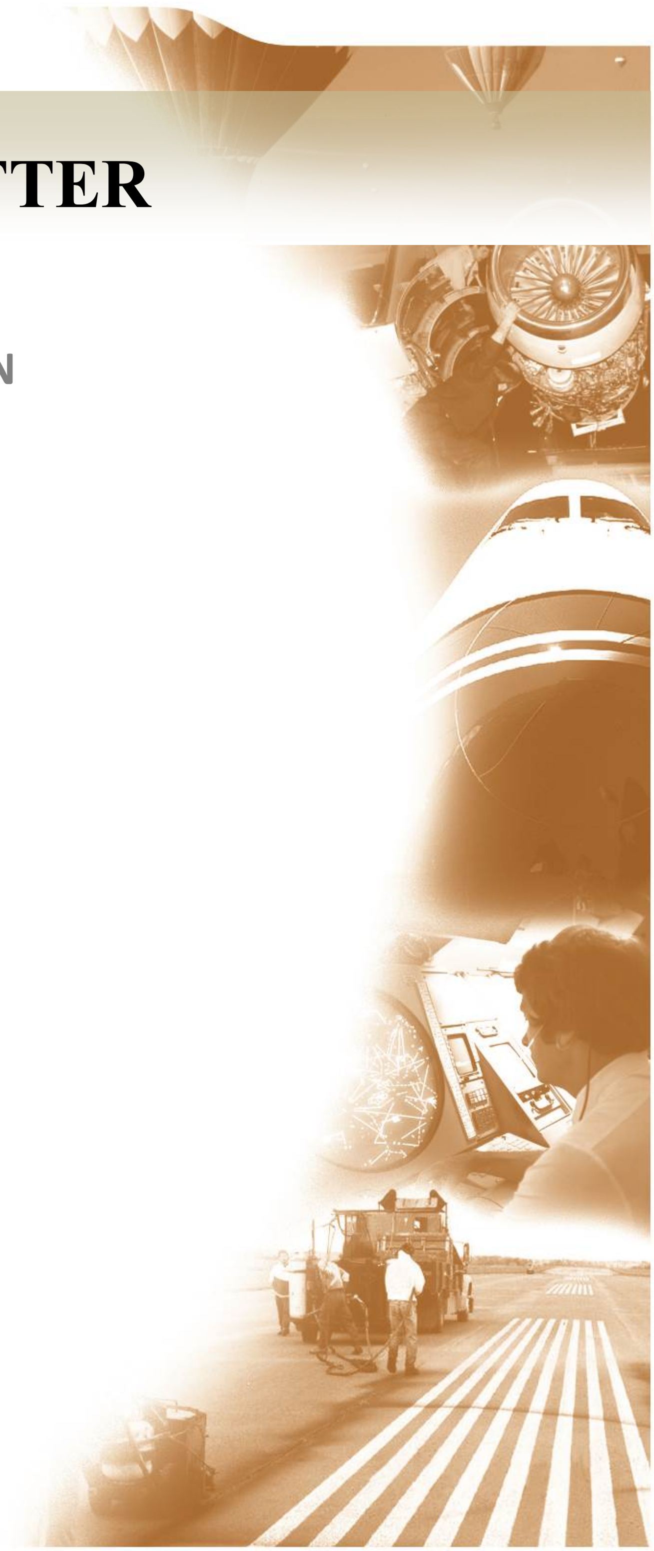
Transport Canada Transports Canada

TP 185E
Issue 1/2018

AVIATION SAFETY LETTER



GENERAL AVIATION—SPECIAL EDITION

Learn from the mistakes of others;
You'll not live long enough to make them all yourself…

Canada

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Letters with comments and suggestions are invited. All correspondence should include the author's name, address and telephone number. The editor reserves the right to edit all published articles. The author's name and address will be withheld from publication upon request.

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Electronic distribution:
To subscribe to the ***Aviation Safety Letter*** e-Bulletin notification service, visit: www.tc.gc.ca/ASL.

Print-on-Demand:
To purchase a Print-on-Demand (POD) version (black and white), please contact:

The Order Desk
Transport Canada
Toll-free number (North America): 1-888-830-4911
Local number: 613-991-4071
E-mail: MPS1@tc.gc.ca
Fax: 613-991-2081

Sécurité aérienne — Nouvelles est la version française de cette publication.

ISSN: 0709-8103
TP 185E

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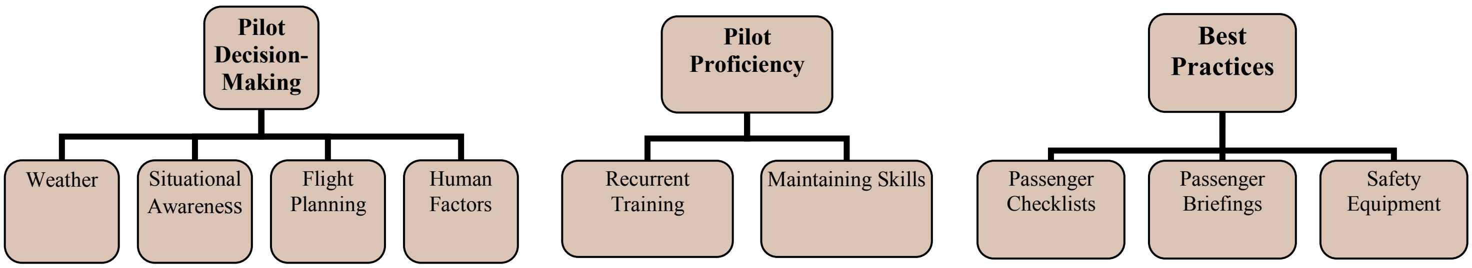
General Aviation—Special Edition

This issue of the *Aviation Safety Letter (ASL)* focuses on general aviation safety. Since the launch of the General Aviation Safety Campaign (GASC) at the Canadian Owners and Pilots Association (COPA) convention back in June 2017, Transport Canada (TC) and COPA have been working diligently at analyzing data (see article GASC Update), identifying safety concerns, connecting the right people to each other, determining the next steps and mapping an achievable yet purposeful project plan to bring this 3-year campaign into fruition. With the first year coming to an end, we are excited to share with you new initiatives and things that can be expected in the next two years.

First of all, the GASC team pinpointed areas to zero in on and came up with three main topics to be addressed during this campaign: Pilot decision-making, pilot proficiency and best practices. These topics encompass subjects such as:



With this in mind, we are pleased to announce the new GASC website (www.canada.ca/general-aviation-safety) which includes resourceful information on each of the topics. This website is a one-stop shop for all general aviation safety related information. You will find videos, posters, articles and tips on how to stay safe. The website will be continuously updated, so don't forget to check often to get the latest details.

Another initiative that we are really excited about is the renewal of our TC regional safety seminars. TC recognizes the importance and the value of offering these safety seminars as they are a great way for pilots to stay current and fulfil their 2 year recurrent training requirement as per *Canadian Aviation Regulations* (CARs) Standard 421.05(2). Starting in April 2018, you will be able to attend a free safety seminar in your region that will focus on general aviation issues. To find a safety seminar near you, head to our website.

Additionally, a new section in the *Aviation Safety Letter* will be dedicated to the campaign. Each issue will contain an article that will cover a specific GA topic and provide periodic updates.

We would love to hear from you! If you would like to reach us, send us an email at TC.GeneralAviation-AviationGeneral.TC@tc.gc.ca.

Looking towards the future, we are enthusiastic and eager to be working with so many members of the aviation community, and we are looking forward to continuing to improve general aviation safety.

Stay informed! Stay safe! △

Will Boles, Civil Aviation Safety Inspector at the Hawkesbury Flying Club (Ontario) presenting a TC safety seminar.

GENERAL AVIATION SAFETY CAMPAIGN

General Aviation Safety Campaign Update

by Simon Garrett, Civil Aviation Safety Inspector, General Flight Standards, Standards Branch, Civil Aviation

The General Aviation Safety Campaign (GASC) is now in full swing. The GASC focus group comprised of general aviation safety partners (including but not limited to the Transportation Safety Board, Magnes, COPA, Transport Canada (TC), Greg Sewell, SmartPilot) held its first meeting in May 2017, followed by a second meeting in October 2017. These meetings gave members the opportunity to share their knowledge and expertise and provide their insights on the top three main areas the campaign will focus on: pilot decision-making (PDM), pilot proficiency and best practices. The next focus group meeting will take place in March 2018 where members will provide an update on their projects.

