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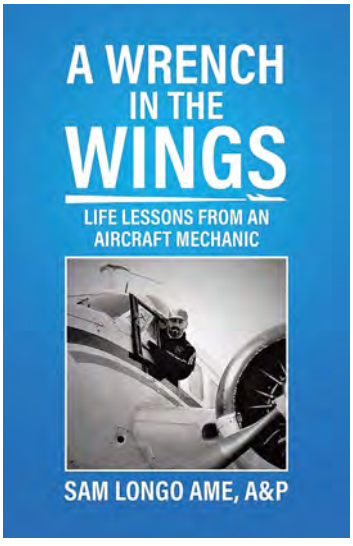
Sam Returns in Book Form



Long-time AMU columnist tells all.

MANY sharp-eyed Air Maintenance Update readers will fondly remember **Sam Longo** whose column AMU Chronicles was for many years our back-of-the-book feature. Sam reached out to us the other day with the news he has now published the book "A Wrench in the Wings" which is a compilation of those columns.

A former AME instructor and licenced tech, Sam's lengthy career has been a journey with countless challenges, both human and technical, and now he wants to share some of the knowledge acquired after a lifetime of problem solving. His aim is to provide clarity and insight for the current crop of AME students as they progress through their various learning curves.

"Spending all my adult life either fixing aircraft or teaching others to carry on in that profession has been an enlightening journey," says Sam. "Based on stories that I related to my aircraft maintenance students, the benefits were three-fold. First, it tended to keep their attention with real insight into daily life as an aircraft mechanic. Second, it gave me a chance to show the more human side of myself while hopefully injecting some humor into the classroom. Finally, and perhaps most importantly, the stories often ended with lessons learned … [Many topics are touched upon, from rapid decompression to rock stars and everything in between…)"

A Wrench in the Wings is published by Tellwell Talent. ■

— John Campbell, Editor

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Features

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Upcoming Events

Vanderhoof Airshow 2021: Chatting with Jodi

A feature performer at the (tentatively) scheduled 2021 Vanderhoof Airshow is the charismatic Jodi Rueger. Organizers of the show had a few questions for her, leading up to this summer's August 14-15 event. For starters: what led her to become an airshow and airline pilot?

"What made me want to get into flying? When I was 12, I wanted to be older to drive. I helped my dad build a go-kart I used to race around in, I like heights and wanted to travel – so airplanes looked really cool. My parents couldn't afford flying lessons, so I joined Air Cadets and earned a scholarship for a private pilot licence through them. I attended Sault College to earn my Commercial License, multi engine and Instrument ratings and an advanced diploma in aviation.

"I then became a flight instructor and aerobatic instructor in British Columbia. I have taught on 48 different types of aircraft and flown 80 types, and currently fly the Boeing 737 for a major Canadian airline. I found many role models along the way including my fiancé Sean, who I met camping beside the runway at aerobatic competitions borrowing airplanes. He has been a coach and great friend through everything.

"Sean recently proposed by having me flip the airplane upside down with a ring tied to a string on his parachute, so it flew up to eye level when we hung upside down (in a Pitts S2E). I also participate in competition aerobatics in the intermediate class in a Pitts S1S and am the President of the Aerobatic Club of BC, and Chair on Aerobatics Canada.

What do I do when I'm not flying? I enjoy training dogs (mine knows how to fetch a beer from the fridge)."

The Shows Must Go On: Summer 2021 Tentative Calendar

As do we all, organizers of air show events hope the summer of 2021 will bring with it some degree of normalcy. "The show must go on," as they say and with that in mind the following is a list of events (Canadian only) tentatively scheduled through the months of June to July. It goes without saying, COVID-19 will ultimately be the determining factor as to whether or not the various events can stay on track. If you are making plans to attend, please keep a weather eye for local health authority recommendations.

