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Aviation Safety Letter

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TP 185E

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Canada

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INSTRUCTOR'S CORNER

Professionalism in Flight Training

by Michael Schuster, Chief Instructor, Aviation Solutions

"My students don't prepare. They show up late.
They expect me to spoon-feed everything to them.
They're just not professional."

Having managed over sixty flight instructor refresher courses (FIRCs), I can say with certainty that some version of this has been uttered by attendees on every single one of those courses. Having been around the flight training industry for two decades as a student and instructor, I can also confirm that this feeling is nothing new!

There can be an abundance of causes. But one to focus on is remembering that any group of people, students included, generally conform to their environment. Simply put, humans like to go unnoticed. They like to fit in. Think about if you meet a group at a restaurant, if everyone else is having a beer, do you order one too? When "masking up" was new, did you decide to do so based on how many others you observed doing so? Social psychology professor Catherine Sanderson notes that 25% is a tipping point in behaviour change,[1] meaning just a few bad habits can be toxic to your training environment.

Ultimately, fitting in, our comfort, and culture are all related. People will conform to the culture around them to fit in and feel comfortable. **In other words, the culture of the instructor and school are the number one influence on student professionalism—so let's look within!**

Here are some ideas for flight instructors to set a professional tone and role model to their students:

- Manage your time effectively. Be sure you have prepared for every lesson *(flight and ground)* that you are going to teach. If you are not prepared, why would the student think it's necessary to prepare their procedures, read up for the next flight, etc.?
- Respect the student's time and manage distractions such as cell phones, interruptions to your briefings, etc. If it's okay for you to be late or interrupted, isn't it okay for your student to do the same?
- Train the student to become a pilot, not just pass the next flight test. If we focus on "here is how to pass your ride" instead of "these are the skills you need to be effective," we are teaching students that fully understanding a topic is not important, and that simply being able to execute a manoeuvre in isolation is.

[1] https://www.cbc.ca/news/canada/mask-wearing-attitudes-coronavirus-1.5569515

Photo: iStock

- Share your passion for aviation, precision, skill, knowledge… any trait that you want your student to develop. For example, if you don't know how to quickly and effectively search something in the CARs, your student won't take any interest in learning that skill.
- Take responsibility for knowing what to do. For example, don't put away the *Flight Instructor Guide* (FIG) after your latest flight test. There is gold in there, such as direction on what steps to take when a student is having a variety of difficulties. If we just expect our supervisors to tell us the answer, how can we expect our students to become independent of us?
- Similarly, be intimately familiar with the flight testing standards and the Pilot Examiner Manual (TP 14277). Specifically, remember that there are five evaluation criteria, not just "aircraft handling." If you don't know in detail what the standards are, how can you expect your students to understand what is expected of them?
- Be present for your student's flight test. Show them you care and are invested by making sure you complete their recommendation paperwork correctly and in advance. Be at the debrief to support your student and show you want to improve as an instructor by taking notes on the examiner's feedback. This will demonstrate to your students that aviation is a lifelong career of learning and that we support each other while valuing constructive feedback.
- Continually improve yourself. Work towards an airline transport pilot licence (ATPL) even if you don't plan on using it: it shows you want to learn more and become a better flight instructor. Attend a FIRC to learn about best practices in flight instruction so that you can offer your students more. Really, any opportunity to improve or upgrade a qualification (even free online courses) will benefit you and show your students that pilots are serious about being on top of their game.

Flight school support is another key area. How well the Chief Flight Instructor (CFI) and the Flight Training Unit (FTU) support these goals and activities is absolutely critical. In an AOPA study on student retention, the top two driving factors were instructor professionalism and how well the school supported those flight instructors.

What does that include?

- Providing aircraft for proficiency flying. At a FIRC in 2019, I asked why the Commercial 180 Precision Approach was so poorly flown during flight tests. I was told it may be because it was a new exercise. Unfortunately, this exercise was introduced in 2006, well over a decade prior! But if instructors in 2006 didn't get a chance to practise and learn themselves, how well could they teach it? Then we go through generations of instructors that are "photocopies of photocopies," who can't accomplish the task well.

- Providing ongoing education. Does the FTU send instructors to FIRCs and aviation training conferences such as the World Aviation Training Summit (WATS), or do they bring in experts such as pilot examiners or meteorologists to give advanced classroom-based training to instructors?
- Providing a living wage. When instructors have to hold two jobs to pay the bills, they can't focus on doing their best.
- Establishing and uniformly enforcing policies. Does the school have a clear cancellation policy? Does it enforce it equally? Or are instructors left to do so on their own with inconsistent results and confused and frustrated students?
- Providing sound operational control systems that contribute to everyone's health and safety, along with effective instructor supervision and support.

The final thought I will leave you with is a list that I keep posted in my office to drive me to do the best I can every day. Following the challenges and crises of the Mercury, Gemini, and Apollo space programs, Flight Director Gene Kranz spearheaded development of the **Foundations of Mission Operations**. I'm sure you can find a way to adapt these core principles into your flight training operation. It would serve as an excellent reminder to all that what we do is difficult and tiring, but doing the job well is absolutely critical to safety and success.

1. **To instill within ourselves these qualities essential to professional excellence:**
    i. **Discipline:** Being able to follow as well as to lead, knowing that we must master ourselves before we can master our task.
    ii. **Competence:** There being no substitute for total preparation and complete dedication, for space will not tolerate the careless or indifferent.
    iii. **Confidence:** Believing in ourselves as well as in others, knowing that we must master fear and hesitation before we can succeed.
    iv. **Responsibility:** Realizing that it cannot be shifted to others, for it belongs to each of us; we must answer for what we do, or fail to do.
    v. **Toughness:** Taking a stand when we must; to try again and again, even if it means following a more difficult path.
    vi. **Teamwork:** Respecting and utilizing the abilities of others, realizing that we work toward a common goal, for success depends upon the efforts of all.
    vii. **Vigilance:** Always being attentive to the dangers of spaceflight; never accepting success as a substitute for rigour in everything we do.
2. **To always be aware that suddenly and unexpectedly we may find ourselves in a role where our performance has ultimate consequences.**
3. **To recognize that the greatest error is not to have tried and failed, but that in the trying we do not give it our best effort.**

A version of this article originally appeared on aviationsolutions.net. *Mike Schuster is an experienced Class 1 flight instructor who has taught at all levels, from ab initio to airline. He is the chief instructor at Aviation Solutions, which is an authorized Flight Instructor Refresher Course provider for rating renewal.* △

RECENTLY RELEASED TSB REPORTS

The following summaries are extracted from final reports issued by the Transportation Safety Board of Canada (TSB). They have been de-identified. Unless otherwise specified, all photos and illustrations were provided by the TSB. For the benefit of our readers, all the occurrence titles are hyperlinked to the full report on the TSB Web site. —Ed.

TSB Final Report A20C0016—Runway Excursion

Factual information

History of the flight

On 24 February 2020, the Fairchild SA227-DC Metro 23 was conducting a flight between Dryden Regional Airport (CYHD), Ontario, and Sioux Lookout Airport (CYXL), Ontario, with two crew members and six passengers on board. This was the sixth flight of the day for the flight crew. The first officer (FO), who sat in the right seat, was to be the pilot flying (PF), and the captain, who sat in the left seat, was to be the pilot taxiing and the pilot monitoring (PM) for the flight.

The crew completed the "Engine Start" checklist, followed by the "After Start" checklist and the "Before Taxi" checklist. While conducting the "Before Taxi" checklist, the FO initiated the "Start Locks" task, which has three subtasks required to be completed by both the captain and the FO. The captain instructed the FO to stand by, after which the FO then verbalized the correct "Start Locks" subtask response. There was no response from the captain.

Approximately seven seconds later, the captain began assessing runway conditions and then engaged for a period of time with Sioux Lookout Radio about flight plan and departure details. The captain then called for the "Before Takeoff" checklist, which was completed, and began to taxi the aircraft to Runway 12 for takeoff. Directional control of the aircraft during taxi was accomplished using the nose wheel steering and no differential thrust for turns was required.

After completing the "Line Up" checklist, the captain transferred aircraft control to the FO. At approximately 1610, take-off power was applied and, while the aircraft was accelerating during the take-off roll, directional control was lost. The aircraft ran off the right side of the runway approximately 150 m from the runway threshold lights. The aircraft struck a frozen snowbank and came to rest in an upright position, about 18 m off the side of the runway and in about 46 cm of snow (Figure 1). The crew then shut down the engines following the "Stopping Engines" checklist.