In order to determine the top three topics, analysis of past GA accidents was required to figure out the main causes and contributing factors. Not wanting to reinvent the wheel, TC looked at what methods and analysis tools other international organizations used and was particularly interested in the FAA's five-year non-regulator strategic approach. In light of this, TC has met with the FAA to exchange ideas and discuss strategies, tools and lessons learned.

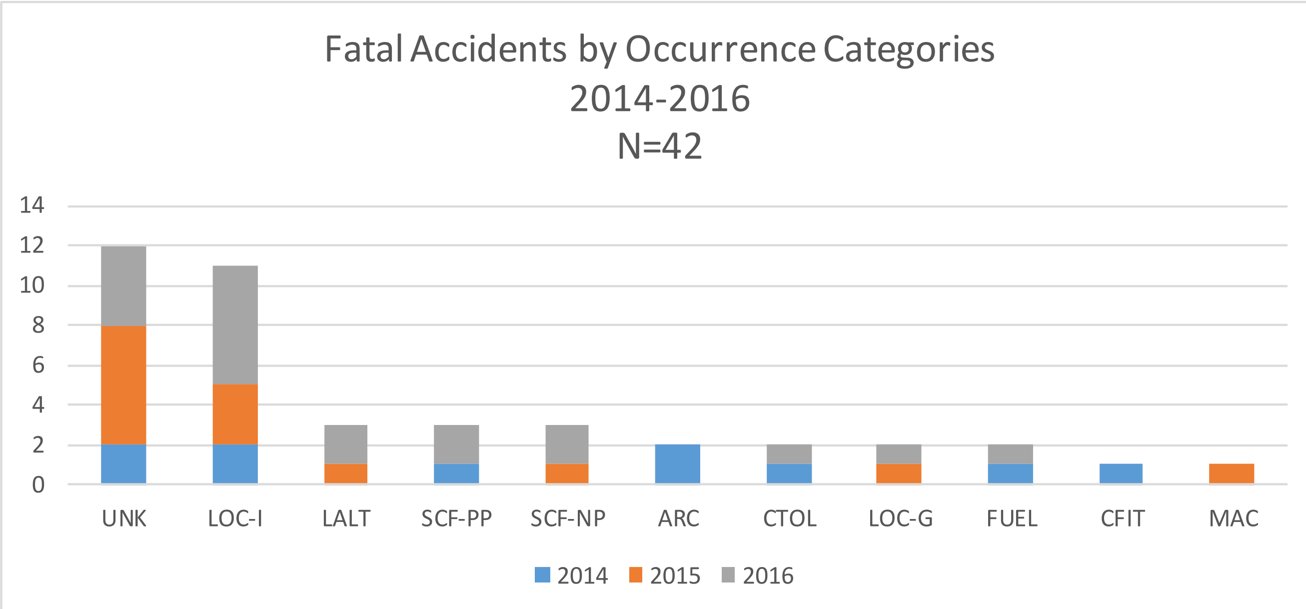
Once the baseline was predetermined, a thorough review of GA accident data was able to establish that the majority of GA fatalities in Canada were due to a Loss of Control In-flight (LOC-I), of which a high percentage were in visual meteorological conditions, within or close to an airport environment and below 1000 ft AGL. This data parallels that of the FAA, where statistically, the approach to landing, maneuvering and initial climb are the phases of flight where the most fatalities are occurring. It is estimated that nearly 80% of all aviation accidents are related to human factors; therefore one of the GASC's main focuses will be on pilot decision-making during all phases of flight.

Fatal Accidents by Occurrence Categories

Occurrence Categories	**2014**	**2015**	**2016**	**Grand Total**
Unknown or Undetermined (UNK)	2	6	4	**12**
Loss of Control - In flight (LOC-I)	2	3	6	**11**
Low Altitude Operations (LALT)		1	2	**3**
System/Component Failure or Malfunction [Power plant] (SCF-PP)	1		2	**3**
System/Component Failure or Malfunction [Non-power plant] (SCF-NP)		1	2	**3**
Abnormal Runway Contact (ARC)	2			**2**
Collision With Obstacle(s) During Take-off or Landing Whilst Airborne (CTOL)	1		1	**2**
Loss of Control - Ground (LOC-G)		1	1	**2**
Fuel-related (FUEL)	1		1	**2**
Controlled Flight Into or Toward Terrain (CFIT)	1			**1**
Airprox/TCAS Alert/Loss of Separation/(Near) Midair Collisions (MAC)		1		**1**
Grand Total	**10**	**13**	**19**	**42**

** Unknown or undetermined are accidents that are currently under review and have not yet been categorized.*
*** The grand total represents the number of fatal accidents, but not the total number of fatalities.*
Source: Transport Canada, adapted from the Transportation Safety Board, preliminary data as of November 2017

Notes:
For the purpose of the GASC, General Aviation includes all recreational aircraft, including gliders, ultra-lights, amateur-built and flight training aircraft (406 operators), but excludes helicopters and aircraft flown by 604 operators.
Aviation occurrence categories are based on the international CICTT taxonomy. https://www.icao.int/safety/airnavigation/AIF/Pages/Taxonomy.aspx



The GASC's goal is to enhance safety and reduce the number of fatal accidents, using a non-regulatory approach. Instead, educational materials such as videos, posters and pamphlets will be used to promote awareness and reduce the likelihood of accidents in the future. Be sure to visit our GASC Website: Canada.ca/general-aviation-safety.

As the campaign progresses, we will be looking for feedback from the GA community, not only on the campaign itself, but also on real and/or perceived obstacles to safety, as well as the gathering of data, so that we are able to maintain our focus and efforts on the real issues. Please send your feedback to TC.GeneralAviation-AviationGenerale.TC@tc.gc.ca. △

COPA Corner

by Bernard Gervais, President and CEO, Canadian Owners and Pilots Association (COPA)

Last year, COPA was asked by Transport Canada to collaborate on the General Aviation Safety Campaign. This campaign, following the same model as the FAA's General Aviation Joint Steering Committee, is a working partnership between government and industry to address important topics and implement new initiatives related to safety in general aviation aircraft. COPA, and other industry-group participants, are encouraged that Transport Canada has chosen to approach the community with the aim of improving safety through education and technology, and not increased and unnecessary regulations. Through our interactions with our American counterparts, both at the FAA and in industry, the message is clear that such an initiative is only possible when government and industry collaborate as equals, and where safety in the community is encouraged and enabled, rather than regulated and imposed.

Data analysis from recent fatal accidents, as well as those where individuals were seriously injured, has given the campaign a clear picture of where our efforts need to be focused to improve the safety record in Canadian general aviation. Loss of control incidents both in the air and on the ground continue to be the top killers in GA aircraft. It is our hope that the new tools and safety enhancements delivered through the Campaign will assist pilots in making more informed decisions about the hows, wheres and whys of their flying.

We are optimistic that this campaign presents us with the opportunity to further the cause of general aviation in Canada and address some of the systemic barriers to safety such as shortfalls in training, barriers to adopting new technology in the cockpit, and assisting pilots in making safety-conscious decisions in the interests of their aircraft and their passengers. We commend Transport Canada for this initiative and for recognizing that the path to safer skies lies not in burdening GA pilots with new regulations but in harnessing data to support real, needed changes in each of the three pillars of training, technology and culture.△

Accident Forgiveness

by Belinda Bryce, Executive Vice President, Magnes Group Inc. *This article was originally published in the COPA Flight magazine, January 2018.*

It has been said that, "Aviation in itself is not inherently dangerous. But to an even greater degree than the sea, it is terribly unforgiving of any carelessness, incapacity, or neglect."

At Magnes, we handle over 100 aircraft claims per year. Gratefully, the majority are "fender bender" type losses, without injury, but each year, we inevitably deal with injuries and tragically, a few fatalities.

According to Transport Canada, since 2007, there have been over 225 reportable accidents per year, with at least 20-50% resulting in fatalities or serious injury. In addition to that, there are between 530 to 730 reportable incidents per year. Many of these result in an insurance claim.

Accidents, incidents and claims can and do happen. It is the reality of our chosen passion and avocation as pilots.

Transport Canada announced a new General Aviation Safety Initiative at the COPA Convention and Annual General Meeting in Kelowna, B.C. earlier this year. Together with COPA and other industry leaders they are taking an in-depth look at the causes of aircraft accidents with the goal of determining and promoting ways in which they might be prevented.

As part of these efforts, Magnes was invited to share our own data which unsurprisingly shows that one of the leading causes of claims is pilot error. The insurance industry has always been a strong believer that the level of initial and ongoing training is a significant factor when assessing the degree of exposure and risk each operation, aircraft owner or pilot presents.

