

DATA SUMMARY

LOCATION

Date and Time	Saturday, May 29, 2010; 11:45 local time
Place	Airdrome San Luis (Menorca)

AIRCRAFT

Enrollment	N-554RB
Type and model	BEECHCRAFT E55 BARON
Exploitative	Private

engines

Type and model	TELEDYNE CONTINENTAL IO-520-C
Number	2

CREW

Pilot in command

Age	60 years
License	private pilot
Total flight hours	2,255 h
Flight hours on the type	138 h

INJURIES

	dead	Graves	Minor / None
Crew	1		
passengers	1		
Others			

DAMAGE

Aircraft	destroyed
other damage	Area of 50 square meters due to fire

FLIGHT DATA

Type of operation	General aviation - Other - Aerial Competition
Phase of flight	maneuvering

REPORT

Approval date	June 28, 2012
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† All times in this report are expressed in local time. To calculate UTC time will be necessary to subtract two hours local time.

1. FACTUAL INFORMATION

1.1. Flight review

The pilot of the aircraft would participate in an air race² which would take place the same day in the afternoon. During the morning he had practiced the route (see Annex 1) and intended to continue doing it. After refueling the aircraft with 207 l to its full capacity, he started to take off on runway 02 San Luis aerodrome in Menorca.

On board the aircraft were the pilot and a passenger.

After takeoff, the aircraft made a left turn to follow the marks ("scatter points") that had the circuit with a height above ground of approximately 200 ft (see Figure 1). Then again turn left to fit the second control points (scatter point) land constituting the test circuit (see Annex 2). In this shift warpage of the aircraft it was very pronounced, close to 90 degrees, and the aircraft plunged to the ground. Then there was an explosion and the aircraft burned.

The aircraft was completely destroyed by the impact and subsequent fire. The two occupants of the aircraft died.

Emergency services were at the airfield immediately came to extinguish the fire occurred.



Figure 1. Flight path followed by the aircraft

²This competition was the 2nd. ¹⁰ race time offset being held in Menorca, organized by The Royal Air Club Records, Racing and Rally, in collaboration with the Spanish Royal Aeronautical Federation, the Royal Aero Club of Spain and the Real Aeroclub de Mahon Menorca.

In the fire an area of approximately 50 m burned.

According to data collected in a video of the accident the aircraft completed a shift of approximately 180 ° at an interval of 8 seconds.

1.2. Injuries to persons

injury	Crew	passengers	Total in the aircraft	Others
dead	1	1	2	
serious				
Minor				Not applicable
unhurt				Not applicable
TOTAL	1	1	2	

1.3. Staff Information

The pilot of the aircraft, an Englishman, had a licensed private pilot issued by the British Aviation Authority (CAA). He enabling had multiengine piston valid until April 27, 2011.

His experience in flight was 2,255 h of which 138 were in the aircraft type.

During the last month he had performed 28 h flight.

He had a valid medical certificate class 2, and in force and had a FAI license.

To participate in such competitions pilots must hold a license issued by the FAI (International Aeronautical Federation) as well as the private pilot license airplane. They must have more than 100 hours as pilot in command and 5 hours on the aircraft type experience that will compete, and finally have demonstrated their ability to fly with absolute precision at any position of the aircraft.

To do this they have to take an exam with a series of theoretical and practical tests. Among practical tests must complete a takeoff using only half of the track width available to fly a constant loss during takeoff and landing, flying straight and level flight for 2 minutes, to be able to make turns the flush left and maximum power of the aircraft, execute a turn of 360 ° of roll 60 with a maximum of 40 feet vertical error and performing a 180 ° turn with 70 warp with a maximum of 40 ft of vertical error.

1.4. Aircraft information

1.4.1. *general*

The aircraft, a Beechcraft E55 "BARON" had American registry but its owner was a British national. It was made in 1978. The current owner acquired the aircraft in July 2007.

