Transport Canada Safety and Security
Transports Canada Sécurité et sûreté

Aviation Safety Letter

TP 185E
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Learn from what others are doing right...

Issue 4/97

Electrical Fire

Overcome by electrical fire.

The Beech Baron pilot was on a single-pilot courier run between Winnipeg, Manitoba, and Thunder Bay, Ontario. He had made two stops and was inbound to Thunder Bay when he advised air traffic control that he had "a minor electrical problem with smoke in the cockpit."

Three minutes later, he announced that he was experiencing increasing smoke in the cockpit. Radar contact was then lost as the aircraft descended below the radar horizon.

The aircraft, found the next afternoon by a search and rescue (SAR) aircraft, had been destroyed and the pilot killed on impact.

Although the Transportation Safety Board investigation has not yet been completed, it seems likely that the pilot was overcome by the electrical smoke, fumes and/or fire and lost control of the aircraft. The fact that he continued to communicate and his transponder continued to function until radar contact was lost would seem to indicate that he did not carry out the appropriate check for an electrical fire.

Most aircraft checklists are fairly generic when it comes to electrical smoke or fire:

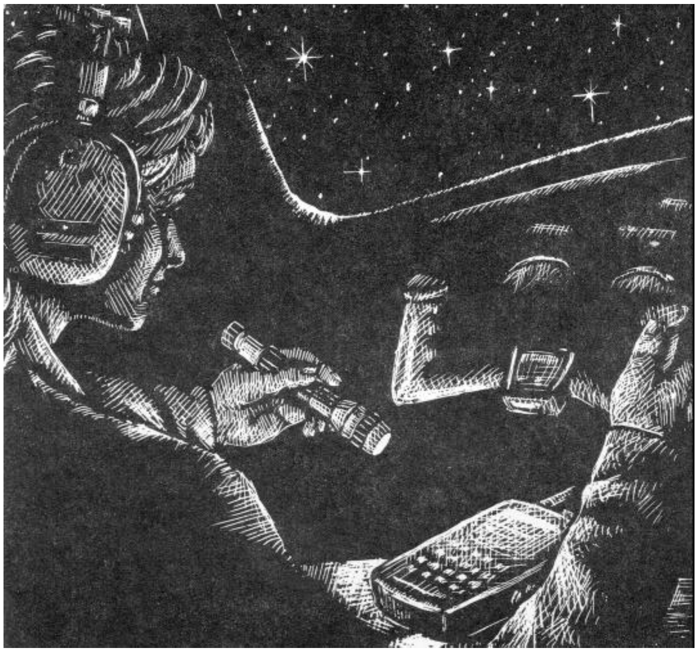
- Immediately turn OFF the battery and generators to eliminate the source. Even in instrument conditions, you can still fly the aircraft using the remaining air-driven instruments, as in the following story about one pilot's total electrical failure at night over the cold grey North Atlantic. One big difference between the two occurrences was the availability of portable communications. If he had had he another means of communication, the Baron pilot might not have been so hesitant to turn off all electrics.
- Go on oxygen and don a smoke mask if you have one.
- Turn OFF all electrical switches. With the source eliminated, the smoke should disappear or the fire go out.
- Essential electrics can then be brought back online one item at a time, while ensuring that the smoke does not re-appear. The key word is "essential." If you don't absolutely need it, don't turn it ON.

Electrical smoke or fire is not a minor problem; it is just as critical an emergency as an engine failure on takeoff is.

THINK COLD-WEATHER FLYING

Canada

Total Electrical Failure . . . Using Your Resources



The ferry pilot was making a night transit from Reykjavik, Iceland, to Florida via St. John's, Newfoundland, in a Britten-Norman Islander.

Sometime after departing Iceland, she noticed that the right alternator had failed, but she elected to continue to St. John's.

About 160 mi. from destination, still over the cold grey North Atlantic, she had a complete electrical failure, leaving her without light, radios or navigation aids. However, she was not without resources: using a portable global positioning system and a flashlight, she was able to continue to St. John's, where, with the aid of a portable radio, she re-established communications.

The weather was 300 ft. overcast with 2 mi. visibility and, without electrical power, she was unable to fly an instrument approach. Undaunted, air traffic control provided the pilot with vectors for a successful emergency surveillance approach.

As the aircraft touched down, one engine quit. The pilot shut down the other engine after the landing roll.

After the aircraft was towed to the ramp, she called the tower controller to thank her for her assistance during the approach.

That's keeping cool and using all of your resources.

Maintenance found that the right generator had failed owing to an electrical fault, the left generator was hanging by one bolt, and the battery was completely drained.

Winter Fog

I was intending to depart Watson Lake, Yukon Territory, in my Seneca II for an IFR flight to Whitehorse. A telephone weather briefing had the Watson Lake 1500Z weather as 400 ft. obscured, with the visibility 1/2 mi. in fog, temperature -24°, dew point -27°, and wind calm. At 1600Z, it was 500 ft. obscured with 1 mi. visibility in fog.

On arriving at the airport, we started the engines. A radio call to the Watson Lake community aerodrome radio station revealed that the latest weather was now down to 100 ft. obscured, with the visibility 1/8 mi. in fog, temperature -22°, dew point -25°, and wind calm. This meant, of course, that our departure was going to be delayed, but we decided to taxi the aircraft over to the nearby terminal so that we could at least go inside and be warm while we waited for the weather to improve.

On shutting down and deplaning, I was amazed to note that 1/2 to 3/4 in. of ice had formed on the leading edge and the entire back surface of the propeller blades. The ground run and taxi had taken less than five minutes. The props are electrically heated, but little of the ice was on the heated area.

We removed the ice and, after the fog lifted, we departed without incident. What would have happened had we attempted to take off earlier, I don't know. There would certainly have been substantially more ice on the props after the taxi, run-up and takeoff roll.

It's something to keep firmly in mind when operating in fog at low temperatures.

John Faulkner
Whitehorse, Yukon Territory

There is little data on aircraft icing characteristcs in freezing fog. However, the icing environment is known to be severe. And, evidently, at the propeller (RPM) being used for ground operations, the props became very efficient collectors.

At takeoff RPM, the ice might have been shed, but there are no guarantees. There would likely have been a significant loss of thrust along with a corresponding increase in takeoff distance and a reduced climb performance. If and when the ice broke off, there might have been serious damage from vibration or from ice striking the fuselage or being ingested by the engine. An engine failure with a poorly performing "good" engine is not a happy thought.