And so, in support of Transport Canada's new safety initiative, and in partnership with COPA, Magnes and AIG have developed a new program called "Accident Forgiveness".

Normally, if you have an insurance claim, whether it be in an aircraft, car, home or business, you typically expect to see your insurance premiums rise the following year by anywhere from 5% to 50% or higher.

Starting in 2018, if an aircraft insured under the COPA Gold program is involved in an occurrence as defined by the policy and the approved pilot at the time of the occurrence has completed at least one "Qualifying Safety Event" as defined below within six months prior to the accident, your COPA Insurer, AIG, will agree to waive any premium surcharges as a result of such occurrence.

Furthermore, AIG will waive the applicable physical damage deductible as set forth in the policy declarations up to a maximum of CAD $250.

Qualifying Safety Events are:

- completing a flight review with an instructor;
- attending a COPA "Rust Remover" safety seminar;
- participating in a Transport Canada-approved recurrent training program;
- completing a training program or pilot proficiency check (PPC) required by Part IV, VI or VII of the CARs;
- completing the requirements for the issue or renewal of a licence, permit or rating.

Of course, there are conditions: (a) the policyholder will only be eligible for Accident Forgiveness for one claim every 36 months; (b) the completion of the "Qualifying Safety Event" must be evidenced via a completion certificate or applicable log book endorsement; and (c) the program will exclude an occurrence arising out of or relating to drug or alcohol abuse or fuel exhaustion.

In 1901, Wilbur Wright addressed a group of engineers:

Now, there are two ways of learning how to ride a fractious horse: one is to get on him and learn by actual practice how each motion and trick may be best met; the other is to sit on a fence and watch the beast a while and then retire to the house and at leisure figure out the best way of overcoming his jumps and kicks. The latter system is the safer, but the former, on the whole, turns out the larger proportion of good riders. It is very much the same in learning to ride a flying machine.

COPA is integral to promoting safety in general aviation in Canada. Magnes and AIG are excited to be able to support COPA by being the first partnership in Canada to offer Accident Forgiveness as a unique and exclusive benefit to COPA members who appreciate the importance of learning through practice and ongoing training.

For more information on Accident Forgiveness or the COPA VIP Insurance Program please call the COPA VIP Magnes Team toll-free at 1-855-VIP-COPA (1-855-847-2672) or email us at vipcopa@magnesaviation.com. As always, we are at your service to answer your questions, assist you in obtaining the best premium and coverage possible and help you stay protected year after year. △

General Aviation Targeted Inspections–What to Know

by Nicole Boyle, Civil Aviation Safety Inspector, Technical Programs, Evaluation and Coordination Division, Standards Branch, Civil Aviation

In the spirit of continuous improvement, Transport Canada Civil Aviation (TCCA) has been working on evolving its surveillance program. One of the new tools being introduced is targeted inspections. Unlike traditional methods, targeted inspections are designed to gather information on specific sectors, topics, or safety trends. They go further than measuring compliance with regulations and attempt to uncover why and how things are happening. They're flexible, adaptable, and each is designed uniquely for the area we are seeking to learn more about. The outcome is more informed policy and strategic decision making supported through data collection and analysis.

This year, we want to learn more about the general aviation community. Targeted inspections will be conducted across Canada helping us to better understand the population and what challenges are being faced. You may see TCCA Inspectors out in the field looking to talk to, and learn from, you.

The topics being covered and some examples of questions they will ask are:

Annual Aircraft Information Report	Aircraft Owners–have you filed your AAIR for 2018? Even if your aircraft is not being flown you must still file unless you have notified TCCA that it is out of service
Pilot Decision Making	What are the primary tools you use when planning a flight? How do you assess your fatigue before flying? What are your primary and secondary methods of navigation? Who you file your flight plan/itinerary with?

Pilot Currency	How often do you complete recurrent training? What are the activities you complete?
Best Practice	What emergency equipment do you carry onboard your aircraft? What restraint systems are installed? Are there safer options available? What topics do you cover during passenger briefings? When did you last re-certify your transcoder?

The focus of the upcoming targeted inspections is to learn and gather information. While our goal is to motivate compliance through oral counselling, if a serious safety concern is identified it will be addressed as is appropriate to the situation. TCCA Inspectors' first priority is always safety.

Consider this as an opportunity to talk directly to TCCA and help inform the future of general aviation in Canada. Your experiences and insights are important to make the skies safer for everyone.

We look forward to your engagement and participation! △

Angle-of-Attack Indicators—Cost-effective Safety Enhancement

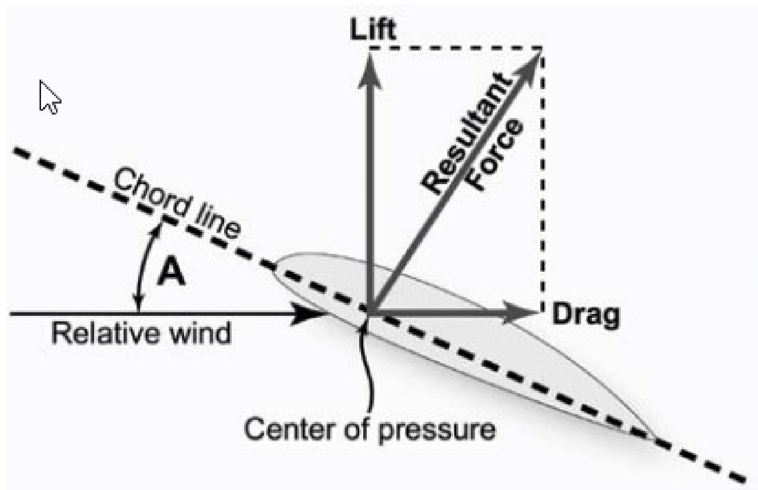
by Jean-Claude Audet, Manager of Operations, Canadian Owners and Pilots Association (COPA)

In its findings, the U.S. General Aviation Joint Steering Committee (GAJSC) has identified that the Angle-Of-Attack (AOA) indicator is a key safety enhancement to reduce fatal Loss Of Control–In flight (LOC-I) accidents in general aviation (GA). The Transport Canada Civil Aviation (TCCA) and Canadian Owners and Pilots Association (COPA) joint General Aviation Safety Campaign (GASC) that was launched in June 2017 has reached the same conclusion with its review of recent Canadian statistics. In fact, the GASC strongly believes that the installation of an AOA indicator system is one of the best investments one could perform to enhance the safety of his or her GA airplane. As a responsible and safety-conscious pilot, you might be considering the installation of an AOA indicator system in your type-certified airplane, but are probably thinking that the cost and complexity of installing such a system is daunting. In this case, please keep on reading.

The aviation industry, particularly with electronics, offers us an extensive selection of aviation products using modern technology. The current *Canadian Aviation Regulations* (CARs) appeared before this new technology arrived. These regulations, in many cases, have made it more time-consuming and expensive to incorporate this new technology in the cockpit than may be desirable, even when the safety benefits that this new technology can offer would seem obvious. The COPA staff reviewed this situation with TCCA staff to determine possible ways forward. TCCA staff have advised that, for several of the latest "lifesaving technologies" that have been identified for GA, including AOA indicators, the number of regulatory approvals required, with their associated time and cost, may be lower than we expected. The appropriate TCCA staff have reviewed and accepted this article. We publish it for your information as well as to support you when discussing a potential new installation with your AME.

Example of some AOA indicators that could be viewed in a cockpit. The color ranges indicate the available lift reserve: green is normal, yellow indicates a gradual reduction in lift (the pilot is pulling too hard), and red indicates approaching the critical angle of attack (the wing is about to stall).

CAR 571–*Aircraft Maintenance Requirements* provides regulations in respect of maintenance and elementary work performed on aircraft. CAR 571.06 provides that each modification on an aeronautical product shall conform to the requirements of the relevant technical data. Aircraft modifications are classified as either "major" modifications, which must be done in accordance with "approved data" or "specified data" as defined in CAR Standard 571.06; or "minor" modifications, which may be done in accordance with "acceptable data" also as defined in CAR Standard 571.06. The definition of "major modification" is provided under CAR 101.01 as an alteration that would not be expected to have any more than a "negligible effect on the weight and centre-of-gravity limits, structural strength, performance, power plant operation, flight characteristics or other qualities affecting its airworthiness or environmental characteristics." The decision as to whether any particular modification proposed for a particular aircraft is classified as "major" or "minor" is up to the aircraft maintenance engineer (AME) who will need to sign the maintenance release, pursuant to CAR 571, following incorporation of the modification.