The aircraft was substantially damaged. One passenger sustained serious injuries to his hand from splintered wooden propeller blade pieces that penetrated the fuselage. All flight crew and passengers egressed the aircraft through the main cabin door and were met by emergency response.

Damage to aircraft

The occurrence aircraft sustained substantial damage to the propellers and fuselage. The landing gear was intact.

Aircraft information

Records indicate that the occurrence aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

Figure 1. Occurrence aircraft after coming to a stop (Source: Ontario Provincial Police)

Propeller and propeller start locks

In February 2015, the occurrence aircraft was modified with two propellers made by MT-Propeller in accordance with Supplemental Type Certificate (STC) SA03893AT. The propellers were five-bladed, reversible, hydraulically controlled, variable-pitch, and constant-speed.

During propeller operation, springs and counterweights are always forcing the propeller blades toward a high-angle (or feathered) position, while high engine oil pressure opposes this force to move the propeller blades toward a low-angle (or flight-idle) position.

As propeller blade angles increase, the blades take a larger bite of air, resulting in increased propeller thrust and engine torque. Propulsion of the aircraft is controlled by the pilot using the engine power levers and speed levers that are mounted in the centre console in the cockpit.

The propeller-control system is designed to operate in either propeller-governing range or beta range. Propeller-governing range[1] is used for flight operations, while beta range[2] is used for ground manoeuvring operations (hereafter referred to as "taxi"). When the engine-power lever is forward of the flight-idle gate, the engine is in the propeller-governing range, and when the engine-power lever is brought aft of the flight-idle gate, the engine is in beta range.

[1] The propeller governor adjusts blade angles to maintain a constant selected propeller rpm.

[2] Propeller blade angles are hydraulically selected by the manipulation of the power levers below flight idle.

While taxiing, slight fore and aft movements of the power levers are required to control the speed of the aircraft. Pilot manipulation of the engine power levers while in beta during the taxi may not always be in unison and can result in a staggered demand of the propeller-control systems. Slight or rapid transient movements of the engine power levers between flight-idle and beta range can produce varying degrees of propeller blade angles and loading on the start locks.

During engine shutdown, when oil pressure is lost, the feathering springs and counterweights force the propeller blades to a high angle. The propeller hub is equipped with a set of start locks that mechanically lock the propeller blades in place at a low blade angle as the engine winds down.

During engine start-up, the start locks remain engaged to minimize load on the engine starter and electrical power supply by keeping the propeller blades at a low blade angle, thus minimizing the drag of the propeller blades while turning. Once the engine has stabilized, the flight crew must disengage the start locks to allow the propeller blades to increase blade angle and produce thrust. The start locks are listed in the "Before Taxi" checklist and are disengaged by momentarily moving the engine power levers over the flight-idle gate, toward reverse.

Following the engine start, the engine power lever typically remains at the flight-idle gate. The feathering spring, combined with the pressure exerted by the propeller counterweights, retains the start locks against a collar on the beta tube housing, preventing any change in propeller blade angle and production of thrust. When the engine power lever is moved aft of the flight-idle gate into beta range toward reverse, the propeller governor oil pressure now opposes the feathering spring and counterweight force. The opposing oil pressure unloads the start locks and allows centrifugal force to free the start locks from the collar on the beta tube housing, allowing movement of the propeller dome piston to produce the desired propeller blade angle and thrust for takeoff.

An inspection of both propeller hubs did not reveal any pre-occurrence anomalies.

Meteorological information

The CYHD hourly meteorological observation for 1600, approximately 10 minutes before the occurrence, was as follows:

- wind 350° true (T) at 7 knots, variable from 320°T to 040°T;
- visibility 9 statute miles (SM);
- sky clear; and
- temperature 1°C, dew point −10°C.

Weather was not considered a factor in this occurrence.

Aerodrome information

CYHD has one asphalt runway (Runway 12/30) that is 5 996 ft long and 150 ft wide. The investigation determined that the runway conditions were not considered a factor.

Flight recorders

The occurrence aircraft was equipped with a cockpit voice recorder (CVR) and a flight data recorder (FDR) that recorded 13 parameters, including engine torque, gas generator speed and propeller speed.

Figure 2. Shattered propellers (Source: Ontario Provincial Police)

The CVR provided the audio recording of the communication between the captain and FO during the occurrence. The recording included all checklist procedures that were conducted from engine start to shortly after the occurrence.

Data obtained from the FDR revealed a steady increase in engine torque on the left engine and no increase in torque on the right engine during power application on the take-off roll.

Wreckage and impact information

The occurrence aircraft came to a rest facing a southerly direction and was subsequently towed to a nearby hangar for further inspection by TSB investigators. The blades of both propellers were shattered and the remaining blade roots were found at a low blade angle (Figure 2). Both engine mounts were found fractured and bent and both nacelles sustained substantial distortion. Both inboard upper wing and forward fuselage skins exhibited slight wrinkling.

The forward fuselage area revealed complete penetration of both reinforcement panels and skins adjacent to the edge of each propeller disc (Figure 3 and Figure 4). The fuselage also sustained smaller punctures to the belly skin.

An inspection of the aircraft cabin area revealed large entry holes by the first seat in the left aisle and the second seat in the right aisle, and also revealed large amounts of propeller debris and splinters (Figure 5).

Figure 3. Right-side fuselage penetration (Source: Ontario Provincial Police)

An inspection of the cockpit revealed that the engine stop-and-feather control was not activated. An inspection of the aircraft systems and engines (including power-lever control rigging) did not reveal any pre-impact anomalies.

Figure 4. Left-side fuselage penetration (Source: Ontario Provincial Police)

Standard operating procedures

An SOP manual was carried on board the occurrence aircraft. It included checklist procedures and indicated that the "Before Taxi" checklist was to be completed using the challenge-and-response method. A challenge-and-response checklist provides standardized communication and understanding between crew members. The generally accepted procedure of a challenge-and-response checklist is that the PF initiates the checklist. The PM challenges the PF by reading aloud the checklist task, which the PF conducts or verifies and then responds back to the PM. If the task cannot be completed, the checklist is paused at that task, the PM announces that the checklist is paused, and it is resumed once the task is completed. The PM waits for confirmation from the PF before moving on to the next checklist task. Once the checklist is complete, the PM will announce that the checklist is complete.

The SA-227 SOPs explain the completion methods for a challenge-and-response checklist; however, they do not mention what to do when a challenge-and-response checklist is interrupted or paused, nor what the PM is to do when the PF's response is not in accordance with the checklist.

Checklists

A checklist is a systematic and sequential list of tasks specific to a phase of flight that must be performed by the flight crew. Complex aircraft have a large number of tasks that require execution before and during each phase of flight, and checklists contain far more tasks than can be safely committed to memory with total accuracy. The purpose of a checklist is to improve flight safety by ensuring that all necessary tasks are completed.

CARs Subpart 704 air operators are required to establish checklists specific to each type of aircraft and crew members are required to follow them. Checklists for all phases of flight were available to the occurrence aircraft flight crew, and execution of the "Start Locks" task is listed in the "Before Taxi" checklist (Figure 6).

Figure 5. Propeller debris in cabin (Source: Ontario Provincial Police, with TSB annotations)

BEFORE TAXI

Fuel Qty & Balance .... SUFFICIENT IN LIMITS
Transponder.................................AS REQUIRED
TCAS...AS REQUIRED
RADAR...STBY
SAS Clutch...ON
Nose Wheel Steering .... ARMED
Parking Brake.................................... RELEASED
Start Locks .... CLEAR CLEAN WING CAP ON
Lights.. TAXI ON
Brakes ....CHECK

Figure 6. "Before Taxi" checklist (Source: Perimeter Aviation, SA-227 Normal Checklist [Revision 8])

"Start Locks" task

The "Start Locks" task is one of several tasks listed on the "Before Taxi" checklist within the SOPs and has three subtasks (Figure 7).

Start Locks ....CLEAR CLEAN WING CAP ON

Each pilot will verify:

- Their prop area clear forward and behind;
- Their wing free of contaminates;
- Their fuel cap in place and secure.

Beginning with the First Officer, each pilot will verbalize, **"Clear, clean wing cap on left/right"** before their propeller is removed from their start locks.

Figure 7. "Start Locks" task from the "Before Taxi" checklist

Once the subtasks are completed, the power levers are pulled over the flight-idle gate toward reverse to release the start locks to complete the "Start Locks" task; however, neither the checklist nor the SOPs have a call to confirm that the start locks have been released.