As Mr. Faulker wrote, it's something to keep in mind when operating in freezing fog. △

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

Nominations for the TC Aviation Safety Award

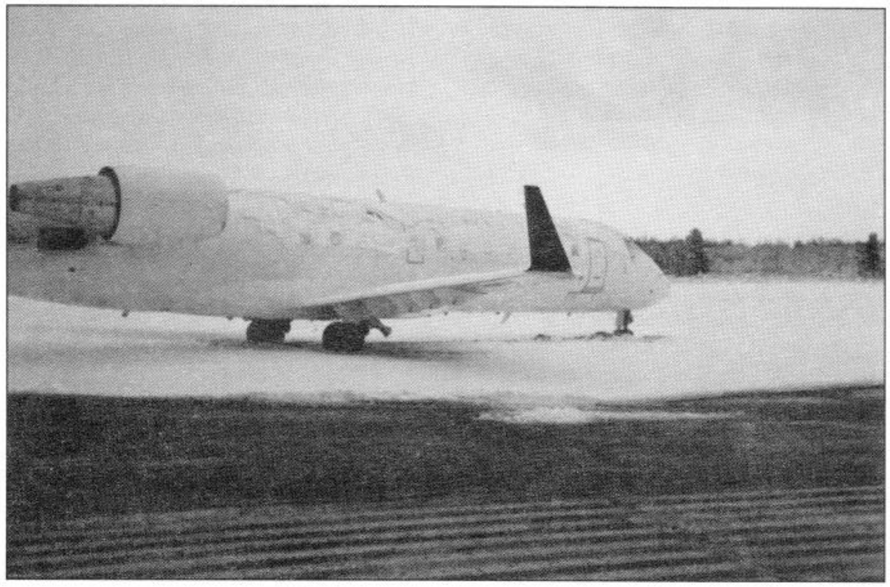
Do you know someone who deserves to be recognized?

The Transport Canada Aviation Safety Award is presented annually to stimulate awareness of aviation safety in Canada by recognizing persons, groups, companies, organizations, agencies, or departments that have contributed in an exceptional manner to this objective.

You can obtain an information brochure explaining award details from your Regional System Safety Officers: (506) 851-7110;
(514) 633-3249;
(416) 952-0175;
(204) 983-2926;
(403) 495-3861;
(604) 666-9517.

The closing date for nominations for the 1998 award is December 31, 1997. △

Slippery-Runway Technique



Runway excursion.

The Canadair Regional Jet (RJ) operating manual contains the following caution about landing on a slippery runway with a crosswind:

> When changing from reverse thrust to forward idle, pause at idle reverse to allow the engines to unspool before selecting forward idle. If reversers are stowed while the engines are still spooled up, there will be a noticeable decrease in deceleration or a forward surge of the aircraft.

It also advises that thrust levels be reduced symmetrically, if necessary, if control difficulties are experienced.

Further advice is provided: "If directional control difficulties are experienced, release the brakes." This is because main-gear tire cornering forces available to counteract drift will be at a minimum when the anti-skid is operating at maximum effectiveness for the existing conditions.

It pays to review those procedures frequently — perhaps as part of the crew's approach briefing when anticipating a crosswind landing on a contaminated runway.

With that in mind, here's an occurrence from last winter:

The RJ was inbound from the sunny south. Destination weather was 800 ft. obscured, visibility was 0.75 mi. in light snow, and the wind was 90° to the runway at 10 kt. No James Brake Index readings were available because snow clearing was in progress and the runway was contaminated with snow and slush, but the runway-condition report passed to the crew a few minutes before landing was :

> 100-ft. centreline, 60 per cent bare and wet, 20 per cent light slush and 20 per cent light snow; outside the centreline 1 in. of slush and snow mixed.

These conditions did not exceed the recommended runway surface conditions for the aircraft type. Nor did the crosswind component of 10 kt. exceed the operator's 15kt. maximum for wet or slippery runways. However, the crew reported after the event that the runway was 100 per cent snow-covered.

The aircraft approach and touchdown speeds were normal and the spoilers deployed at touchdown. Thrust reversers were deployed and rudder and aileron inputs were applied to counteract the left crosswind.

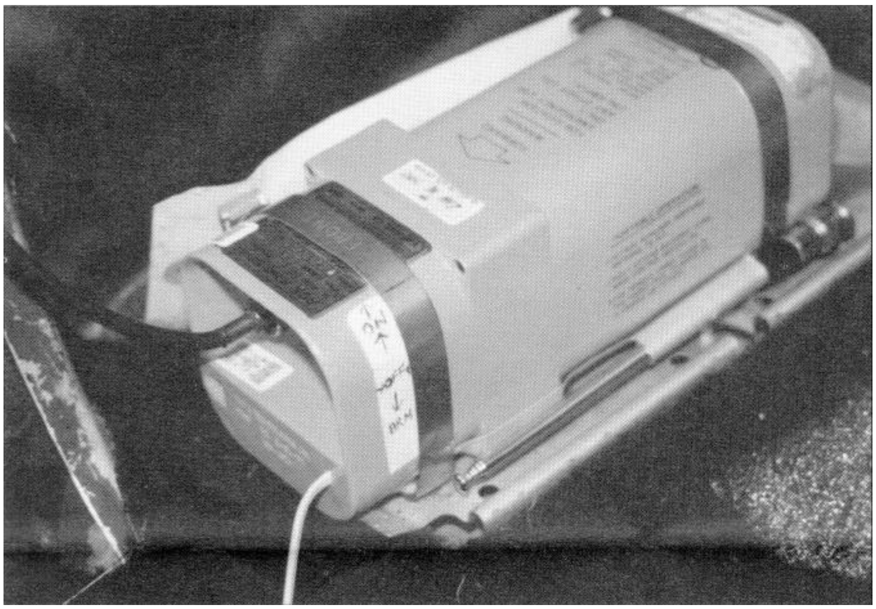
So far, so good. Then, as the

aircraft slowed to about 40 kt., it yawed into wind. To counteract the yaw, the pilot maintained full right rudder and continued braking. He reduced reverse thrust to idle and then quickly stowed the reversers. However, his quick actions did not allow the engines to spool down and they transitioned to forward thrust at a setting higher than the idle-thrust setting. He then reselected first the left-engine and then the right-engine reverser, with the left engine unintentionally slightly above idle power.

The aircraft continued to the left, departed the runway at low speedand, as it came to a stop, its nose gear sank into the soft ground.

There were no injuries or aircraft damage, only a long bus ride to the terminal.

Let's Take the SAR...out of "garbage"!



Have you removed the batteries?

"What's that?" you say. "There's no SAR 'in garbage', regardless of what language you're spelling." That may be true, but a month or so ago, there were numerous SAR techs and other SAR-related people rummaging around in a Canadian garbage dump, much to the consternation of the resident Jonathan Live-it-up seagulls, who are not accustomed to fighting with SAR techs for their share of the — ahem — spoils.

