FINAL REPORT

AAIU Synoptic Report No: 2010-013
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In accordance with the provisions of SI 205 of 1997, the Chief Inspector of Air Accidents, on 06 December 2008, appointed Mr. Paddy Judge as the Investigator-in-Charge to carry out a Field Investigation into this Accident and prepare a Report. The sole purpose of this Investigation is the prevention of aviation Accidents and Incidents. It is not the purpose of the Investigation to apportion blame or liability.

Aircraft Type and Registration:	Pipistrel Taurus 503, EI-ECS	
No. and Type of Engines:	1 x Rotax 503 UL	
Aircraft Serial Number:	039	
Year of Manufacture:	2008	
Date and Time (UTC[1]):	06 December 2008 @ 16.04 hrs	
Location:	Near Birr Airfield, Co. Offaly, Ireland N53º 04.53', W008º 53.97'	
Type of Flight:	General Aviation – Check flight	
Persons on Board:	Crew – 1	Passengers – 1
Injuries:	Crew – Nil	Passengers – Nil
Nature of Damage:	Damaged beyond economical repair	
Commander's Licence:	JAA PPL (M)	
Commander's Details:	Male, aged 46 years	
Commander's Flying Experience:	974 hours, of which 0 were on type	
Notification Source:	Gardaí at Birr	
Information Source:	AAIU Field Investigation	

SYNOPSIS

The new motor glider took off from Birr Airfield (EIBR) on a check flight prior to issuance of a Permit to Fly. There were two persons on board, the Check Pilot and the Owner. During the climb the engine suddenly stopped and subsequent attempts to restart it failed. An attempt was made to return to the airfield but the aircraft became low on approach. In attempting a forced landing into a field short of EIBR the aircraft struck the topmost branches of a tree and descended into a garden. Neither occupant was injured other than minor cuts. The Pilot candidly stated that he had misjudged the approach back to the airfield, having been distracted by the engine stoppage and the attempts to restart it. The Emergency Services attended and were warned by the crew that an unmarked ballistic parachute, an explosive rocket device, was installed on the aircraft.

[1] **UTC**: Universal Time Coordinated (which is the same as local time)

Four Safety Recommendation are issued as a result of this Investigation: Three Safety Recommendation are issued; to the Irish Aviation Authority (IAA), to the European Aviation Safety Agency (EASA) and to the State of Slovenia requiring that warning placards are placed on the outside of an aircraft, when such an aircraft is equipped with a ballistic parachute system. A fourth Safety Recommendation is issued to Pipistrel concerning the provision of information in the Flight Manual regarding the possibility of sudden engine stoppage.

1. FACTUAL INFORMATION

1.1 History of the Flight

The Owner had recently travelled to the manufacturer of the motor glider in Slovenia where he purchased the aircraft and had acquired 10 hours training on the aircraft. He returned with it to Ireland and registered the aircraft with the IAA. The process of acquiring a Permit to Fly requires that a technical inspection and a check flight are conducted on the same day by inspectors from the National Microlight Association of Ireland (NMAI). The aircraft had been technically inspected earlier that morning and then began the check flight with two persons on board, the Check Pilot in the left seat and the Owner in the right seat. The aircraft took off from Runway (RWY) 18 at EIBR and was climbing on crosswind when the engine stopped. During an attempt to land back on RWY 18 the aircraft became low and the Check Pilot attempted to make a forced landing into a field short of the runway. However, it struck the upper branches of an ash tree on short finals, rotated and impacted the ground in a steep nose down attitude travelling backwards. There was substantial damage to the cockpit area and the aircraft was damaged beyond economical repair. Children playing nearby saw the aircraft and said that there was no noise from the engine prior to impact. The pilot of an over-flying aircraft saw EI-ECS "*hit a tree, spin and crash*".

1.2 Check Pilot

The Check Pilot, who had a current JAA PPL (M) AFI[2] and 974 hours flying experience, stated that he was conducting a new aircraft check flight at the time. This was authorised by the National Microlight Association of Ireland (NMAI), and he was the Pilot-In-Command (PIC) and handling pilot. Following an earlier technical inspection, he took off from RWY 18 at EIBR using full power and throttled back after takeoff during the climb. The engine suddenly stopped and he made a right hand circuit. As he could not see to the right, the Owner gave him turning guidance. The approach was over buildings. He saw the tree and attempted to clear it, but had insufficient airspeed/height and hit the top branches. He believed that had they cleared the tree they would have had adequate height to land in the adjacent field.