In this occurrence, the captain called for the "Before Taxi" checklist, which the FO then began. In response to the FO's call to conduct the "Start Locks" task, the captain acknowledged it but did not complete his actions, although the FO completed his own. The captain then called for the "Before Takeoff" checklist; however, the remaining two tasks on the "Before Taxi" checklist, brakes and lights, and the FO's call that the "Before Taxi" checklist was complete, were not done.

Normal take-off procedures

Normal take-off procedures contained in the SOP manual specify that when the FO is conducting the takeoff, the captain is required to advance the power levers through 20% torque. When both engines have passed through 20% torque, the captain is then required to call "positive torque."

In this occurrence, no calls were made during the initial take-off roll to ascertain positive torque.

The SA227 aircraft flight manual (AFM) contains information that applies to that specific aircraft, including limitations, emergency procedures, abnormal procedures, normal procedures, performance data, as well as weight and balance and manufacturer data.

Pilot operating tips contained in the AFM suggest that the engine torque be monitored during initial take-off roll. Failure of the torque to rise above approximately 20% indicates a possibility that the associated propeller start locks are still engaged.

Additional information

Interruptions

Task interruptions can have a negative effect on performance, leading to increased error frequency and response time. The impact varies with the length of the interruption and the type of task being carried out, where even very short interruptions increase the error rate. When performing sequential tasks, an interruption can impair place-keeping in memory, potentially resulting in errors in the sequence of subtasks. When completing checklists, one's position in the sequence is activated in memory: each task to be performed is activated one after the other. Once a task is completed, it remains activated for a moment, while the upcoming task is also activated.

When an interruption occurs, a completely different task from the one in progress becomes activated as well, inhibiting the mental processing of the original, primary task. With time, the traces of the primary task in memory fade, and it becomes very difficult to remember where one was in the sequence before the interruption, or even that the sequence was interrupted at all.

Slip of attention

Among the errors most frequently associated with routine, well-practised tasks are slips of attention. This type of error occurs when a check on the progress of a task sequence is mistimed or does not occur because the operator's attention is focused on another aspect of the task or some other preoccupation.

A necessary condition for these errors to occur is the presence of attentional capture, when the operator's attention is focused on another aspect of the task.

Trans-cockpit authority gradient

Optimum trans-cockpit authority gradient means that there is coherence between pilots on the same aircraft. It is well known that a too-strong or too-weak authority gradient between crew members can be a barrier to effective crew resource management. An authority gradient is attributable to differences between the pilots, such as in age, experience, or rank, and the manner in which one or both crew members explicitly or implicitly place emphasis on these differences. A gradient may be too weak, as in the case of two pilots with the same ratings and the same degree of experience, or too strong, as in the case of an experienced chief pilot working with an inexperienced FO. In circumstances such as those, there is a risk of lowered coherence between the crew members and reduced crew effectiveness, which increases the risk of an error going undetected and/or uncorrected.

In this case, the authority gradient was strong as the FO had just completed his training and it was his first day flying a scheduled flight for the operator. The captain had approximately 20 years of experience operating the SA-227 with the operator, was a line indoctrination training pilot, and had accumulated approximately 20 000 total flying hours.

Analysis

General

There was no indication that an aircraft system malfunction contributed to this occurrence. As a result, the analysis will focus on the operational factors that contributed to the aircraft departing the runway. The analysis will also focus on the penetration of the reinforcement panels and fuselage skins on either side of the fuselage by the shattered/splintered propeller blade debris.

Standard operating procedures and checklists

The “Start Locks” task is listed as a single item among several others on the “Before Taxi” checklist and has three subtasks. According to the standard operating procedures (SOPs), the subtasks must be completed before the desired action and goal of releasing the start locks from the propellers.

Finding as to causes and contributing factors

While the crew was carrying out the “Before Taxi” checklist, the “Start Locks” task was initiated; however, it was interrupted and not completed.

Finding as to causes and contributing factors

After the captain told the first officer to stand by, the crew’s focus shifted to other tasks. It is likely that this slip of attention resulted in the power levers not being pulled over the flight-idle gate to release the start locks.

The SOPs required that the “Before Taxi” checklist be completed using the challenge-and-response method. However, the response required by the checklist following the “Start Locks” challenge indicated only that the three subtasks were complete; it did not include a response to verify that the start locks had been removed.

Finding as to causes and contributing factors

The “Before Taxi” checklist did not contain a task to ensure that the start locks were removed and, as a result, the crew began taxiing unaware that the propellers were still on the locks.

Challenge-and-response checklists tasks are not complete until the proper response and action is completed and communicated between the crew. The SOPs did not include specific guidance as to what to do when a challenge-and-response checklist is interrupted, paused, or if the response is not what is expected. In this occurrence, neither the brakes nor the lights tasks in the “Before Taxi” checklist were initiated, nor was a statement made that this checklist was completed. The investigation was not able to determine why the “Before Taxi” checklist was not fully completed.

Finding as to risk
If procedures for challenge-and-response checklists do not include guidance on task interruptions, pauses, or non-standard responses, there is a risk that checklist tasks will be incomplete or omitted, which may result in the aircraft operating in an unsafe or undesirable configuration.

Accident sequence
When the aircraft taxied for departure, it was well below the maximum take-off weight, and the thrust requirement for taxi was minimal.

Following an engine start and during normal taxi, movement of the engine power levers can range from slightly forward of the flight-idle gate, to beta, to full reverse. Movement of the engine power levers while in beta after an engine start or during the taxi by the pilot may not always be in unison, resulting in asymmetrical propeller blade angles, and loading on the start locks when engaged.

Finding as to causes and contributing factors
After the engine was started or while the occurrence aircraft commenced taxiing for departure, it is likely that slight or rapid transient movements of the engine power levers, which were needed to taxi the aircraft, resulted in the release of the left-propeller start locks while the right-propeller start locks remained engaged.

The SOPs require that when power is advanced for takeoff, and torque has increased through 20%, the captain will verify the torque indication for both engines and call "positive torque." However, once power was applied for takeoff, the call was not made, and the crew was still unaware of the status of the start locks.

Data recorded by the flight data recorder suggest that once take-off power was applied, the left-propeller rpm and engine torque began to increase; however, although the right-propeller rpm also began to increase, the right engine torque remained near zero. This difference in torque indicated that the left propeller's start locks were released, whereas the right propeller's start locks remained engaged. The aircraft exited the runway to the right and struck a frozen snowbank shortly after the take-off roll began.

Finding as to causes and contributing factors
As the power was advanced through 20%, the "positive torque" call required by SOPs was not made, and the engine torque differential was not noticed by the crew. As a result, power lever advancement continued although the right engine torque/thrust remained near zero.

Finding as to causes and contributing factors
The engaged start locks on the right propeller prevented forward thrust, which resulted in a significant thrust differential. This differential thrust during the take-off roll resulted in a loss of directional control of the aircraft and, ultimately, a lateral runway excursion.

Findings

Findings as to causes and contributing factors
These are conditions, acts or safety deficiencies that were found to have caused or contributed to this occurrence.

1. While the crew was carrying out the "Before Taxi" checklist, the "Start Locks" task was initiated; however, it was interrupted and not completed.

2. After the captain told the first officer to stand by, the crew's focus shifted to other tasks. It is likely that this slip of attention resulted in the power levers not being pulled over the flight-idle gate to release the start locks.
3. The "Before Taxi" checklist did not contain a task to ensure that the start locks were removed and, as a result, the crew began taxiing unaware that the propellers were still on the locks.
4. After the engine was started or while the occurrence aircraft commenced taxiing for departure, it is likely that slight or rapid transient movements of the engine power levers, which were needed to taxi the aircraft, resulted in the release of the left-propeller start locks while the right-propeller start locks remained engaged.
5. As the power was advanced through 20%, the "positive torque" call required by standard operating procedures was not made, and the engine torque differential was not noticed by the crew. As a result, power lever advancement continued although the right engine torque/thrust remained near zero.
6. The engaged start locks on the right propeller prevented forward thrust, which resulted in a significant thrust differential. This differential thrust during the take-off roll resulted in a loss of directional control of the aircraft and, ultimately, a lateral runway excursion.
7. Following the runway excursion, the propellers, which were operating at a high rpm, shattered and splintered when they struck a frozen snowbank.
8. High-energy release of the nickel-cobalt erosion strips and splintered wood core debris from the propeller blades penetrated the reinforcement panel, fuselage skin and cabin wall, and resulted in serious injuries to a passenger sitting next to the penetrated cabin wall.