What on earth brought them there? Initially, it was something above the earth. COSPAS-SARSAT to be exact. These alert sentries detected an ELT signal. Using suitable linkage, the SAR system came up with a fairly large circle in which the ELT could be located. A SAR aircraft initially aimed at the circle, then, as it flew closer to the site, homed to the beacon. The spotters squinted through their various windows, looking for the scattered remains of an aircraft.

Despite their squintiest gazes, there was no sign of an aircraft, but there was lots of aerial activity. Flocks of seagulls, buzzards and pterodactyls wheeled, soared and swung in the air currents wafting heavenward from the local garbage dump.

Could the aircraft have gone in like a dart and been covered up with garbage? Perhaps, but there were no reports of missing aircraft in the local area. Besides, as garbage dumps go, this one was reasonable tidy. It did not look as though it had recently been rearranged to accommodate a crashed aircraft.

But there was no doubt about it. The ELT signal was coming from the garbage dump. What to do? Find it. Thus it was that a flock of folks went rummaging through a garbage dump looking for a transmitting ELT.

Eventually, they found it. Down at about the 3-ft. level, searchers came upon a perfectly serviceable ELT, squawking its little electronic heart out. Someone had discarded it with the batteries still inside, and the function switch in the ON position. When the bulldozer operator came along to spread out fresh treats for the gulls, the blade evidently gave the ELT a sharp enough rap to set it singing.

SAR was in the seagull-herding business on the West Coast, as well. Several aircraft, Vancouver ACC and the satellites all reported an ELT close to Vancouver Harbour. Again, there were no reports of missing aircraft, and the ATS people running the harbour traffic still had an equal number of takeoffs and landings. Even if they hadn't, any ELT that had slipped below the waters wouldn't be disturbing all those folks on the surface. A SAR Labrador was summoned. Again, the spotters had their eyeballs spring-loaded to the pop-out position. When they got close to the "on-top" position they looked down and saw a ship. The signal ceased before they could confirm its origin. They went home.

A few hours later, the Coast Guard reported hearing an intermittent ELT signal. Industry Canada was called in. After following the bouncing signal around the Harbour, they were led to the same ship which had attracted the Lab. Being a container ship, it was full of —

what else? — containers. Inside one of the containers was a neatly packaged helicopter headed to an exotic foreign destination.

Inside the helicopter was — you guessed it — an ELT with its function switch in the ARMED position. Apparently the crane operator didn't set the helicopter container on the deck with the same delicacy that a pilot might have used. The ELT thought that it had crashed. Despite all the bits of ship that were in the way, the signal still made it out into the ether with sufficient strength to keep SAR excited for the best part of eight hours.

Not many people are discarding ELTs right now. The ones that they have are adequate; they'll do until the regulations change, some time around the year 2000. But as that time comes closer, more people will buy new ELTs and discard their old ELTs. If they do it the way that the garbage dumper did it, *they could destroy the SAR alerting system for a lengthy period.*

Never, ever, throw away an ELT with a battery in it. Never, ever, throw away an ELT with its function switch ARMED or ON; battery or no battery. The transmission from an undamaged ELT in a garbage dump can mask a transmission from a damaged ELT trying to alert SAR to an emergency.

Similarly, if you're shipping an aircraft by ship, train, truck or air, *ensure that the ELT function switch is OFF. Ifpossible, remove the batteries.* Placard the aircraft when you do this, so that the pilot at the other end of the voyage knows that the ELT- and the batteries-must be re-installed before flight.

The ELT-SARSAT-SAR-CASARA team works well to provide SAR alerting, pinpointing and rescue. Around the world, the team has been instrumental in locating and rescuing 1624 aviators in 755 aviation distresses since 1982.

Good as they are, they need your help. You buy, use, maintain and eventually discard the alerting part of the system. When doing so, please use the same high standards of airmanship that mark your other aviation activities.

Help keep SAR out of garbage dumps. It'll help prevent neurotic seagulls.

Tips on Mountain Flying - Part I by Pat Very

When the geography of the land is irregular, as it is in the mountain and coastal areas, flying can prove to be the most efficient and cost-effective way to travel. The spinoff to this is the feeling that you get looking out over the spectacular beauty and awesome ruggedness of the panorama below. It can be truly breathtaking.

Here are a few tips that I've picked up over the years that you may find helpful when contemplating flight out West, in God's country.

Looking out for Number One ...and Your Passengers

The key word when it comes to mountain flying has to be flexibility. You must gear your mind for constant change and be ready and willing to adjust your plans. This is not to say that the trip has to be cancelled if you run into weather, but rather rethought. Maybe the primary route is not such a good idea on that particular day. A good mountain pilot will make that ssessment, adjust his or her routing, notify the FSS as soon as possible and carry on. Be flexible: have a plan B or C or D...

You must plan to have as many things going for you and your passengers as you possibly can. Filing a flight plan along with any amendments to your route can enhance your chances of survival in the event of a mishap. What is on board will determine how comfortable your stay will be. Always carry appropriate survival gear and clothing for you and your passengers, make sure that you dress for the terrain, and carry a good first-aid kit. Remember that being 10 min. from home in the mountains can put you into country that could severely strain your survival skills. Always let someone know where you're going and when you expect to return, even on short flights. Make sure that your ELT is operational, regardless of the inspection or battery date.

Know your aircraft's performance, especially how much room it takes to turn it around. Practise and become proficient in minimum-radius turns. Turning is part of learning to fly in the mountains.

Schedule frequent stops when flying unfamiliar mountain routes, Talk to local pilots; I've usually found them to be friendly, helpful and very knowledgeable. Other benefits of stopovers are enjoying the local topography and becoming familiar with the airport and local services, such as courtesy cars, rentals and proximity to hotels. You never know — on a future trip, when the weather turns sour, you might be spending the night there.

Assessing the Conditions

Visibility is essential when mountain flying. What is marginal on flat land might not be acceptable in the mountains. If you encounter poor visibility en route, slow down, and remember that the radius of the turn increases with speed. Be flexible: consult plan B.

Try to determine the wind direction and strength when entering mountain valleys and passes. Look for clues such as ridge and peak plumes created by compression, forming clouds on the downwind side. On the water, whitecaps will form at about 10 mph. Bear paws, those dark patches on the water, are caused by downbursts of wind, indicating gusty conditions, downdrafts and probably a rough ride. Trees will bend and appear lighter on the upwind side. Cumulus and towering cumulus will often slope downwind at the top, becoming a great wind indicator.