In retrospect, he considered that he had spent too much time concentrating on restarting the engine and lost focus on the plan of getting back to the airfield. Due to the slow rate of descent of the glider, he felt he had been lulled into believing that he had adequate height to reach the runway. As the engine was extended, he ended up with too little height.

[2] **AFI**: Authorised Flight Instructor

1.3 Owner

The Owner stated that the aircraft was new. He had bought it from its manufacturer Pipistrel in Slovenia, where he had 10 hours flight training and a checkout on the aircraft. The manufacturer had supplied him with placards to be placed on the outside of the aircraft stating that the aircraft was equipped with a ballistic parachute system. However, these had not been put in place at the time of the flight. This check flight was the aircraft's first flight in Ireland. He accompanied the Check Pilot as he had been trained on the aircraft, whereas it was new to the Check Pilot, being the first aircraft of its type on the Irish register. He said that when the engine (**1.5.2 Engine Information**) initially started it "*fired only on one cylinder before it picked up on the other*". The take-off was into wind. They turned cross-wind and, when they were about 1,200 ft to 1,400 ft, the engine stopped as if "*switched off*". They made a wide right hand circuit back to land on the runway from which they had taken off. The Check Pilot tried unsuccessfully to restart the engine a number of times and believed the primer may have been used[3]. He remembered an attempt being made to lower the engine but the propeller did not align and could not therefore be retracted, however he was not sure what the airspeed was at the time. He did not realise the sink rate was so high and thought the aircraft descended more quickly with the engine extended than he would have expected. Immediately before landing, they hit a tree and the canopy shattered on ground contact. They had no problem exiting the aircraft and they de-activated the ballistic parachute system. They advised the emergency response personnel when they arrived that there was a ballistic parachute system on board the aircraft. He said that there was plenty of fuel on the aircraft.

The Owner had a current JAA PPL (M) with 470 hours flying experience and he too believed they had not managed the situation properly, having been distracted by the stopped engine. They did not notice the increased rate of descent caused by the engine being extended, nor did they pick up the visual cues in time that they were getting too low. The Owner said that he had not glided the aircraft any significant distance with the engine up and the descent was steeper than he expected.

1.4 Site Examination

The Investigation visited the accident site the following morning. It was in the rear garden of a house, the garden size being circa 0.26 hectares (0.6 acres) approximately 200 metres to the northwest of RWY 18 threshold at EIBR. Broken branches were observed on an ash tree that grew on the garden boundary to the north and an ash branch was found embedded in the port wing at mid span.

The aircraft was on a heading of 340°M facing the direction from which it had come **(Photo No. 1).** The canopy had shattered and the fuselage underneath the cockpit was distorted and fractured. The landing gear was found extended. The engine was partially extended, the rear actuating support having fractured but not separated thus allowing the propeller to fall from a fully extended position onto the engine bay doors. Witness marks on the engine bay doors show that the propeller was stopped but not aligned at impact. The flaperons[4] were found near the T or fully extended position. Continuity was established for all controls at the accident site.

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[3] The Pipistrel Flight manual recommends use of the primer for all in-flight starts.

[4] **Flaperon**: A combined aileron and flap where the aileron also acts as a flap.

Photo No. 1: Accident site

The aircraft bore registration marks and although equipped with a ballistic parachute system, there were no external markings to indicate that this system was installed, or where it was located. However, the egress panel outline could be seen on the hoar frost that covered the aircraft the following morning (**Photo No. 2**).

Photo No. 2: Ballistic parachute egress panel outlined in frost

1.5 <u>Aircraft Information</u>

1.5.1 General

The Taurus is a mid-wing, high aspect ratio, T-tail, tail dragger motor glider, constructed mainly from a Kevlar, carbon, and glass fibre composite **(Photo No. 3)**. Two side-by-side seats are provided in a cockpit that is covered by a bubble canopy. The wings can be removed for storage by removing two large spar pins that interlock the main spar of each wing. The twin undercarriage main wheels are retractable while the tail wheel castors.

Photo No. 3: Taurus (copyright Pipistrel)

This ultralight aircraft is designed as a high performance self-launching sailplane or glider. This performance is achieved by a low airframe weight utilising high strength low weight composite materials and a very clean low drag design. When the aircraft is operated in a high drag configuration (engine extended but stopped, undercarriage and flaperons lowered), the combination of low weight and high drag results in a much poorer glide angle and a higher rate of descent.

