found in the wreckage. Both checklists were opened on the same page covering “Take off”, After Take-off” and “Pre stall / Aerobatic Checks”.

We can note that the “Pre stall / Aerobatic Checks” chapter mentions among other items:

<i>Height</i>	<i>Sufficient to recover by 3000 ft AGL. (If spinning see POH)</i>
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Selected extracts of this “Pilot’s Operating Handbook” about the stall and spin and the above mentioned page of the “Checklist” are enclosed at the end of this report.

1.7 Meteorological conditions (At EBLG Airport).

Wind direction: 66°
 Wind speed: 12 kt with gust up to 19kt. (Note: the rescue workers reported heavy wind and gusts at arrival on the crash site a few minutes after the crash)
 Temperature: 12° C
 Dew point: 01° C
 Visibility: More than 10 km
 QNH: 1015 HPa
 Ceiling: More than 10000 feet

1.8 Aids to navigation.

Not applicable

1.9 Communication.

No known communication was established with EBST, Belgo Control or EBLG.

1.10 Aerodrome information.

Not applicable

1.11 Flight recorders.

There was no flight recorder on board, nor was the airplane supposed to carry one.

However, based on the radar trace and the mode S transponder, the fatal flight could be reconstructed from 12:02 to 12:25, the time of the accident.

The radar track shows first the airplane climbing N to S and turning 180° to the left in direction of the north. At 12:07, the airplane stops climbing not far from EBST airfield at 1900 feet.

From that time, the radar track shows several courses north to south and in reverse. These courses stay generally at an altitude of around 1900 ft but are interrupted by at least two turns.

The radar track shows also a lot of severe variation of the speed.

At the end of the flight, 50 to 30 seconds before the crash, the radar images show that the speed of the airplane decreases slightly.

From 30 seconds to 15 seconds before the crash the speed decreases drastically.

The 3 last echoes (During about 15 seconds) do not give any value of speed and the two last plots don't give any value of altitude.

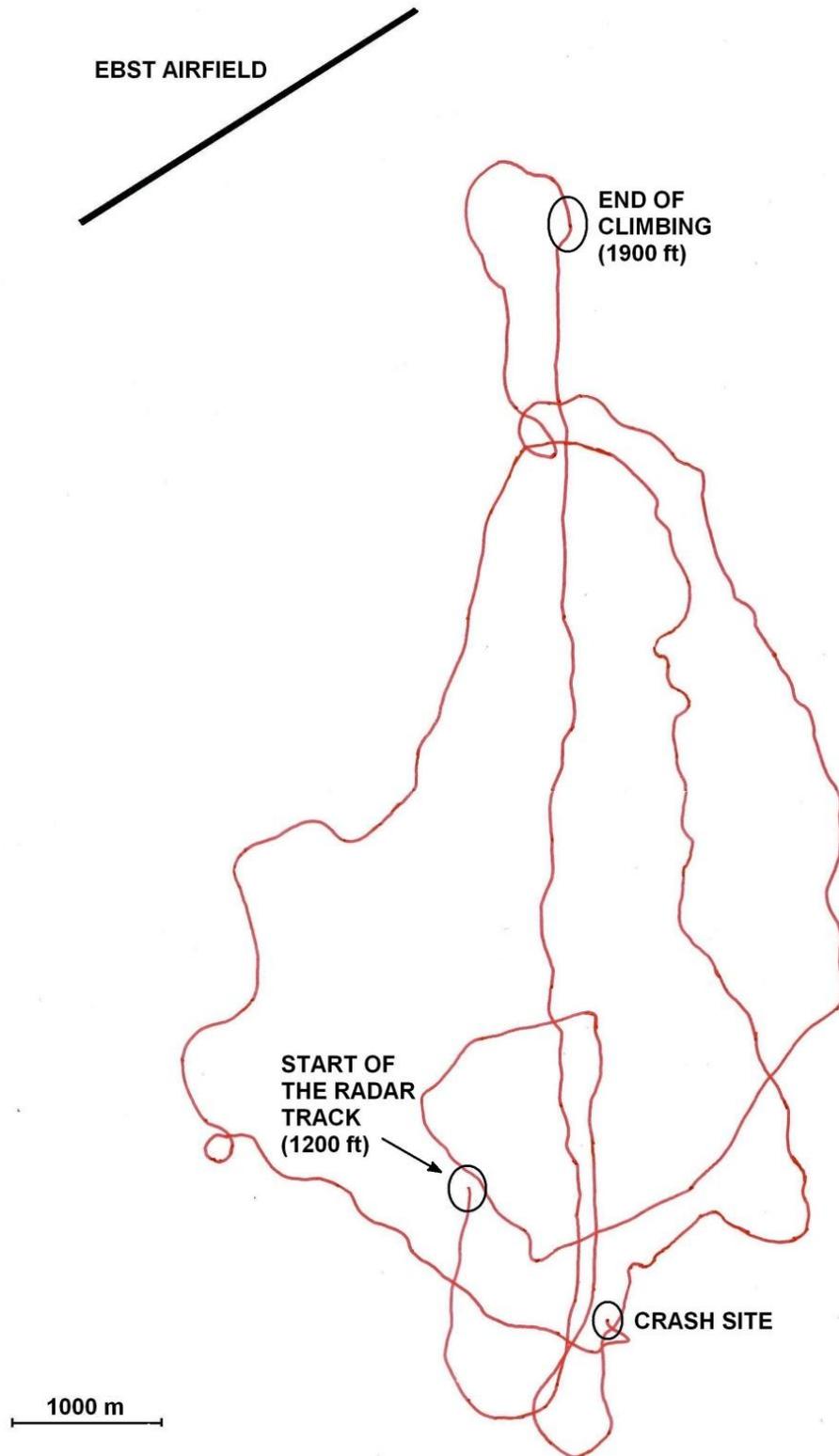


Figure 2

1.12 Wreckage and impact information.

The airplane collided into the ground with a pitch angle around 60°.

All the parts of the airplane were found assembled on the crash site. There was no skidding trace found. The airplane impacted on the ground and remained at the impact place

The propeller and the front/underside of the engine impacted the ground first followed by both wings.

The two wing leading edges were symmetrically crushed and torn open by impact force.

Both blades of the propeller were bent backward. However, one blade was squeezed between the ground and the engine was more bent than the other. The leading edge of the blades did not show trace of impact.

The rear side of the fuselage was folded towards the front right side of the airplane causing the left hand elevator to be folded almost above the cockpit.

The airspeed indicator needle was found stuck at 110 Knots.

The engine RPM indicator needle was stuck by debris at 1600 RPM.

The right hand control wheel (Instructor pilot side) showed extensive damages. Both rubber hands grips were pulled out and both hand grip bars were folded 90° forward. The left hand control wheel was less damaged.

1.13 Medical and pathological information.

The occupants of the airplane died instantly from the impact.

The student pilot upper body was lying outside of the cabin on the upper surface of wing root while his legs remained inside of the cabin.

The upper body of the instructor pilot was lying on the left hand seat while the underside of his body remained seated on the right seat.

1.14 Fire.

There was no fire.

1.15 Survival aspects.

The accident was not survivable, due to the important impact force.

1.16 Tests and research.

Not applicable.

1.17 Organizational and management information.

Not applicable.

1.18 Additional information.

On 4 March 1994, a PIPER PA-38-112 Tomahawk airplane crashed in the United States Kansas after a 5- or 6-turn spin.

This accident, along with several other accidents involving similar circumstances, prompted the National Transportation Safety Board to review the stall/spin characteristics of the PA-38-112.