Always check both sides of valleys when they are obscured by cloud. Stratus fractus, the ragged cloud often encountered in moist air masses, clings to the valley walls. The view from one side can give you a totally different perspective than that from the other.

Cumulonimbus clouds are bad news in the mountains and should be avoided like the plague. Visibility can drop to near zero in no time, and downdrafts created by the storm cell can rush out of the valleys and over the ridges with a vengeance, generating severe turbulence. They are also, by the way, the cause of many a forest fire in those out-of-the-way valleys. If you came across a fire en route, punch the position into your long-range navigation system (LORAN) or global positioning system (GPS) and pass it on to the nearest FSS as soon as possible.

Outflow winds are a common occurrence at certain times of the year in this area and have to do with pressure differences between the interior and the coast. Air flows out from the interior through valleys and fjords and, as it accelerates in venturi effect, it can reach velocities as high as 70 and 80 mph. The mechanical turbulence generated by these winds can be enough to ruin your day. Surprisingly enough, though, because of the nature of these winds, flying 2000 to 3000 ft. above the range usually puts you in smooth air. That said, you should always be cautious and expect turbulence when surface winds are high.

Next issue —
Enroute & Mountain Strips

About the Author

Pat Very is a private pilot with a commercial licence. He started flying in 1970 on the East Coast, but since moving out West in 1978, he has accumulated over 4000 hrs of experience in and around the Rocky Mountains.

Through the Mountains

He departed the Calgary area late in the afternoon on a VFR flight to the West Coast. However, the planned six-hour flight ended tragically less than an hour later when he mistakenly followed the wrong fork in the river and turned into a narrow box canyon.

Surrounded by 9000-ft. mountains, he could neither outclimb the terrain nor turn around. As he strained for altitude, the classic stall/spin occurred, with no altitude or room to recover. Neither he nor his passenger survived.

Weather did not bring about this accident, as it was a clear and sunny afternoon with light winds; nor was a lack of mountain-flying experience to blame, as the Cessna 150 pilot had flown the routes in the Rocky Mountains on numerous occasions.

Three factors may have led to the accident: vision, available charts and altitude.

First, the pilot was classified as having monocular vision (one good eye), and he was looking directly into the afternoon sun. Depth perception and map reading would have been difficult even without his visual handicap.

Second, the only map of the accident area recovered from the crash site was a 1:1,000,000 scale chart. World aeronautical charts show little detail of the valleys and passes in the mountains, and so it would have been easy to mistake the turn along the south branch of the river for that of the main river 3 mi. farther on.

Third, the pilot had flight-planned an altitude of 9000 ft., but evidently had not climbed to that altitude: the accident site was at the 6300-ft. level. △

When Hiring a Pilot

Loss of control.

The Cessna 337 pilot was en route on an IFR flight plan originating from an uncontrolled aerodrome in Olds to Peace River, Alberta. Thirteen minutes after takeoff, he received his IFR clearance and was cleared to maintain 8000 ft. Several minutes later, he was observed at 6600 ft. and the controller queried about the altitude. The pilot responded that he was between layers but would start a slow climb. Three minutes later, he was still at the same altitude and was again queried about his intentions. This time, he responded that he had a rough-running engine but would continue the climb and make a decision on the engine when he got to Rocky Mountain House.

Nineteen miles from Rocky Mountain House, the pilot requested and received clearance to the airport. Radar showed him heading to the nondirectional beacon.

Twelve minutes later, he asked for and received the latest weather from the UNICOM operator: 500 ft. broken and 1500 ft. overcast, with visibility 0.5 mi. in light snow and fog. He stated that he had the ground in sight.

Radio contact was lost and the aircraft failed to arrive. An air/ground search located the plane the following morning 2 mi. from the airport. It had struck a stand of trees in a steeply banked out-of-control attitude and been consumed in a post-crash fire. Neither the company president nor his pilot had survived.

Several witnesses had observed the aircraft near the airport. All reported that the front propeller was rotating slowly. (Transportation Safety Board (TSB) investigators later confirmed that the front engine had a cracked No. 4 cylinder, accounting for the reported rough-running engine. The front propeller was at the low-pitch stop at impact. However, *the pilot had not completed the engine failure check* to the point of feathering the propeller.) One witness familiar with the C337 stated that the rear engine did not sound as if it was at high power and that the aircraft appeared to be wallowing at low speed in a nose-high attitude. These witnesses also reported heavy snow showers in the area, with visibility as low as 0.25 mi. in snow and fog.

The pilot had received a detailed weather briefing by phone prior to the departure from Olds. The forecast predicted extensive low cloud persisting along the foothills throughout the forecast period, creating ceilings 0 to 1000 ft. AGL, with visibilities of 0.5 to 4 mi. in snow and fog. Severe clear icing in local freezing drizzle was included in the forecast. Another C337 pilot who flew into Rocky Mountain House 30 min. after the accident reported picking up 0.5 to 0.75 in. of ice during the approach. The accident aircraft was not equipped for flight into known icing conditions.

Although the pilot held an airline transport licence, his medical category had expired and his licence was valid for private pilot privileges only. His instrument rating had expired 10 months prior to the accident flight. During the two years before it expired, his instrument rating had twice been suspended. It was first suspended when he attempted to take off into known icing conditions with an aircraft that was not properly equipped — during an instrument check ride. The second suspension came when he failed to follow his air traffic control (ATC) clearance. He did both on the accident flight.

He initiated this flight despite his knowledge of the weather and icing conditions and the capabilities of the aircraft. He maintained an altitude of 6600 ft., between layers, possibly to avoid icing conditions, without informing ATC of the deviation from the clearance to 8000 ft. that he had accepted.

When hiring a pilot, how carefully do you check his or her paperwork, capabilities, past performance and references?

The TSB accident report (A93W0026) concluded, in part, that:

> It is possible that the aircraft was unable to maintain flight on one engine because the front propeller was not feathered, and because the aircraft was likely contaminated with ice during the descent through clouds.

Reduced performance and environmental conditions ended with the loss of control at an altitude that did not leave room for recovery.

V_1 Decision Revisited

Issue l/97 of the *Aviation Safety Letter* featured a story about a runway overrun after a rejected takeoff.

One reader rejected our contention that “a reject decision at V_1 plus leaves no doubt — you *are* going off the end.” The statement was made in the context of a balanced-field scenario.

Here are the reader’s comments:

To quote you: “But a reject decision at V_1 plus leaves no doubt — you *are* going off the end.”

This is not so, even though many pilots agree with you.