Lift and Drag vectors contributing to the Resultant Force on the wing as a result of the angle of attack.

The installation of some models of the AOA indicator onto some GA airplanes may be found by an AME to be no more than a minor modification. In these cases, the AME may accomplish the minor modification using an appropriate set of "acceptable data", such as the AOA indicator manufacturer's recommended installation instructions, Federal Aviation Administration (FAA) Advisory Circular (AC) 43.13-2B *Acceptable Techniques and Practices,* or as otherwise specified in CAR Standard 571.06(1).

Where a particular modification is deemed to be a major modification, the AME requires "approved data" as defined in CAR Standard 571.06(1). Typically, approved data takes the form of a service bulletin from the aircraft manufacturer or a third-party Supplemental Type Certificate (STC). Where approved data does not exist for your particular airplane model and proposed AOA indicator combination, it may be time-consuming and more expensive to have this data developed (by the aircraft manufacturer or a third-party aircraft design engineering service) and approved by Transport Canada or its appropriately authorized aircraft certification delegate (e.g. Design Approval Representative (DAR)).

On March 31, 2016, the FAA issued Policy Statement PS-AIR-21.8-1602 - *Approval of Non-Required Safety Enhancing Equipment (NORSEE)*. This policy was intended to support the FAA's objective "to encourage and enable voluntary safety enhancements" of the GA and rotorcraft fleets. The policy provided criteria under which NORSEE could obtain a production approval under Title 14, *Code of Federal Regulations* (14 CFR), Paragraph 21.8(d), without a corresponding specific installation approval (e.g. under an STC). Equipment approved as NORSEE may have a variety of uses, including:

1. Increasing overall situational awareness;
2. Providing additional information other than the aircraft primary system;
3. Providing independent warning, cautionary, or advisory indications; and/or
4. Providing additional occupant safety protection.

Most NORSEE categories fall under the avionics, electronic instrument, and display categories. In accordance with the NORSEE policy, AOA indicators may be manufactured under 14 CFR Part 21 so long as they are determined to be a minor change to a type design and their failure condition is minor. It is further to this policy that many AOA indicator system kits are in production and are currently available for sale to owners and operators of GA airplanes.

In the absence of the FAA policy, the manufacture of articles under 14 CFR Part 21 is only permitted where a design approval has already been obtained, either together with a Technical Standard Order Authorization (TSOA) or Parts Manufacturer Approval (PMA), or through a type-certification process. The policy alleviates both real and perceived challenges to incorporating safety advancements in the GA and rotorcraft fleets. The NORSEE policy was intended to reduce equipment costs by allowing applicants the flexibility to select various industry standards that suit their product, as long as it meets the minimum design requirements established by the FAA. TCCA staff confirm that the installation of some of these products into a type-certified GA aircraft in Canada can be done as a minor modification under existing regulations, and therefore may not require an STC or manufacturer's service bulletin.

The FAA policy was aimed at supporting the objectives of the FAA-led international efforts to overhaul the airworthiness standards for GA airplanes through reorganizing 14 CFR Part 23, EASA's *Certification Specifications* CS-23, Transport Canada's *Airworthiness Manual* (AWM) Chapter 523, and equivalent other foreign airworthiness authority standards. By restructuring 14 CFR Part 23 and replacing the prescriptive design requirements with performance-based standards, these design-standard amendments are intended to help get safety enhancing technologies into the marketplace quickly while reducing costs. TCCA participated actively in the FAA Part 23 Reorganization Aviation Rulemaking Committee (ARC) that led to the amendments and is in the process of amending the AWM so that it aligns with the FAA's amendment 23-64 to 14 CFR Part 23. To view a short video on these internationally supported efforts to revitalize GA, please visit https://www.faa.gov/tv/?mediaId=1258.

The installation of an AOA indicator system in your certified aircraft could be an example of a minor modification. Searching the internet for AOA's takes us to a well-known (at least to amateur builders) aircraft parts supplier. Their selection of AOA systems includes some AOA's with an STC, but most do not have an STC. Be aware that an STC has applicability to only those aircraft models identified on the STC, so be sure that your aircraft is covered by the STC before you buy it. Should you purchase an AOA for which installation on your aircraft model is approved by an STC, your AME should have no issue with the installation and maintenance release of your aircraft. If you choose an AOA that is not approved for your aircraft by an STC, then your AME will have to decide if this installation is a minor modification or a major modification. The factors affecting the AME's decision will include the level of details and the quality of the installation instructions provided by the manufacturer. (For example, does your chosen AOA system interface with other systems on the aircraft and to what extent? Does it have an FAA approval letter or form?) The products offered by that supplier typically indicate what documentation accompanies the item; some even indicate that their product may be installed as a minor modification (always confirm with your AME) requiring only a log book entry.

TCCA does recognize the installation of several products as minor modifications and intends to publish an AC to clarify the regulation in respect of installation of NORSEE articles in GA aircraft. Pending the publication of such an AC, TCCA recognizes the accuracy and validity of the information provided in this article for the purpose of assisting aircraft owners in working with their AMEs in these circumstances.

Mr. Blake T. Cheney, Chief, Aircraft Certification Standards at TCCA, has reviewed and significantly improved the content and accuracy of the information published here. We sincerely appreciate his contribution to this important aspect of aircraft operations. △

Airport Emergency Exercises: Tips for Working with Your Local Responders

by Mark Fletcher, Emergency Exercise Coordinator, Rockcliffe Airport/Flying Club

For those of us in the general aviation community, our local and regional airports are a precious resource. Many of them are run or supported by knowledgeable volunteers and a core group of dedicated professionals. Navigating the requirements of the *Canadian Aviation Regulations* 302.202 (1) Airport Emergency Plan and 302.208 (1) Testing of the Emergency Plan can be a daunting prospect since there is little distinction made between airports in terms size and resources. Nevertheless, it is an important requirement in support of safety.

Photo credit: Rockcliffe Flying Club and the Ottawa Paramedic Service

For those of us who operate from uncontrolled airports with no dedicated emergency services, it is essential to build and maintain a regular working arrangement with the three core emergency agencies—the fire service, the paramedic service and the police—in order to maintain a safe and effective operation. While not the subject of this article, another aspect of the emergency plan is having a good relationship with the community around the airport and with municipal authorities who manage the emergency services, without whom the airport would not be permitted to operate.

Photo credit: Rockcliffe Flying Club and the Ottawa Paramedic Service

The Rockcliffe Airport in Ottawa shares many characteristics with small airports across the country, but perhaps has a combination of factors which make it a good test-case for the challenges facing others:

- it is located in an urban area
- it has both new and long-standing adjacent residential development
- it has a major water feature under its circuit
- it has wooded areas at the end of its runways
- it is adjacent to a busy road network
- it has large and busy public venues (Canada Aviation and Space Museum) next to the runway
- it is capable of night-time operations it operates a circuit across a jurisdictional boundary for emergency response
- it has high-profile and restricted areas along nearby VFR routes
- it is located between an international and a regional airport
- it has over 100 aircraft based at the airport plus many visitors
- it supports VIPs, military flights, air ambulances, and small air shows

Based on table top exercises, live exercises and real-life accidents that we have had, here are a few tips and lessons learned which we hope will be useful to others. We would also appreciate learning from others on their experiences.

General Tips

One of the most important general aspects of having an effective emergency response is the safe manoeuvring of emergency vehicles at an uncontrolled airport during an incident.

A major component of all of our exercises is to have emergency services practise the following procedure while live flight operations are underway. This is done under the supervision of an air boss, with the issuance of a NOTAM and a radio advisory to all departing and arriving aircraft. At a large uncontrolled airport, it is impossible to ensure that all aircraft are immediately aware of an accident, so the assumption is that the airspace and runways are active until proactively shut down. So we practise... and that has paid off when real-world accidents have happened.