It had a total of 2,292 h from manufacturing. The power plant were two motors CONTINENTAL IO-520-C, installed on the aircraft from the manufacture thereof.

Cruising speed at maximum power exceeds 100 miles per hour and required to participate in races compensated time.

1.4.2. *Condition of the aircraft and maintenance*

The last annual inspection was held on 22 April 2010 with a total of 2,264 h at Aerotech, English maintenance company. The review had been carried out tasks which contained the program maintenance of aircraft, engines and propellers.

1.5. weather information

According to information provided by witnesses on the day of the accident there was good visibility and a north wind around 10 kt.

1.6. Aerodrome information

San Luis airfield is located in the town of Mahon. It has an asphalt runway 1,850 m long and 167 ft elevation with an orientation 02/20.

This is a private airfield that is used primarily for sports aviation.

1.7. Information on the remains of the aircraft and the impact

The aircraft impacted the ground 250 m from the runway center line and then there was an explosion. The main wreckage were in the path, north-south direction, which followed the aircraft on the ground and were affected by the fire that occurred below (see sketch of the wreckage in Annex 3).



Figure 2. head rests and detail of a piece of the fuselage in the near bush

Because of the explosion instruments and parts of the aircraft in bushes on both sides of the path of the aircraft and did not affect the fire found.

1.8. Fire

As a result of impact with the ground was an explosion that caused a fire. The rapid intervention of emergency services contained the fire was confined to an area of 50 m².

1.9. Testing and research

1.9.1. tests

Gas

After the incident fuel samples from Cuba where he had made the last refueling the aircraft were taken. The fuel analysis of the sample indicated that Cuba gasoline 100 LL analyzed did not meet specifications³. However, the parameters were outside the limits marking specifications (residue and the distillation loss) were not considered significant.

On the other hand, the gasoline sample showed no signs of microbiological contamination.

³ASTM D-910-07a and DCSEA 118 / B in the composition, volatility, combustion, etc., fuel type defined.

1.10. Additional Information

1.10.1. *Interviews with witnesses*

private pilot and member of the Aeroclub de Menorca

He reported that the aircraft exceeded the first mark or marks on the ground and then made a steep turn. The second shift was made with greater than 45 (close to 90) warpage. Then he began to descend until it struck the ground.

Vice president of the Aeroclub de Menorca

According to the witness refueled aircraft 207 l of fuel to fill the tanks. Regarding flight reported that both the first and second steering the aircraft was flying at low altitude, about 200 ft. In his opinion it could influence the wind as it was from the north when the aircraft veered to the south.

He also reported that on a previous flight, the same aircraft by the pilot that day, the maneuver was very similar and indeed the second shift had ended by leveling the plans abruptly and in it there was some loss of height.

Participant in the air race

He knew the pilot and was with him the days before the accident. In no time he mentioned any problems with the aircraft. I knew I had refueled because the air race was in the afternoon and the next day had to return home.

Member of the emergency services

He arrived at the accident scene two minutes after the accident occurred. They began extinguishing the fire and when they located the crew of the aircraft found that they had died.

They focused on suppressing the fire to prevent the fire from spreading.

1.10.2. *Air Race Time offset or Air Race Handicap*

Air races are a corrected time racing mode powered flight.

In this type of test are considered the wind in the area and various characteristics of the aircraft participants (maximum speed, weight, power and glide ratio) to sort based on their ability to complete a circuit in a minimum time. Participants take off so that the slowest makes the first and the fastest last. This set the output mode makes it almost simultaneous arrival test and win the first crossing the finish line.

1.10.3. *Regulatory information developed by national civil aviation authorities on Air Race*

FAA

American Aviation Authority (FAA) in Volume 3, Chapter 6, Section 1 "Issue a Certificate of Waiver or Authorization for an aviation event" of the "FAA Order 8900.1 Flight Standards Information Management System" stated in point 3-151 *AIR RACES* information about the altitude, speed and circuit design for such competitions.