Without complicating the point by discussing the differences between critical-field and balanced-field usage, or the multitude of calculations used to determine whether a given runway is acceptable for use for your flight, let’s attempt to summarize:

Civil transport jets use a balanced-field concept. Oversimplified, this means that a reject/ abort around V_1 will burn up about the same amount of runway as a “go” decision if you lose an engine near V_1. On heavy, long-haul operations, runway-length requirements usually come damn close to the end of the longest runway available. However, in reality, the vast majority of airline departures do not fall into this category. Excess runway is usually available. Most operators use reduced thrust in this situation. Taking off with minimum allowable reduced thrust is quite common at light takeoff weights off long runways.

V_1, until recently, has been a *published fixed speed* based on two parameters: aircraft weight and flap configuration. The runway length has nothing to do with it, bearing in mind that the runway and flap configuration chosen has already been determined appropriate by the process in para. 3. You’ve determined that it’s long enough, but not how much extra you have. This applies especially to the case in which the runway length is less restrictive than maximum reduced thrust.

Assume that a DC-9 or 737 light enough to depart from Vancouver International Airport’s Runway 12 (7300 ft.) was given a runway change to 26L (11,000 ft.), and chose to keep the same flap/thrust configuration. The planes’ respective V_1 speeds would remain identical. In reality, both aircraft would probably use less flap on the longer runway with an increased fixed V_1, and more reduced thrust. However, in few cases would their runway-length requirements even come close to 11,000 ft.

A reject at V_1 + 20 off Runway 26L in bare and dry conditions, in this hypothetical example, would probably not result in an overrun.

The latest safety evidence suggests that pilots be “go” minded approaching V_1. It’s good advice; however, it’s important that pilots, especially in this expansionary period, be armed with knowledge of all of their options and not just those currently being hyped.

We referred the letter to the experts in Commercial and Business Aviation, and they agreed that a reject at V_1 + 20 probably would not result in an overrun. However, consider what they said in detail:

We agree wholeheartedly with your last paragraph. There is a reason why the safety evidence is biased towards the “go” case. That is because we have learned the hard way that high-speed rejects often fail to achieve the objective, that being a safe recovery from an engine failure or other anomaly on takeoff.

Let’s start with a review of what V_1 is supposed to do for you. A reject initiated at or before V_1 should result in a full stop within the confines of the runway and stopway. A "go” decision at V_1 should result in a successful engine-out takeoff to 35 ft. In both cases, we assume that the runway is bare and dry.

Now let’s talk facts. *High-speed (over 100 kt.) rejects are among the top three causes of aviation accidents and fatalities.* V_1 + 20 in a transport-category aeroplane certainly lies in the high-speed range. How many accidents result from “go” decisions made in the high-speed regime? The numbers are so low as to be insignificant. An aircraft certified to reach 35 ft. with an engine out will still complete a successful takeoff with a “go” decision made up to 5 kt. early. A stop decision made 5 kt. after V_1 doesn’t work out nearly so well.

What limited V_1 for your airplane today? Were you limited by accelerate-stop, accelerate-go or improved climb-obstacle requirements, or brake energy? Unless you have done the calculations yourself, you don’t know. If you don’t know, you cannot determine your maximum safe reject speed. A reject at V_1 + 20 may result in tire or brake failure or fire, and may ultimately leave you outside the confines of your 11,000-ft. runway. As you said in your example, V_1+20 *probably* would not lead to a runway overrun. My question to you as the risk-manager, the pilot-in-command, is, "Why take this risk?"

Rejecting a takeoff above the scheduled V_1 is one of the most hazardous manoeuvres that a crew can initiate. Passenger injury and aircraft damage are very likely. *Unless you feel that the aircraft will be uncontrollable after takeoff, your chances are better in the air.* That is true when there are limiting runway conditions as well as when there is a surplus. High-speed rejected takeoffs result in sideline excursions before the runway end a significant percentage of the time. An 11,000-ft. runway is still only 200 ft. wide.

A switch to a longer-than-planned runway may be a bonus. Do the same speed schedule and configuration apply? Maybe; maybe not. The new runway, although longer, may have a different slope or obstacle environment. As a result, V_1 may be limited differently than on the other runway. That's why the performance rules in the *Canadian Aviation Regulations* consider the runway in use when determining takeoff-weight limitations.

A crew faced with a runway change — any runway change — should recalculate the speeds for the weight, configuration and power setting appropriate to the new runway and its limiting obstacles. If a crew desires additional safety margins, using maximum approved thrust (or minimal thrust reduction) is a much safer option than planning an overspeed reject. Determine a V_1 for takeoff and stick to it!

Aeroplane Performance (TP 12772) addresses some of these issues. To order a copy, call (613) 991-9973 (English) or (613) 991-9970 (*français*), or fax your request to (613) 998-7416.

to the letter

Re: Struck by Lightning

Dear Mr. Schonberg,

As an interested and appreciative reader of the *Aviation Safety Letter*, and a professional pilot for the past 12 years, I was somewhat taken aback by the tone of the article on lightning strikes in Issue 3/97. The article insinuates that many highly trained and experienced airline crew members flew aircraft near a lightning storm merely to meet a schedule. The article also suggests that the on-board weather radar would have indicated this hazard, and that the crews either didn't use the radar or didn't care about the returns. I feel that both of these comments are inaccurate at best.

As you know, weather radar indicates returns from precipitation and is consequently very useful in avoiding turbulence, windshear and hail, but gives a pilot no indication of the electrical activity in a storm cell. Recent research suggests that many lightning strikes occur when the aircraft is abeam a storm cell, rather than under or in a cell, and that they can occur at distances up to 20 NM from the edge of a storm cell. In addition, the lightning-strike potential around a storm cell is highly variable and topography-dependent; an area that is safe at one point can quickly become unsafe, and vice versa.

While I am not saying that, with hindsight, the situation could not have been better managed, I feel that it is somewhat unfair to be so quick to judge. If all aircraft avoided thunderstorms by 20 NM at all times, most western Canadian airports would be closed every afternoon in the summer months! Conventional thought and practices seem to indicate that pilots can safely circumnavigate such storms using many sources of information (that is, using weather radar, stormscopes (if the aircraft is so equipped), air traffic control, and pilot weather reports, and merely by looking out the front windshield. Thus, lightning strikes are a fairly rare occurrence and, when they do occur, the design of the aircraft does what it is supposed to do and damage is usually minimal. In light of the above, to suggest that several dozen professional pilots jeopardized their passengers' safety to make a schedule is somewhat rash.

Thank you once again for the *Aviation Safety Letter*. I find it to be a truly useful and educational resource that is very easily understood.

Kevin Maher
Vancouver, British Columbia

More Lightning

The article states that "The lightning could easily have fried the aircraft's electronics...."