Finally, this review revealed that the fatal stall/spin accident rate for the Piper PA-38-112 was higher than for comparable aircraft and the National Transportation Safety Board recommended the Federal Aviation Administration to expand the PA-38-112 certification flight test program.

Five recommendations were published accordingly.

The National Transportation Safety Board recommendation letter dated 10 July 1997 is available on the website of the NTSB.

Selected extracts of this letter as well as the five recommendation texts and histories are also enclosed at the end of this report.

1.19 Useful or effective investigation techniques.

Not applicable.

2 Analysis.

2.1 Flight path

The flight path, as seen on figure 2, shows that the airplane made several courses, generally from north to south and reversed. Some of these courses were interrupted by turns.

The radar information did not show significant altitude change. During these courses, the altitude remained generally around 1900 ft. more precisely, from 12h06 to the time of the crash (12h25) the airplane flew at an altitude between 1800 ft and 2000 ft.

The detailed radar image shows a lot of erratic information as for example brutal changes of speed and/or direction. Most of those changes of speed and/or direction did not correspond to real turns. These changes were specific to OO-MSG and did not happen to the other airplane flying in the neighboring.

Reportedly, the crew intended to make stall exercises in the afternoon with extended flaps.

The 3 last echoes of the flight (During about 15 seconds) did not give any value of speed and the two last plots don't give any value of altitude.

It is likely that the transponder antenna was hidden by the fuselage due to an unusual flight attitude and was therefore unable to work properly. Furthermore, the last plots are not depicting the actual position of the airplane as the radar works predicatively.

2.2 Loss of control

Both witnesses reported that they saw the airplane approaching and suddenly diving.

Only one witness recalled hearing the engine sputtering. The other witness saw the airplane not only diving but also spinning.

It is likely that the pilot reduced the throttle position to reduce the speed as first step of a stall exercise. Reducing the engine power could have induced a specific engine noise that the witness had considered as engine sputtering.

Stalls with flap extended leave the airplane first in a relatively horizontal flight attitude before diving, which corresponds to the declaration of the witnesses.

This usual flying attitude could explain why the witnesses saw the airplane flying normally and then suddenly diving while it was flying horizontally.

As mentioned in § 1.12, the airplane collided the ground with a pitch angle of about 60°, first with the engine and front part of the fuselage and then with both wings.

The damages to the right hand control wheel prove that the instructor pilot took the control of the airplane and was trying to recover the loss of control.

2.3 Wreckage examination

The wreckage was thoroughly examined. The flight controls were inspected and no pre impact anomaly was found.

The engine accessories suffered extensive damage due to the impact force. However, the carburettor remains have been inspected and no pre impact anomaly was found. The fuel filters were checked and found clean. One magneto was destroyed but the other, despite the damage, was tested and was found operational. The fuel pumps were damaged as well as most of the fuel lines. The mechanical fuel pump was further dismantled for inspection and no anomaly was found.

The damage to the propeller showed that the engine delivered low power or was stopped. However, it has not been considered as abnormal due to the procedure of stall/spin recovery asks to close the throttle (see Pilot's Operating Handbook § 3.19).

The flaps were found retracted which is also normal as the spin recovery procedure requires them to be retracted (see Figure 3 - Pilot's Operating Handbook § 3.19).

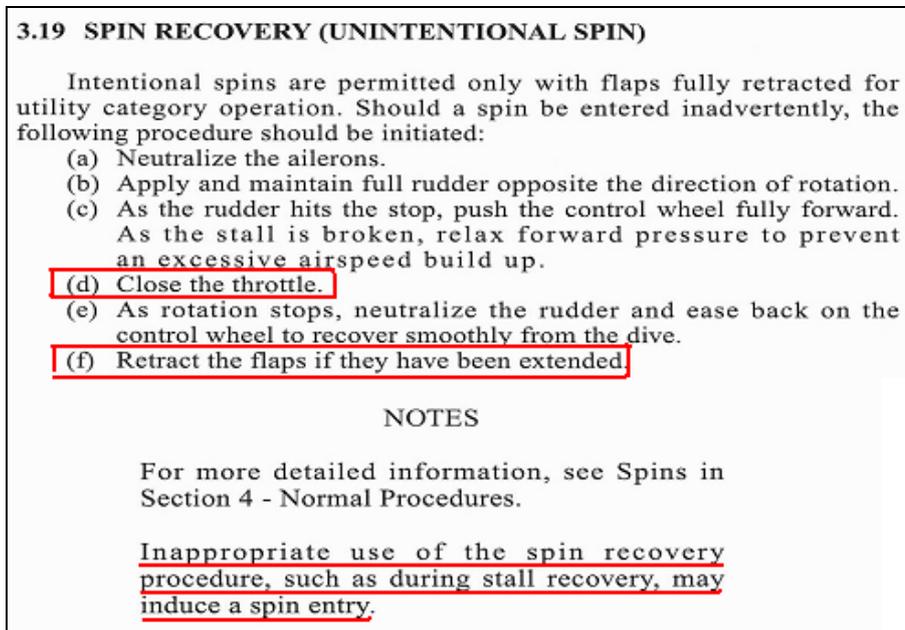


Figure 3 – Note: Red underlinings are not originating from the POH

2.4 Altitude and Pilot's Operating Handbook

The airplane was flying below EBLG TMA (TMA: 2500ft => 4500ft) at an average altitude of 1900 feet MSL while the elevation of the terrain is around 400 feet.

We can estimate that the airplane was flying around 1500 feet AGL.

As mentioned in the "Pilot's Operating Handbook § 4-35" the loss of altitude during stalls can be as great as 320 feet, depending on configuration and power.

The safety margin to recover from a stall when flying at or above 1500 feet AGL may first seem to be acceptable.

However,

- As mentioned in the Pilot's Operating Handbook § "3.19 Spin Recovery", a stall exercise not properly executed can induce an unintentional spin. (See Figure 3).
- An unintentional spin needs much more altitude than a stall to recover.
- Spins should only be started at altitude high enough to recover fully by at least 4.000 feet AGL so as to provide an adequate margin of safety. (See Pilot's Operating Handbook § 4.43 Spins – Figure 4).

4.43 SPINS

The airplane is approved for intentional spinning when the flaps are fully retracted.

BEFORE SPINNING

Carrying baggage during the spin is prohibited and the pilot should make sure that all loose items in the cockpit are removed or securely stowed including the second pilot's seat belts if the aircraft is flown solo. Seat belts and shoulder harnesses should be fastened securely and the seat belts adjusted first to hold the occupants firmly into the seats before the shoulder harness is tightened. With the seat belts and shoulder harnesses tight, check that the position of the pilots' seats allow full rudder travels to be obtained and both full back and full forward control wheel movements. Finally check that the seats are securely locked in position. Spins should only be started at altitudes high enough to recover fully by at least 4,000 feet AGL, so as to provide an adequate margin of safety. A one-turn spin, properly executed, will require 1,000 to 1,500 feet to complete and a six-turn spin will require 2,500 to 3,000 feet to complete. The airplane should be trimmed in a power-off glide at approximately 75 knots before entering the stall prior to spinning. This trim airspeed assists in achieving a good balance between airspeed and "g" loads in the recovery dive.

Figure 4 - Note: Red underlinings are not originating from the POH

Finally, based on the Pilot's Operating Handbook, it is only when reading § "3.19 Spin Recovery" and § 4.43" that a pilot could be warned that stall trainings should only be started at altitudes adequate to recover fully from an unintentional spin.

Nevertheless, the flight school requires instructors and pilots to use dedicated checklists. The checklist developed for the Piper PA 38-112 by the flight school clearly requires a sufficient height to recover by 3000 ft when performing pre stall and aerobatics checks.