The engine/propeller powerplant assembly is located in a bay behind the cockpit. The engine bay doors automatically cover the powerplant assembly when retracted. The engine drives a wooden twin-blade, fixed-pitch propeller via a reduction gearbox and a toothed belt. The Ibis propulsion and control system controls operation of the powerplant, including extension and retraction. This allows the engine and propeller, which are mounted on a swing arm system, to be lifted into the airstream by an electrical actuator. The engine may then be started.

The engine must be stopped and the propeller allowed to automatically align and lock before retraction can commence. The Flight Manual states that the speed must be first reduced to 40 kts at which point the propeller will cease rotation and align. When the propeller is stopped in the correct position, the assembly can be lowered and the engine bay doors finally cover the propeller/engine assembly. The engine cannot be started unless fully extended and cannot be retracted unless stopped with the propeller correctly aligned. All the pilot has to do is to select either extend or retract; the Ibis system then ensures that all interlock conditions are met before it actuates.

The aircraft was fitted with two 12V gel type batteries of 11 Ah[5]. One battery provided starting power for the engine while the other supplied avionics.

The aircraft has a 30-litre fuel tank in the starboard wing and couplings connect the fuel line to the fuselage. The couplings lead to an electrical fuel pump that in turn feeds dual carburettors.

[5] **Ah:** Ampere hour - Units of electric charge used to denote the capacity of a battery.

1.5.2 Leading Particulars

Aircraft type:	Motor Glider
Manufacturer:	Pipistrel
Model:	Taurus 503
Constructor's number:	039
Year of manufacture:	2008
Certificate of registration:	27 November 2008
Engine:	Rotax 503 UL
Maximum authorised take-off weight:	472.5 kg
Length:	7.4 m
Wingspan:	14.97 m
Best Glide Ratio, landing gear and propeller retracted:	1:41
Glide Ratio: Landing gear and Propeller extended:	1:25
Stall speed flaps extended:	34 kts

Table No. 1

The minimum sink speed and sink rate of the aircraft, with the landing undercarriage and propeller retracted, is published as 48 kts with sink rate of 156 ft/min. Although this rate of descent almost doubles with the propulsion unit extended the manufacturer believed that it was surprising that a return to the field could not have been achieved after the engine stopped. The manufacturer carried out a test from a similar position at 1,400 ft with the engine extended. Using correct landing procedures (downwind to base leg to finals) and normal flight parameters, the time from 1,400 ft to landing was 3 minutes. The sink rate encountered during the glide from 1,400 ft to 800 ft on the downwind leg was 300 ft/min.

1.5.3 Engine Information

A Rotax 503 UL, two-cylinder, two-stroke engine, powers the aircraft. Dual independent magnetos provide a spark at each of the two spark plugs on each cylinder. An ignition switch on the Ibis control panel controls the magnetos.

The engine is air cooled by propeller air, which enters a duct on the propeller arm, passes over the engine thereby cooling it and exits into the engine bay. This heated bay air in turn feeds the carburettor air intakes, thus reducing the possibility of carburettor icing. The engine is not fitted with a carburettor heating system although the intake air is warmed. The recommended fuel is Mogas[6].

The Rotax Maintenance Manual for Engine Type 503 UL contains the following information:

6.2) Safety information

▲ *WARNING: This engine, by its design, is subject to sudden stoppage! Engine stoppage can result in forced landings, no power landings or crash landings. Such crash landings can lead to serious injury or death.*

[6] **Mogas**: Motor gasoline.

▲ *WARNING: Never fly the aircraft equipped with this engine at locations, airspeeds, altitudes, of other circumstances from which a successful no-power landing cannot be made, after sudden engine stoppage.*

Aircraft equipped with this engine must only fly in DAYLIGHT VFR conditions.

▲ *WARNING: This is not a certificated aircraft engine. It has not received any safety or durability testing, and conforms to no aircraft standards. It is for use in experimental, uncertificated aircraft and vehicles only in which an engine failure will not compromise safety.*

User assumes all risk of use, and acknowledges by his use that he knows this engine is subject to sudden stoppage.

