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FLIGHT TEST NEWSLETTER

Issue 1

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Introduction

This newsletter, the first to be published by CAA Flight Test Section, contains news and information on our work. We get involved in flight testing of large and small aircraft, gyroplanes, airships and take part in UK and EASA rulemaking groups that write policy on flight test issues. We want to share the knowledge gained from continued airworthiness check flights on individual aircraft to raise awareness across the wider fleet. We will also give updates on related EASA rulemaking groups that we are involved in.

We have two test pilots, four flight test engineers and a technical assistant with over 120 years of combined flight test experience. Between us, the whole spectrum of aircraft flight testing, from autogyros and microlights to light fixed-wing aircraft and rotorcraft, to amphibians, airships and large transport aircraft is covered.

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If you have any comments on this newsletter or any suggestions for future issues, please send them to:

Editorial office:

Flight Test Section
Safety Regulation Group
Civil Aviation Authority
Aviation House, Gatwick Airport South
West Sussex, RH6 0YR.

e-mail: flightdept.afts@caa.co.uk

Content:

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What We Find

In order to assess the airworthiness standard of the UK fleet, CAA Flight Test Section actively participates in a small percentage of check flights for Certificate of Airworthiness (CofA) / Permit to Fly / Issue or renewal as well as briefing pilots to perform check flights on its behalf.

Poor Performance

During a check flight carried out on an ex US Army Piper L-4B (J3C-65 Cub) aircraft being brought back to flying status, a number of airworthiness issues were uncovered that had to be addressed before the CofA could be issued.

The aircraft had a military (restricted) Pilots Operating Instruction Manual which gave some operating limitations and some basic performance data. However, these were incomplete and reference to other sources of information revealed some potential inconsistencies.

Firstly, it was apparent that the instruments (e.g. the limit and colour markings on the RPM, ASI, oil temperature and oil pressure gauges) did not reflect either the engine that was fitted to the aircraft or to the speed restrictions that were appropriate for the type.

Secondly, it was difficult to obtain an accurate rate of climb figure from the available documentation; so an accurate assessment of the aircraft's capabilities relative to that schedule was not possible. Nevertheless, it was possible to establish that the climb performance was below expected and, of greater concern, were the significant discrepancies between the scheduled take-off and landing distances against the measured values.

With this over-optimistic performance data there was a risk that the aircraft may not take off safely as has been the case in a number of light aircraft incidents.

Corrections to the take-off distance and landing distances were incorporated into the CofA once it had been established that the engine was developing the correct power.

Sportcruiser Light Sports

The Sportcruiser is one of a number of types introduced into the UK under the new EASA Light Sport Aircraft Code (LSA). This is part of an emerging European Light Aircraft (ELA) process that will result in a simpler certification and maintenance regulatory regime for recreational aircraft and, in particular, light sport aircraft which have a maximum all-up weight of 600kg.

EASA has yet to finalise the standard against which these aircraft will be certificated and, as a result, LSA types do not currently qualify for an EASA CofA. In the meantime, EASA's method for endorsing the design of an LSA is to approve a document entitled Flight Conditions. This indicates that EASA is satisfied that the specified aircraft is capable of safe flight under certain defined conditions. Thus, when new LSA aircraft arrive into the UK, they are issued with an EASA Permit to Fly with (EASA) flight conditions. No flight testing is required to be done.



EASA has yet to define the maintenance or continuing airworthiness standards for LSA; consequently the national requirements for Permit to Fly aircraft are to be followed. In the UK, they are therefore required to complete a check flight prior to renewal of the Permit to Fly.

In the case of the Sportcruiser, many of which are fitted with ground-adjustable fixed-pitch propeller, the check flights on the first three aircraft due for Permit renewal revealed that the measured climb performance was well below the scheduled data in the Pilot's Operating Handbook (POH) (135 to 184 ft/min below at the tested altitudes).

Subsequent investigations revealed that the aircraft performance had been determined and scheduled with a fine pitch setting, but that the aircraft were delivered with a coarse pitch setting. As a result, the take-off and climb performance on these aircraft was well below that scheduled.

There was no performance data in the POH to accommodate a coarse propeller pitch setting, so the performance in the POH was therefore invalid. This meant that a number of aircraft were effectively grounded until a solution could be found. To get the aircraft back in the air, CAA, at no cost to the owners, undertook a flight test to determine a performance factor that could be used as an interim measure to ensure the safe operation of these aircraft until the manufacturer data was made available.