As we found the checklist's books open at the concerned page for both the instructor and the student pilots, they would have been aware that stall training at 1600 ft AGL was unsafe.

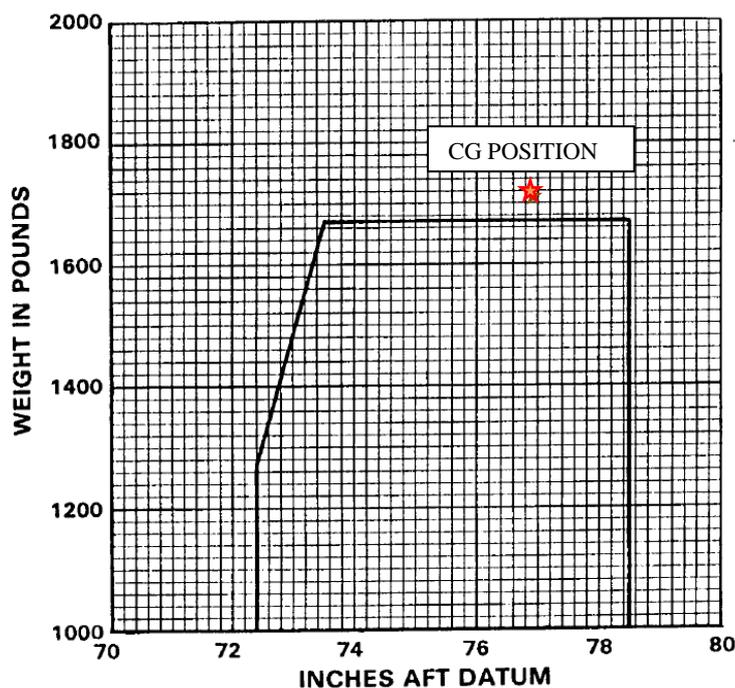
2.5 Weight and balance analysis

The last records of refuelling allow determining that the airplane was completely refuelled just before the fatal flight and reportedly, the total weight of both occupants was around 350 lbs.

The airplane was around 53 Lbs (24 Kgs) overloaded but remained within the manufacturer center of gravity limits.

This value of 53 Lbs when compared to the MTOW (1670 Lbs) corresponds to a 3,2% overload.

Simulation with the fuel quantity and occupant's weight corresponding to the crash configuration (Based on a fuel consumption of 6 Gal/hour)						
	Fuel quantity (Litres)	Fuel quantity (Gal)	KGS	LBS	Arm (In.)	Moment (Lb-In.)
Empty weight			548	1207	74,4	89857
Occupants			159	350	85,5	29925
Fuel	102,1	27	73	162	75,4	12215
Baggage			2	4	115,0	460
TOTAL			782	1723	76,9	132456
Overload			24,1	53		



Taking into account the center of gravity remained inside the manufacturer specification and the rather limited overload percentage, it is likely that the influence on the airplane stability in flight was negligible.

However, the stall speed would have been slightly increased.

2.6 Student pilot and instructor experience

Student pilot experience

As seen in Chapter 1.5, the student pilot performed 60 training flights on Cessna 150/152 airplanes (+ 1 flight on Cessna 172) and the fatal flight was the 9th flights on PA-38-112.

The flight exercise number 53 and 58 (Cessna 152) respectively dated 6 August and 9 September 2010 were dedicated to practice stalls. At the end of both lessons the instructor reported that this training had to be repeated.

After the flight number 54 dated 10 August 2010, the instructor made additional remarks about stall in climbing turn.

We can conclude that the student pilot's aptitude to control the stalls was not yet completely satisfactory.

It was therefore logical to restart the stall training with the Piper PA-38-112 airplane after 8 familiarization flights made with this type of airplane.

Instructor pilot experience

As seen in Chapter 1.5, the pilot had a large experience of instructional flights mostly using Cessna 152 airplane.

On the other hand, the recent (or total) experience of the pilot on Piper PA-38-112 was limited to 28 flight hours from which 27 hours were instructional flights and one hour was for the proficiency test.

The former experience of the pilot on Piper PA-38-112, before January 2008, was not supported by any document and reportedly the pilot had no or less experience flying this type of airplane.

Before starting to give instruction flights on Piper PA-38-112, the EBST flight school proposed the instructor one hour of flight with another instructor; the purpose being to fully explore the airplane's flight envelope and properly feel the airplane characteristics.

The pilot used this opportunity and flew on a Piper PA-38-112 with another pilot. On the log book, this flight is identified as an instructional flight with himself as instructor.

There is no indication that spins were performed at that occasion.

On 11 April 2011, the instructor pilot succeeded in a proficiency check for the renewal of his Flight Instructor Rating. This flight check had been done using OO-MSG Piper PA-38-112.

The following exercises were performed, as recorded in the "*Flight Instructor rating (FI(A)) – Revalidation and renewal Form*" :

Straight level flight, Go Around, Steep turns, Stalls, Circuit, Short and soft field landings.

Although the Piper PA-38-112 was known for possible unintentional spins further to stall, there are no records showing that the instructor performed spins on this type of aircraft.

Finally, we can say:

- The instructor pilot had less (or less recent) experience flying Piper PA-38-112.
- The instructor pilot had no (or no recent) experience of spin recovery.
- The instructor pilot had not flown recently to fully explore the flight characteristics of the Piper PA-38-112.

2.7 NTSB analysis of similar accidents

OO-MSG crash shows similarities with Piper PA-38-112 Tomahawk, N2496L accident that occurred in the United States on 4 March 1994.

This accident, along with several other accidents involving similar circumstances, prompted the National Transportation Safety Board to review the stall/spin characteristics of the PA-38-112.

The American Safety Board (NTSB) determined that the probable cause of the N2496L accident was an unintentional spin that occurred during the maneuvering phase of a biennial flight review.

NTSB Safety Recommendation letter dated 10 July 1997 pertained widely this subject and among others recommended:

The FAA to immediately require that the slow flight & stall training in the PA-38-112 be conducted at or above the minimum altitude currently specified in the PA-38-112 pilots operating handbook for spin training ... (Ref: A-97-045).

*For information, the Pilot's Operating Handbook states on § 4.43 :
... Spins should only be started at altitudes high enough to recover fully by at least 4.000 feet AGL, so as to provide an adequate margin of safety ...*

Note: Red underlining's are not originating from a NTSB recommendation or from the POH.

The FAA action following the above recommendation A-97-045 was to send a letter to all regional flight standard division managers to inform all known operators of the PA-38-112 of the procedure contained in the POH for spin training flight.

This action was classified by the NTSB as "Closed – Unacceptable action".

2.8 Fuel pressure and Intercom failure

On the day before the accident, the following remark was reported by another pilot: “Continuous low fuel pressure; Intercom failure”.

More information were asked from the concerned pilot and it was determined that the fuel pressure was quite low but remained within the acceptable limit. The fuel pressure remained also on the low side of the acceptable range when the electrical fuel pump was switched on.

No pressure fluctuation was reported.

We can conclude that the fuel pressure indicator indicated less than the actual pressure implying that the fuel system was not affected by this event.

The pilot reported also that the intercom failure was caused by a bad contact when introducing the plugs of the headsets in their respective receptacles. The users had to move the plugs forward and backwards to find a good electrical contact position.

It is possible that a bad electrical contact occurred during a critical situation rendering the communication difficult between the instructor pilot and the student. However no evidence was found to support this.