This regulation divides the type of air racing between "Cross-country" and "closed-course" *air races*. In both cases it is mandatory to request authorization to perform the test and in the case of "closed-course" must be sent prior circuit design for approval. The latter type of racing, "closed-course" are held with the attendance.

In these regulations focus on the separation between the area in which the public and the area where it will make the flight or air show is held.

As for the height it defines that should never be less than 500 ft. For circuit design points to the importance of factors such as maximum aircraft speed and acceleration forces (g's) to which subject can be seen when flying the circuit.

Depending on the type of air race defines a series of speed and in terms of acceleration forces is considered that the maximum acceleration should be 3.5 g's. With these two conditions the minimum turning radius for each type of race are calculated.

This regulation states that course changes to avoid too long. It considers that a maximum 65 ° is suitable.

⁴Examples of this are racing Reno Air Race or Red Bull Air Race World.

CAA

The britância Authority (CAA) issued the CAP 403 airshows on the procedures governing the organizers and participants in air shows to follow. This type of legislation refers to events with attendance.

also includes the national organization and control of air races, including the issuance of permits organization and licensing of participants, it has taken "The Racing, Rally and Records Association of the Royal Aero Club (RRRA)." It also reports that the standards for air races, which are distributed following a request to the RRRA, are designed so as to ensure the highest safety standards. It is recommended that Air Race organizers count on the advice of RRRA.

According to information provided by the RRRA all racing circuits are referred to the CAA.

TO THAT

The Spanish authorities issued Royal Decree 1919/2009 of 11 December, which regulates aviation safety in civil aerial demonstrations. This document describes the security conditions in which civilian air shows must be made collect. It refers to air shows with attendance.

"Aerial competitions" are explicitly excluded.

The document no recommendations or guidelines for air races or other competitions are included.

1.10.4. *Organization of competition*

The second time offset air race was organized by The Royal Air ClubRecords, Racing and Rally, in collaboration with the Spanish Royal Aeronautical Federation, the Royal Aero Club of Spain and the Real Aeroclub de Mahon-Menorca.

The normative s that was followed for the organization of the test was used by The Royal Air Club-Records, Racing and Rally, as was the organization that had more experience in these competitions.

Accordance with the rules provided by this organization before each competition is necessary to perform a "pre-flight briefing" with a responsible organization.

^sRoyal Aero Club Records, Racing and Rally Association. 2011 Air Racing Rules and Handbook. Issue 1. (20-01-2011).

We also have to meet a number of key rules to ensure safety, the crew on the aircraft, the circuit design, etc. In particular, recalls that the aircraft within its limitations is operated flight and a special mention is also made to the twists that require a change of larger course of 120 °.

The path is a closed circuit having a length between 20 and 25 miles, on which are made four or five turns, usually on the left and around a series of checkpoints often marked with pyramids orange surface terrain.

The height required by the first control point of the circuit is 500 ft although normally increases to 700 ft for noise attenuation.

According to information in the manual of the organization and confirmed by an expert pilot in such competitions when takeoff is performed in the opposite direction of the circuit it is necessary to leave the left two or more brands or known control points as "scatter points".

The purpose of these "scatter points" is on the one hand ensure that the aircraft has enough distance to reach a speed that allows you to make a turn after take off safely without any danger of a stall and the other aligned with the direction of the circuit through a series of left turns. Having more than two "scatter points" enables the aircraft aligned with the desired direction several turns.

Within the organization manual focus on the actions of the aircraft during cornering and in particular the increase in the rate of loss by increasing bank angles especially above 70 ° is provided.

One of the examples given is the stall speed for an aircraft with a speed of about 80 kt loss in level flight is increased to 137 kt for roll angle 70 °. Also it includes the accelerations to which it is subjected to an aircraft during a turn of 70 ° are 3 g's.

This manual no explicit limitations of warps or accelerations for circuit design are included.