1.6 Flight Manual

The Flight Manual gives the following procedures:

Initial climb

When airborne, accelerate at full power and later maintain proper speed of climb. As you reach 100 km/h (55kts) at a height above 50 meters (165 ft), retract flaps to neutral position and retract the landing gear. Continue climbing with full power at 100 km/h.

The Flight Manual contains an emergency procedure for an engine failure.

Engine failure in climb

First ensure proper airspeed by reducing angle of attack, then start analysing terrain underneath and choose, in your opinion, the most appropriate landing site for landing out.

Warning! The decision where to land when landing out is final! Do not change your mind even if you happen to come across a different, perhaps more appropriate landing site.

Providing the engine failed aloft, first retract the propulsion unit and prepare for an emergency landing if the conditions prevent you from gliding to the airport.

The Flight Manual also contains an emergency procedure for landing the aircraft with the engine extended. Normal operations do not permit landing with the engine extended.

Emergency landing propulsion unit extended or refusing to retract

1. *Attempt to retract the propulsion unit by setting the retraction switch up and back down if your height is 300 m* (1,000 ft) *or higher. Otherwise, proceed with emergency landing.*
2. *Fasten your seat belts.*
3. *Master switch OFF (key full left).*
4. *Should the propulsion unit remain extended or partially extended land the aircraft onto the main wheels first in order to minimise vertical ground impact on the propeller arm.*

The landing out manoeuvre MUST be performed with regard to all normal flight parameters.

The Flight Manual states on Page 16, "*The engine is not certified for aviation use, therefore there is no assurance it cannot fail in its operation at any given moment, without prior notice to the user*". In addition, it later advises against warming up the engine at idle power as it may foul the spark plugs.

The Flight Manual also states that the *"First noticeable signs of carburettor icing are loud engine noises and gradual loss of power"*. It cautions that carburettor icing can occur at temperatures as high as +10°C.

1.7 Aircraft Examination

The wreckage was taken to the AAIU facility at Gormanston for technical examination. The spark plugs were removed and found to be clean. Fuel was found in the tank, which had not ruptured. The engine extension actuator, which had fractured during the impact, was replaced for testing purposes by a steel fitting. Following attachment of the wings, bypassing the engine interlocks and attaching the fuel lines, engine starting was attempted. Initially the engine ran on one cylinder, possibly due to inadvertent flooding. The engine cleared after a short time and subsequently ran smoothly on both cylinders with little magneto drop on either magneto. The engine was started a number of times on different days without further abnormality. The manufacturer informed the Investigation that starting on one cylinder is a characteristic of the engine. If throttle is then added this results in a flooded engine whereas if the engine is shutdown and restarted it normally restarts on both cylinders.

All defects found were attributable to either impact or post impact damage.

A fully charged 11 Ah gel battery was then installed in the engine battery position and the engine cranked by starter motor with ignition off until flat. An engine cranking time of 59 seconds was achieved.

1.8 Ballistic Parachute System

The aircraft was fitted with a Galaxy Rescue System (GRS), a rocket-deployed emergency rescue system that allows a light aircraft to be lowered to the ground by a large parachute. Precise minimum altitude figures for activation are not given but the Flight Manual indicated that this can be as little as 30 m to 150 m depending on installation, speed and trajectory.

Subsequent examination of the ballistic parachute system by the Investigation determined that this system was fully functioning. The entire GRS system was housed in a tube in the centre of the aircraft behind the pilot seats. This tube had a detachable top cover that formed part of the upper fuselage surface (**Photo No. 2**). The system consists of a large parachute, whose lines are attached to the airframe, and an upwards-firing rocket, which deployed the parachute. Pulling the manual handle, mounted behind and between the pilot's heads, activates the rocket, which fires through the upper surface of the fuselage and pulls out the deployment bag that contains the parachute canopy.

In flight, the deployment bag is pulled 15-18 m clear of the aircraft. The bag then opens and a drogue chute emerges to deploy the canopy, which stabilises and lowers the aircraft to the ground. A safety pin should always be installed when the aircraft is parked to prevent accidental activation of the system. The pilot removes this pin during his pre-flight check.

The metal rocket is approximately 8 inches long by 2 inches in diameter and reaches speeds in excess of 100 mph in 1/10 of a second. It fires for approximately one second and is a dangerous projectile.

Although the Flight Manual showed various placards that are available for the aircraft, it did not show a placard for the Parachute Rescue System that was installed in the aircraft.