3 Conclusions.

3.1 Findings.

- The Instructor Pilot held a valid CPL SEP (Land) license with a flight Instructor rating (A)
- The student pilot held a valid Student Pilot License Aeroplanes.
- The Instructor Pilot had a large experience of flight Instruction using CESSNA 152 airplane but much less experience flying Piper PA-38-112 airplanes.
- The purpose of the flight was to perform slow flight and stall training with the flaps extended.
- The entire flight was performed at an elevation of around 1550 feet AGL (1900 feet MSL).
- The airplane was airworthy for VFR flight
- The airplane was slightly in overload but remained inside the “Pilot’s Operating Handbook” center of gravity range.
- No pre impact anomalies could be found that would explain the loss of control in flight. All the damage found on the wreckage was due to the force of the impact.
However, the possibility does exist an intercom failure occurred during a critical situation rendering the communication difficult between the instructor pilot and the student.

3.2 Causes.

The cause of the accident is an unintentional spin of the aircraft further to stall exercise conducted at an altitude insufficient to recover.

Contributing factors

- The Instructor Pilot had a low (or low recent) experience flying Piper PA-38-112 airplanes.
Moreover, he did not fly alone or with an experimented flight instructor in Piper PA-38-112 to fully familiarize himself with recovery from unusual attitudes (Spin ...) before starting instructional flights.
- The “Pilot’s Operating Handbook” does not adequately draw the attention of the pilots that slow flights and stall trainings should only be conducted at altitudes adequate to recover fully an unintentional spin.

4 Safety recommendations.

4.1 Recommendation 2011-P-21 to FAA.

It is only when reading POH § “3.19 Spin Recovery” that a pilot would be warned that stall exercises could lead to an unintentional spin, and therefore should only be started at altitudes adequate to recover fully from an unintentional spin:

The AAIU(be) recommends the FAA to require a clarification of the Piper PA-38-112 “Pilot’s Operating Handbook” in order to clearly draw the attention of pilots that slow flight and stall training should only be conducted at altitude adequate to recover fully from an unintentional spin.

4.2 Recommendation 2012-P-2 to Belgian Flight Schools (FTO and RF).

Because inadvertent spins can occur during instructional flights while attempting slow flight or stall training:

The AAIU(be) recommends that Belgian Flight Schools inform all instructors and student pilots using Piper PA-38-112 that slow flight and stall training in the Piper PA-38-112 be conducted at or above the minimum altitude currently specified in the PA-38-112 “Pilot’s Operating Handbook” for spin training.

5 Enclosures

5.1 Enclosure 1: Selected extracts of the "Pilot's Operating Handbook"

SECTION 3 PIPER AIRCRAFT CORPORATION
EMERGENCY PROCEDURES PA-38-112, TOMAHAWK

Control wheel.....full forward
Throttle.....close
Rudder.....neutral (when rotation stops)
Control wheel.....as required to smoothly
regain level flight attitude
Flaps.....retract

OPEN DOOR

If both upper and side latches are open, the door will trail slightly open and airspeeds will be reduced slightly.

To close the door in flight:
Slow airplane to 90 KIAS
Cabin vents.....close
Storm window.....open

If upper latch is open.....latch
If side latch is open.....pull on arm rest while
moving latch handle to
latched position.

If both latches are open.....latch side latch
then top latch

ENGINE ROUGHNESS

Carburetor heat.....ON
If roughness continues after one minute:
Carburetor heat.....OFF
Mixture.....adjust for max. smoothness
Electric fuel pump.....ON
Fuel selector.....switch tanks
Engine gauges.....check
Magneto switch.....L then R, then BOTH

If operation is satisfactory on either one, continue on that magneto at reduced power and full "RICH" mixture to first airport.

Prepare for power off landing.

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SECTION 3 PIPER AIRCRAFT CORPORATION
EMERGENCY PROCEDURES PA-38-112, TOMAHAWK

Electrical fire (smoke in cabin):
Master switch.....OFF
Cabin heat.....OFF
Defroster.....OFF
Vents.....open to clear cabin
Land as soon as practicable.

LOSS OF OIL PRESSURE

Land as soon as possible and investigate cause.
Prepare for power off landing.

LOSS OF FUEL PRESSURE

Electric fuel pump.....ON
Fuel selector.....check on full tank

HIGH OIL TEMPERATURE

Land at nearest airport and investigate the problem.
Prepare for power off landing.

ALTERNATOR FAILURE

Verify failure
Reduce electrical load as much as possible.
Alternator circuit breaker.....check
Alt switch.....OFF (for 1 second),
then ON
If no output:
Alt switch.....OFF

Reduce electrical load and land as soon as practical.

SPIN RECOVERY (UNINTENTIONAL SPIN)

Ailerons.....neutral
Rudder.....full opposite to
direction of rotation

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SECTION 4
NORMAL PROCEDURES

PIPER AIRCRAFT CORPORATION
PA-38-112, TOMAHAWK

SECTION 4
NORMAL PROCEDURES

PIPER AIRCRAFT CORPORATION
PA-38-112, TOMAHAWK

The down can be secured to rings provided under each wing and to the tail skid. The rudder is held in position by its connections to the nose wheel steering and normally does not have to be secured.

4.35 STALLS

An approaching stall is indicated by a stall warning horn which is activated between five and ten knots above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall.

The stalling speed at 1670 lbs. gross weight with power off, outboard flow strips installed, and full flaps is 47 KIAS, with flaps up this speed is increased 1 knot; with both outboard and inboard flow strips installed and full flaps the stall speed is 49 KIAS, with flaps up this speed is increased 3 knots. Loss of altitude during stalls can be as great as 320 feet, depending on configuration and power.

NOTE

The stall warning system is inoperative with the master switch OFF.

During preflight, the stall warning system should be checked by turning the master switch ON, lifting the detector and checking to determine if the horn is actuated. The master switch should be returned to the OFF position after the check is complete.

4.37 TURBULENT AIR OPERATION

In keeping with good operating practice used in all aircraft, it is recommended that when turbulent air is encountered or expected, the airspeed be reduced to maneuvering speed to reduce the structural loads caused by gusts and to allow for inadvertent speed build-ups which may occur as a result of the turbulence or of distractions caused by the conditions (See Subsection 2.3). Flight into thunderstorms or severe turbulence should be avoided.

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4.39 WEIGHT AND BALANCE

It is the responsibility of the pilot and aircraft owner to determine that the airplane remains within the allowable weight vs. center of gravity envelope while in flight.

For weight and balance data, refer to Section 6 (Weight and Balance).

4.41 MANEUVERS

The airplane is approved for certain acrobatic maneuvers, provided it is loaded within the approved weight and center of gravity limits (See Section 2 - Limitations). The approved maneuvers are spins, steep turns, lazy eights, and chandelles.

Intentional spins are prohibited in the normal category airplane. Lazy eights and chandelles may be performed in the normal category provided a 60 degree angle of bank and/or a 30 degree angle of pitch is not exceeded. For approved maneuvers and entry speed, refer to Section 2 - Limitations.

4.43 SPINS

The airplane is approved for intentional spinning when the flaps are fully retracted.

BEFORE SPINNING

Carrying baggage during the spin is prohibited and the pilot should make sure that all loose items in the cockpit are removed or securely stowed including the second pilot's seat belts if the aircraft is flown solo. Seat belts and shoulder harnesses should be fastened securely and the seat belts adjusted first to hold the occupants firmly into the seats before the shoulder harness is tightened. With the seat belts and shoulder harnesses tight, check that the position of the pilots' seats allow full rudder travels to be obtained and both full back and full forward control wheel movements. Finally check that the seats are securely locked in position. Spins should only be started at altitudes high enough to recover fully by at least 4,000 feet AGL, so as to provide an adequate margin of safety. A one-turn spin, properly executed, will require 1,000 to 1,500 feet to complete and a six-turn spin will require 2,500 to 3,000 feet to complete. The airplane should be trimmed in a power-off glide at approximately 75 knots before entering the stall prior to spinning. This trim airspeed assists in achieving a good balance between airspeed and "g" loads in the recovery dive.