1. After emergency vehicles enter the airport via the emergency route gate they must stop before entering or crossing the runway.
2. The vehicle commander or driver if alone, must exit the vehicle and do a 360 scan of the runway and circuit to see and hear if there is an aircraft taking off or landing.
3. Once certain that the way is clear, the vehicle is permitted to cross and proceed to the accident site. If there is more than one vehicle responding and they are all in one group, the lead vehicle makes the call that all is clear to proceed.
4. Preference is for vehicles to use taxiways rather than runways because it reduces the risk down to the two horizontal dimensions. The option to use the runway is open to the responders, depending on the situation.
5. Responders are taught to drive down taxiways and runways in the middle rather than to one side (their normal tendency is to treat it like a road) as it is safer in case an aircraft pulls out from a parking spot onto the taxiway or from a taxiway onto the runway. We also think it is easier for a pilot on the ground or in the air to see and understand that a runway or taxiway is obstructed by a manoeuvring emergency vehicle if it is being operated in the middle.
6. Speed of the vehicle should be commensurate with the congestion and size of the taxiways/runways.
7. Emergency responders are taught that for our airport procedure, aircraft always have the right of way over emergency vehicles –on the ground, rolling for departure, and in the air on approach.
8. If an aircraft is blocking a taxiway, the responders are taught to wait until the aircraft has manoeuvred out of the way.

Every airport must have a grid reference map. On the reverse side of that map, we have found that it is useful to also include a route map with marked entrances, including special notes, contact numbers, fire hydrants and the emergency service rendezvous point. The double-sided map is distributed to the emergency services and dispatch centres. We also have a detachable map at the Emergency Route 1 (ER1) entrance in case the responding vehicles do not have one on board. The dispatchers are aware of this map in the premise notes via their computerized dispatch system and can advise responders. If any of the routes are not maintained in the winter, this should be noted. Consider the optimal route for responding emergency services and train them to use that route as the default. Rockcliffe recently swapped the location of ER1 and ER2 because large static aircraft and events between the museum buildings were becoming a manoeuvre hazard.

Photo credit: Rockcliffe Flying Club and the Ottawa Paramedic Service

Most emergency responders are familiar with the Incident Command System which is a scalable protocol for managing emergency response. Airport managers and pilots should familiarize themselves with that system so they can best understand how em ergency services will organize themselves, especially in a multi-agency response. See http://www.icscanada.ca/en/home.html.

It is a good idea to periodically review what premise notes exist for your airport with the emergency service dispatchers. This is the first thing that emergency responders look at when the call comes in to 911. Please note that depending on your municipality, there may be more than one relevant dispatch centre and not all emergency service radios can talk to one another. Rockcliffe is covered by four primary emergency services, all operating on different systems (RCMP, Ottawa Police, Paramedic and Fire Services) plus the Gatineau emergency services in Quebec. Our runway 09/27 circuits are on both sides of the provincial boundary, separated by the Ottawa River, which can complicate the response to an aircraft accident on departure or approach. It also means that water rescue is part of the consideration for the initial response plan.

Specific Tips for the Fire Service

The fire service has a mandate to protect property and life, including fire suppression, victim extrication, spill/hazmat control, and first aid. Your local fire service should know:

1. The location of hydrants or nearby accessible bodies of water if in a rural area
2. The location of hazards on the airfield including refuelling points and fuel tanks
3. Importantly, that there is no fire service at the airport and that they are the primary fire service (as per your situation). If a nearby airport has a fire service (Ottawa International), that are a good resource to contact for technical advice on aircraft if there are no airport staff or pilots available to give advice
4. Fire services should be oriented to common types of aircraft, safety hazards and the location of critical systems:
    - master electrical switch
    - fuel cut-off lever
    - location of fuel tanks (high and low wing)
    - location of fuel lines in A, B or C posts
    - types and quantity of fuel and hazardous materials on board
    - the possibility of ballistic parachute systems and fire suppression systems in some aircraft
    - direction of prevailing winds for location of incident command upwind of scene
    - high likelihood of post-impact fires
    - tie-down points which can be useful in stabilizing aircraft in high winds, as well as the need to stabilize under the aircraft tail in a tricycle-gear situation during the treatment and extrication of victims
    - location of door pins or easy cutting points
    - how to remove front seats to get at rear passengers

- materials typical to light aircraft and windscreens and how to remove them
- dangers of propellers and staying clear even when the motor is not operating

5. Airport staff/AMEs should proactively make themselves known to the Fire Service Incident Commander to provide technical advice on the aircraft.

During our most recent exercise in the fall of 2017, while the emergency services were in the middle of extrication, we went up to our club Cessna 172 and started to rock the wings, simulating a high-wind situation which was one of the causal factors in the crash. The heavy-rescue team immediately jury rigged a stabilization system of steel bars pounded into the ground with adjustable straps from the tie-down points to the bars (see photo). This was a creative solution and is recommended for you to pass on to your local fire/rescue service.

Specific Tips for the Paramedic Service

The paramedic service has a mandate to protect life, including patient triage, stabilization, first-responder treatment and patient transportation. Your local paramedic service should know:

Photo credit: Rockcliffe Flying Club and the Ottawa Paramedic Service

1. General hazards of an aircraft (see fire service list) but especially post-impact fires
2. The types of passenger restraint systems typically used
3. The typical trauma impact points–steering column, instrument panel, windows, etc.
4. To look for patients outside of the aircraft as often some may have been ejected far from the primary crash site given the velocities and trajectories involved
5. To be prepared for mass-casualty accidents depending on the size and number of aircraft and proximity of the public. Keeping a good rhythm of responding and transporting ambulances is important to an effective response, especially in a rural or very busy urban area when response times can be long.
6. Location of patient or bystander indoor triage areas if there is heavy or hazardous weather.

Specific Tips for the Police Service

The police service has a mandate to protect life and property, investigate crime, and ensure civil order, including crowd control, access control, initial investigation if a crime has been committed (intoxicated pilot, terrorist incident, intentionally-caused accident, etc.), and the general safety of all concerned. Your local police service should know:

1. What types of events are typically held at the airport
2. If there are VIPs, diplomatically protected persons, or celebrities who are often at the airport
3. Who at the airport is responsible for media communication (the accident will be on social media within minutes)
4. Who at the airport is responsible for liaison with the Transportation Safety Board for accident investigation
5. Who is calling the Rescue Coordination Centre and NAV CANADA to notify them of the accident
6. What are the best containment and interview areas for witnesses
7. Who at the airport is responsible for notification of management and stakeholders, and can support next-of-kin
8. What are the optimal access-route control/choke points to ensure scene safety
9. Who controls the locks and gates for the perimeter fence at the airport

In conclusion:

Keeping our uncontrolled airports operational and safe is an essential part of keeping general aviation alive and well in Canada, in addition to being our responsibility to the communities we live and work in.

These airports are where many of our commercial pilots begin their aviation career and are arguably the place where the soul of Canadian aviation can be found. Reaching out to our emergency services is not only necessary, it is also part of making the airport an integral part of the fabric of the community. We are still learning and improving our airport emergency plan at Rockcliffe. We encourage others to share what they have learned, so we can all benefit one from another.

Special thanks to the Canada Aviation and Space Museum, the Rockcliffe Flying Club, the Ottawa Paramedic Service, the Ottawa Fire Service, the RCMP and the Ottawa Police Service for being an essential part of the Rockcliffe Airport and its operations. △

Shoulder Harnesses and Seat Belts—Double Click for Safety

by Rob Freeman, Civil Aviation Safety Inspector, Commercial Flight Standards, Standards Branch, Civil Aviation, Transport Canada. This article was originally published in Aviation Safety Letter*, Issue 4/2013.*

Excerpt from a recent Transportation Safety Board report: "The pilot's shoulder harness was found post-accident tucked into a storage pouch behind the seat."

If you are like most of us, you don't even think about putting on your seat belt and shoulder harness when you get into your car. You just do it. It's been a long time since people actively fought against the seat belt law in Canada. Yet years ago, it was commonly held that you were actually safer if you were ejected from the vehicle during a collision! Now it feels uncomfortable to move a car even a short distance without being strapped in. So it is a bit of a surprise to find that many of the same pilots who drive their vehicles to the airport while buckled and secured do not attach their shoulder harnesses when they go flying.

We know that to be true because aircraft accident investigations often reveal the sad reality—survivable accidents aren't survived, and the ever-present crew shoulder harnesses that are required to be installed on all aircraft manufactured after the dates specified below have been neatly tucked away or secured behind the now-deceased pilot's seat. The FAA has estimated that roughly one third of all general aviation accidents with fatalities would have been survivable if the pilots had been using their shoulder harnesses. www.faa.gov/aircraft/gen_av/harness_kits/system_accidents/

For cars and aircraft, it is the secondary collision that kills. The dynamics of the deceleration sequence in a sudden-stop accident are straightforward and have been well understood for a long time. The vehicle (either car or aircraft) undergoes a sudden and complete deceleration during contact with an immovable surface (ground or water). The driver or pilot is still moving forward at the original velocity and now pivots from the waist, where he or she is secured only by the lap belt. No one is physically strong enough to prop themselves up against the high g-force deceleration that may occur during an accident sequence, so heads and arms strike the dashboard or instrument panel violently.

