

Cessna Citation CJ1+,
N680KH

Bournemouth Airport

13 April 2019

Serious Incident

Investigation Synopsis

The aircraft had been modified with a system intended to enhance its performance, which included supplementary control surfaces designed to deflect symmetrically and automatically to alleviate gust loads. Shortly after takeoff, an electrical failure in this system caused one of these control surfaces to deploy separately, causing an uncommanded roll. The resulting aircraft upset caused the pilot significant surprise and difficulty in controlling the aircraft.

The pilot was not aware of supplementary procedures associated with the modification. The procedures did not adequately characterise the significance of the system failure, nor address the failure in all anticipated flight conditions. Certification flight tests of the system did not reveal the severity of possible outcomes. The 'Aircraft Safety and Certification Reform Act 2020' underway in the USA will review existing assumptions on pilot recognition and response.

Four safety recommendations are made, and safety action has been taken or is intended in the areas of training and the information to be provided, both for this system and for other supplementary systems capable of influencing the flight path of an aircraft.

Safety Recommendation 2020-027

Justification

The ATLAS inoperative in flight procedure currently specified is not relevant to all anticipated flight conditions

Therefore, the following safety recommendation was made:

Safety Recommendation 2020-027

It is recommended that Tamarack Aerospace Group amend the ATLAS inoperative in flight procedure to ensure actions are specified that are relevant in all anticipated flight conditions.

Date Safety Recommendation made: 26 November 2020

LATEST RESPONSE

Response received: 03 March 2021

Tamarack worked closely with EASA to develop the procedure, which was then validated by other aviation authorities in other countries, including FAA, ANAC, TCCA, and others. During certification, EASA flight test personnel flew simulated emergency conditions, and contributed directly to the process of writing the procedures to address them. This process included a variety of critical and less-critical flight conditions, initially to confirm which flight conditions were critical to begin with, and later to confirm that the procedures were appropriate for all.

Tamarack is concerned, as was EASA during certification, that the AIFP must be written explicitly and simply, to give pilots the necessary safety information for responding to the most critical condition identified

during the certification process. While it is true that certain steps in the procedure are more critical in some flight conditions than others, the AIIFP was developed to ensure that executing the full procedure in accordance with good pilot judgement and aviation best practices is safe for all anticipated flight conditions.

As an example, step three of the AIIFP to disconnect the autopilot and the subsequent procedural step to maintain lateral control would apply to an ATLAS fault event which does not introduce an asymmetric deployment. Likewise, the immediate reduction in power would apply to flight conditions slower than maximum cruise. In both instances, however, the less critical flight conditions allow the AIIFP to be executed quickly, either by the lack of induced roll to address in non-deployment fault conditions or by the relative increase of aileron roll authority relative to the TACS at lower speeds. The overwhelmingly favourable flight characteristics inherent to the 525 series continues to support this conclusion, as do confirmed reports of ATLAS asymmetries and subsequently uneventful executions of the AIIFP in a variety of flight conditions.

Flight conditions for abnormal and emergency procedures should be carefully considered. However, the primary contributing factor to the incident described in the AAIB report was pilot lack of familiarity with the AIIFP itself, rather than ambiguity of the procedure in a particular flight condition. Tamarack has received no other feedback from subject matter experts, pilots, or certification authorities to suggest that the procedures are not appropriate to all flight conditions as currently approved. Therefore, no major changes are planned for the ATLAS Inoperative In Flight Procedure.

Safety Recommendation Status **Closed**

AAIB Assessment **Partially Adequate**

Action Status **Planned Action Completed**

Feedback rationale

The AAIB notes that the addressee has considered the Safety Recommendation and that it does not intend to amend the ATLAS inoperative in flight procedure. (EU Regulation 996/2010 article 18 refers).

RESPONSE HISTORY

N/A

(SRIS Reference:)

Safety Recommendation 2020-028

Justification

The information currently provided may be inadequate for pilots to understand the significant and potentially escalating nature of TACS failures.

Therefore, the following safety recommendation was made:

Safety Recommendation 2020-028

It is recommended that Tamarack Aerospace Group expand the information within the ATLAS inoperative in flight procedure to provide a level of detail consistent with other AFM procedures and to enable pilots to understand the significant and potentially escalating nature of TACS failures.

Date Safety Recommendation made: 26 November 2020

LATEST RESPONSE

Response received: 03 March 2021

Tamarack agrees that emergency procedures must balance the need for short, concise steps that are easy to remember and follow with the need to provide pilots with sufficient information to understand the intent of the procedures and the conditions for which they are written. In the case of the AIIFP, Tamarack agrees that there is an opportunity to add potentially useful additional information.

The AAIB report indicated that the pilot perceived that the control forces during the recovery were higher than expected, and that these control forces diminished as the airspeed was reduced. This is exactly in line with the original intent of the procedure, which specifies a reduction in airspeed to reduce control forces and minimize pilot exertion during execution of the AIIFP in the event of an asymmetric deployment.