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NORMAL PROCEDURES

PIPER AIRCRAFT CORPORATION
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SECTION 4
NORMAL PROCEDURES

PIPER AIRCRAFT CORPORATION
PA-38-112, TOMAHAWK

SPIN ENTRY

The spin should be entered from a power-off glide by reducing speed at about 1 kt/sec until the airplane stalls. Apply full aft control wheel and full rudder in the desired spin direction. This control configuration with the throttle closed should be held throughout the spin. The ailerons must remain neutral throughout the spin and recovery, since aileron application may alter the spin characteristics to the degree that the spin is broken prematurely or that recovery is delayed.

SPIN RECOVERY

- (a) Apply and maintain full rudder opposite the direction of rotation.
- (b) As the rudder hits the stop, rapidly move the control wheel full forward and be ready to relax the forward pressure as the stall is broken.
- (c) As rotation stops, centralize the rudder and smoothly recover from the dive.

Normal recoveries may take up to 1-1/2 turns when proper technique is used; improper technique can increase the turns to recover and the resulting altitude loss.

FURTHER ADVICE ON SPINNING

SPIN ENTRY

Application of full aft control wheel and full rudder before the airplane stalls is not recommended as it results in large changes in pitch attitude during entry and the first turn of the spin. Consequently the initial 2-3 turns of the spin can be more oscillatory than when the spin is entered at the stall.

SPIN RECOVERY

The recommended procedure has been designed to minimize turns and height loss during recovery. If a modified recovery is employed (during which a pause of about 1 second - equivalent to about one half turn of the spin - is introduced between the rudder reaching the stop and moving the control column forward) spin recovery will be achieved with equal certainty. However the time taken for recovery will be delayed by the length of the pause, with corresponding increase in the height lost.

In all spin recoveries the control column should be moved forward briskly, continuing to the forward stop if necessary. This is vitally important because the steep spin attitude may inhibit pilots from moving the control column forward positively.

The immediate effect of applying normal recovery controls may be an appreciable steepening of the nose down attitude and an increase in rate of spin rotation. This characteristic indicates that the aircraft is recovering from the spin and it is essential to maintain full anti-spin rudder and to continue to move the control wheel forward and maintain it fully forward until the spin stops. The airplane will recover from any point in a spin in not more than one and one half additional turns after normal application of controls.

MISHANDLED RECOVERY

The airplane will recover from mishandled spin entries or recoveries provided the recommended spin recovery procedure is followed. Improper application of recovery controls can increase the number of turns to recover and the resulting altitude loss.

Delay of more than about 1-1/2 turns before moving the control wheel forward may result in the aircraft suddenly entering a very fast, steep spin mode which could disorient a pilot. Recovery will be achieved by briskly moving the control wheel fully forward and holding it there while maintaining full recovery rudder.

If such a spin mode is encountered, the increased rate of rotation may result in the recovery taking more turns than usual after the control column has been moved fully forward.

In certain cases the steep, fast spin mode can develop into a spiral dive in which the rapid rotation continues, but indicated airspeed increases slowly. It is important to recognize this condition. The aircraft is no longer auto-rotating in a spin and the pilot must be ready to centralize the rudder so as to ensure that airspeed does not exceed 103 kt (V_A) with full rudder applied.

DIVE OUT

In most cases spin recovery will occur before the control wheel reaches the fully forward position. The aircraft pitches nose down quickly when the elevator takes effect and, depending on the control column position, it may be necessary to move the column partially back almost immediately to avoid an unnecessarily steep nose down attitude, possible negative "g" forces and excessive loss of altitude.

Because the aircraft recovers from a spin in a very steep nose-down attitude, speed builds up quickly in the dive out. The rudder should be centralized as soon as the spin stops. Delay in centralizing the rudder may

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PA-38-11Z, TOMAHAWK NORMAL PROCEDURES

result in yaw and "fish-tailing." If the rudder is not centralized it would be possible to exceed the maximum maneuver speed (V_A) of 103 kt with the surface fully deflected.

ENGINE

Normally the engine will continue to run during a spin, sometimes very slowly. If the engine stops, take normal spin recovery action, during which the propeller will probably windmill and restart the engine. If it does not, set-up a glide at 75 kt and restart using the starter motor.

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5.2 Enclosure 2: Selected page of the “Checklist”

TAKE OFF

1	LOOKOUT	RWY / APP / DEP check clear. ATC clearance
2	On Runway	Check Compass & DI against Runway QFU
3	RPM	Full power
4	Engine	Temp & pressure within limits
5	Airspeed	Increasing

AFTER TAKE-OFF

1	Flaps	Up if necessary
2	Engine	Temp & pressure steady & within limits
3	Radios	Set – ATC as necessary
4	Altimeter	Check
5	Fuel pump	Off above 1000ft agl

PRE STALL / AEROBATIC CHECKS (H A S E L L)

1	H	Height	Sufficient to recover by 3000ft agl (if spinning see POH)
2	A	Airframe	Gyros caged – Parking brake OFF Flaps as required (see POH)
3	S	Security	Harness tight and secure Doors closed and latched No loose articles
4	E	Engine	Temp & pressure Check for carburettor ice Mixture RICH Fuel pump ON
5	L	Location	Clear of <u>A</u> irfields, <u>B</u> uilt-up area's, <u>C</u> loud, <u>C</u> ontrolled Airspace, <u>D</u> anger area's
6	L	LOOKOUT	Turn L & R to check for aircraft, especially below

CONTINUED STALL / AEROBATICS (H E L L)

5.3 Enclosure 3: Selected extracts of NTSB Safety Recommendation letter dated 10 July 1997.

On March 4, 1994, a Piper PA-38-112 Tomahawk, N2496L, crashed during a biennial flight review for a private pilot in Inman, Kansas.

The flight review was being administered by a certified flight instructor (CFI) who held airplane single engine, multiengine, and instrument ratings and had 7,945 hours total flight time, including 745 hours in the PA-38-112.

Witnesses reported that the airplane was in a 5- or 6-turn left spin and that the airplane spun until just before it struck the ground.

Both occupants were killed, and the airplane was destroyed.

Post accident examination revealed no mechanical problems with the airplane.

The Safety Board determined that the probable cause of this accident was an unintentional spin that occurred during the maneuvering phase of a biennial flight review.

A factor related to the accident was the airplane's lateral-directional characteristics at or near the stall.

This accident, along with several other accidents involving similar circumstances, prompted the Safety Board to review the stall/spin characteristics of the PA-38-112.

This review revealed that the fatal stall/spin accident rate for the Piper PA-38-112 was higher than for comparable aircraft and that certain required stall tests had not been performed during the certification of the airplane.

Although the FAA is planning a flight test program to perform the omitted tests.

This review raises significant concerns about the stall/spin characteristics of the PA-38-112.

Stall/Spin Accident History

To provide a basis for comparison, the Safety Board estimated the fatal stall/spin accident rate for Piper PA-38-112 and for Cessna 150/152 series aircraft for the period 1985 through 1994.

During this period, Piper PA-38-112s were involved in 12 fatal accidents in which a stall/spin was cited by the Board as a cause or factor; Cessna 150/152s were involved in 35 such accidents.