TSB Final Report A20A0027—Loss of Control and Collision with Terrain

History of the flight

On 20 July 2020, the privately registered Robinson R44 Raven II helicopter was returning from a remote fishing camp located 7 nautical miles (NM) east of Reeds Pond, Newfoundland and Labrador (NL), on a day visual flight rules flight to St. John's (Paddy's Pond) Water Aerodrome (CCQ5), NL. On board were the pilot and two passengers. A second Robinson R44 helicopter, which was conducting the same flight, departed the fishing camp at about the same time.

As the flight progressed, the pilots of both helicopters made a number of en-route stops due to ground fog along the south coast of Labrador, and planned to refuel at the Springdale Aerodrome (CCD2), NL. However, after landing at CCD2, they realized that fuel service would not be available for several hours. The pilots were familiar with an approved maintenance organization (AMO) located on the east side of Thorburn Lake, across the lake from the Thorburn Lake Water Aerodrome (CCW5), NL. The occurrence pilot made contact with the AMO by telephone and confirmed that fuel was available on site. At 1425, both helicopters departed CCD2 for CCW5, located about 110 NM southeast.

The intended landing site at CCW5 was a small clearing approximately 60 ft in diameter on the road just outside the main entrance gate to the AMO. The site was a confined area surrounded by trees that stood approximately 80 ft tall.

The pilot of the second helicopter flew over the landing site first. He rejected the landing based on the wind conditions and the size of the site. He then transmitted his intention to land elsewhere to the occurrence pilot and orbited in the area while the occurrence pilot attempted to land in the confined landing site.

At approximately 1535, the occurrence helicopter made a right base leg turn onto the final approach heading of 240° magnetic (M). The wind direction at the time varied from 180°M to 230°M at an estimated speed of 16 to 20 kt. The occurrence pilot continued his approach to the landing site and entered an out-of-ground-effect hover over the landing site, just below the treetops (Figure 1). Once established in the hover, the pilot determined there was not enough room to continue with the landing and initiated a vertical climb.

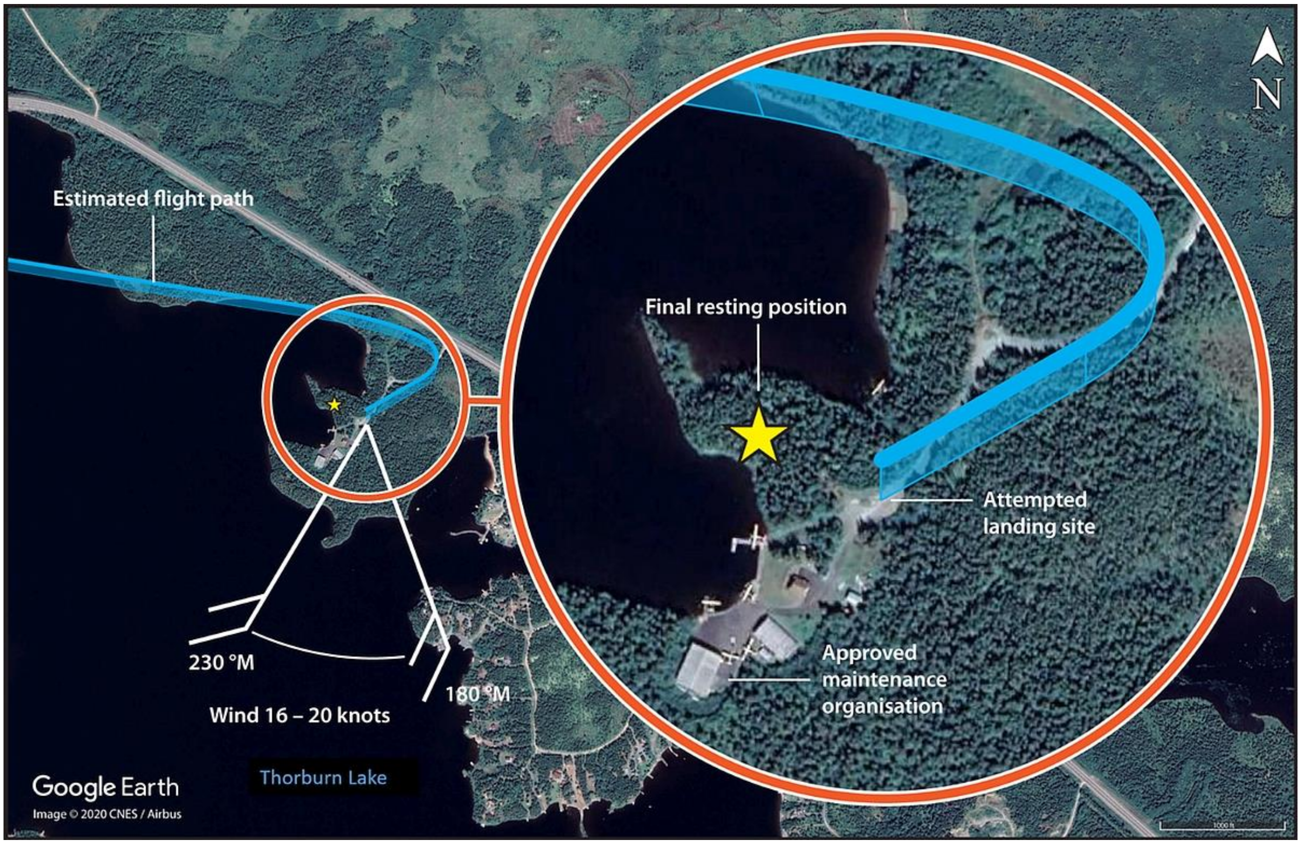

Figure 1. Estimated flight path, derived from global positioning system data
(Source: Google Earth, with TSB annotations)

When the helicopter cleared the treetops, it began to slowly yaw to the right. The pilot applied left anti-torque pedal input; however, the helicopter continued to yaw and the yaw rate increased. The pilot then deflected the anti-torque pedals to the right and back to the left several times to check for pedal response while the helicopter continued the right yaw. The pedal inputs did not arrest the right yaw.

As the pilot was trying to control the yaw rate, alternating nose-up and nose-down pitch excursions began with increasing amplitude. After at least two full rotations to the right the main rotor severed the tail boom as the pitch excursions increased beyond a controllable range. All control of the helicopter was lost and it fell into the trees. The helicopter came to rest upright on the forest floor against several large trees. The helicopter was destroyed. The pilot, who was sitting in the right front seat, and the passenger sitting in the left front seat were seriously injured. The passenger seated in the right rear seat was fatally injured. All occupants were wearing the available lap belts and shoulder harnesses.

The 406 MHz emergency locator transmitter activated on impact.

Bystanders attended the site and extinguished a small post-impact fire, which was confined to the engine compartment area. First responders transported the pilot and the surviving passenger to a local hospital.

Following the occurrence, the pilot of the second helicopter flew to the west side of the lake and landed uneventfully in an open area.

Pilot information

The occurrence pilot held a Private Pilot Licence—Helicopter with an R44 rating and a Recreational Pilot Permit—Aeroplane. The pilot kept two separate personal logs to record his flight hours (one for helicopters and one for airplanes). The last flight entered in the pilot's personal helicopter log was on 25 March 2015. At that time, the total time accumulated on helicopters was 148.9 hours, with 91.1 hours on type.

The pilot had purchased and taken delivery of the helicopter eight days before the occurrence and received 3.7 hours of dual flight time with the previous owner. At the time of the occurrence, he had accumulated 15.7 hours as pilot-in-command while on the fishing trip to Reeds Pond.

The pilot's Category 3 Medical Certificate had expired on 1 October 2017, which meant his licence was not valid at the time of the occurrence. The pilot's medical status was not considered a factor in this occurrence.

Aircraft information

The helicopter was being operated within its weight-and-balance and centre-of-gravity limits. Wreckage examination did not identify any pre-existing system malfunctions that would have played a role in the loss of control in this occurrence.

The journey log for the occurrence aircraft had not been updated since it was delivered to the new owner. The CARs require that the pilot-in-command record flight information in the journey log daily, after completing each flight or series of flights.

Weather information

CCW5 does not have a weather reporting station. The nearest limited weather observation site location is Terra Nova National Park, NL, approximately 20 NM north-northeast. At the time of the occurrence, there was a heat warning issued for high ambient temperatures and humidity in the area. The following weather data was recorded at Terra Nova Park:

- temperature 23.6°C
- humidex 28°C
- wind from 220°M at 7 kt

In close proximity to the landing area at Thorburn Lake, winds were observed to be from 180°M to 230°M at an estimated speed of 16 to 20 kt.

Landing site

The occurrence pilot was familiar with the landing site from the ground because it is part of the access road to the AMO. Although he had driven by the landing site many times in a vehicle, he had never landed a helicopter there. The pilot also knew that other larger helicopters, such as a Bell 206 and a Eurocopter AS 350, had landed there in the past.