2. ANALYSIS

2.1. Study Flight

The aircraft took off from runway 02 San Luis airfield in Mahon. According to the requirements of the test he had to take off and adjusted to the left of two brands or

^eThe loss rate for the Beechcraft E55 is 83 kt according to the flight manual of the aircraft.

control points (scatter points) was in the vicinity of the airfield before heading to the point of Isla del Aire south of the island. This maneuver required a 180-degree turn.

According to the images collected in a video of the accident, the aircraft made the turn in 8 seconds. For level flight, maintaining constant height and performing a shift from the runway to the second scatter point, **bank angle must be 67 ° and speed 107 kt. This warpage loss rate increased by 55% compared to a straight and level flight**, which for the configuration of the aircraft in yaw (gear and flaps up) would be 128 kt and the aircraft would be flying below this speed.

Actually the turn was not uniform even greater warps observed in steps over the two control points. During the last turn next warpage angles were observed at 90 and as the aircraft lost control and hit the ground.

This maneuver also took place at low altitude and low speed probably because the aircraft had just taken off. Therefore he was close to the ground making a steep turn. According to information provided by witnesses it was flying at about 200 feet on the ground but generally the minimum height for these competitions is 500 ft.

Figure 1 is observed as the aircraft at the end of his career began to level the wings but was unable to complete the recovery maneuver given the low altitude at his disposal.

It is conceivable that if there had been more "scatter points" maneuver required to follow the path of the circuit would not have been so demanding and could be completed with a softer twist.

There are precedents in the regulations developed by Aviation Authorities (FAA) proposed examples for circuit design. Specifically, the American legislation establishes a maximum 65 ° shift in one spin and maximum accelerations as 3.5 g's. The manual used by the organization for the circuit design did not include this limitation and was not taken into account in drawing it. The application of these limitations to this case would have made the 180-degree turn had taken place in 3 or 4 sections which would have allowed the warps were not so sudden and prolonged.

Also, if the aircraft had more height above ground is possible that the pilot, given its proven expertise, as indicated by the evidence that must be overcome for

⁷It has made the hypothesis that it is uniform circular motion.

participate in this type of competition, it could regain control of the aircraft and avoid the accident. Further away from the marks of the circuit also it would have allowed more time to gain height safety.

It is clear that participation in air racing is a challenge for the contestants who try to outdo themselves better marks previously reached and thus assuming certain risks. However, it is necessary to establish formulas to ensure that the risks are assumable reach.

Although national regulations which have been consulted in the design of circuits refer to airshows, ie, with attendances; the criteria and the conclusions that there are collected could be extended to other competitions such as air racing if that is got improved security.

For all the above would recommend studying the design of circuits for air racing considering that course changes that are proposed do not entail having to maneuver too abrupt or otherwise set a height above the minimum ground before design circuit forces to make a turn.

3. CONCLUSION

3.1. conclusions

- The aircraft had all certificates and licenses valid and in force.
- The pilot had all the valid and in force licenses and certificates.
- The aircraft was refueled to capacity.
- Start the sense circuit was contrary to the departure of the aircraft.
- To join the circuit the aircraft had to turn 180 degrees.
- The pilot initiated a left turn very pronounced nothing more then leveled off.

- Then again make another left turn and was increasing bank angle until he lost control of the aircraft.