To calculate rates for comparison, the Board used aircraft exposure data gathered and reported by the FAA.

Each year, the FAA uses survey results to calculate an activity estimate (total flight hours) and an associated standard error statistic for each model aircraft.

Survey data are subject to sampling error, and the error statistic is used to create an interval within which the actual number of flight hours is assumed to lie.

Using lower- and upper-bound estimates of flight hours, the PA-38-112 accident rate ranged from 0.336 to 0.751 fatal stall/spin accidents per 100,000 flight hours, compared to 0.098 to 0.134 for the 150/152.

The Board concludes that the PA-38 has been more likely to be involved in these kinds of accidents than the 150/152.

Since the airplane was introduced, the Safety Board has investigated 51 PA-38-112 stall or stall/spin accidents that resulted in 49 fatalities. Each of these accidents involved inadvertent spins that occurred during instructional flights while attempting slow flight or stall training.

The PA-38-1 12 Pilot's Operating Handbook (POH) states that a properly executed 1-turn spin will require 1,000 to 1,500 feet, and a 6-turn spin will require 2,500 to 3,000 feet to complete the recovery.

The POH recommends that spins should only be started at altitudes high enough to recover fully at least 4,000 feet above the ground, so as to provide an adequate margin of safety.

In each of the accidents cited, the investigations revealed that slow flight or stall training was in progress when the airplane entered a spin. In all cases (for which evidence was available to determine altitude), the training was being performed at altitudes below that specified in the handbook as adequate for spin training.

Safety Recommendation references: A-97-41 through -45

Safety Recommendation: A-97-041**Rec Status: Closed - Unacceptable Action**

THE NTSB RECOMMENDS THE FOLLOWING TO THE FAA: EXPAND THE UPCOMING PA-38-112 CERTIFICATION FLIGHT TEST PROGRAM TO INCLUDE THE FOLLOWING: (1) A MINIMUM OF TWO TEST AIRPLANES. DOCUMENT ANY CHANGES NECESSARY TO BRING THESE TEST AIRPLANES INTO CONFORMANCE WITH THE TYPE CERTIFICATE.

Safety Recommendation History for A-97-041 FAA[Close](#)

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<p>Response Date: 9/25/1997</p> <p>Response: The FAA believes that there is adequate certification data available to demonstrate compliance of the Piper PA-38-112 with the spin test requirements and to show conformity of the aircraft. Our respective staffs discussed the FAA's flight test plan on September 4, 1997, and as a result, the FAA has a better understanding of the Board's concerns about additional spin tests. At this time, the FAA remains satisfied that the precertification spin testing of the PA-38, as well as those tests done in the fall of 1978 by both Piper and FAA to support the installation of additional leading edge stall strips, met FAA requirements. Consequently, the flight test plan does not include repeating these tests. Once the flight test program is completed and all data are analyzed and examined in the context of existing certification data, the FAA will be in a position to determine if any additional tests are necessary. The FAA proposes to convene a meeting with the Board's staff and Piper representatives at the completion of the flight test program referenced in response to Safety Recommendations A-97-42 and -43. During the meeting, conformity records and all appropriate compliance and production records regarding spin testing will be available for review and discussion. I anticipate that the meeting will be conducted in October or early November. My staff will contact your staff to arrange the meeting to resolve these issues.</p>	<p>From: Addressee</p>
<p>Response Date: 3/31/1998</p> <p>Response: Letter Mail Controlled 4/6/98 4:05:05 PM MC# 980437) THE FAA DETERMINED THAT ONLY ONE AIRCRAFT WAS NECESSARY FOR THE FLIGHT TEST PROGRAM. THE CONFORMANCE INSPECTION REVEALED CRACKS IN THE ELEVATOR TRAILING EDGES AND RUDDER CONTROL CABLE TENSION OUTSIDE ALLOWABLE LIMITS. IN FEBRUARY 1998, THE FAA PUBLISHED AN ARTICLE IN ADVISORY CIRCULAR (AC) 43.16, GENERAL AVIATION AIRWORTHINESS ALERTS, TO REMIND MAINTENANCE PERSONNEL OF THE IMPORTANCE OF CONTROL CABLE TENSION & CONTROL SURFACE INTERGRITY.</p>	<p>From: Addressee</p>
<p>Response Date: 11/19/1998</p> <p>Response: THE BOARD APPRECIATES THE INTENT OF THE ARICLE, WE BELIEVE THAT ITS EFFECTIVENESS IN IDENTIFYING AND CORRECTING POSSIBLE SIMILAR DEFICIENCIES IN OTHER PA-38-112S WAS DILUTED BY THE GENERIC NATURE OF THE ARTICLE. BECAUSE THE FAA CONSIDERS ITS ACTION TO BE COMPLETED ON THIS RECOMMENDATION, A-97-41 IS CLASSIFIED "CLOSED--UNACCEPTABLE ACTION.</p>	<p>From: NTSB</p>

Safety Recommendation: A-97-042

Rec Status: Closed - Acceptable Action

THE NTSB RECOMMENDS THE FOLLOWING TO THE FAA: (2) SECTION 23.201 WINGS-LEVEL STALL TESTS, TO ENSURE THAT AMONG OTHER REQUIREMENTS, THE STALL IS DEFINED BY A DOWNWARD PITCHING MOTION OF THE AIRPLANE.

Safety Recommendation History for A-97-042 FAA [Close](#)

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<p>Response Date: 9/25/1997</p> <p>Response: The Federal Aviation Administration (FAA) agrees with the intent of these safety recommendations. A Piper PA-38-112 has been obtained for the flight tests. The aircraft is undergoing conformity tests, after which the flight test program will be conducted. It is anticipated that the program will be completed by the end of September. As part of the wings-level stall tests, the stall warning characteristics and horn activation will be evaluated. At the completion of the flight test program, the data will be available to address the issues outlined in these safety recommendations. I will keep the Board informed of the FAA's progress on these safety recommendations.</p>	<p>From: Addressee</p>
<p>Response Date: 1/13/1998</p> <p>Response: The FAA has stated that it agrees with this recommendation; TIA SP2827AT-A authorizes stall testing in accordance with section 23.201. On September 16, 1997, Safety Board staff confirmed that an FAA test pilot performed a complete series of stall tests in the test airplane. Until data from the flight test program is made available to the Safety Board for review, Safety Recommendation A-97-42 is classified "Open--Acceptable Response."</p>	<p>From: NTSB</p>
<p>Response Date: 3/31/1998</p> <p>Response: (Letter Mail Controlled 4/6/98 4:05:05 PM MC# 980437) THE FAA CONDUCTED WINGS-LEVEL STALL TESTING IN ACCORDANCE WITH SECTION 23.201. NO PROBLEMS WERE NOTED.</p>	<p>From: Addressee</p>
<p>Response Date: 11/19/1998</p> <p>Response: A-97-42 ASKED THE FAA TO EXPAND THE UPCOMING PA-38-112 CERTIFICATION FLIGHT TEST PROGRAM TO INCLUDE SECTION 23.201 WINGS-LEVEL STALL TESTS, TO ENSURE THAT AMONG OTHER REQUIREMENTS, THE STALL IS DEFINED BY A DOWNWARD PITCHING MOTION OF THE AIRPLANE. THEREFORE, A-97-42 AND A-97-43 ARE CLASSIFIED "CLOSED--ACCEPTABLE ACTION."</p>	<p>From: NTSB</p>

Safety Recommendation: A-97-043

Rec Status: Closed - Acceptable Action

THE NTSB RECOMMENDS THE FOLLOWING TO THE FAA: (3) SECTION 23.207 STALL WARNING TESTS, TO ENSURE THE STALL WARNING HORN ACTIVATES AT LEAST 5 KNOTS BEFORE STALL.

