

ACCIDENT

Aircraft Type and Registration:	Druine D.31 Turbulent, G-ARNZ
No & Type of Engines:	1 Volkswagen 1600 piston engine
Year of Manufacture:	1961 (Serial no: PFA 579)
Date & Time (UTC):	14 August 2016 at 1430 hrs
Location:	In the intertidal zone, Herne Bay Beach, Kent
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Minor) Passengers - N/A
Nature of Damage:	Damage to the wing and from salt water immersion
Commander's Licence:	Private Pilot's Licence
Commander's Age:	71 years
Commander's Flying Experience:	922 hours (of which 360 were on type) Last 90 days - 8 hours Last 28 days - 2 hours
Information Source:	AAIB Field Investigation

Synopsis

During the 'balloon bursting' element of a flying display on the coast, the engine lost power and the pilot ditched the aircraft in shallow water. The aircraft flipped inverted and the pilot was trapped in the cockpit by his lifejacket, which had inflated automatically, and his proximity to the sea bed. Two members of the public righted the aircraft and helped the pilot out of the cockpit. The pilot had suffered a minor injury. CAA Safety Sense Leaflet 21d, '*Ditching*', provides advice on the correct type of lifejacket to wear and guidance and information on ditching.

The investigation revealed that a fragment of balloon had become lodged in the carburettor restricting the airflow into the engine. An approved modification has since been developed to fit a screen to the intake of the carburettor.

History of the flight

The aircraft was one of a team of three Turbulent aircraft participating in the 2016 Herne Bay Air Show. The aircraft had assembled at Maypole Farm, where the pilots briefed for their display and walked through the routine they planned to carry out. Consideration was given to the fact that, because the display was taking place just offshore, adjacent to a congested area, the option in the event of an engine failure would probably be to ditch the aircraft in the sea.

The display routine proceeded normally until the 'balloon bursting' segment, for which the aircraft adopted a race-track pattern aligned with the display line. A member of the Turbulent Team ground crew, who had been pre-positioned in a small boat, released a series of balloons so that the team aircraft could burst them by flying into collision with them. The position of the boat was dictated by a light onshore breeze and the need for the aircraft to encounter the balloons at a height of approximately 500 ft asl. This was the usual height used, as the balloons stood out better against the sky at that height.

On his first run at a balloon, the pilot of G-ARNZ did not make contact with the target but on his second he hit a balloon "dead centre" with the propeller. He then continued around the race-track but, when established on the downwind leg, the engine power "much reduced". The pilot checked the instruments and controls but found nothing untoward. Both ignition systems were ON and their associated indicator lights were not flashing to indicate a fault. The throttle was operating normally, the carburettor air was selected to HOT and the fuel was ON. The engine continued running but at low power as the aircraft descended.

From a height of about 500 ft asl, the pilot assessed that it would not be possible to glide as far as open land inland of the seafront. So, he continued on an easterly track towards an area just off the beach, beyond the display area, where there were fewer people than along other parts of the seafront. He flew at a speed of approximately 60 KIAS and planned to stall the aircraft onto the water. His intention was for the aircraft's tail to touch the surface first, followed by the landing gear, so that the aircraft remained upright.

The aircraft's descent continued until it was a few feet above the water, when the pilot flared the aircraft to "hold off". The aircraft's mainwheels touched the water first and the drag they experienced caused the aircraft to pitch forward rapidly onto its back (Figure 1). Although the pilot was able to unfasten his straps, he found himself trapped in the cockpit, with his head close to the sea bed and insufficient space to manoeuvre himself out of the cockpit. Moreover, his automatic lifejacket had inflated and its bulk and buoyancy were pressing him up into the inverted cockpit.

Members of the public ran into the water and the first two to reach the aircraft lifted its tail up and successfully pitched the aircraft the right-way-up. The pilot, whose head had been submerged for about 20 seconds, was assisted out of the cockpit and on to the beach. He was aware of a small cut to his face, from impact with the canopy surround, but was otherwise physically unharmed and had remained conscious throughout his ordeal.

Recorded information

A video of the ditching was provided to the AAIB. The video showed people on the beach, some standing knee deep in the sea a few metres from the water's edge, and no-one swimming.

An indication of the distance of the aircraft from the beach can be gauged from the fact that the person who ran directly out to the aircraft from the water's edge took approximately 18 strides to reach it.



Figure 1

Inverted aircraft just prior to pilot's rescue

Meteorology

The weather was fine, with visibility of 10 km or more and no low cloud. The 1420 hrs METAR from Southend, on the opposite side of the Thames estuary, 20 nm west-north-west of Herne Bay, stated that the surface wind was from 350° at 4 kt, varying between 300° and 040°, and the temperature and dewpoint were 21° and 9° respectively. The light wind was causing ripples on the sea surface, which gave it visible texture.

The pilot

The pilot obtained a PPL(A) in 1988 and then joined the club which operated the Turbulent Team. He subsequently became a member of the team, gaining his first Display Authorisation in June 2007. Over subsequent years he has flown regularly as a member of the display team.