June 9, 2021
Armed Forces Day
North Bay, Ontario
www.rcaf-arc.forces.gc.ca

June 12-13, 2021
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CFB Borden, Ontario
www.facebook.com/CanadianForces-BaseBorden

June 26, 2021
Spectacle Aerien International de Bagotville 2021
CFB Bagotville, Quebec
www.rcaf-arc.forces.gc.ca

July 1, 2021
Canada Day Canadian Snowbirds
Ottawa, Ontario
www.rcaf-arc.forces.gc.ca

July 17, 2021
Boundary Bay Airshow
Delta, British Columbia
www.rcaf-arc.forces.gc.ca

July 18, 2021
Snowbirds Fly for CH.I.L.D
White Rock, British Columbia
www.rcaf-arc.forces.gc.ca

July 21, 2021
Northwest Regional Airshow
Terrace, British Columbia
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More events to come... stay tuned!

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Safety tool specialist **Cementex** now offers its T-handle driver tools, including hex head wrenches, six-point socket wrenches, and drives, with a two-layer insulation system and solid core handle to distribute pressure evenly through the gloved hand. The tools' rigid construction prevents twisting and flexing and the wrenches are available in multiple shaft lengths and a range of combinations.The wrenches can be purchased individually or in kits, and can be added to custom Cementex insulated hand tool kits. **www.cementexusa.com**

Clipped washers save space

Boker Inc.'s clipped washers have a flat edge on either the outside diameter, the inside diameter or both and are designed for use in limited spaces where there's a need to control axial motion. The functionality of the clipped washers comes from providing a flat bearing surface within assemblies. They are generally used under the head of a bolt and/or a nut to disperse loads as well as to prevent the washer from turning in the application. The washers are available in steel, stainless steel, and aluminum. **www.bokers.com**

POE tester is pocket-sized

Platinum Tools' new TPS200C is a pocket-sized Power-over-Ethernet tester designed for all varieties of PoE up to 56 volts and 280 watts of power. Powered by the PoE circuit, the TPS200C requires no batteries and can be used inline with an actual PoE device to measure current flow, or by itself in Powered Device Simulation mode to determine the maximum power available from the PoE power source. Additional features include easy-to-read, bright, scrolling OLED display and automatic mode and polarity detection. **www.platinumtools.com**

FlankJaw design busts them free

The new eight-inch Talon Grip FlankJaw slip-joint pliers from **Snap-on** Industrial works to prevent fasteners from being rounded off by using FlankJaw geometry to place the load away from the corners on hex nuts and bolts. This design secures hex heads without rounding, while also providing up to 30 percent more torque to bust them free; the Talon Grip, with a relocated-joint design, provides up to 57 percent increased pulling power. The patented three-position slip joint, plus shear cutter provides a smooth cut with minimal hand pressure. **www.snapon.com**

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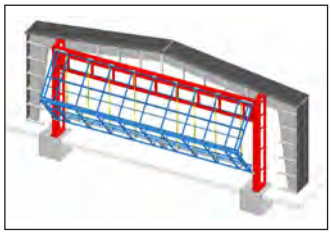

Building costs are significantly reduced with **Schweiss Doors'** tripod leg design, self-supported bifold doorframe for general aviation and commercial jet hangars. Hydraulic doors have three major components: the cylinders, the doorframe and the subframe header. By connecting all the major components together, Schweiss doors comprise a huge structural advantage. Heavy-duty hinges are pre-welded to the door-frame and horizontal continuous member for ease of installation. They are pre-assembled and delivered pre-hung within a pre-squared frame for ease of installation. **www.Schweissdoors.com**

Propeller offers faster cruise speed

Hartzell has expanded the eligibility of its three-blade aluminum Voyager props. The Voyager is now STC approved for the fleet of Cessna 180/182/185/206 aircraft, powered by Continental 520 and 550 engines. The Voyager was previously approved for Cessna's A185E/F Skywagon and Ag Carryall aircraft. The custom-designed Voyager propeller provides up to seven knots faster cruise speed, 10 percent better take-off acceleration, an exceptional climb rate, and quieter flight. It features swept aluminum blades designed for optimal performance. **www.hartzellprop.com**

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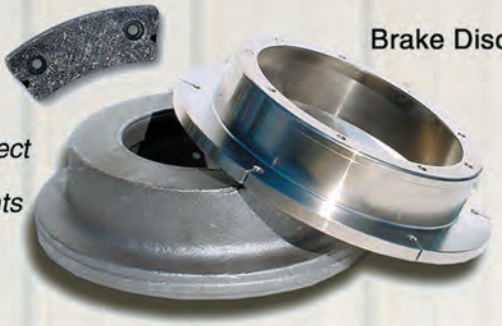

