



A technical review of the safety investigation report of the Fly Synthesis Amphibian aircraft, model: Catalina NG 582, registration number 9H-UTA



Use of the report

The sole purpose of this report is to highlight lessons learned in aviation safety and therefore prevent accidents and serious incidents without apportioning blame or responsibilities. The identification of one or more causes does not imply a determination of administrative, civil or criminal liability. Therefore, any use of the report, or parts of it, for purposes other than its aim of improving safety is contrary to the spirit of the laws and regulations and falls within the responsibility of the user.

Summary and short description of the accident.

Date and time of accident: 31st August 2018 at approx. 8:00 am.

Place of event: RWY 05, Malta International Airport.

Company: Private.

Aircraft: Fly Synthesis, Catalina NG 582 , Amphibian aircraft, registration no.: 9H-UTA.

Nature of flight: Leisure.

Number of persons on board: 2

Summary of the accident: The aircraft took off from **RWY 23**. Whilst flying the pilot notes that out of three undercarriage indicators, two were green and one red. This is an indication that one of the wheels is still completely or partially lowered. The aircraft returns to the airport area and makes a low fly pass over the flight control tower. Flight control personnel provided a visual check and confirmation that one wheel on the main undercarriage was stuck midway. The pilot decides to make an **emergency-controlled** crash landing on **RWY 05**, with the left main wheel and nose wheel extracted, while the right main wheel partially retracted. *Following a skid of approximately 107 m on the runway, the aircraft came to a stop, the result of which was minor damage to the undercarriage but no injuries to the two occupants.*

Composition of the safety investigation group

Dr Robert Camilleri (Investigator in Charge)

Capt. Frank Zammit (Chief Investigator)

Manufacturers and manuals consulted

Fly Synthesis (Manufacturer)

Catalina NG 582 (Manual)

Structure of this report

This report is composed of four sections: Section 1 presents the facts relevant to the accident. Section 2 analyses possible causes of the accident. Section 3 draws conclusions of this analysis and presents the identified causes. Finally, Section 4; Safety recommendations.

Section 1: Factual information.

Location: RWY 05, Malta International Airport, Luqa as shown in Fig. 1.

Geographical coordinates: N 35°51'/E 014°28'

Time of day: The incident took place at ca. 8:00 am. The investigators have been called on site at ca. 8:50 am. The investigators were on site at approx. 9:30 am.

Weather conditions: Good visibility with highest temperature recorded at 30 °C; wind direction from the North; wind speed of ca. 6 km/h.

Aircraft permits: The aircraft is certified to fly over Malta.

Damage to aircraft: Minor damage to the undercarriage.

Other damage: Superficial scratch marks on the runway.

Personnel information: The pilot has a valid license.

Injury to Persons: None.