These days drivers and their passengers may be saved by airbag deployment, but that is not the case in most aircraft. Pilots are often rendered unconscious or unable to extract themselves from the wreckage due to serious injuries or shock. Hypothermia, drowning or fire is often the second and final complication for the incapacitated crew and their trapped and panicked passengers.

The intent of the Canadian Aviation Regulations (CARs) is that pilots wear both the lap strap and shoulder harness where installed. Where there are two pilots, at least one must wear the safety belt (lap strap and shoulder harness) at all times while in flight.

Here are some excerpts from the CARs concerning the use of safety belts that apply specifically to pilots. Sections referring to other occupant restraint systems have been excluded for clarity and brevity.

Canadian Aviation Regulations (CARs)

Interpretation

101.01 (1) In these Regulations:

"safety belt" means a personal restraint system consisting of either a lap strap or a lap strap combined with a shoulder harness; *(ceinture de sécurité)*
"crew member" means a person assigned to duty in an aircraft during flight time; *(membre d'équipage)*
"flight crew member" means a crew member assigned to act as pilot or flight engineer of an aircraft during flight time; (membre d'équipage de conduite)

Seat and Safety Belt Requirements

605.22 (1) …no person shall operate an aircraft other than a balloon unless it is equipped with a seat and safety belt for each person on board the aircraft other than an infant.

Shoulder Harness Requirements

605.24 (1) No person shall operate an aeroplane, other than a small aeroplane manufactured before July 18, 1978, unless each front seat or, if the aeroplane has a flight deck, each seat on the flight deck is equipped with a safety belt that includes a shoulder harness.

(4) No person shall operate a helicopter manufactured after September 16, 1992, the initial type certificate of which specifies that the helicopter is certified as belonging to the normal or transport category, unless each seat is equipped with a safety belt that includes a shoulder harness.

(5) No person operating an aircraft shall conduct any of the following flight operations unless the aircraft is equipped with a seat and a safety belt that includes a shoulder harness for each person on board the aircraft:

> (a) aerobatic manoeuvres;
> (b) class B, C or D external load operations conducted by a helicopter; and
> (c) aerial application, or aerial inspection other than flight inspection for the purpose of calibrating electronic navigation aids, conducted at altitudes below 500 feet AGL.

Use of Crew Member Safety Belts

605.27 (1) Subject to subsection (2), the crew members on an aircraft shall be seated at their stations with their safety belts fastened

> (a) during take-off and landing;
> (b) at any time that the pilot-in-command directs; and…

(2) Where the pilot-in-command directs that safety belts be fastened by illuminating the safety belt sign, a crew member is not required to comply with paragraph (1)(b)

> (c) if the crew member is occupying a crew rest facility during cruise flight and the restraint system for that facility is properly adjusted and securely fastened.

(3) The pilot-in-command shall ensure that at least one pilot is seated at the flight controls with safety belt fastened during flight time.

Note that the definition of safety belt includes a lap strap OR a lap strap AND shoulder harness, to address all aircraft, including those exempted from having shoulder harnesses due to their age and original basis of certification. The definition was not intended to provide an either/or choice to the flight crew. Unfortunately, that has become a common interpretation. It does not help that unlike automobiles, where both the lap strap and the shoulder harness are generally a combined unit that cannot be separated, aircraft systems normally permit lap straps and harnesses to be latched individually. This tends to reinforce the widespread misunderstanding of having a choice when strapping in.

CAR 605.27(3) requires one pilot to be fully restrained at all times when the aircraft is in flight. Where the aircraft is operated by a single pilot, that obligation applies to him or her without exception.

Pilots of some aeroplanes have pointed out that the layout of the instrument panel and controls make it impossible to reach those controls when the shoulder harnesses are attached. Similarly, helicopter pilots involved in longline operations complain that twisting sideways to monitor the load is very uncomfortable or not manageable when the shoulder harness is attached.

Operators, as part of their SMS programs for identifying hazards and for constant improvement, should be addressing these issues within their organizations to see what can be done. There are very few low-cost improvements that can be implemented as simply and have such a profound increase in safety and crew survivability as the constant use of pilot shoulder harnesses.

Aftermarket installation of inertia reel harnesses might be one solution for aircraft that do not have these devices; relocating switches or avionics control heads may be another. Some helicopter models can now be retrofitted with crew seats that have some swiveling capability specifically for longline operations.

As a start, we strongly suggest that you include a line "**shoulder harness–fastened"** on your pre-flight and pre-landing checklist and keep it attached whenever the aircraft is in motion, particularly during takeoff and landing. If you have to unfasten your shoulder harness when it interferes with cockpit duties, get into the habit of reattaching it as soon as you can.

The risk remains that not attaching or removing your shoulder harness for whatever reason and continuing to fly without it will multiply the severity of any crash, perhaps, and most sadly, beyond the point of survival. △

TSB Final Report Summary

The following summary was extracted from the final report issued by the Transportation Safety Board of Canada (TSB). It has been de-identified and includes the TSB's synopsis and selected findings. Unless otherwise specified, all photos and illustrations were provided by the TSB. For the benefit of our readers, the occurrence title is hyperlinked to the full TSB report on the TSB Web site. —Ed.

TSB Final Report A16Q0119—Loss of Control and Collision With Terrain

Summary

The privately operated Cessna U206F equipped with amphibious floats was flying under visual flight rules from Kuashkuapishiu Lake, Que., to Ra-Ma Lake, Que., near the Manicouagan Reservoir, Que., with a pilot and 2 passengers aboard.

History of the flight

The day before the accident, the pilot flew from Ottawa/Gatineau Airport, Que., with 1 passenger aboard, to Kuashkuapishiu Lake, Que., where his hunting and fishing camp was located. The Cessna U206F stopped at the airport in Trois-Rivières, Que., to refuel and take on a second passenger. After dropping off the 2 passengers at Kuashkuapishiu Lake, the pilot made 3 more flights between Kuashkuapishiu Lake and Louise Lake, Que., to transport luggage and freight and to pick up 2 other passengers, who had arrived at Louise Lake by car, and bring them to Kuashkuapishiu Lake. The aircraft was refuelled twice between flights.

The pilot made a return flight to Louise Lake on the morning of the accident. The fuel transaction record from Louise Lake indicates that the pilot obtained 278 litres of aviation fuel. After returning to Kuashkuapishiu Lake, the pilot made pre-flight preparations to fly to Ra-Ma Lake, Que., with 2 passengers. The aircraft was loaded with food supplies, a 20-pound propane gas cylinder, 3 firearms, ammunition, an outboard motor and fuel, and luggage. One passenger was in the right-hand seat next to the pilot, and the other passenger was in the seat behind the pilot. The pilot gave the passengers a safety briefing that included a description of the seat belts, emergency exits, and lifejackets.

At around 14:00 EDT, the aircraft left the dock and taxied over the water toward the south end of the lake. After warming up the engine, the pilot selected 20° of flap, raised the water rudders, turned the aircraft into the wind, and applied full throttle. The aircraft then began its takeoff run northward and became airborne mid-course, about 1 600 ft from the starting point. The aircraft began a climbing turn to the left when it reached the north end of the lake. The aircraft was then lower than the surrounding terrain, the elevation of which was 228 ft higher than the elevation of the lake (Figure 1). A few moments later, the engine stopped and the pilot felt a reduction in the response to elevator and aileron control input, and at the same time noticed a 20-knot reduction in airspeed.