To that end, the approved procedures at the time of the incident included a warning preceding the memory items: "Large aileron input may be required if an ATLAS failure at high indicated airspeed includes a TACS runaway. Speed reduction is the first priority in these failure conditions."

Tamarack has amended the wording of the warning to more clearly indicate the intent behind prioritizing speed reduction as follows: "Large aileron input may be required if an ATLAS failure at high indicated airspeed includes a TACS runaway. Speed reduction to reduce control forces is the first priority in these failure conditions at high indicated airspeed."

This change makes the intent of the warning and procedure sequence more explicit without dramatically changing the look of the procedure with which current pilots are already familiar. Further, adding this note is in line with conventional pilot training, which stresses from the earliest stages that speed reduction reduces control forces. Tamarack hopes that better comprehension of the procedure and associated critical flight condition will assist other pilots familiarizing themselves with the AIIFP.

Tamarack is also committed to addressing questions and feedback from current and prospective pilots and owners and will continue to review these procedures if feedback or questions indicate that there are further opportunities for improvement.

Safety Recommendation Status

Closed

AAIB Assessment

Adequate

Action Status

Planned Action Completed

Feedback rationale

(EU Regulation 996/2010 article 18 refers).

RESPONSE HISTORY

N/A

(SRIS Reference:)

Safety Recommendation 2020-029

Justification

The operation of supplementary systems fitted to an aircraft may require pilot behaviours different to those for which pilots are trained on the unmodified aircraft.

Therefore, the following safety recommendation was made:

Safety Recommendation 2020-029

It is recommended that the European Union Aviation Safety Agency determine the additional training it requires pilots to undertake in order to operate aircraft fitted with supplementary systems that influence flight path, where training on the original aircraft would not adequately prepare pilots for operating the modified aircraft in normal, abnormal or emergency situations.

Date Safety Recommendation made: 26 November 2020

LATEST RESPONSE

Response received: 02 March 2021

The following provisions of Commission Regulation (EU) No 965/2012 on air operations ensure that flight crew are suitably trained for the aircraft type operated (including those with supplementary systems installed), and cover the availability and use of relevant checklists:

- NCC.GEN.106(a)(4)(viii) which requires the flight crew to be properly rated and meet competency and recency requirements;
- ORO.FC.100(c) on ratings, i.e. type-specific training;
- ORO.FC.125 on differences and familiarisation training;
- ORO.GEN.110(h) on checklists per aircraft type in normal, abnormal and emergency procedures in accordance with the latest relevant documentation from the design approval holder.

Furthermore, in accordance with Article 11 of Regulation (EU) 2018/1139, operational suitability data (OSD) associated with a type design must be approved, when the applicant has demonstrated that the design of the product meets the applicable certification basis, and this approval must be included in the type certificate (TC) (or supplemental type certificate - STC).

This provision is further detailed in Commission Regulation (EU) No 748/2012, which in its Article 7a requires aircraft that are newly certified or delivered as new to an EU operator after February 2014 to have OSD, including for flight crew (FC) approved as part of the TC, covering type specific training associated with the aircraft design.

Further to that, point 21.A.93 of Annex I (Part-21) to Commission Regulation (EU) No 748/2012, as amended by Commission Regulation (EU) No 69/2014 and applicable from 19 December 2016, requires an applicant for a change to a TC or for an STC to consider the effects of the change to the OSD certification basis, and include the necessary changes to the OSD FC, when applicable, in their application for approval. Guidance to assess the impact of design changes on the OSD are provided in GM No 1 to 21.A.93(b)(1)(iii). Part of the resulting approval covers the pilot training elements associated with a specific design, when such elements are identified in the certification process and captured in the OSD FC associated with the TC or STC.

In turn, approved training organisations (ATOs) and operators have an obligation to use the mandatory elements of the OSD FC in developing initial, differences and recurrent training programmes and courses (cf. points FCL.710(a) and FCL.725(a) of Annex I (Part-FCL) to Regulation (EU) 1178/2011; point ORO.FC.145(b) of Annex III (Part-ORO) to Commission Regulation (EU) No 965/2012.).

The process embedded in the relevant regulations as described above provides a high level of confidence that, when training elements are necessary to support a specific aircraft design, these are properly identified, approved as part of the TC, change to a TC or STC, and delivered to pilot, reinforcing the principle of them receiving the appropriate training to ensure safe operation of the aircraft and its modifications.

Safety Recommendation Status **Open**

AAIB Assessment **Not Adequate**

Action Status **Not Enough Information**

Feedback rationale

The EASA response describes the regulatory framework that existed at the time of this serious incident. These regulations demonstrably were not adequate to address the circumstances of this occurrence. It is not clear what additional training the EASA has now determined it requires pilots to undertake (to operate aircraft fitted with supplementary systems that influence flight path) to improve on the situation that existed at the time of this serious incident and thus help to avoid those circumstances. (EU Regulation 996/2010 article 18 refers).