1.9 Meteorological Information

The weather at Shannon Airport (EINN), some 42 nm to the southwest, at 16.00 hrs was recorded as very light WSW wind, 10 km visibility, temperature +4°C and dew point +3°C, QNH 1018 hPa, scattered cloud with 93% humidity.

1.10 Fuel and Oil Analysis

The wing fuel tank remained intact and was found to be almost full. Samples of this fuel, the remains of fuel in a container from which the aircraft was fuelled, fuel from the fuel bowser in EIBR, and a sample of the oil used in the two-stroke oil mix, were sent for analysis.

The fuel analyses indicated that the samples were clear and bright with the density and distillation within the acceptable limits for British and Irish Unleaded Gasoline. There was no bacteria, yeasts & moulds or sulphate reducing bacteria present in the fuel samples. The analysis was consistent with the fuel being Mogas. A trace amount of extra material at a higher boiling range was also present in Gas Chromatogram readings from the aircraft fuel tank and the container fuel.

This was probably due to the two-stroke oil premix being present in the aircraft fuel sample. Although a trace of non-saline water was also detected in the fuel from the aircraft fuel tank, this is considered likely to be from contamination during siphoning of the fuel as the fuel in the container from which the aircraft's tank was filled did not show any water trace.

1.11 Carburettor Icing

As the temperatures on the day were approximately +4°C with a dew point of +3°C this indicates that the atmospheric conditions were conducive to the formation of serious carburettor icing. Although the graphic in **Figure No. 1** was produced for Avgas[7], the Mogas used on this aircraft is known to be more susceptible to carburettor icing.

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[7] **Avgas**: Aviation gasoline.

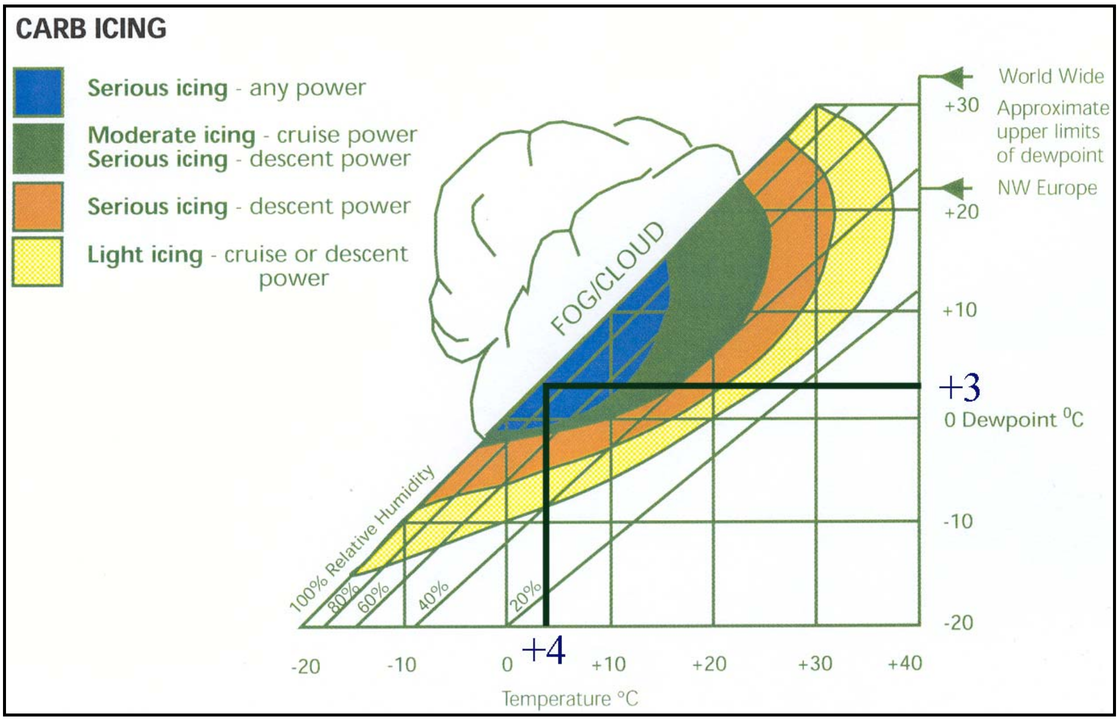

Figure No. 1: Carburettor icing likelihood while using Avgas

The manufacturer, when requested to comment on the likelihood of carburettor icing, stated that he considered carburettor icing possible but believed it to be unlikely due to the following reasons:

- The metal manifold that leads the air/mixture from the carburettors was specially designed to prevent icing from forming.
- There had been no reported occurrences of carburettor icing on the aircraft despite operating quite a few seasons in a cold and wet environment.
- The engine uses ducted air from the engine bay to feed and cool the membrane carburettors. This also keeps that area warm in cold/wet conditions.
- During tests in 95%-100% humidity and a temperature of 8°C on the ground with clouds at 2,000 ft and occasional rain, icing symptoms had not occurred.