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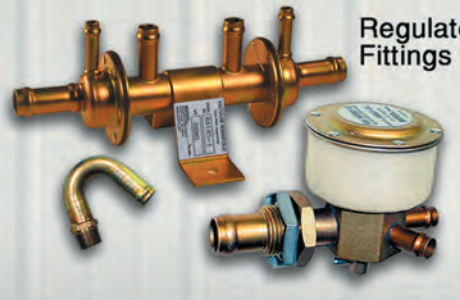

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MRO provider VSE Corporation has entered into a life-of-program distribution agreement with Pratt & Whitney Canada. Under the terms of the agreement VSE Aviation will be the exclusive global distributor for new radial parts and inventory of Pratt & Whitney Canada's APS500 Auxiliary Power Unit for commercial applications. The distribution licence applies to more than 1,500 aftermarket parts and components supporting Pratt & Whitney Canada's APS500 and the Embraer Regional Jet, De Havilland Canada DHC-8 (Dash 8), Gulfstream, Bombardier and includes Textron aircraft platforms.

DEVELOPMENT COMPLETE ON 480B PANEL

Development is now complete on Anodyne Electronics Manufacturing Corporation's MCP480B master caution panel project, which was awarded to the Canadian avionics manufacturer by Enstrom Helicopter Corporation last year. Enstrom selected AEM to design and manufacture the new annunciator panel for their flagship aircraft, the 480B helicopter, in July of 2019. AEM's next-generation caution/warning panels feature upgraded electronics and redundant LED lighting. The MCP480B project is one of several collaborations between Enstrom and AEM including past projects involving loudspeaker systems and illuminated panel products. The MCP480B is only available from Enstrom on the newly upgraded 480B helicopter.

TC GRANTS TYPE CERTIFICATE TO PRAETOR 600

Embraer says its Praetor 600 super-midsize business jet has been granted a type certificate by Transport Canada Civil Aviation. The Praetor 600 is capable of flying beyond 4,000 nautical miles in long-range cruise speed or beyond 3,700 nautical miles at Mach .80 from runways shorter than 4,500 feet. It is now the farthest-flying super-midsize jet, able to make nonstop flights between Toronto and London, Montreal and Paris, Calgary and Honolulu, Vancouver and San Juan. It is the first super-midsize jet with full fly-by-wire technology.

TIME'S UP FOR THE LEARJET

Learjet production will end this year following a slump in demand due to competition from newer and less-expensive rivals. Created by American entrepreneur Bill Lear, the Learjet 23 first took off from Wichita, Kansas in 1963, forging a new market for modern business aircraft with owners like Frank Sinatra, while shattering speed records. Bombardier, which acquired Learjet in 1990, said production would end this year but it will service the plane, which accounts for about 42 percent of its in-service fleet of just under 5,000 business aircraft, according to JETNET data.

WESTJET PULLS THE PIN ON FOUR MARKETS

WestJet has temporarily suspend operations to St. John's, Newfoundland, London, Ontario, and Lloydminster and Medicine Hat, Alberta until June 24, 2021. The flights between St. John's and Halifax were suspended as of March 21, while service between London and Toronto ceased on March 22. WestJet Link service from Calgary to Lloydminster ended March 19, and Calgary to Medicine

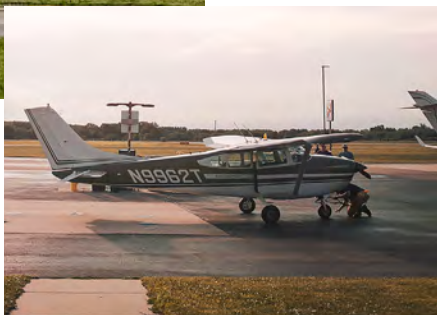
Hat was discontinued as of March 21. WestJet president and CEO Ed Sims said the company's ability to return to markets remains directly correlated to government policies and the prioritization of a domestic travel.