RESPONSE HISTORY

N/A

(SRIS Reference:)

Safety Recommendation 2020-030

Justification

The operation of supplementary systems fitted to an aircraft may require pilot behaviours different to those for which pilots are trained on the unmodified aircraft.

Therefore, the following safety recommendation was made:

Safety Recommendation 2020-030

It is recommended that the Federal Aviation Administration determine the additional training it requires pilots to undertake in order to operate aircraft fitted with supplementary systems that influence flight path, where training on the original aircraft would not adequately prepare pilots for operating the modified aircraft in normal, abnormal or emergency situations.

Date Safety Recommendation made: 26 November 2020

LATEST RESPONSE

Response received: 20 July 2022

In response to this safety recommendation, the FAA reviewed the following documentation:

- AAIB Safety Recommendation Document AAIB-25698, dated November 26, 2020.
- ATLAS Aircraft Flight Manual (AFM) Supplement
- CE-525 AFM
- CE-525 Flight Standardization Board Report
- FAA policy and guidance in FAA Order 8900.1, Flight Standards Information Management System, FAA Order 8110.4C, Type Certification - With Change 6, and Advisory Circular 120-53B, Guidance for Conducting and Use of Flight Standardization Board Evaluations
- Current Federal Aviation Regulations.

We acknowledge that the AAIB report requested that the FAA determine the additional training necessary for pilots to operate aircraft with supplementary systems that could influence flight paths. However, these types of systems could vary widely in their complexities and applications to a number of different aircraft types. Potential alternatives the FAA could use to determine such training could be through Flight Standardization Board reports and Operational Suitability reports. These processes allow the FAA to evaluate the specific system on the aircraft and determine what level of training if any would be required for a pilot to safely operate. The FAA's Flight Standards Service Aircraft Evaluation Group (AEG), along with the Aircraft Certification Service also review aircraft flight manual supplements (AFMS) as part of these supplemental type certificate (STC) projects. These AFMS's are reviewed for adequacy of information regarding the implementation of an STC and how it would affect performance and handling characteristics of the aircraft as well as any additional abnormal/emergency procedures.

In this particular case the winglet manufacturer, Tamarack, went through the European Union Aviation Safety Agency for certification and design approval. It is beneficial for AEG to work closely with aircraft certification offices on foreign validation projects to be able to provide input on operational and training needs. The root cause of the incident that occurred on April 13, 2019, was found to be a mechanical failure with a Tamarack Control Unit (TCU). Since this event, the FAA has issued Airworthiness Directive (AD) 2020-24-06, Textron Aviation, Inc., (Type Certificate Previously Held by Cessna Aircraft Company) Airplanes (85 FR 74595), on November 23, 2020, requiring a fix which includes a modified TCU and centering strips to prevent asymmetrical deployment. As a result, Tamarack has developed a training program to provide additional details and instruction to pilots on system operation and potential failures

placing importance on required memory items. They are also ensuring all pilots that operate aircraft with this STC get information needed with an ATLAS delivery checklist and handoff briefing. Moreover, Title 14, Code of Federal Regulations § 91.505(a), Familiarity with Operating Limitations and Emergency Equipment, states that “each pilot in command of an airplane shall, before beginning a flight, become familiar with the Airplane Flight Manual for that airplane, if one is required, and with any placards, listings, instrument markings, or any combination thereof, containing each operating limitation prescribed for that airplane by the Administrator, including those specified in § 91.9(b).”

After concluding the review of current FAA policies and procedures, and taking into account newly published documentation such as AD 2020-24-06 and Tamarack’s Active Winglet Proficiency Course, the FAA determined there are adequate measures in place as it relates to training needs, including supplementary systems that influence flight path and any additional safety concerns highlighted in Safety Recommendation 20.094.

Safety Recommendation Status **Closed**

AAIB Assessment **Adequate**

Action Status **Planned Action Completed**

Feedback rationale

(EU Regulation 996/2010 article 18 refers).

RESPONSE HISTORY

Response received: 07 July 2021

The FAA’s Flight Standards Service, Aircraft Evaluation Division, has reviewed the AAIB’s proposed safety recommendation. In order to properly research and prescribe action on this safety recommendation, the FAA has begun internal coordination with the appropriate offices needed for collaboration and will need time to properly review the history and data of this particular incident. In addition to the ATLAS system on this fleet type, there are other systems on other fleet types that influence an aircraft’s flight path without a pilot’s input.

As a result, a broader look will be needed to fully respond to this recommendation. We anticipate providing an updated response to this recommendation by August 31, 2022.

AAIB Assessment – Partially Adequate Open

(SRIS Reference:)