1.12 National Microlight Association of Ireland (NMAI)

The NMAI informed the Investigation that the check flight on the Pipistrel Taurus was conducted under their auspices. As the aircraft was a new type in Ireland, NMAI procedures required that only the Chief Check Pilot, or a check pilot nominated by him, could carry out a check flight on a new unfamiliar aircraft type that had not come through BCAR Section S[8]. The NMAI informed the Investigation that the Chief Check Pilot had delegated the check on EI-ECS to the Check Pilot who was an NMAI approved and insured check pilot, an IAA approved instructor and who had 20 hours on Pipistrel type aircraft though not on high performance motor-gliders such as the Taurus 503.

[8] **BCAR Section S**: British Civil Airworthiness Requirements are the basis for the issue of Permits to Fly by the UK for new types of small light aeroplanes.

The IAA informed the Investigation that as the aircraft was equipped with an engine it therefore qualified as a Microlight under EU Regulation 216/2008 (Annex II Uncertified Aircraft) and it fell under the aegis of the NMAI to conduct the check flight.

1.13 Manufacturer Information

The Taurus S/N 039 airframe was returned to the manufacturer which conducted powerplant tests in its engine testbed without altering the settings of the engine. The manufacturer stated that the test data revealed full compliance with production tolerances and that a static pull force measurement of 130 kg was recorded thus proving that the engine propulsion unit was still producing full power.

The results of these engine tests and the records of the original engine tests conducted on the 25 October 2008 (before the maiden flight of the aircraft) were supplied to the Investigation. These results were compared and, although there was a difference of 18 hPa in atmospheric pressure, no significant deviation in parameters was observed.

The manufacturer also stated that following the engine runs in the testbed a teardown of the engine was conducted. No abnormalities were discovered and that there were no signs of lack of lubrication, indicating that there was sufficient oil in the fuel/oil mix.

2. ANALYSIS

2.1 General

The check flight had to be conducted prior to issuance of a Permit to Fly and therefore the Check Pilot was the PIC. However, since the PIC was inexperienced on this type and the Owner was checked out on the type, it was reasonable that the flight was conducted with both persons on board.

The weather was suitable for the VFR flight and, as visibility was good and the wind was light, these were not factors in the accident. Adequate fuel was on board the aircraft for the intended flight.

Shortly after take off the engine stopped at a height from which the manufacturer said that it was possible to land back on the airfield. However, an unsuccessful forced landing ensued.

Subsequent examination of the accident site and wreckage indicated that the aircraft, having hit a tree, rotated 180º immediately before impact, which occurred with the aircraft travelling backwards. The flaps, undercarriage and engine were found extended.

2.2 Engine Failure

The crew reported that during the climb the engine stopped at about 1,400 ft and did not restart. Examination of the engine bay, cover panels confirmed that the witness marks showed no evidence of propeller rotation at impact and eyewitnesses reported no sound from the engine prior to impact.

The subsequent examination of the engine by the Investigation did not find any technical reason for engine stoppage. Analysis of the fuel indicated that it was clean, the electrics operated correctly and the engine started and ran when adequate battery power was available. Although a minor trace of water was found in the analysis of the fuel taken from the aircraft tank the Investigation is satisfied that this was due to post accident contamination of the fuel sample.

The Owner believed that the engine should be throttled back by about 10% after take off, however the manufacturer stated that this was not the case and that the two-stroke engine should be left on full power during the climb to avoid plug fouling. However, the Investigation noted that in the subsequent technical engine examination by the AAIU the engine plugs were found to be in a clean condition, therefore plug fouling can be excluded as a cause of engine stoppage.

As the engine had been operating for some time at a high power setting, it is unlikely that the engine was flooded and therefore this cause can also be excluded.