Safety Recommendation History for A-97-043 FAA Close

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3 records found

<p>Response Date: 9/25/1997</p> <p>Response: The Federal Aviation Administration (FAA) agrees with the intent of these safety recommendations. A Piper PA-38-112 has been obtained for the flight tests. The aircraft is undergoing conformity tests, after which the flight test program will be conducted. It is anticipated that the program will be completed by the end of September. As part of the wings-level stall tests, the stall warning characteristics and horn activation will be evaluated. At the completion of the flight test program, the data will be available to address the issues outlined in these safety recommendations. I will keep the Board informed of the FAA's progress on these safety recommendations.</p>	<p>From: Addressee</p>
<p>Response Date: 3/31/1998</p> <p>Response: (Letter Mail Controlled 4/6/98 4:05:05 PM MC# 980437) The FAA conducted wings level stall tests in accordance with 14 CFR 23.201, Amendment 23-14. The flight tests were conducted using the Piper PA-38-112, S/N 38- 78A0294, Registration Number N9246T. The airplane demonstrated satisfactory stall characteristics. For clarity, it should be noted that although Safety Recommendation A-97-42 states that a stall is defined by a "...downward pitching motion of the airplane," 14 CFR 23.201, Amendment 23-14, states that a stall is produced "...as shown by an uncontrollable downward pitching motion of the airplane {or} until the control reaches the stop." The stalls for the Piper PA-38-112 were accompanied by the classic downward pitching motion as detailed in The New Piper Aircraft, Inc., Report FT-192, Revision B, dated October 28, 1997, and the FAA Type Inspection Report SP2827AT-A, dated October 29, 1997. Stall warning tests were conducted satisfactorily in accordance with 14 CFR 23.207, Amendment 23-7. The Piper PA-38-112, S/N 38-78A0294, was also used for these tests. The FAA Type Inspection Report SP2827AT-A indicates that "...stall warning, in all conditions/configurations, occurred at least seven knots prior to the stall (FAR 23 minimum is five knots)." One issue that was raised with respect to the PA-38-112 was that the wings of production airplanes were not structurally the same as the certification airplane. Consequently, as part of this program, a review was conducted of the latest production drawings. The comparison of the development engineering orders with the latest drawing release confirms that all changes required/approved during development and certification of Piper PA-38-112 wings were incorporated into the production wings. Therefore, the production wings are equal in strength and stiffness to the certification test wings, and this conformity was verified prior to tests. This fact is germane to the stall characteristics discussion. The Board's letter dated July 10, 1997, refers to reports of significant differences in the stall characteristics between the certification-tested airplane and the production airplanes during the 1979-1982 timeframe. The review of the Piper flight test reports does not confirm this statement by the Board or the testimony of the Piper engineer cited by the Board. In September 1983, the FAA issued Airworthiness Directive 83-14-08 for all PA-38-112 series airplanes which added a second set of stall strips to the airplane. Since that date, all PA-38-112 airplanes have the four stall strip configuration. The recent test airplane (Piper PA-38-112, S/N 38-78A0294) had the required four stall strip configuration. Both the FAA and Piper flight tested this condition. The FAA Type Inspection Report SP2827AT-A includes the results of deep stall investigation, stalls with sideslip (to include stalls without rudder use), and stalls with intermediate flap setting. The results are that "...deep stalls (yoke full aft) were investigated in all configurations (flaps up, flaps intermediate, and flaps full down) at full power and with the power at idle. The airplane was fully controllable in all axes during all tests. Stalls with sideslip (ball displaced 1/2 L and R) yielded a slow roll rate (approximately 5 degrees/second) in the direction away from sideslip (away from the ball) that was repeatable, easily recognized, and easily controllable. Stalls at the intermediate flap position behaved similar to the flaps down configuration, and no adverse handling qualities were noted." The New Piper Aircraft, Inc., Report FT-192, Revision B, states that "...lateral/directional characteristics at or near the stall are acceptable with no rapid, abrupt, or unpredictable loss of lateral control observed." The New Piper Aircraft, Inc., Report FT-192 further states that "...no unpredictable behavior was observed/encountered when flying at or near the stall." As part of the normal sequence, airspeed calibration, stall warning, and wings level stall tests were conducted prior to the turning flight and accelerated stalls. The Board made an attempt, prior to issuing Safety Recommendations A-97-41 through - 45, to determine if the FAA had flight tested the four stall strip configuration. At the time of the Board's inquiry, the FAA could not locate the report. However, the FAA has located the report (Type Inspection Report A4150EA-DO dated August 27, 1979). This report documented the results of stall and spin tests on a four stall strip</p>	<p>From: Addressee</p>

configured Piper PA-38. The results were satisfactory. As an element for the justification of these safety recommendations, the Board cited statements of three former Piper employees who purport that the production airplanes were unpredictable in that the pilot never knew in what direction the aircraft would roll as a result of a stall. The FAA's discussions with Piper and a review of the production flight test records show that none of the employees cited by the Board were employed as production test pilots. Additionally, one of the individuals did not work at the Lockhaven facility during the years that the PA-38-112 was produced. The production flight test reports for all PA-38-112 airplanes do not indicate that a single aircraft failed to meet all type design specifications, including those tested with the two stall strip configuration. The Board further discussed stall/spin flight tests with the two and four stall strip configuration on two different airplanes conducted in Sweden. The stated purpose of the tests was to study the low speed, stalling, and spin characteristics of the airplane. One fact not referenced was that the right wing of each airplane was tufted for the study. Further, it was not established in the report that conformity inspections were conducted prior to the tests. The test results indicated that stalls did not produce the nosedown pitching expected, but they were characterized by a roll disturbance usually to the right without pitch change. In addition, the Swedish report stated that the airplane did not meet the stall warning requirement because stall warning occurred only two knots prior to the stall. It is feasible that the tufts could have affected the stalls, since they were installed on only one wing. As for insufficient stall warning, the aircraft tested by the FAA performed satisfactorily. There is a procedure for stall warning system adjustment available in the maintenance manual. It is important to note that the Swedish report concluded that "...spin characteristics are very good throughout. The aircraft is easy to bring into a spin and the spin is stationary after three turns. Exit is distinct and repeatable." Based on the above information, I consider the FAA's action addresses the full intent of these safety recommendations, and I plan no further action.

Response Date:
11/19/1998

From:
NTSB

Response:

A-97-43 ASKED THE FAA TO EXPAND THE UPCOMING PA-38-112 CERTIFICATION FLIGHT TEST PROGRAM TO INCLUDE SECTION 23.207 STALL WARNING TESTS, TO ENSURE THE STALL WARNING HORN ACTIVATES AT LEAST 5 KNOTS BEFORE STALL. THEREFORE, A-97-42 AND A-97-43 ARE CLASSIFIED "CLOSED--ACCEPTABLE ACTION."

Safety Recommendation: A-97-044

Rec Status: Closed - Unacceptable Action

THE NTSB RECOMMENDS THE FOLLOWING TO THE FAA: (4) SECTION 23.221 SPIN TESTS, TO ENSURE THAT IT IS IMPOSSIBLE TO OBTAIN UNRECOVERABLE SPINS WITH ANY USE OF THE FLIGHT CONTROLS OR THROTTLE AND TO VERIFY THAT THE RESULTS OBTAINED IN THE ORIGINAL CERTIFICATION PROGRAM (SPIN RECOVERY IS ALWAYS POSSIBLE IN ONE ADDITIONAL TURN AFTER INPUT OF ANTI-SPIN CONTROLS) CAN BE DUPLICATED ON PRODUCTION AIRPLANES.