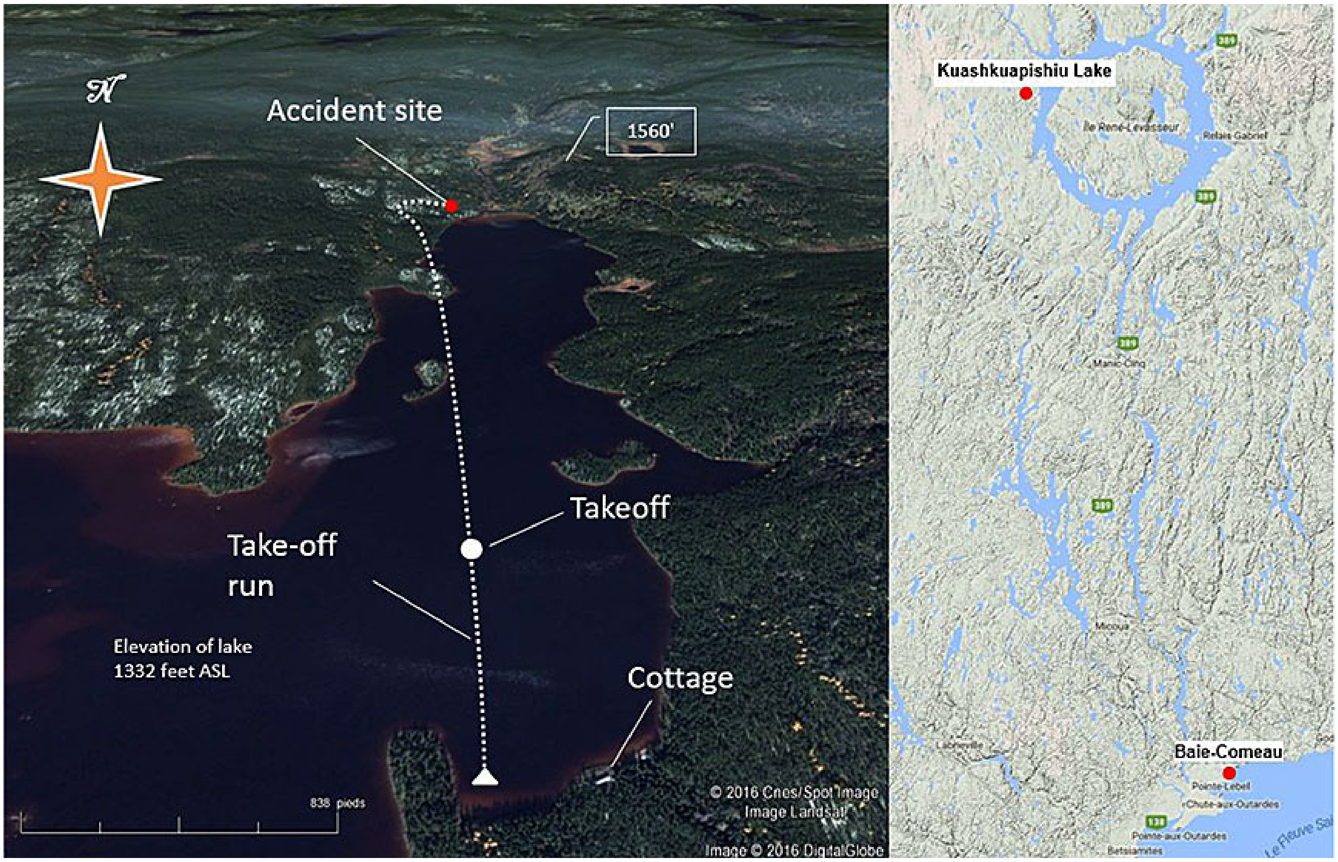


Figure 1. *Trajectory of the aircraft during takeoff at Kuashkuapishiu Lake (51° 31'01.12 N, 069° 12'03.47 W)*
(Source: Google Earth, with TSB annotations)

The pilot decided to return to Kuashkuapishiu Lake and began a right turn by applying the right rudder pedal. The stall warning alarm then began sounding. The right wing dropped, and the aircraft nosedived.

The pilot pushed the control yoke forward. The aircraft lost altitude and crashed into a forested area a few metres from the lake tributary (51°30′58.95″ N, 069°12′2.92″ W). An intense fire broke out immediately upon impact. Only the pilot, whose clothes were on fire, was able to escape from the wreckage and dive into the river.

Two eyewitnesses at the cottage observed the takeoff and the column of smoke that appeared after the aircraft descended out of sight behind the tree tops. They rushed to the scene of the crash to provide assistance.

Back at the cottage with the survivor, one of the eyewitnesses provided first aid and used a satellite phone to request assistance. A helicopter from the private ambulance service Airmedic arrived at the Kuashkuapishiu Lake cottage at around 18:35 EDT with nurses to administer first aid. The Joint Rescue Coordination Centre (JRCC) Halifax deployed a Cormorant helicopter. At around 21:00 EDT, the survivor and the nurses were winched aboard the Cormorant and taken to the hospital in Sept-Îles.

Wreckage and impact information

General

The aircraft crashed 350 ft from the north end of Kuashkuapishiu Lake, in an area sparsely covered with short spruce trees and where the ground is covered in lichen. The elevation of the accident site was 1 330 ft ASL. The aircraft struck the trees in a nose-down attitude of at least 20° in a steep right bank curve and struck the ground 75 ft away.

Engine examination

No abnormalities were found on the engine. Disassembly of the engine-driven fuel pump, however, revealed that the coupling shaft between the pump and the engine was sheared. No other sign of failure that might have contributed to the accident was found. No indication of engine or propeller rotation was observed.

Engine-driven fuel pump examination

An examination of the engine-driven fuel pump was unable to reveal what had caused the shearing of the coupling shaft. An examination of the area where the coupling shaft had sheared, however, indicated that the shearing had occurred while the engine was running at high speed, rendering it instantly inoperative and cutting off the engine's fuel supply.

Propeller examination

The 3-blade propeller was coupled to the engine. An examination of the propeller at the accident site and at the TSB Engineering Laboratory did not reveal any signs of rotation at impact. The blade that was perpendicular to the top of the engine was not bent or twisted. The 2 other blades were bent backward and showed no sign of torsion (Figure 2). There were no further indications of propeller rotation observed on the trees or ground.

Figure 2: View of engine and propeller

Flight manual

The flight manual states that if the auxiliary fuel pump is running at the same time as the engine-driven fuel pump, the resulting air-fuel mixture will be too rich unless the pilot leans the mixture. Therefore, the START switch must not be in the ON position during takeoff.

Flight manual emergency procedures

Section III of the flight manual contains the emergency procedures, including a specific procedure for engine failure after takeoff, as well as several procedures for rough running or power loss, such as that caused by a failure of the engine-driven fuel pump.

Procedures for rough running or power loss

Failure of engine-driven fuel pump

Figure 3. Auxiliary fuel pump switch

The flight manual states that "failure of the engine-driven fuel pump will be evidenced by a sudden reduction in the fuel flow indication <u>prior to a loss of power</u>."

The manual also states that:

“In the event of an engine-driven fuel pump failure during take-off, immediately hold the left half of the auxiliary fuel pump switch in the HI position until the aircraft is well clear of obstacles. Upon reaching a safe altitude, and reducing the power to a cruise setting, release the HI side of the switch. The ON position will then provide sufficient fuel flow to maintain engine operation while maneuvering for a landing.”

In this occurrence, to prevent the fuel-air mixture from becoming too rich, the auxiliary fuel pump was not running when the engine-driven fuel pump failed, because the use of the auxiliary fuel pump during takeoff was counter-indicated by Cessna.

Procedure to follow in the event of engine failure after takeoff

In the event of an engine failure after takeoff, the flight manual recommends "prompt lowering of the nose to maintain airspeed and establish a glide attitude." The manual also states that in

- most cases, the landing should be planned straight ahead and with only small changes in direction to avoid obstructions, and
- altitude and airspeed are seldom sufficient to execute a 180° gliding turn necessary to return to the runway. The procedure for engine failure after takeoff (Figure 4) assumes that there is enough time to secure the fuel and ignition systems prior to touchdown.

Procedure for in-flight engine failure

While gliding toward a suitable landing area, an effort should be made to identify the cause of the engine failure. If time permits, and if an engine restart is feasible, the following procedure applies:

(1) Airspeed -- 90 MPH.
(2) Mixture -- IDLE CUT-OFF.
(3) Fuel Selector Valve -- OFF.
(4) Ignition Switch -- OFF.
(5) Wing Flaps -- AS REQUIRED (40° recommended).
(6) Master Switch -- OFF.

Figure 4. *Excerpt from flight manual: Procedure to follow in the event of an engine failure after takeoff*
(Source: 1975 Cessna Stationair Owner's Manual)

(1) Airspeed -- 85 MPH.
(2) Fuel Selector Valve and Quantity -- CHECK.
(3) Mixture -- RICH.
(4) Auxiliary Fuel Pump -- ON for 3 - 5 seconds with throttle 1/2 open; then OFF.
(5) Ignition Switch -- BOTH (or START if propeller is not windmilling).
(6) Throttle -- SLOWLY ADVANCE.

Figure 5. *Excerpt from flight manual: Procedure for in-flight engine failure*
(Source: 1975 Cessna Stationair Owner's Manual)

Training

Managing an engine failure during takeoff on a single-engine aeroplane is critical because of the significant workload and the little time available before making an emergency landing.