Transport-category aircraft certified to the *Federal Aviation Regulations* in the United States, *Joint Aviation Requirements* in Europe, or *Canadian Aviation Regulations* in Canada have to meet stringent airworthiness standards for protection against the effects of lightning strikes. Two types of effects have to be considered:

(1) <u>direct effects</u>: The aircraft must be shown to be able to withstand a direct lightning strike and not suffer structural or significant surface damage, nor shall any fuel in tanks, lines, and so on, be ignited by the strike; and
(2) <u>indirect effects</u>: The aircraft avionics and electrical systems, including electronic controls for systems such as landing gear, flight controls, and fuel management, must be able to withstand

electrical impulses induced in the aircraft wiring as a result of the electromagnetic field created by a lightning strike.

As you can see from the above, there should be no risk of the electronics being fried. The aircraft may suffer minor surface damage from the lightning-strike attachment or discharge points, and the carrier should conduct a post-strike inspection of the exterior surface to determine the extent of any damage.

A few years ago, I was in a Canadian B-737 that was struck by lightning on approach to Vancouver International Airport. After disembarking, I stood by the window at the gate and was pleased to see a mechanic walking around the aircraft, looking carefully at the radome and rear lower fuselage, including antennas. Obviously, the flight crew had reported the strike to the ground crew.

John Carr
Principal Engineer
Avionics and Electrical Systems Engineering
Aircraft Certification Branch
Transport Canada

Updating Your Global Positioning System ?

The following was taken from a daily occurrence report:

In IFR conditions, a Saab 340 with 20 people on board was cleared for the approach into an MF [mandatory frequency] aerodrome. It was on short final when the FSS staff observed a Robinson RH22 inbound near the approach path to the runway.

The helo was not in radio contact with FSS and was not monitoring the MF. The Saab pilot was able to land safely and saw the helicopter on short final,

FSS staff approached the pilot of the helicopter after it landed and the pilot said [that] he had been communicating on 118.0 [MHz] (that frequency had been decommissioned [three] years previously). He said [that] this frequency was provided by his GPS equipment, but, on [being] questioned, admitted that the GPS database had not been updated for “a couple of years.” He did not consult his copy of the *[Canada] Flight Supplement,* which was on the seat beside him, because he was "too busy.” When FSS staff asked for his name, the pilot declined to give it, and said [that] “[he hoped] nothing would come of this.

Upon departure, the pilot did not file a flight plan; rather, he flew on a company flight note.

Weather at the time of the incident was 700 ft. broken [and] 2000 ft. overcast, [with] visibility 5 mi. in light rain and fog.

Communicating on the right frequency in an MF is mandatory. Having an up-to-date *Canada Flight Supplement* and looking at it or getting your GPS database updated regularly may cost a few dollars, but a mid-air collision could ruin the day for a lot of people.

What’s New in Prairie and Northern Region

As part of Transport Canada’s ongoing effort to prevent aviation accidents and promote safety in the industry, a new Regional Aviation Safety Council (ASC) for the Prairie and Northern Region is being created to identify safety issues and to provide managers with information to implement corrective measures.

The ASC quarterly meetings will rotate among regional centres. To play an active role, contact Rod Ridley at (204) 984-4114 or Carol Beauchamp at (403) 495-2258. The first meeting is scheduled for **Thursday, October 16, 1997, at 7 p.m.** in Edmonton, Alberta. The participation of industry representatives is vital to the sharing of information and the decision-making process to promote aviation safety.

Upcoming Workshops/Courses

Command, Leadership Resource Management
Two days– Course fee: $100
Saskatoon, Saskatchewan – October 21 and 22, 1997

Pilot Decision Making
One day– Course fee: $50
Edmonton, Alberta – October 23, 1997
Calgary, Alberta – November 14, 1997

Company Aviation Safety Officer
Two days – Course fee: $100
Winnipeg, Manitoba – November 18 and 19, 1997
Calgary, Alberta – November 25 and 26, 1997
Saskatoon, Saskatchewan – December 9 and 10, 1997

For more information call:
Carol Beauchamp (403) 495-2258

SARS*CENE* ‘97 — Partners in Search and Rescue

The National Search and Rescue Secretariat is staging the sixth annual search and rescue (SAR) workshop in Sault Ste. Marie, Ontario, from October 16 to 18, 1997, at the Holiday Inn. The registration fee is $85.
Among this year’s topics are critical incident stress management, media relations, mountain rescue, ground search and volunteers.
To register, please write to or e-mail the Secretariat at:
National Search and Rescue Secretariat — Editor of SARSCENE
275 Slater Street, Ottawa, Ontario K1A 0K2 *e-mail: carole@nss.gc.ca*

Good Judgement Overruled *cont. from page 12*

airports, it is likely that the weather was just as bad at his uncontrolled departure airport, and there was no instrument approach.

He was given a vector for the ILS localizer. He flew through the localizer and, when queried by the controller, acknowledged that he was turning to intercept. The controller noted that he was intercepting the on-course and the pilot agreed. Less than a minute later, the pilot advised that he was having a gyro problem. "It's all mixed up," he said.

The controller immediately responded by telling the pilot to climb to 3000 ft. The pilot acknowledged, but added, "I'm going to lose communication pretty soon. My battery is pretty bad." The controller intended to provide a surveillance no-gyro approach and he began giving directions to turn, stating when to start the turn and when to stop. The static-filled transmission "DG not working" was the last from the aircraft. It crashed in a residential area, killing the pilot. No one on the ground was hurt.

Including the time required for engine start-up, the aircraft had been operating at power for about 30 min. when it crashed.

Investigators found no indications that the gyro was not operating normally at impact. Even without communications or navigation capability, the pilot should have been able to fly the aircraft. However, it is possible that, in the high-stress situation, he started to overcontrol the aircraft to the point where he thought that the instruments were malfunctioning. When he stopped believing and scanning his instruments, he apparently became disoriented and lost control.

A 14-mi. trip in good VFR conditions would not likely have caused any difficulties, even on questionable battery power; however, the weather for the attempted flight was not "good VFR." It had beenreported at 300 ft. overcast with visibility 2 mi. most of the day. Waiting until the following morning to ferry the aircraft to airport B to get the alternator replaced would have cost the pilot a couple of hours' delay in the start of his Florida trip.

When forced by the weather to fly a full instrument approach on a fading battery, the pilot knew that he had a serious emergency, and he should have declared it. The controller knew about the aircraft's mechanical conditions, but reasonably expected the pilot to have enough battery power available to do what was expected during the flight. Since the pilot did not declare the emergency, the flight was treated in a routine manner. Had the controller known that an emergency existed, he could have assisted by turning him in early for the ILS approach or perhaps immediately giving vectors for the surveillance approach.