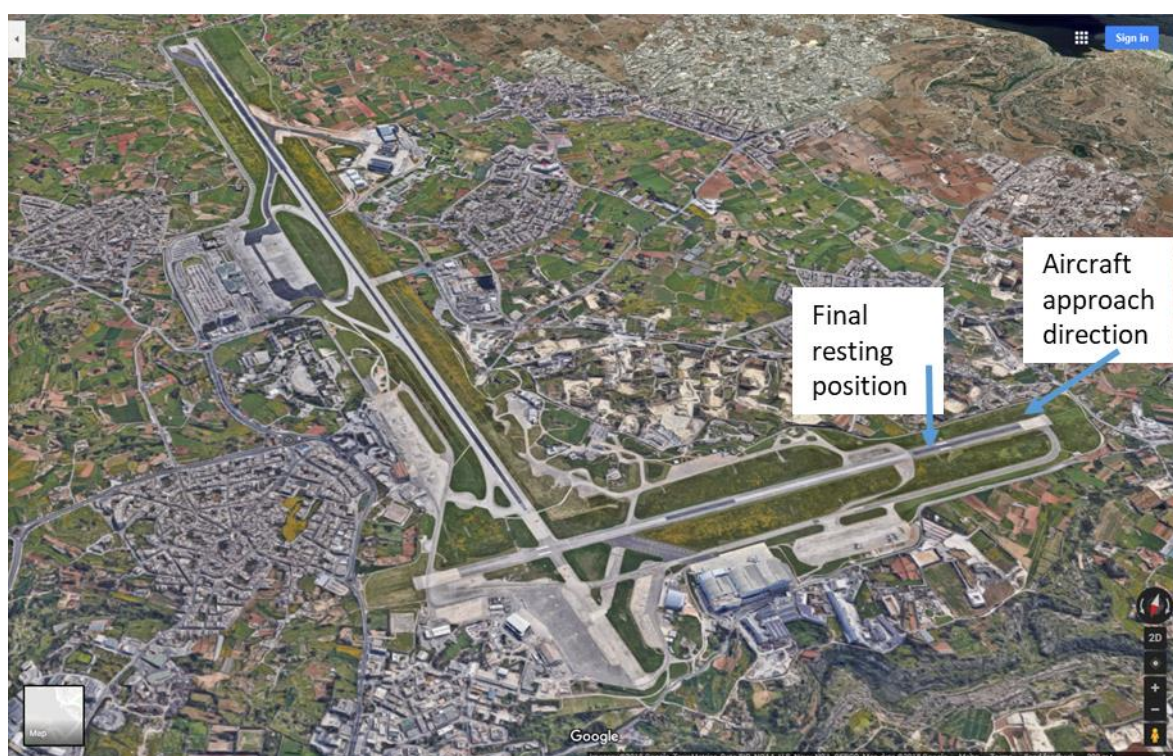


Fig. 1. Overview of the runway with approx location of the final position.

On-site Evidence: The aircraft was found on the centre line of **RWY 05**, tilted to the right due to the retracted main wheel. Evidence of the touchdown position could be traced back from the surface scratches on the runway. It was estimated that the aircraft skid for approximately 107 m.

On-site Photographic Evidence: Several photographic evidences were gathered on-site. These are shown in Fig. 2 – Fig. 5.



Fig.2. The aircraft in its final resting position.



Fig.3. Front view of the aircraft in its final resting position.



Fig.4. Superficial scratch marks on the runway as a result of the landing incident could be traced back to the final position of the aircraft.



Fig.5. Details of the *unextracted* left wheel.

Section 2: Analysis of the accident

This accident involves an amphibious aircraft that can take off and land on the ground and on the water. Whilst in flight, the pilot notes that out of three undercarriage indicators two were green and one red. In this amphibian aircraft, green is an indication that the landing gear has fully retracted, making it safe to alight on water. Conversely, red indicates that the landing gear is completely or partially extracted. The indicator lights are shown in Fig. 6. If a water landing is attempted under this unsafe condition, the drag resulting from the wheel in contact with the water would risk overturning the aircraft. This is also highlighted in the aircraft manual, which makes use of the keyword **PRUDENCE** indicating that if the instruction or procedure is not correctly observed it could cause an accident or death. It is noted that the indicators are inverted in this aircraft compared to traditional ground type aircraft. This is because the most dangerous phase is to alight or take off from water. The inversion of the lights is however considered to have NO contribution to the accident.

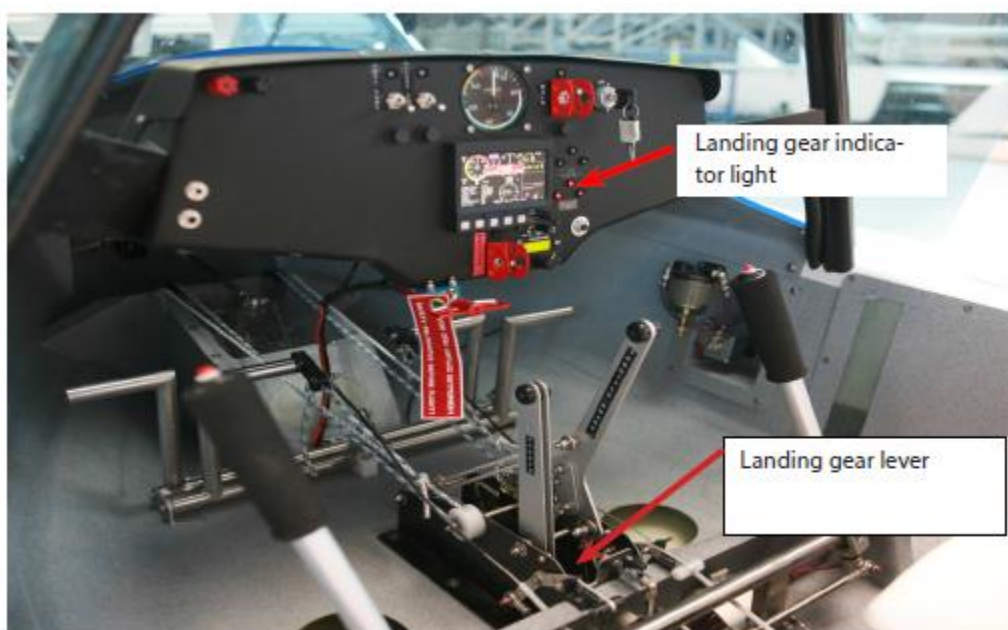


Fig. 6. An extract from the aircraft manual showing the landing gear indicator light and landing gear lever.