In view of the experience on the Sportcruiser aircraft, CAA has participated in a number of renewal check flights on other LSA Types with similar findings. For example, most types have demonstrated significant performance shortfalls compared to published data, stall speeds and placards have been inconsistent with POH data, document control has been poor and some aircraft have exhibited marginal handling qualities. These findings have been highlighted to EASA and the manufacturers for resolution. In the meantime, CAA Flight Test Section will continue to monitor closely developments in this area.

Lear 60XR Stalling

During a check flight carried out on a second-hand Lear 60XR imported from a non-European register, numerous faults were found (e.g. cavitating hydraulic pumps, pressurisation problems and spurious warnings), which necessitated the check flight having to be completed over two separate flights. The hydraulic problem was confirmed during subsequent ground maintenance and a failed relief valve was replaced. It was disappointing that the aircraft was presented for a check flight in such a condition and that normal maintenance procedures had not identified these problems beforehand. In certain flight conditions, these problems could have resulted in serious consequences.

The most significant finding was that the stall handling characteristics were unacceptable - the wing drop associated with the stall being in excess of 60° - it should have been less than 20°.

The manufacturer subsequently conducted its own stall evaluation flight on the aircraft and also deemed the stall characteristics unacceptable. They noticed excessive use of sealant on the wing and winglet leading edge seams, which was removed from the upper leading edge surface and the stall fence joints.

All the excessive sealant was removed from the lower surface of the wing leading edge and winglets. Additionally, the position of the stall strips was adjusted. On the second flight the characteristics were then found to be acceptable; the roll was within the tolerance of $\pm 20^\circ$, and the stall speeds within ± 3 knots of the scheduled values.

Although we all know that a stall will always be inadvertent, it does happen. The condition of wing leading edges and the correct alignment of stall strips on many aircraft is paramount to ensuring safe stall handling. Proper adherence to Maintenance Manuals, Repair Manuals etc. will lessen the risk. If in doubt, speak to the manufacturer.



The above demonstrates the value in conducting Second Hand Import Non EU (SHINE) check flights, since the findings were found by taking the aircraft to conditions not normally encountered in service by a crew experienced in conducting these non-routine flights.

Bell 206 - Crossed Wires

A check flight on a used, imported Bell 206 helicopter identified a cross-wired dual tachometer. This was found during an autorotation with the throttle reduced to flight idle; the power turbine rpm needle was seen to rise above the rotor rpm needle which was confusing for the crew as it could have been indicative of a freewheel problem. Rotor rpm control in a critical and high workload flight regime could easily have been affected if the cause was not identified quickly with the potential for a rotor overspeed and possible damage to the aircraft.

The problem would not have been easily observed in normal power-on operations as the two needles are usually synchronised during start up and shut down. The cause was probably a maintenance error and pilots should be aware that this type of problem can exist and is not easily identified by the pilot in normal operations.

Take - Off Abandoned

A check flight on a used imported Citation XL aircraft had to be abandoned before take-off when the check of the take-off configuration warning system did not work as expected. A modification to install a Flight Data Recorder had just been completed. This had disturbed the flap position sensing which resulted in false flap position indications to the take-off configuration warning system. There was a risk that crews would not be alerted to genuine take-off configuration errors.

Whenever modifications are installed which disturb flying controls, proper ground testing of the affected systems must be carried out.



Cessna Citation XLS

Next Edition

The next CAA flight Test Newsletter will be published in 3 month's time. As well as telling you about more of our flight test findings, we aim to include an update on the work EASA has been doing to develop requirements and guidance for the safe conduct of maintenance check flights.

Numerous Failures on a Hawker 900 Check

Following its import from the Middle East, a Hawker 900 aircraft with only 400 hours since new was subject to a check flight. As the flight progressed, more and more systems failed; a Primary Flight Display blanked; the autopilot and Mach trim systems stopped working and it was not possible to achieve full cabin pressure. In view of these problems and inclement weather, the flight was swiftly curtailed.

Considering the aircraft's low utilisation, it was extremely disappointing to see so many failures on what was such a new aircraft. If we had not conducted this check flight, it remains unknown whether this aircraft would have been released into service in this condition. Hopefully it wouldn't.