Carrying out the procedure for engine failure after takeoff requires skills that are rarely put into practice, even in recurrent training. The pilot had carried out the procedure for dealing with engine failure only during in-flight training; however, for obvious safety reasons, the engine failure drills consisted of simulating the failure at altitude. Because the engine was not actually shut off, the pilot had never had to carry out the entire procedure for dealing with in-flight engine failure. The pilot had also never practised the procedure for dealing with a failure of the engine-driven fuel pump during takeoff.

When an engine failure occurs immediately after takeoff, the pilot does not have time to look up the appropriate procedure before taking corrective measures. In this type of situation, the pilot needs to have a plan for dealing with the emergency. A flight over an area that is not suitable for a forced landing requires a detailed plan that carefully considers several factors, including terrain, altitude, the aircraft's glide ratio when gliding, and wind strength. Developing this plan generally includes the minimum altitude at which a 180° turn would be attempted to return to the takeoff point after an engine failure.

In this occurrence, an examination of the terrain indicated that the only area clear of trees was about 1 300 ft north of the accident site.

Analysis

The aircraft was operating in favourable flight conditions and there was no indication that weather conditions could have caused this occurrence. The pilot was qualified to conduct the flight in accordance with existing regulations.

The aircraft's weight and balance were calculated using the weight of its occupants, the estimated quantity of fuel on board, and the weight of the luggage. The weight of the aircraft was estimated to be approximately 3 700 pounds at the time of the crash, or 100 pounds below the maximum allowable weight. According to calculations, the centre of gravity was within the centre of gravity range.

The information obtained, such as the aircraft's trajectory in the trees, indicates that an aerodynamic stall occurred at the beginning of a right turn less than 200 ft above ground level (AGL). Consequently, the analysis will look at the various modifications made to the aircraft, the takeoff, the low-altitude engine malfunction, and post-impact survival.

Low-altitude engine malfunction

The information gathered during the investigation established that the aircraft experienced an engine shutdown during the initial climb after takeoff, at 200 ft AGL, an altitude lower than the neighbouring terrain.

It can be difficult to diagnose a failure of the engine-driven fuel pump because the duration and characteristics of the symptoms vary depending on the type of failure. If the fuel pump's performance had deteriorated, the pilot would have observed a gradual reduction in engine speed and the possible rough running of the engine. These symptoms would have provided noticeable audible and tactile indications that may have prompted the pilot to apply the procedure for failure of the engine-driven fuel pump. Instead, the shear in the pump coupling shaft resulted in the fuel supply being cut off immediately, in turn shutting off the engine.

Flight manual emergency procedures

The section of the flight manual on rough running or power loss contains a specific procedure to follow if the engine-driven fuel pump fails after takeoff. The procedure consists primarily of keeping the auxiliary fuel pump EMERG switch set to HI to keep the engine running until the aircraft has cleared all obstacles.

The procedure for dealing with an in-flight engine failure mentions starting the auxiliary fuel pump, but the procedure for dealing with engine failure after takeoff does not. The after-takeoff procedure emphasizes maintaining control by lowering the nose promptly to maintain speed and by landing straight ahead. It also states that the engine, the fuel supply, the ignition, and the electrical supply should be shut off, if time permits. However, the auxiliary fuel pump needs to be used if the engine-driven fuel pump fails during takeoff.

If emergency procedures in the flight manual do not include relevant material contained in other procedures, there is a risk to the safety of flight if the crew is not able to take appropriate actions in time.

Because the procedure for dealing with engine failure after takeoff did not include elements from the procedure specific to failure of the engine-driven fuel pump during takeoff, the pilot did not have a routine, practised during flight training, to rely on.

In this occurrence, the pilot first had to maintain control of the aircraft and follow the procedure for dealing with engine failure after takeoff, while at the same time remembering that there was another procedure to be used if the engine failure was caused by the failure of the engine-driven fuel pump. Because the engine failure occurred at low altitude, the pilot did not have time to identify the type of failure, recall the various relevant procedures, and take actions that could have restored engine power.

Managing engine failure after takeoff

The engine failure occurred at a key moment, when the aircraft was in the most vulnerable stage of the flight after takeoff, just as it was flying over a forest at low altitude after passing the north shore of the lake.

Considering how suddenly the engine had failed and how low the aircraft was at the time, as well as the fact that the failure occurred during a phase of the flight when there were significant demands on the pilot's attention, the pilot had little time to evaluate the situation. Under these circumstances, it would have been vital for the pilot to have a plan or at least to have chosen the minimum altitude at which a 180° turn could be attempted in the event of an engine failure.

The engine failure probably took the pilot by surprise. Once the engine failed, the first measures necessary were to stabilize the speed and put the aircraft into a glide while maintaining control of the aircraft as it proceeded to a landing site. Although it is to be expected that the pilot would take a few seconds to react to the engine failure, the aircraft's speed diminished sufficiently to cause the stall warning to sound. The element of surprise, combined with a nose-up trim position during takeoff, probably affected the pilot's reaction time with regard to lowering the nose in time to compensate for the loss of speed.

Because the aircraft had just taken off, its configuration, with flaps at 20°, generated a significant amount of drag due to the flap settings and downward aileron deflection. The amount of drag was further increased by the floats and their fastening devices. In these conditions, the sudden loss of traction would require the control yoke to be pushed forward quickly to lower the nose and reduce the negative effects of drag on the aircraft's speed.

In the moments that followed the engine failure, the pilot noticed that the control yoke inputs on the ailerons and elevator had little effect on the aircraft's trajectory and that the stall warning horn was sounding. The pilot did not maintain glide speed, and the aircraft entered slow flight, just above the stall speed.

For obvious safety reasons, engine failure drills were carried out at altitude without completely shutting off the engine. Therefore, the pilot had never had to carry out the entire procedure for an in-flight engine failure and had never been exposed to the conditions present on the occurrence flight when the engine failed.When the engine failed, the pilot had to make decisions and take action quickly without being able to rely on prior real-world experience. Given that the pilot's experience was limited to training simulations, it is likely that the pilot was not prepared to switch, within a fraction of a second, from a routine flight situation to an emergency situation that required extreme availability and concentration. Even though the pilot had taken the training required by regulations, the pilot was not prepared to manage the emergency effectively.

Attempt to make a 180° turn and loss of control

Faced with the prospect of having to make a forced landing in the forest ahead, the pilot decided to make a 180° turn to perform a water landing on Kuashkuapishiu Lake. The decision to make a 180° turn at low altitude suggests incomplete planning before takeoff, because it is impossible to make a 180° turn when gliding below 200 ft AGL.

Given the sluggish response of the ailerons during slow flight, the pilot pressed the right rudder pedal to begin the 180° turn. The rotation around the vertical axis (yaw) resulted in the right wing's critical angle of attack being exceeded in an uncoordinated turn. The aerodynamic stall of the right wing resulted in an incipient spin (autorotation) to the right, which the pilot immediately stopped. The manoeuvre, however, resulted in a sudden right turn and a steep descent. The pilot attempted a 180° turn at low altitude, and an aerodynamic stall ensued at too low an altitude for control to be regained before the aircraft struck the ground.

Findings

Findings as to causes and contributing factors

1. The coupling shaft of the engine-driven fuel pump sheared soon after takeoff while the engine was running at high speed, cutting off the engine's fuel supply and causing it to stop suddenly.
2. Because the engine failure occurred at low altitude, the pilot did not have time to identify the type of failure, recall the various relevant procedures, and take actions that could have restored engine power.
3. The pilot did not maintain glide speed, and the aircraft entered slow flight, just above the stall speed.
4. The pilot attempted a 180° turn at low altitude, and an aerodynamic stall ensued at too low an altitude for control to be regained before the aircraft struck the ground. △

David Charles Abramson Memorial—Flight Instructor Safety Award

The 15th recipient of the annual DCAM Flight Instructor Safety Award for the year 2017 was Luke Paul Penner of Harv's Air Winnipeg, MB.

A true aviator, an accomplished pilot, a Class 1 Flight Instructor & a Class 1 Aerobatic Instructor, he strongly believes that even some aerobatic experience can make a pilot more competent and much safer.

He states, "I personally have pushed myself to fully experience the flight envelope through my competitive aerobatic flying, to pursue disciplined precision flying with the hopes of inspiring others to reach for their true potential, and ultimately become safer pilots." This flight instructor finished first in his category at the U.S. National Aerobatic Championships in 2016.

This years' deadline for submission is September 14, 2018: http://dcamaward.com/contact-information/

Stay informed, Stay safe!

Canada.ca/general-aviation-safety

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