Aircraft description

The Druine Turbulent is a low wing monoplane, of conventional layout, constructed of wood and covered with fabric. This aircraft was originally built in 1961 and is fitted with a modified air-cooled, four-stroke automotive engine with a horizontally opposed four-cylinder arrangement and dual electronic ignition. A single carburettor provides the fuel air mixture. It is provided with a pilot-selectable carburettor heating system which allows hot air to be fed to the carburettor, from a heater muff surrounding an exhaust pipe, instead of its normal cold air supply. No filters were provided to either the cold or the hot air intakes.

The aircraft was operated on a Permit to Fly and its Certificate of Validity was in date.

Engineering examination

The aircraft was recovered from the sea intact but there was some damage to the wing leading edge. It could not be determined whether this was caused by the ditching or the subsequent recovery activity by members of the public. Initial examination did not identify any other anomalies with the aircraft.

Further detailed examination of the engine found a piece of balloon, approximately 50 mm in diameter, lodged in the air path of the carburettor (Figure 2).



Figure 2

Balloon fragment (orange) lodged in the carburettor air path

Survivability

The pilot's lifejacket

The pilot was wearing a 150 Newton (N) life jacket of a design intended for use in boats. He had selected an automatic design as he perceived this to be a desirable feature and wore it whenever flying over water.

CAA Safety Sense Leaflets

The CAA has published General Aviation Safety Sense Leaflet 21d, entitled '*Ditching*', which provides the following advice in the section headed '**Knowledge**':

*'Many automatically inflated lifejackets, used by the sailing community, are activated when a soluble tablet becomes wet. This type is **totally unsuitable** for general aviation use as it will inflate inside a water-filled cabin, thus seriously hindering escape.'*

This publication contains guidance on suitable lifejackets and further advice relating to ditching, covering knowledge, preparation and the practices to employ in the event of a ditching.

Analysis

Operations

The aircraft was involved in a flying display, as part of an air show on the north coast of Kent. Its pilot was a regular member of the display team, having gained his PPL(A) in 1988 and his first Display Authorisation in 2007.

The display proceeded normally until the 'balloon bursting' element. This part of the routine involved flying the aircraft around a racetrack pattern, aligned with the 'display line', and into a balloon which had been released from a boat below by another member of the display team. Having missed a balloon on its first pass along the display line, the aircraft was flown around the racetrack and struck a balloon with its propeller on the second attempt. As the aircraft continued around the racetrack, its engine suffered a loss of power and the pilot was unable to maintain height.

With insufficient range to reach open ground onshore, the pilot elected to ditch the aircraft beyond the display area and just off the beach, where there were fewer people than along other parts of the seafront. He intended to stall the aircraft on to the surface of the sea tail first, so that the aircraft remained upright. In the event, the main wheels touched the surface first and the aircraft pitched forward, coming to rest inverted in shallow water. The pilot, who had remained conscious found that his head was close to the sea bed. He released his harness but his lifejacket inflated automatically, as designed, and he was unable to extricate himself from his position in the cockpit.

Members of the public rapidly made their way to the aircraft and two of them righted the aircraft. The pilot, whose head had been submerged for about 20 seconds, was helped out of the aircraft and escorted ashore.

Survivability

The pilot was wearing a type of lifejacket intended for use in boats. The CAA's Safety Sense Leaflet 21d, entitled 'Ditching', states:

*'Many automatically inflated lifejackets, used by the sailing community, are activated when a soluble tablet becomes wet. This type is **totally unsuitable** for general aviation use as it will inflate inside a water-filled cabin, thus seriously hindering escape.'*

The leaflet provides guidance on suitable lifejackets, and where to obtain them, and information and advice on the preparation for and practices to employ in the event of having to ditch an aircraft in water.

Engineering

A fragment of balloon was found lodged in the carburettor causing a significant restriction to the airflow through the carburettor, causing the loss of engine power experienced by the pilot.

Safety action

The operators of the aircraft developed a modification to fit a screen to the engine's carburettor intake, with the intention of preventing the ingress of similar debris to the balloon fragment. Should this screen become blocked, air can still be supplied to the carburettor via the alternative hot air supply, thereby allowing the engine to operate normally. After satisfactory testing, the modification was approved by the Light Aircraft Association.

Conclusion

During the 'balloon bursting' element of a flying display on the coast, the engine lost power and the pilot ditched the aircraft in shallow water close to the beach. On touchdown, the aircraft flipped inverted and the pilot was trapped in the cockpit by his lifejacket, which had inflated automatically, and his proximity to the sea bed. Two members of the public righted the aircraft and helped the pilot out of the cockpit. CAA Safety Sense Leaflet 21d, '*Ditching*', provides advice on the correct type of lifejacket to wear and guidance and information on ditching.

The investigation revealed that a fragment of balloon had become lodged in the carburettor restricting the airflow into the engine. An approved modification has since been developed to fit a screen to the intake of the carburettor, to prevent ingress of debris similar to the balloon fragment.