Historically, two stroke engines have proved more temperamental than four stroke engines, and the Rotax 503 UL Maintenance Manual for Engine Type 503 UL supports this. This contains warnings that the engine is uncertificated and that the engine, by its design, is subject to sudden stoppage. Therefore, this is also another possibility but in this case the engine should have been capable of being restarted. Although there is a statement regarding the engine in the Taurus 503 Flight and Maintenance Manual that "*…there is no assurance it cannot fail in its operation at any given moment, without prior notice to the user"* this is not a warning, *ipso se.* As such, it does not carry the same emphasis as the warning published by the engine manufacturer in its manual. The Investigation believes it should and issues a Safety Recommendation to the aircraft manufacturer to that effect.

There were initial concerns regarding battery power and that the attempted restarts of the engine had discharged the battery to the extent that it would not retract the propeller. Battery power drain during engine starting in flight was reduced due to the air stream assisting the rotation of the propeller. The Investigation is satisfied, from the 59 seconds of starter motor cranking achieved on the ground with a charged battery, that there was sufficient battery power provided on the aircraft for multiple in-flight start attempts.

Although the Flight Manual addresses carburettor icing, it indicates that there may be a change in engine noise or speed prior to stoppage. No such change was reported by the pilots who stated that the engine stopped suddenly, as if switched off. The air temperature at the time was about +4°C with high humidity. As can be seen in **Figure No. 1** this corresponds with an area on the graph, which states that serious carburettor icing can be expected. In addition, as the engine was not being operated at full power, carburettor icing would be more likely to form. Therefore, although the manufacturer designed the engine installation to be carburettor ice resistant, the Investigation is of the opinion that it is possible that carburettor icing did occur, since the symptoms displayed could coincide with this scenario and the Investigation could subsequently restart the engine in its facility.

2.3 Crew

The PIC had no experience on this aircraft type, a high performance motor glider. The owner had only limited experience on the aircraft type. Consequently, in the high-pressure situation following the engine failure, the PIC was not well equipped to deal with the situation. In addition, as it was a check flight the Owner, who had more relevant experience, probably felt inhibited from intervening or offering advice. This lack of experience manifested itself by the inability to retract the engine, as the propeller had not stopped in the vertical position (as required to retract the engine).

The failure to stop the propeller in the required position was due to flying the aircraft at excessive airspeed. The successful alignment of the propeller for retraction required that the airspeed be reduced initially to 43 kts, flaps are then lowered and the airspeed then reduced to 40 kts, which is only 6 kts above the stalling speed (flaps extended). It is probable that, with his lack of experience on type the PIC was reluctant to reduce the airspeed to a level close to the stall speed, particularly in a low level engine failure situation, in an aircraft which he had never flown before and never explored the stall/low speed flying handling.

2.4 Forced Landing

It is important to remember that in the event of engine failure on a single engine aircraft, the primary objective is to place the aircraft on the ground safely. In the case of an engine power loss or stoppage the pilot must initially assume that the engine cannot be recovered and prepare accordingly.

However, there is often an expectation that the engine can be restarted, especially when dealing with a new aircraft or engine type on which the pilot has little or no experience. Accordingly, too much time can be spent in attempting to restart the engine while not enough attention is directed to monitoring the developing position of the aircraft relative to the runway.

As there were two pilots on board, tasks could have been separated with one person attempting to restart the engine and the other devoting full attention to performing the return to landing. The Owner recollected an attempt to retract the propeller, as required by the Flight Manual in an engine failure, but it continued to turn over and did not lock. Consequently, it could not be retracted. It is likely that the propeller may have continued rotating due to excessive airspeed, as the Investigation did not find any deficiency in the alignment locking system subsequently. This rotation resulted in the propeller staying extended throughout the occurrence with the rate of descent effectively doubling. The circuit to landing was probably planned with a better glide angle and lesser descent rate in mind. The failure to realise that this was not being achieved resulted in not reaching the airfield, even though this was possible in light of tests conducted by the manufacturer. These tests indicated that there was adequate height for the aircraft to return to the runway with the engine stopped and the propeller extended.

Because of this, a forced landing was attempted into a field short of EIBR when it became apparent that they were too low to reach the RWY 18 threshold. This resulted in the aircraft crossing a garden, which was immediately short of that field, at a low altitude. In doing so, they struck and broke the upper branches of an ash tree.

It is probable that the glide angle during the forced landing may again have been misjudged because of aircraft type inexperience and the increased rate of descent encountered due to the extended propeller and landing gear.