The combination of the terrain, wind direction, and velocity was conducive to conditions of mechanical turbulence.

Unanticipated yaw

When seen from above, the main rotor blades of the Robinson R44 turn counterclockwise. Due to this rotation, the helicopter experiences a torque reaction in the opposite direction, which results in the helicopter yawing to the right (Figure 2).

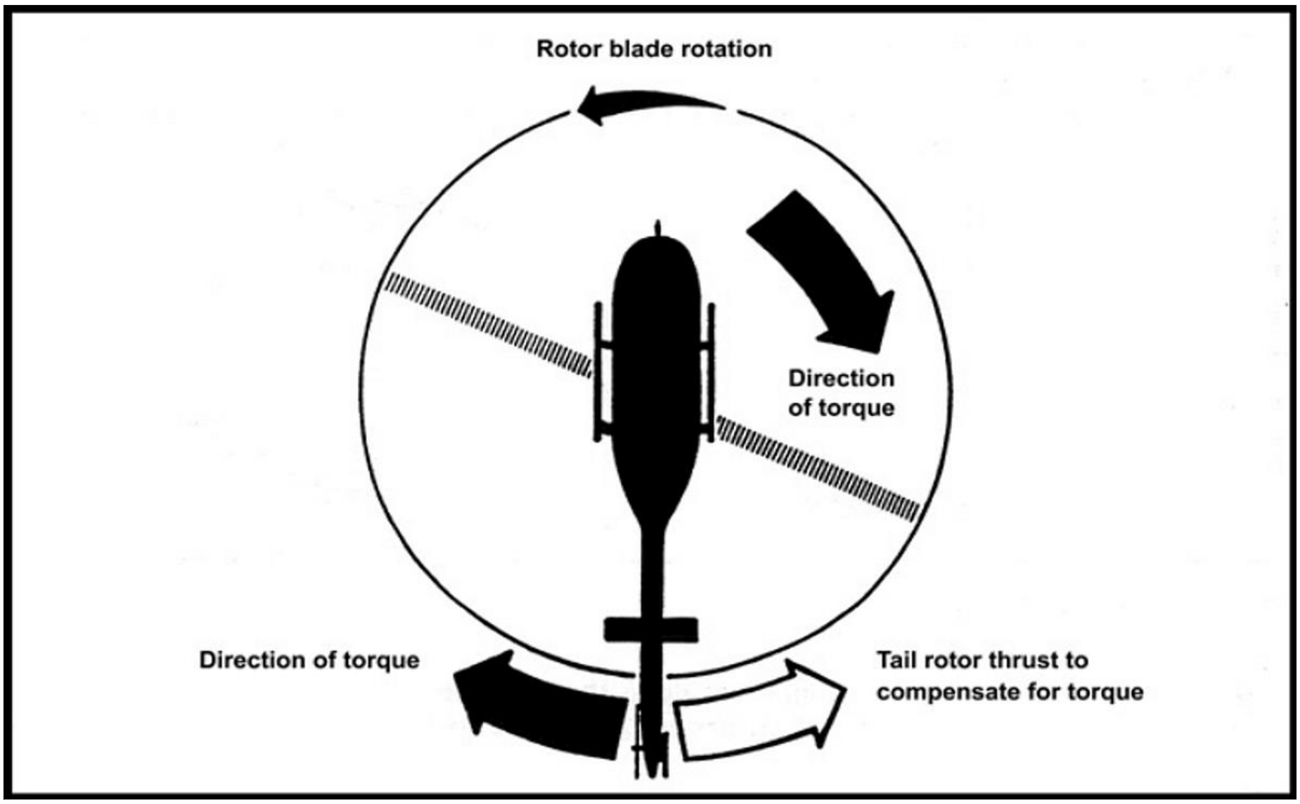

Figure 2. Torque effect (Source: Transport Canada, TP 9982, Helicopter Flight Training Manual, Second Edition [June 2006], Figure 3-3)

To counter this movement, the helicopter is equipped with a tail rotor that produces lateral thrust. To compensate for the torque created by the main rotor during many normal regimes of flight, the pilot applies pressure to the anti-torque pedals to increase or reduce tail rotor thrust, as required.

However, when this yawing movement is not expected, it is referred to as an unanticipated yaw, or loss of tail rotor effectiveness (LTE), which is defined as follows:

LTE is a critical, low-speed aerodynamic flight characteristic which can result in an uncommanded rapid yaw rate that does not subside of its own accord and, if not corrected, can result in loss of aircraft control.

LTE is unrelated to equipment failure or defective maintenance, and any single-rotor helicopter flying at low speeds can experience this phenomenon. Rather, it is the result of the tail rotor not providing sufficient thrust to maintain directional control.

In addition, four relative wind azimuth regions can produce an environment that is conducive to LTE (Figure 3):

- main rotor disc vortex wind (winds from 285° to 315° relative to the helicopter);
- weathercock stability (winds from 120° to 240°);
- tail rotor vortex ring (winds from 210° to 330°); or
- loss of translational lift (winds from all directions).

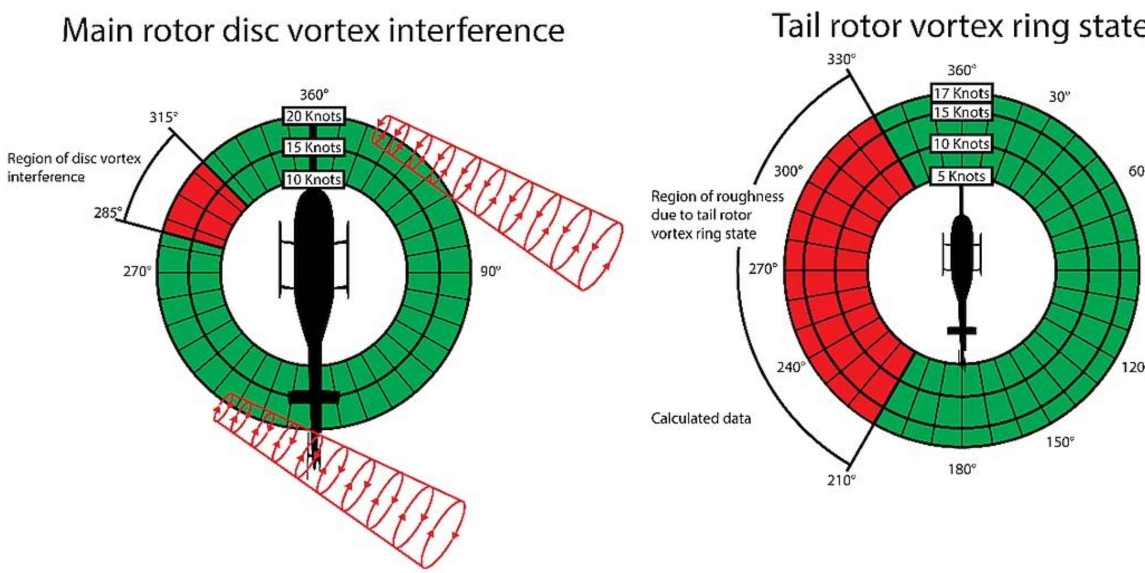

Figure 3. Main rotor disc vortex interference and tail rotor vortex ring state angle (Source: TSB, based on figures included in Federal Aviation Administration, Advisory Circular 90-95: Unanticipated Right Yaw in Helicopters [1995])

At the time of the occurrence, the helicopter was approximately 130 lb below the maximum gross weight and in an out-of-ground-effect hover. Winds were estimated to be gusting up to 20 kt, turbulent, and approaching the helicopter from the left. Given these conditions, the helicopter was operating in a high-power regime within the critical wind azimuth regions of the main rotor disc vortex wind and tail rotor vortex ring that could induce an unanticipated yaw.

Safety notices are issued by the Robinson Helicopter Company as a result of lessons learned from various occurrences. The safety notices reside in the helicopter *Pilot's Operating Handbook* (POH) and are also available on the manufacturer's Web site. Safety Notice 42 entitled *Unanticipated Yaw* was issued in May 2013, with the latest revision issued in July 2019. The POH for the occurrence aircraft did not contain any version of Safety Notice 42. According to this safety notice, operations in strong left crosswinds may require significant pedal inputs; failure to do so may result in unanticipated yaw without the helicopter necessarily experiencing LTE.

Confined area operations
Confined area operations are advanced manoeuvres that require a pilot to use a detailed and methodical process to conduct the operation safely. Transport Canada outlines a comprehensive process to conduct a confined area approach, landing, and departure in its *Helicopter Flight Training Manual* (TP 9982).