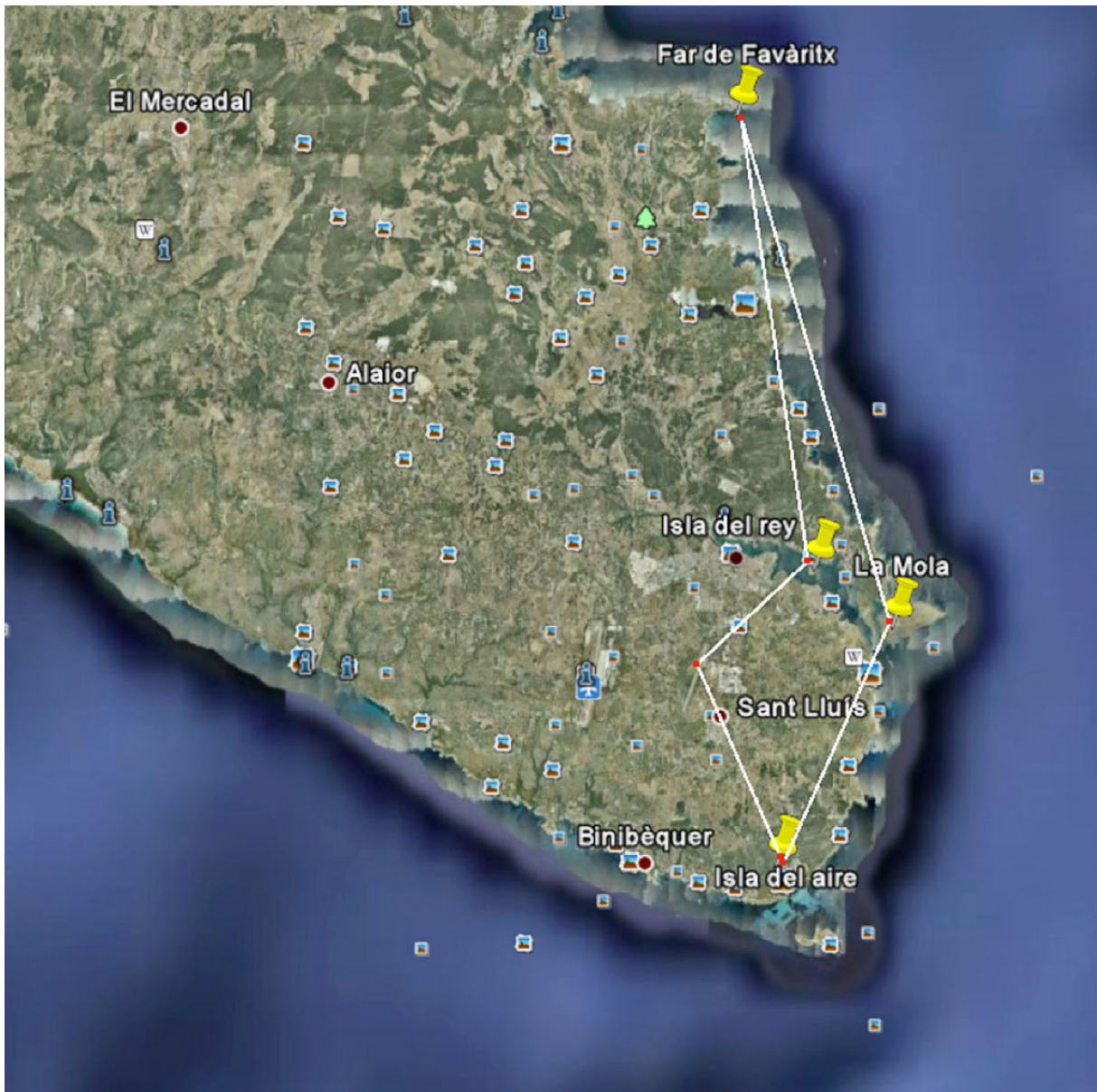
3.2. Causes

The accident was caused by a loss of control of the aircraft due to a stall during a turn very pronounced at low altitude. It is considered as a contributing factor to the first turning point was found very close to the end of the runway which did not allow the aircraft gained enough energy to make the turn safely.

4. SAFETY RECOMMENDATIONS

- REC 15/12.** It is recommended to The Royal Air Club Records, Racing and Rally and the Royal Aeronautical Federation Spanish to include within their internal instructions on designing circuits for air racing similar to those established criteria by the regulations developed by the FAA in its Order 8900, establishing specific limitations for variations in course with special attention to the takeoff phase to join the competition circuits in which operations are carried out at low altitude and low speed.

ANNEX I
Circuit provided for testing



ANNEX II
Situation checkpoints
circuit



ANNEX III
Sketch of remains