The accident should not have happened. It happened because the pilot convinced himself that it was acceptable to take a questionable aircraft through poor weather to save a couple of hours. His good judgement was overruled by the self-imposed pressure to get an early start the next day.

Human factors experts would call it an example of a mental "trap" known as a "framing bias."

One of the things that contribute to the poor judgment illustrated in this accident is the way that a problem is framed. In risky decision making, there is a tendency to frame the problem as a choice between gains and losses.

With respect to losses, people are biased to chance the risky loss, which they see as less probable, although more disastrous, than the certain loss.

Think about which way your bias is!

Answers

1. KNMH
2. 121.5
3. may not
4. ground level; sea level
5. 5/8 (5 oktas)
6. greater than 6
7. 1045Z on the 29th day of the month; 1100Z on the 29th; 1100Z on the 30th
8. winds calm, visibility greater than 6 SM and sky clear
9. first correction to the original observation
10. stratus fractus 5/8 (5 oktas); 800
11. recent freezing rain
12. while in controlled airspace
13. 3000
14. cruise portion
15. 1000
16. 5000
17. 5
18. a means of preventing malfunction caused by icing
19. Class B
20. two-way radio communication equipment; transponder and automatic pressure altitude reporting equipment
21. Class G
22. initiate SAR action
23. V
24. G; F; O
25. (1) squawk 7600;
    (2) land at the aerodrome associated with the control zone;
    (3) inform ATC as soon as possible of actions taken
26. Have the numbers, **or** With the numbers
27. ATF areas
28. reporting departure intentions before moving onto the runway; and reporting departure from the aerodrome traffic circuit
29. joining the circuit, giving position; on the downwind leg, if applicable; established on final approach; clear of the active runway after landing
30. 5 min., where possible
31. when flying VFR at night outside visible range of an aerodrome
32. pilots must make their own Customs arrangements
33. green
34. TP 10737E — *Use of Automotive Gasoline (MOGAS) for General Aviation Aircraft*
35. 20°C
36. during the winter when strong inversions in the lower levels are present and ground separation is marginal
37. geographical area; season; seasonal climatic variations
38. during takeoff and landing and when flying below 2000 ft. AGL within terminal areas and aerodrome traffic zones (ATZ)

Good Judgement Overruled

There are times when you just don't take off. There is no question about it, no thought needed, when, for example, the weather is totally outrageous, the airplane is not really airworthy or some other problem exists that makes [the] proposed flight just downright dangerous. Every pilot is confronted with such circumstances every so often. There is little doubt about what could happen if the airplane leaves the ground that day.

Brian Jacobson
corporate pilot and Contributing Editor to Aviation Safety *magazine*

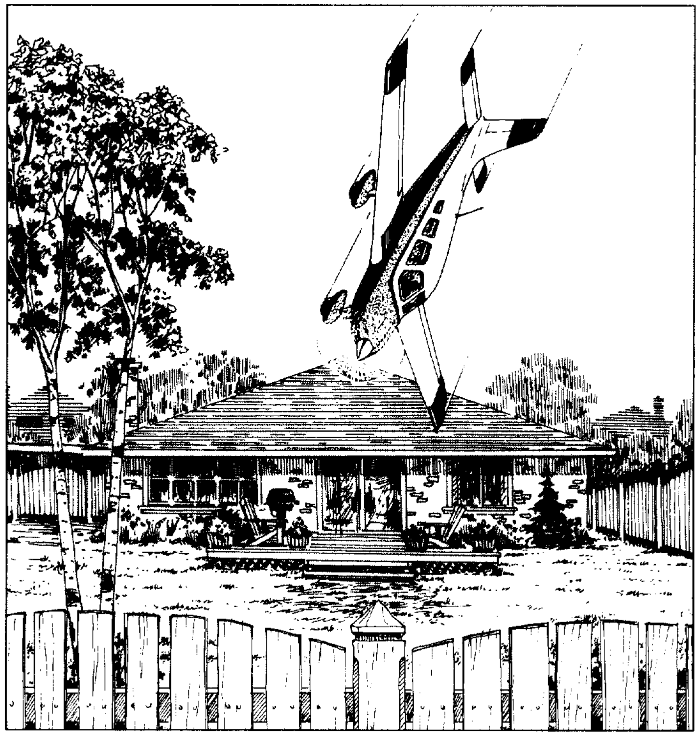
One pilot's reason for departing VFR into instrument meteorological conditions was that he needed to get his Piper Archer from airport A to airport B 14 mi. away to have it repaired so that he could leave for Florida the next morning.

He had had a total electrical failure the previous day while practising instrument approaches with a friend. He was recharging the battery but needed to get his alternator repaired. The problem was that the weather was solid IFR.

When he called the FSS that morning for a weather briefing, he explained to the specialist that, while he held an IFR rating (having 600 hrs' total time, of which 60 hrs were instrument time and 370 hrs were on type), he could not file an instrument flight plan because of his electrical problem. If he were flying VFR, he could use battery power for his radio and transponder to enter the Class C airspace at airport B.

The weather at B was 300 ft. overcast, with visibility 0.75 mi. in light rain, and forecast to stay that way until evening. The briefer told the pilot that VFR was not recommended.

The pilot explained that he needed to get to B for repairs since he was leaving early the next morning for Florida. "Well, the thing is, if I could fly there IFR... but it's just not legal for me to do that, you see, with only the battery working.



"The alternator is completely out, and I don't know how long the battery is going to last, much less if I'll get the airplane started.

"I guess I'll check with you again, maybe around noon. When will this be updated?"

The pilot's urgency was evident in the conversation. When he called back, he repeated his story about the alternator failure and the need to fly VFR to B for repairs. The updated forecast for B called for 500 ft. overcast and visibility 2 mi. for the rest of the day and into the evening. He told the briefer that he would be in touch with the tower at B in case the weather improved enough for him to get there.

When he called the briefer back a third time just before 5 p.m., he told much the same story, but this time, instead of saying that he needed VFR, he said, "I have to get special VFR." He had decided to go regardless of the weather.

The briefer advised him to wait until morning, when the weather would improve. The actual weather at B was 300 ft. overcast and visibility 2 mi., with the forecast not much better for the rest of the night. The pilot thanked the briefer, hung up and called the tower at B. He advised the controller of his need to get special VFR into the control zone. After confirming that he had a radio, the tower controller advised him to contact the terminal controller after takeoff to make his request.

The pilot did that just about an hour later. He was given a transponder code, identified on radar and advised that there would be a 5-min. delay because instrument approaches were in progress at B. When the clearance was given, the pilot asked for a heading to the airport. He was assigned a vector.