In general, before landing, the pilot conducts a high and a low reconnaissance of the confined area to help identify the many factors that require consideration during the approach, such as the size of the confined area and the wind direction. Then, the pilot prepares an approach and landing plan, which should include a practice approach to confirm that the plan is sound. Lastly, after any modifications determined necessary by the practice approach, the actual approach is flown.

Safety messages
Landing and taking off in a confined area presents unique challenges. All helicopter pilots—no matter how experienced—need to conduct a detailed and methodical evaluation of a confined area to assess the factors that could affect the approach, hover or landing, and departure.

An unanticipated yaw can pose a significant threat during flight at low speeds and in high-power regimes, and when a helicopter is operated within critical wind azimuth regions. It is important for helicopter pilots to recognize the factors that may induce unanticipated yaw that, if not corrected, can result in a loss of control of the helicopter.

TSB Final Report A21O0006—Loss of Control and Collision with Terrain

History of the flight
On 10 February 2021 at approximately 1249, a privately registered Blackshape S.P.A. Prime BS100 aircraft started conducting circuits on Runway 28 at Ottawa/Carp Airport (CYRP), Ontario, with only the pilot on board (Figure 1).

Figure 1. The occurrence aircraft (Source: N. Horn, with permission)

The first two circuits were both normal. After the touch-and-go following the second circuit, the aircraft climbed straight ahead likely to conduct a third circuit. Before the aircraft reached the departure end of Runway 28, the pilot initiated a left turn. At the same time, the pilot made a radio call on the CYRP aerodrome traffic frequency, reporting an unspecified engine issue.

At approximately 1300, when the aircraft was approximately 787 ft (240 m) south of the runway and still in the left turn, a loss of control occurred and the aircraft entered a near-vertical descent, impacting the ground in a wooded area (Figure 2). The exact altitude at which the loss of control occurred could not be determined; however, based on primary radar data supplied by NAV CANADA, it was determined that the loss of control happened at an altitude below 550 ft above ground level (AGL).

The pilot was fatally injured.

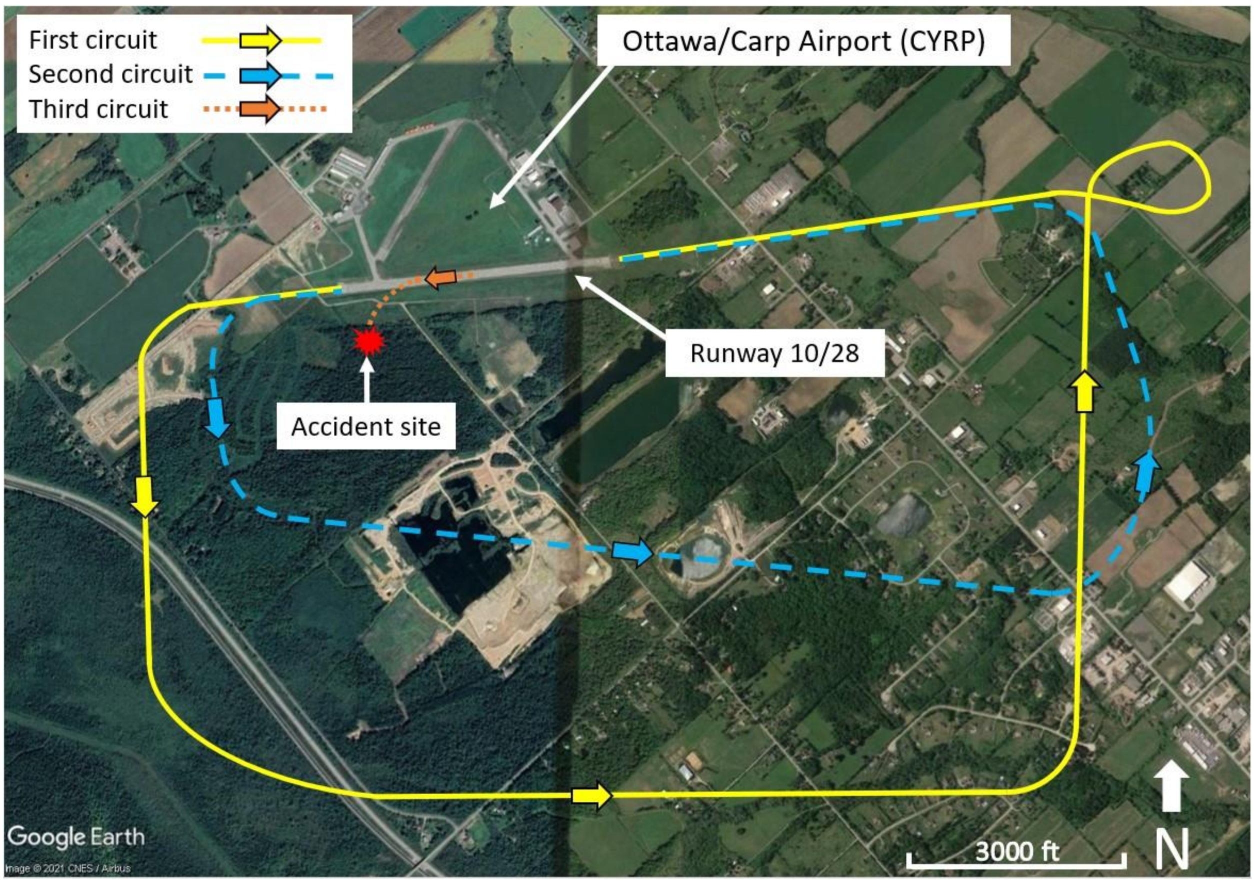

Figure 2. Map showing the occurrence aircraft's circuits and the accident site (Source: Google Earth, with TSB annotations)

Aerodrome information

CYRP has two runways. Runway 10/28, on which the occurrence aircraft was conducting circuits, is an asphalt runway that is 3 936 ft long and 98 ft wide. Runway 04/22 is a gravel runway that measures 2 205 ft long by 65 ft wide, and is not maintained in the winter months.

Weather information

The weather was suitable for the flight under visual flight rules (VFR). The hourly aerodrome routine meteorological report issued at 1300 for CYOW, the closest airport to the accident site, reported the winds from 290° true (T) at 10 kt, gusting to 17 kt. Visibility was 15 statute miles (SM). There were few clouds at

6 000 ft AGL, with a temperature of −8°C and a dew point of −18°C. The altimeter setting was 30.29 in. of mercury.

Pilot information

The occurrence pilot held the appropriate licence for the flight in accordance with existing regulations.

Aircraft information

The occurrence aircraft was a two-seat tandem, low-wing aircraft made mostly from carbon fibre. It was equipped with a Rotax 912 ULS3 engine, a retractable landing gear, a bubble canopy and an optional ballistic parachute.

The occurrence aircraft was manufactured and received its flight test certificate in Italy in 2015, and was imported to Canada in 2019. It was one of three Blackshape S.P.A. Prime aircraft registered in Canada. The aircraft had accumulated approximately 65 hours of total air time before the occurrence and had been owned by the occurrence pilot since August 2019. A review of the aircraft technical records indicated that the last annual inspection was conducted in January 2021.

The maximum certified take-off weight for the aircraft was 620 kg, and at the time of the occurrence, its weight was estimated to be approximately 538 kg. An estimated weight and balance calculation was completed, and it was determined that the aircraft was being operated within the weight and balance limitations at the time of the occurrence.

The aircraft was registered with Transport Canada and had been issued a Special Certificate of Airworthiness (C of A)—Limited. The Limited classification means that the aircraft model must meet specific eligibility criteria outlined in the *Canadian Aviation Regulations* (CARs) Standard 507, or those in an exemption to that standard. Except where specifically stated in the operating limitations, aircraft issued any Special C of A, including one with a Limited classification, are subject to the same operational and maintenance regulations as aircraft with a normal C of A issued pursuant to section 507.02 of the CARs.

Ballistic parachute

The aircraft was equipped with a Magnum 601 ballistic rescue parachute system made by Junkers. The system is designed to be used in the event of an in-flight emergency and can be activated by the pilot from inside the cockpit.

When the pilot activates the system, it triggers a ballistic charge that launches the parachute, which is harnessed to three anchor points attached to the aircraft's structure. The system is designed to slow the aircraft's descent to the ground in an upright, controlled manner.

The parachute and associated ballistic charge are mounted in a compartment forward of the cockpit canopy. The Blackshape S.P.A. Prime *Pilot's Operating Handbook and Airplane Flight Manual* explains the sequence for operating the system in the event of an airborne emergency. The minimum altitude required to deploy the ballistic parachute is 80 m or 262 ft AGL.