Safety Recommendation History for A-97-044 FAA Close

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<p>Response Date: 9/25/1997</p> <p>Response: The FAA believes that there is adequate certification data available to demonstrate compliance of the Piper PA-38-112 with the spin test requirements and to show conformity of the aircraft. Our respective staffs discussed the FAA's flight test plan on September 4, 1997, and as a result, the FAA has a better understanding of the Board's concerns about additional spin tests. At this time, the FAA remains satisfied that the precertification spin testing of the PA-38, as well as those tests done in the fall of 1978 by both Piper and FAA to support the installation of additional leading edge stall strips, met FAA requirements. Consequently, the flight test plan does not include repeating these tests. Once the flight test program is completed and all data are analyzed and examined in the context of existing certification data, the FAA will be in a position to determine if any additional tests are necessary. The FAA proposes to convene a meeting with the Board's staff and Piper representatives at the completion of the flight test program referenced in response to Safety Recommendations A-97-42 and -43. During the meeting, conformity records and all appropriate compliance and production records regarding spin testing will be available for review and discussion. I anticipate that the meeting will be conducted in October or early November. My staff will contact your staff to arrange the meeting to resolve these issues.</p>	<p>From: Addressee</p>
<p>Response Date: 3/31/1998</p> <p>Response: (Letter Mail Controlled 4/6/98 4:05:05 PM MC# 980437) : The FAA has reviewed all of the certification data for the PA-38-112 and concludes that the original certification of the aircraft met all spin test requirements. The precertification spin testing of the PA-38-112, as well as the tests in 1978 by both the FAA and Piper to support the installation of additional leading edge stall strips, met FAA requirements. Piper has conducted and documented certification spins in both the two stall strip and the four stall strip configurations. The FAA has also tested both configurations. In addition to these tests, there have been spin tests conducted by the British Civil Aviation Authority (CAA) and by Piper for the French Director General for Civil Aviation (DGCA). Piper Report 2201 dated March 14, 1979, documents the results of spin tests conducted to show compliance with the French DGCA requirements for behavior of the aircraft during spin recovery with the engine fully stopped, and during spin recovery with ailerons deflected fully in the direction of the spin. Test results show that the airplane recovered promptly from all spins using the flight manual procedure and, for the engine-out mode, an extra 300 to 600 feet was needed following recovery to permit the propeller to windmill and to restart the engine. It was also noted that spins to the left with prospin aileron (full left deflection) were more violent than those to the right with prospin aileron. In addition to the numerous certification spin tests, Piper conducted and documented 3-turn spins in both directions on the first 50 production airplanes and on one of every 20 until production ceased (weather ceiling permitting). This resulted in approximately 150 airplanes being spun during production flight tests. In the discussion of spins, especially flat spins, the Board cites, as a basis for this safety recommendation, a videotape of a series of Piper PA-38-112 spins conducted by a National Aeronautics and Space Administration (NASA) test pilot who is well respected throughout the industry for his experience in the spin testing of general aviation airplanes. The FAA reviewed the videotape and determined that the narrative of the events that are in the Board's letter of July 10, 1997, is incorrect. The test flight by the NASA pilot does not provide justification for this safety recommendation. Based on the sufficient certification and verification spin tests that have been conducted, no further spin testing is required. I consider the FAA's action to be completed.</p>	<p>From: Addressee</p>
<p>Response Date: 11/19/1998</p> <p>Response: BASED ON THE PA-38-112 STALL/SPIN ACCIDENT HISTORY & THE FLAT SPIN INCIDENTS DESCRIBED IN THE BOARD'S RECOMMENDATION LETTER, THE BOARD BELIEVES THAT FAA MISSED AN IMPORTANT OPPORTUNITY TO REEVALUATE THE SPIN CHARACTERISTICS OF THIS AIRPLANE. BECAUSE THE FAA CONSIDERS ITS ACTION TO BE COMPLETE, A-97-44 IS CLASSIFIED "CLOSED--UNACCEPTABLE ACTION."</p>	<p>From: NTSB</p>

Safety Recommendation: A-97-045

Rec Status: Closed - Unacceptable Action

THE NTSB RECOMMENDS THE FOLLOWING TO THE FAA: PENDING COMPLETION OF THE FLIGHT TEST PROGRAM SPECIFIED IN THE ABOVE RECOMMENDATION, IMMEDIATELY REQUIRE THAT THE SLOW FLIGHT & STALL TRAINING IN THE PA-38-112 BE CONDUCTED AT OR ABOVE THE MINIMUM ALTITUDE CURRENTLY SPECIFIED IN THE PA-38-112 PILOTS OPERATING HANDBOOK FOR SPIN TRAINING; & INFORM PILOTS OF ALTERNATIVE METHODS OF RECOVERY FROM AN INADVERTENT, POSSIBLY FLAT SPIN.

Safety Recommendation History for A-97-045 FAA Close

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<p>Response Date: 9/25/1997</p> <p>Response: The FAA agrees with the intent of this safety recommendation that slow flight and stall training in the Piper PA-38-112 be conducted at or above the minimum altitude currently specified in the Pilot Operating Handbook (POH) for spin training. However, until Piper's conformity check is accomplished and the flight test program completed, it is not advisable to recommend any alternative methods for recovering from an inadvertent, possibly flat spin. As an immediate response to this safety recommendation, the FAA sent a letter on August 18, 1997, to all regional flight standards division managers and flight standards district office managers requesting that they inform all known operators of the Piper PA-38-112 of the procedures contained in the POH for spin training. The procedures recommend that spins should only be started at an altitude high enough to provide an adequate margin of safety and that a properly executed 1-turn spin will require 1,000 to 1,500 feet, and a 6-turn spin will require 2,000 to 3,000 feet to complete the recovery. In addition, all pilots operating Piper PA-38-112 and all certified flight instructors of the Piper PA-38-112 are requested to read all sections of the POH carefully to familiarize themselves with all operational performance characteristics of this aircraft. I have enclosed a copy of the letter to all flight standards division and FSDO managers for the Board's information. I consider the FAA's action to be completed on this safety recommendation.</p>	<p>From: Addressee</p>
<p>Response Date: 3/31/1998</p> <p>Response: THE FAA AGREES THAT SLOW FLIGHT & STALL TRAINING IN THE PA-38-112 SHOULD BE CONDUCTED AT OR ABOVE THE MINIMUM ALTITUDE SPECIFIED IN THE POH. ON 8/18/97, THE FAA SENT A LETTER TO ALL REGIONAL FLIGHT STANDARDS DIVISION MANAGERS REQUESTING THAT THEY INFORM ALL KNOWN OPERATORS OF THE PA-38-112 OF THIS RECOMMENDATION.</p>	<p>From: Addressee</p>
<p>Response Date: 11/19/1998</p> <p>Response: IN ITS PREVIOUS RESPONSE OF 1/13/98, THE BOARD INFORMED THE FAA THAT THIS ACTION DID NOT MEET THE FULL INTENT OF THE RECOMMENDATION & CLASSIFIED THE RECOMMENDATION "OPEN--UNACCEPTABLE RESPONSE." THE BOARD IS DISAPPOINTED TO LEARN THAT NO FURTHER ACTION WAS TAKEN. BECAUSE THE FAA PLANS NO FURTHER ACTION, A-97-45 IS CLASSIFIED "CLOSED--UNACCEPTABLE ACTION."</p>	<p>From: NTSB</p>