A Cessna 421 pilot flying the ILS approach at B overheard the conversation. When he checked in on the tower frequency, he advised that conditions on final were not conducive to special VFR. That information was passed on to the arrival controller handling the Archer.

When told that the ceiling on final at B was 300 ft., the Archer pilot replied, "Well, I guess it's too late for me to go back. So, I'll fly the approach, okay?" Since only 14 mi. separated the two

cont. on page 11

TRANSPORT CANADA
SELF-PACED RECENCY REQUIREMENTS STUDY PROGRAM

Refer to *Canadian Aviation Regulation* (CAR) 421.05(2)(d)

***Note**: The answers may be found in the Aeronautical Information Publication (A.I.P.) Canada references at the bottom of page 11 of this issue (ASL 4/97). A.I.P. amendments may result in changes to answers or references, or both.*

This self-paced study questionnaire is for use from October 10, 1997, to October 9, 1998. When completed, it meets the 24-month recency requirements of CAR 401.05.

1. Under what four-letter ICAO identifier would you request NOTAM information by electronic means on GPS and LORAN-C outages? ______________ (COM 3.17.5)
2. A pilot operating within sparsely settled areas or more than 50 NM from shore should, when able, monitor ________ MHz. (COM 5.11)
3. Portable two-way radio communication devices such as cellular phones and mobile satellite service handsets ______________ (may/may not) be used in an aircraft while airborne. (COM ANNEX B 2.0 - CAR 602.08)
4. Cloud bases in METARs and TAFs are always stated as height above ________________, whereas heights in FAs and PIREPs are stated as height above ________________, unless otherwise noted. (MET 1.1.5)
5. What portion of the sky must be obscured for it to be classified as a ceiling? __________ (MET 1.1.5)
6. A TAF horizontal visibility of P6SM indicates a visibility of ______________ S.M. (MET 3.9.3)

Questions 7 and 8 are based on the following Aerodrome Forecast (TAF):

TAF CYXE 291045Z 291111 24010G25KT WSO11/27050KT 3SM -SN BKN010 OVC040
TEMPO 1802 1 1/2SM -SN BLSN BKN008 PROB30 2022 1/2SM SN VV005 FM0130Z 28010KT
5SM -SN BKN020 BECMG 0608 00000KT P6SM SKC RMK NXT FCST BY 17Z

7. This forecast was issued at ____________________________ and is valid from ________________________ to ____________________________________. (MET 3.9.3)
8. What conditions would you anticipate if your ETA were 1000Z on the 30th? ____ (MET 3.9.3)

Questions 9 through 11 are based on the following METAR:

METAR CYXE 292000Z CCA 30015G25KT 3/4SM R33/4000FT/D -SN
BLSN BKN008 OVC040 M05/M08 A2992 REFZRA WS RWY33 RMK
SF5 SC3 VIS 3/8 TO NW SLP134

9. What does “CCA” represent? ____ (MET 3.15.3)
10. The reported ceiling consists of ______________ at ____________ft. AGL. (MET 3.15.3)
11. What does “REFZRA” represent? _________________________________ (MET 3.15.3)
12. An ATC clearance or instruction is valid only _________________________ . (RAC 1.7)
13. In Canadian Domestic Airspace, cruising altitudes and flight levels apply above __________ ft. AGL. (RAC 2.3.1)
14. VFR OTT is allowed during which portion of the flight only? _______________ (RAC 2.7.4)
15. During VFR OTT, the aircraft must be operated at a vertical distance from cloud of at least __________________ ft. (RAC 2.7.4)
16. During VFR OTT, where the aircraft is operated between two layers of cloud, the layers must be at least _______________ ft. apart. (RAC 2.7.4)

17. The flight visibility for VFR OTT must be at least ______________ mi. (RAC 2.7.4)

18. For VFR OTT, airspeed indicating systems require __________. (RAC ANNEX - CAR 605.15)

19. Normally, all low level controlled airspace above 12,500 ft. ASL up to, but not including, 18,000 ft. ASL is which class of airspace? ______________________ (RAC 2.8.2)

20. For VFR flight in Class C airspace, an aircraft must be equipped with ________________________________ and __________________ . (RAC 2.8.3)

21. Normally, all uncontrolled domestic airspace is ______________________. (RAC 2.8.7)

22. Failure to close a flight plan or flight itinerary will ________________________. (RAC 3.12)

23. What entry is required in Item 8 on a Canadian Flight Plan/Itinerary form for VFR flight? __________________ (RAC 3.16.2; RAC 3.16.9 (Fig. 3.3))

24. An aircraft is equipped with GNSS (GPS), ADF and VOR. What suffixes would you use when filing a flight plan? ____, ____, and ____ (RAC 3.16.4)

25. A transponder-equipped aircraft operating in a Class D control zone experiences two-way radio failure. List the three actions that must be accomplished by the PIC.
____, ____________________________
___________, and ____ (RAC 4.4.8)

26. Prior to your initial call before entering an MF area for landing, the FSS broadcasts the airport advisory. To reduce radio congestion, your initial call should include the expression "____." (RAC 4.5.6)

27. The VFR communication procedures that *shall* be followed when operating within MF areas *should* be followed when operating within ________________________. (RAC 4.5.7(a))

28. What two radio transmissions are mandatory when departing from an uncontrolled aerodrome within an MF or ATF area? ____
____ (RAC 4.5.7)

29. When joining the circuit for landing at an uncontrolled aerodrome within an MF area, the pilot shall report ____,
____, _________________________, and
____. (RAC 4.5.7)

30. Pilots are required to report at least _____________________ prior to entering an MF or ATF area. (RAC 4.5.7)

31. Under what conditions must a power-driven aircraft be equipped with a stabilized magnetic direction indicator or a gyroscopic direction indicator? ____________________________
____ (RAC ANNEX CAR 605.16)

32. When planning a flight from Canada to the United States where Customs must be advised, what must the pilot consider on a flight of less than one hour?
______________________________ (FAL 2.3.2)

33. What colour are AVGAS 100/130 and MOGAS P 87-90? ________________________ (AIR 1.3.1)

34. What Transport Canada publication provides information on the use of MOGAS?
_____________ ____ (AIR 1.3.1)

35. When the aircraft is operating on MOGAS, carburettor icing can form at outside air temperatures up to ____________ higher than with AVGAS. (AIR 2.3)

36. Under what conditions could altimeter error be very hazardous?
____ (AIP AIR 1.5.4)

37. Survival equipment carried on board an aircraft operating in a sparsely settled area must take into account ____, ______________________, and ____. (AIR 2.14)

38. When is the use of landing lights recommended for collision avoidance? _________________
____ (AIR 4.5)