The examination of the wreckage from this occurrence suggests that the emergency rescue system was not activated by the pilot.

Flight display and angle-of-attack indicator

The occurrence aircraft was equipped with a Dynon Skyview Classic electronic flight instrument system display, which provides the display of primary flight instruments with an angle of attack (AOA) indicator displayed on the same screen.

The AOA indicator provides a visual indication of the AOA and improves pilot awareness of the situation when the aircraft is approaching a critical AOA. Such systems provide continuous visual information on the stall margin, regardless of attitude, airspeed, or power, and can help pilots avoid an aerodynamic stall.

The AOA audio alarm can be configured either as a steady tone that sounds very near the critical AOA or, in the case of the occurrence aircraft, as a system-generated beeping tone that increases in frequency as the AOA becomes higher until, very close to the critical AOA, it turns into a solid tone. Beyond this point, the aircraft will enter an aerodynamic stall if corrective action is not taken.

Stall speed

The Blackshape S.P.A. Prime Pilot's Operating Handbook and Airplane Flight Manual contains a performance section that includes a table (Table 1) indicating the calculated stall speed for the aircraft at two different weights: 500 kg and 620 kg. The table references three different flap configurations: level flight, a 30° bank angle, and a 60° bank angle.

Table 1. Stall speeds at different weights and flap configurations for the Blackshape S.P.A. Prime BS100 (Source: TSB table based on Blackshape S.P.A. *Pilot's Operating Handbook and Airplane Flight Manual*, Table 5-1: Stall Speeds)

Aircraft weight	Flap configurations	0° bank angle (level flight)		30° bank angle		60° bank angle	
		KCAS*	km/h	KCAS	km/h	KCAS	km/h
620 kg	Flaps up	50	93	54	100	71	131
	Flaps takeoff (10°)	48	89	52	96	68	126
	Flaps down (30°)	45	83	48	90	64	118
500 kg	Flaps up	46	85	49	91	65	120
	Flaps takeoff (10°)	44	81	47	87	62	115
	Flaps down (30°)	41	76	44	82	58	108

* KCAS: kt calibrated airspeed

Wreckage information and flight profile

The occurrence happened after the second touch-and-go, during the departure for the third circuit while the pilot was making a left turn. The aircraft entered a near-vertical descent and collided with the ground at the base of a stand of large trees.

The maximum angle of bank during the left turn could not be determined; however, the approximate airspeed at the time of the loss of control was calculated to be 45 kt indicated airspeed (±5 kt) based on analysis of a video recording from a nearby security camera. The calculated descent rate was between approximately 4 000 and 6 000 fpm at the time at which the aircraft struck the ground. The wreckage was examined to the extent possible, given that the aircraft had been almost entirely consumed by fire.

Due to the level of damage to the occurrence aircraft, the investigation was unable to determine the flap position at the time of the occurrence. As well, a flight control continuity check could not be performed due to the level of damage. However, no problem had been reported with the flight control system. The landing gear was in the down position at the time of the occurrence.

The emergency procedures section of the *Pilot's Operating Handbook and Airplane Flight Manual* lists 65 kt calibrated airspeed as the speed to be kept during an emergency procedure for an engine failure after takeoff with the flaps in the take-off position.

Engine and propeller examination

The engine examination did not find any mechanical failures of the crankshaft, pistons, valves, gearbox, or any other major engine components. There were no signs of catastrophic engine failure. Damage to the propeller indicated the propeller was rotating at impact; however, it could not be determined how much engine power was being produced.

The investigation was unable to assess the integrity of the associated engine components such as the fuel and ignition systems due to the extent of heat damage. The reason for pilot's reported engine issue could not be determined.

Aerodynamic stall during a turn

An aerodynamic stall occurs when the wing's AOA exceeds the critical angle at which the airflow begins to separate from the wing. When a wing stalls, the airflow breaks away from the upper surface, and the amount of lift generated is reduced to below that needed to support the aircraft.

The speed at which a stall occurs is related to the load factor of the manoeuvre being performed. The load factor is defined as the ratio of the aerodynamic load acting on the wings to its gross weight and represents a measure of the stress (or load) on the structure of the aircraft. By convention, the load factor is expressed in *g*.

In straight and level flight, lift is equal to weight, and the load factor is 1 *g*. In a banked level turn, however, greater lift is required. It can be achieved, in part, by increasing the AOA (by pulling back on the stick/elevator control), which increases the load factor. As the load factor increases with bank angle, there is a corresponding increase in the speed at which the stall occurs. As a result, steep turns are often accomplished with the addition of engine power to maintain or increase airspeed. A stall that occurs at a higher speed as a result of a high load factor, such as bank angle increased beyond 30°, is called an accelerated stall.

Accelerated stalls are usually more severe than unaccelerated stalls and are often unexpected. As an example, a stall from a steep bank angle (greater than 30°) can result in one wing stalling before the other, leading to a spin and the aircraft rapidly losing altitude.

Turning back following engine failure

In this occurrence, an examination of the departure flight paths flown during the previous circuits and the last departure, combined with the fact that the landing gear had been left in the extended position, suggest that the pilot may have attempted to turn back to the runway after reporting an unspecified engine issue shortly after becoming airborne.

If a mechanical problem occurs during takeoff that necessitates an immediate landing, pilots are faced with either attempting to carry out a forced landing in an unsuitable location—risking damage to the aircraft and injury to themselves—or attempting a 180° turn back toward the departure point.

Transport Canada's *Flight Training Manual* states the following:

Numerous fatal accidents have resulted from attempting to turn back and land on the runway or aerodrome following an engine failure after take-off. As altitude is at a premium, the tendency is to try to hold the nose of the aircraft up during the turn without consideration for airspeed and load factor. These actions may induce an abrupt spin entry. Experience and careful consideration of the following factors are essential to making a safe decision to execute a return to the aerodrome:

1. Altitude.
2. The glide ratio of the aircraft.
3. The length of the runway.
4. Wind strength/ground speed.
5. Experience of the pilot.
6. Pilot currency on type.

Should you have only partial power, it may be possible to complete a circuit and execute an emergency landing.

Safety message

In this occurrence, the pilot reported an unspecified engine issue shortly after becoming airborne and conducted a low-altitude left turn. Numerous fatal accidents have occurred involving pilots attempting to turn back to the runway or aerodrome following an engine failure after takeoff. Given the aircraft's low altitude and low airspeed during the initial climb, turn-back manoeuvres during this phase of flight involve a high level of risk and often lead to a loss of control and collision with terrain.

2022-2023 Remotely Piloted Aircraft System (RPAS) Recency Requirements Self-Paced Study Program

Completion of this questionnaire satisfies the 24-month recurrent training program requirements of 901.56(1)(b)(iii) or 901.65(1)(b)(iii) in the *Canadian Aviation Regulations* (CARs).

All remotely piloted aircraft system (RPAS) pilots who meet the requirements in CAR 901 are to answer general aviation questions 1 to 15 **and** the following applicable additional questions:
RPAS Basic pilots—questions 16 to 21.
RPAS Advanced pilots—questions 16 to 26.

The completed copy is to be retained by the pilot.

References are listed after each question. Many answers may be found in the *Transport Canada Aeronautical Information Manual* (TC AIM). Other answers can be found in the *AIP Canada (ICAO)*. Amendments to these publications may result in changes to answers and/or references.

The following resources are available online:

- TC AIM
- AIP Canada (ICAO)
- Canadian Aviation Regulations (CARs)
- Nav Canada VFR Phraseology

General Aviation Questions

TC AIM—GEN–General

1. How do you subscribe to receive e-mail notifications for the *Aviation Safety Letter* Electronic Bulletin (ASL e-Bulletin) (TP185)?

   ____

Reference: TC AIM GEN 2.2.4 *Safety Promotion*

TC AIM—AGA–Aerodromes

2. What is the wind speed when the dry standard wind direction indicator is 5º below horizontal? ________

Reference: TC AIM AGA 5.9 *Wind Direction Indicators*

3. At flight service stations and remote advisory services equipped with direct wind-reading instruments located at the aerodrome, what does it mean when a Flight Service Specialist says “Runway 03”?

Reference: NAV CANADA Blog—Safety

COM–Communications

4. In communications checks, the readability scale 2 and strength scale 1 mean ________________________ and _____.

Reference: Nav Canada VFR Phraseology

5. Aeronautical radio communications are restricted to communications relating to: a) the safety and navigation of an aircraft; b) the general operation of the aircraft; and c) the exchange of messages on behalf of the pilot.
   Pilots should:
   Keep calls a) ___________ using ______________ __________________ whenever practical;
   b) _________ the content of the message before _________; c) and
   _______ on ________ before speaking to avoid interference with other transmissions.