2.5 Ballistic Parachute System

Although a ballistic parachute system was fitted to the aircraft, the crew did not use it during the occurrence nor was there evidence to suggest that they considered it. This is probably because initially they believed that the aircraft could be landed safely. By the time they found out this was not so it was probably too late to activate the system.

The Investigation notes that there were no placards on the aircraft to warn that a pyrotechnic and projectile hazard was on board the aircraft. As time progresses, more and more light aircraft are being equipped with these ballistic parachute systems. By their nature, light aircraft accidents such as this often occur away from airports and in isolated places, thus the first responders are often likely to be members of the public.

If the system is inadvertently activated the rocket should, if undamaged, activate and explode from its casing at a high speed dragging the parachute container. Depending on alignment and direction, it may then become a lethal projectile and its pyrotechnic nature could ignite spilled fuel and other materials at the accident site.

The presence of such a device at an accident site is a significant danger to any person involved in the rescue of casualties. Without a clear warning, the first responders to the accident site, whether members of the public or emergency services, are in danger if such devices are installed and not disarmed. It is particularly dangerous if the devices are armed, the crew are unable to communicate and no warning placards are displayed on the aircraft. It is fortunate that in this case, since no placards were displayed, that the crew were alive and in a position to disarm and warn the emergency services of the presence of a ballistic parachute system.

The Investigation is of the opinion that, for the protection of persons about the aircraft, all aircraft equipped with a ballistic parachute system, should have clear warnings on the outside of the aircraft prior to being allowed to fly. Accordingly, three Safety Recommendations are made to that effect.

2.6 Crew selection

The selection of a check pilot without experience of similar high performance self-launching motor gliders fitted with a retracting engine was not optimum, as he was flying the aircraft as PIC. As a result, the Check Pilot was poorly equipped to deal with an emergency on an aircraft on which he had no experience. The Investigation notes that the NMAI has revised its procedures regarding the selection of a check pilot for check flights in Section 12 of the NMAI Airworthiness Procedures Manual. Consequently, no Safety Recommendation is now considered necessary.

3. CONCLUSIONS

(a) Findings

1. An inspection flight checkout of the new motor glider, prior to issuing a Permit to Fly, was being conducted at the time of the accident.
2. The Check Pilot was properly licensed.
3. The aircraft suffered a sudden in-flight engine stoppage during climb out.
4. An attempt was made to glide back to the runway. However, the crew became distracted in trying to restart the engine a number of times and did not adequately monitor their flight path.
5. The rate of descent with the engine extended was effectively doubled and the aircraft became low on the approach.
6. When this was noticed a forced landing was attempted into a field short of the runway but the aircraft hit a tree with the left wing, as it was too low and slow.
7. The aircraft rotated 180° and fell into a garden backwards at a low speed.
8. There were no markings on the aircraft to indicate that a Ballistic Parachute was installed.
9. Weather conditions at the time were conducive to the formation of carburettor icing, which may have caused the engine stoppage.
10. There were no warnings in the Flight manual and Maintenance manual that the Rotax Engine Type 503 UL is liable to sudden stoppage.
11. The Check Pilot lacked type experience on this high performance motor glider with a retractable engine. This inhibited his ability to respond appropriately to the emergency.

(b) Probable Cause

The engine stopped at a relatively low altitude, possibly due to carburettor icing.

(c) Contributory Factors

1. Failure to adequately monitor the flight path following an engine stoppage at a relatively low altitude.
2. Distraction associated with attempts to restart the engine.
3. Lack of experience on a new aircraft type.

4. SAFETY RECOMMENDATIONS

It is recommended that:

1. The Irish Aviation Authority should require that adequate markings be placed on the exterior of an Irish registered aircraft equipped with a ballistic parachute/recovery system. **(IRLD2010017)**

2. The European Aviation Safety Agency should include in the certification requirements for light aircraft that manufacturers within the EU should place adequate markings on the exterior of an aircraft equipped with a ballistic parachute. **(IRLD2010018)**

3. The State of Slovenia should require that the manufacturer place adequate markings on the exterior of an aircraft equipped with a ballistic parachute prior to delivery to the customer. **(IRLD2010019)**

4. Pipistrel should provide a warning in the Taurus 503 Flight manual and Maintenance manual that the Rotax Engine Type 503 UL is liable to sudden stoppage. **(IRLD2010020)**

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