CONAIR TO CONVERT DASH 8 GROUP

Abbotsford, BC-based Conair Group reports the arrival of the first of 11 Dash 8 Q400 aircraft for conversion to airtankers, engineered specifically for aerial firefighting. The 75-day modification process includes stripping down the cabin to the bare frame in order to reduce the aircraft's weight, the installation of specialized avionics, outfitting the airtanker with an external tank enabling the interior of the fuselage to remain pressurized and climate controlled, creating a safer environment for pilots by reducing fatigue. The Q400AT is then painted in Conair's white, red and black colours. Conair has been modifying the Q400 into airtankers since 2005.

CESSNA SKYLANE NOW A SENIOR CITIZEN

This winter Textron Aviation celebrated 65 years of the Cessna Skylane 182, as more than 23,000 Skylane aircraft have been delivered since its type certification on March 2, 1956. The four-seat, single-engine piston aircraft remains popular with aviation enthusiasts worldwide and is for many pilots the aircraft in which they took their first solo flight. Multiple variants have been produced through the decades, and the aircraft is regularly used by civil operators, cadet organizations and flight schools worldwide.



EVTOL AIRCRAFT ARE BAD INSURANCE RISKS

Aerospace engineering firm Horizon Aircraft warns that most eVTOL aircraft seeking to become commercially operational will fail to secure insurance at an affordable price as they will be unable to meet the requirements of insurers, which includes providing them with enough data for their underwriters to assess the risks. The company also says it will be difficult for eVTOL manufacturers and operators to secure insurance because there is currently a general lack of competition in the aviation insurance market, and less flexibility as more insurers shift towards increasingly traditional underwriting of pilots and risks. With passengers onboard, potential liability for air taxis escalates dramatically. ■

Ashes to Engines

How Qantas and other airlines decide whether to fly near volcanoes.