Reference: Nav Canada VFR Phraseology Recommended Practices

6. For definitions of terminology and phraseology used in aviation in Canada, refer to the_____________________________________, which is available on TC's Web site. Another valuable resource available is NAV CANADA's *VFR Phraseology Guide*, which is available on NAV CANADA's Web site.

Reference: TC AIM COM 1.3 *Language*

MET–Meteorology

7. With regard to weather charts, what is a GFA? ____

Reference: TC AIM MET 4.1

8. The Minister of Transport is responsible for the development and regulation of aeronautics and the supervision of all matters related to aeronautics. For small remotely piloted aircraft (sRPAs), the weather need only be sufficient to ensure that the aircraft can be operated in accordance with the manufacturer's instructions (i.e. temperature, wind, precipitation, etc.) and to allow the pilot or visual observer to keep the sRPA within visual line of sight (VLOS). Where can you find more information regarding the weather, including how to interpret different charts and reports and the general procedures? ___________________

Reference: TC AIM MET 1.1 and RPA 3.2.22

9. With regard to weather reports issued by NAV CANADA, what is a SPECI? ________________________

Reference: TC AIM MET 8.4.1

10. Are the winds reported as true or magnetic in a METAR? ______________________________________

Reference: TC AIM MET 8.3 (f)

RAC–Rules of the Air and Air Traffic Services

11. How long must a pilot wait after cannabis use prior to exercising duties as a crew member? _____________

Reference: CAR 901.19(2) and Transport Canada Civil Aviation's (TCCA) guidance on cannabis legalization

12. When you are operating an aircraft near an uncontrolled airfield, at what altitude would you expect a manned aircraft to enter their circuit? ____

Reference: TC AIM RAC 4.5.2(a)

13. No person shall act as a crew member of an aircraft within _____hours after consuming an alcoholic beverage.

Reference: CAR 901.19(2)

14. Pilots intending to fly in Class F advisory airspace are encouraged to monitor an appropriate frequency, to broadcast their intentions when ______ and _______ the area, and to communicate, as __________, with other users to ensure flight safety in the airspace. In a Class F advisory uncontrolled airspace area, _______MHz would be an appropriate frequency.

Reference: TC AIM RAC 2.8.6 and RPA 3.2.15.3

MAP—Aeronautical Charts and Publications

15. Where can NOTAMs be found? ____

Reference: TC AIM MAP 3.5 *NOTAM Distribution*

RPAS—Specific Questions

16. The Drone Safety Web site names four main areas that limit the use of your drone and prohibits a pilot from flying a drone there. What are they? ______________________________

Reference: Drone Safety Web site

17. How do the CARs define the word "autonomous"? ______________________________

Reference: CAR 900.01

18. The RPA—*Remotely Piloted Aircraft* chapter in the TC AIM provides information and guidance as an example of an acceptable means of demonstrating compliance with regulations and standards. Section 3.2.8 *Visual Observers* provides a CAR reference regarding communication with the RPAS pilot. What shall the pilot and visual observer(s) keep doing throughout the RPAS operation*?* ____________________

Reference: TC AIM RPA 3.2.8

19. The CARs state: "No holder of a pilot certificate—small remotely piloted aircraft (VLOS) […] shall operate a remotely piloted aircraft system unless the holder has, within the 24 months preceding the flight […] successfully completed: ______________________________

Reference: CAR 901.56 or 901.65

20. Reckless or negligent operation of an RPAS is applicable to?
    a) Only small RPAS operated under the Basic Operations regulations
    b) Only small RPAS operated under the Advanced Operations regulations
    c) Not applicable to micro RPAS operated in Canada
    d) All remotely piloted aircraft systems

Reference: CAR 900.02

21. Transport Canada provides five privacy guidelines for recreational drone operators regarding the *Privacy Act*. What are the five guidelines? ______________________________

Reference: Drone Safety Web site

22. Personal Information for RPAS users with regard to privacy guidelines for drone users is defined as? ____

Reference: Drone Safety Web site

23. With regard to control zones in Canada, what does the TC AIM highlight for the following?
    a. Control zones are designated around certain aerodromes to ______________________________________ and to __________________________.

    b. Control zones having a civil control tower within a terminal control area normally have a __NM radius. Others have a __NM radius, with the exception of a few which have a ___NM radius.

    c. All control zones are depicted on __ aeronautical charts.

Reference: TC AIM RAC 2.7.3

24. When using your RPAS in Canada near the U.S. border, can you fly outside of Canadian airspace? Yes / No

Reference: CAR 901.13

25. Information on "Drone innovation and collaboration in Canada" can be found on the Drone Safety Web site, in the "Collaborating at home" section. What four topics received from Drone Talks: Planning for Success workshops in 2019 does it summarize? ____

Reference: Drone Safety Web site

26. In the CARs, what Part IX subpart regulates the requirements for special flight operations outside of those mentioned in Part IX Subpart 1—General Operating and Flight Rules? ____________________________

Reference: CAR 903.01

Answers can be found on page 30.

Answers to Remotely Piloted Aircraft System (RPAS) Recency Requirements Self-Paced Study Program

1- Readers can subscribe to the *Aviation Safety Letter* (ASL) (TP185) e-Bulletin notification service to receive e-mails that announce the release of each new issue by going to the Transport Canada Civil Aviation e-Bulletin page and following the step-by-step instructions.

2- 10 knots (kt).

3- Runway 03 is the determined runway for use. The new Flight Service Specialist runway determination allows Flight Service Specialists to determine the runway with clearer and more concise phraseology. This change will take effect only at flight service stations and remote advisory services equipped with direct wind-reading instruments located at the aerodrome.

4- readable now and then; bad

5-
- a) brief, concisely, standard phraseology
- b) plan, transmitting
- c) listen, frequency

6- *Glossary for Pilots and Air Traffic Services Personnel* (AC 100-001)

7- The graphic area forecast (GFA) consists of a series of temporally adjusted weather charts, each depicting the most probable meteorological conditions expected to occur at or below 24 000 feet (ft) over a given area at a specified time.

8- The MET—*Meteorology* chapter of the TC AIM.

9- **Aerodrome special meteorological reports (SPECI).** Special observations will be taken promptly to report changes that occur between scheduled transmission times whenever one or more elements have changed in the amount specified.

10- True. Wind direction is always three digits, given in degrees (true) but rounded off to the nearest 10º (the third digit is always a “0”).

11- 28 days. The CARs require fitness for duty and state that no person shall act as a crew member of an aircraft while using or under the influence of any drug that impairs the person’s faculties to the extent that aviation safety is affected. Transport Canada’s new policy prohibits flight crews from consuming cannabis for at least 28 days before being on duty.

12- The circuit is normally flown at 1 000 ft above aerodrome elevation (AAE).

13- 12

14- entering; leaving; necessary; 126.7

15- NAV CANADA’s Web site

16-
- a) Airports, heliports, and aerodromes
- b) National parks
- c) Emergency sites
- d) Advertised events

17- “Autonomous,” with respect to a remotely piloted aircraft system, means that the system is not designed to allow pilot intervention in the management of a flight.

18- The pilot and visual observer(s) shall remain in constant and immediate communication throughout the RPAS operation, as stated in CAR 901.20.

19-

a) either of the examinations referred to in paragraphs 901.55(b) and 901.64(b),
b) a flight review referred to in paragraph 901.64(c), or
c) any of the recurrent training activities set out in section 921.04 of Standard 921—*Small Remotely Piloted Aircraft in Visual Line-of-Sight (VLOS).*

20- d) All remotely piloted aircraft systems

21-

a) Be accountable
b) Limit collection
c) Obtain consent
d) Store information securely
e) Be open and responsive about your activities

22- Personal information about an identifiable person. It can include a name, a picture of a person's face, or a licence plate number.

23-

a) Keep IFR aircraft within controlled airspace during approaches; facilitate the control of VFR and IFR traffic
b) 7; 5; 3
c) VFR

24- No

25-

a) Airspace and RPAS Traffic Management (RTM)
b) Beyond Visual Line of Sight (BVLOS) operations
c) Airworthiness and certification
d) Pilot licensing and training

26- Subpart 3–Special Flight Operations–Remotely Piloted Aircraft Systems CAR 903.01

WHERE DID IT COME FROM?

Where is it going?

canada.ca/general-aviation-safety

TP 7088E

Transport Canada Transports Canada

Canada