In this case, it is clear that the undercarriage system malfunctioned. However, in such cases, Chapter 5 of the aircraft manual provides an emergency procedure by which “it is possible to bypass the pressure control and regulation system of the hydraulic plant and force, within certain limits the extraction and retraction of the undercarriage.” To do this, the following instructions should be followed:

- “Position, if not already done, the undercarriage switch in the wanted position (extract/retract)
- Move up/down and hold the Emergency switch until the indicator light of completed extraction/retracted will switch on.”

This investigation found that this procedure was not followed due to a concern of causing further damage to the aircraft. **However, not following procedure could have had more serious consequences.**

This investigation also notes that Chapter 5 Emergency (pp5. 8) and Appendix A of the aircraft manual present conflicting procedures on how to force the undercarriage down without causing further damages to the aircraft.

Chapter 5 of the manual highlights that: “Using the Emergency switch the plant pressure control system is bypassed, so as to avoid damage to the undercarriage plant, it is suggested to activate it **for more than 10** consecutive seconds. The switch can be used both to lift or lowering the undercarriage. If necessary, repeat the operation after a 10 second stop.”

Conversely, Appendix A highlights that: “Using the Emergency switch the plant pressure control system is bypassed to avoid damage of the undercarriage plant it is suggested to activate it **for no more than 10** consecutive seconds. If necessary, repeat the operation after a 10 second break.”

While the wording of this manual was NOT the cause for the accident, a Safety Recommendation is made in Section 4.

Section 3 Causes of the accident

Having established the dynamics of the accident, this section delves into understanding the causes of such accidents. This investigation found that a tyre change was performed the night before the flight. It was later found that a braking cable restricted movement of the wheel, therefore impeding the full retraction of the wheel. While a full check could have highlighted the problem before the flight, this investigation finds that the instruction manual fails to provide a detailed guideline on how such checks could be safely implemented. The manual also fails to include photos and/or diagrams of the critical processes related to landing gear maintenance.

Section 4: Recommendations

The following recommendations can be drawn from this accident

Safety Recommendation No. 1:

The aircraft manual refers to an emergency procedure for the CATALINA NG 582 aircraft equipped with an electric landing gear actuation system in two instances: Chapter 5: Emergency procedures (pp. 5.8) and Appendix A.

The wording of these two instances is in contradiction and requires correction:

Chapter 5 Emergency Procedures (pp.5.8)

“Using the Emergency switch the plant pressure control system is bypassed to avoid damage to the undercarriage plant it is suggested to activate it **for more than 10** consecutive seconds. The switch can be used both to lift or lowering the undercarriage. If necessary, repeat the operation after a 10 second stop.”

Appendix A:

“Using the Emergency switch the plant pressure control system is bypassed, so as to avoid damage to the undercarriage plant it is suggested to activate it **for no more than 10** consecutive seconds. If necessary, repeat the operation after a 10 second break.”

Safety Recommendation No. 2:

The landing gear of this amphibious aircraft is a critical component both for landing on the ground and for landing on the sea (due to the risk of overturning the vehicle as a result of the drag caused). While the manual or the aircraft includes maintenance procedures for the landing gear in Chapter 9, it is recommended that this is expanded further to include step by step diagrams and warnings for critical processes, such as how to avoid that the brake lines get entangled with the kinematics of the landing gear. It is also recommended that the manual includes a statement, whereby following any maintenance procedures on the landing gear, this is to be extracted and retracted as a final check on the ground, thereby ensuring that the system functions as expected.

Safety Recommendation No. 3:

This report stresses that flight and maintenance procedures should be followed. Failing to do so may cause damage, injuries or death. It should also be noted that the aircraft manual caters for unscheduled aircraft maintenance in case of a hard landing and damage to the composite structure. These include:

- 1) “Disassembly of the landing gear, checks for breaks in the wheels and in the kinematic motion components. Check for misalignments, check the connection and tightening of the bolts. Check for leaks or breaks in the step and check the welds. Replaced damaged components.”
- 2) Check for any leaks or abrasions on the hull

It is advised that repairs to the damaged hull are made according to the manufacturer’s procedure.



Dr Robert Camilleri.
(Investigator in Charge)



Capt. Frank Zammit
(Chief Investigator)