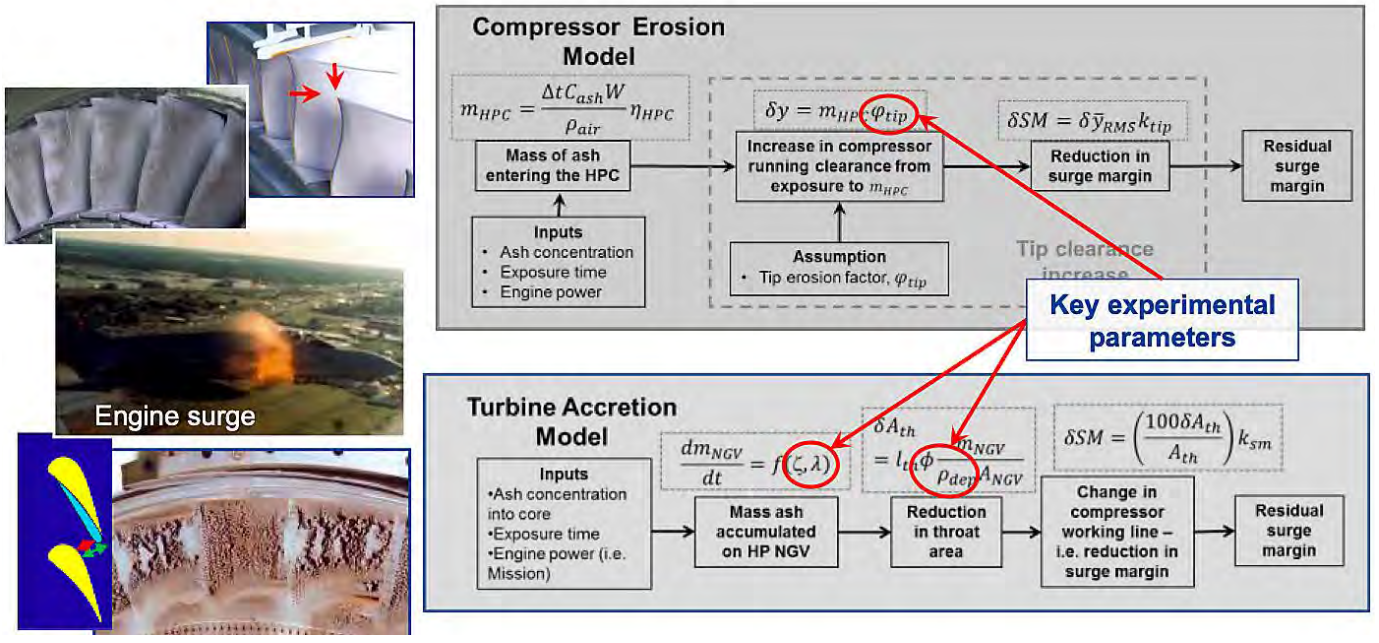
BY HEATHER HANDLEY AND CHRISTINA MAGILL

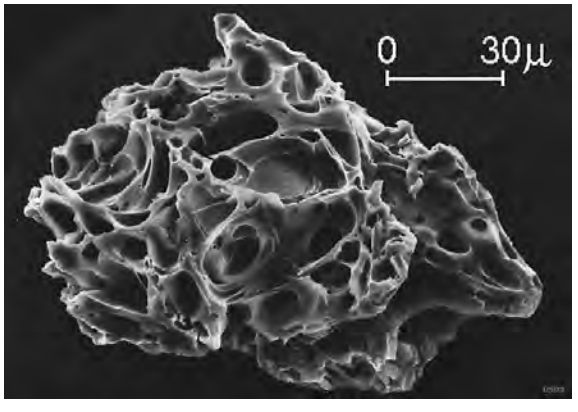
MOUNT AGUNG VOLCANO IN BALI, Indonesia, has been erupting intermittently since November 2017. The volcano erupted at least six times during the month of May in 2019 and resulted in the cancellation and delay of some flights in and out of Bali's Ngurah Rai International Airport. Such continuous but sporadic volcanic activity is a challenge for local emergency management. But it's also an issue for planes.

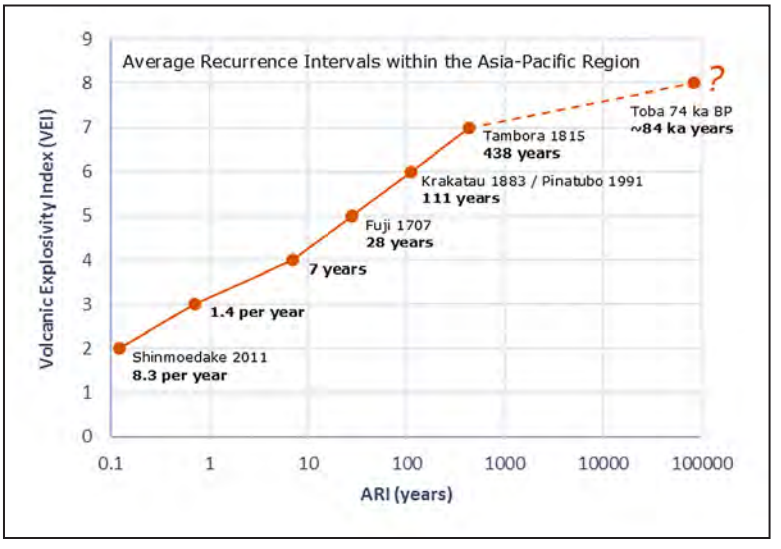
Captain Mike Galvin, head of fleet operations at Qantas Australia, says volcanic ash in the air is a concern for airlines. "The primary issue of volcanic ash for aeroplanes is the melting of ash in the engine turbines and the blocking of sensors that measure air speed and altitude. This can result in differences in flight information displayed to each pilot," Galvin said. "Qantas pilots are trained in these procedures during simulator training. Additional problems arise from reduced

Above: A plane dusted in volcanic ash sits grounded at the San Carlos de Bariloche airport, southern Argentina. AP Photo/Alfredo Leiva.

Here: The loss from the Eyjafjallajökull eruption was US$ 1.8bn for the airlines alone, according to IATA estimates.







visibility due to the opacity of windscreens, and contamination of air entering the cabin."

Currently the airline industry adopts a "no fly" policy for any visible or discernible volcanic ash. "Engine and aeroplane manufacturers will not certify any level of ash tolerance," Galvin said.

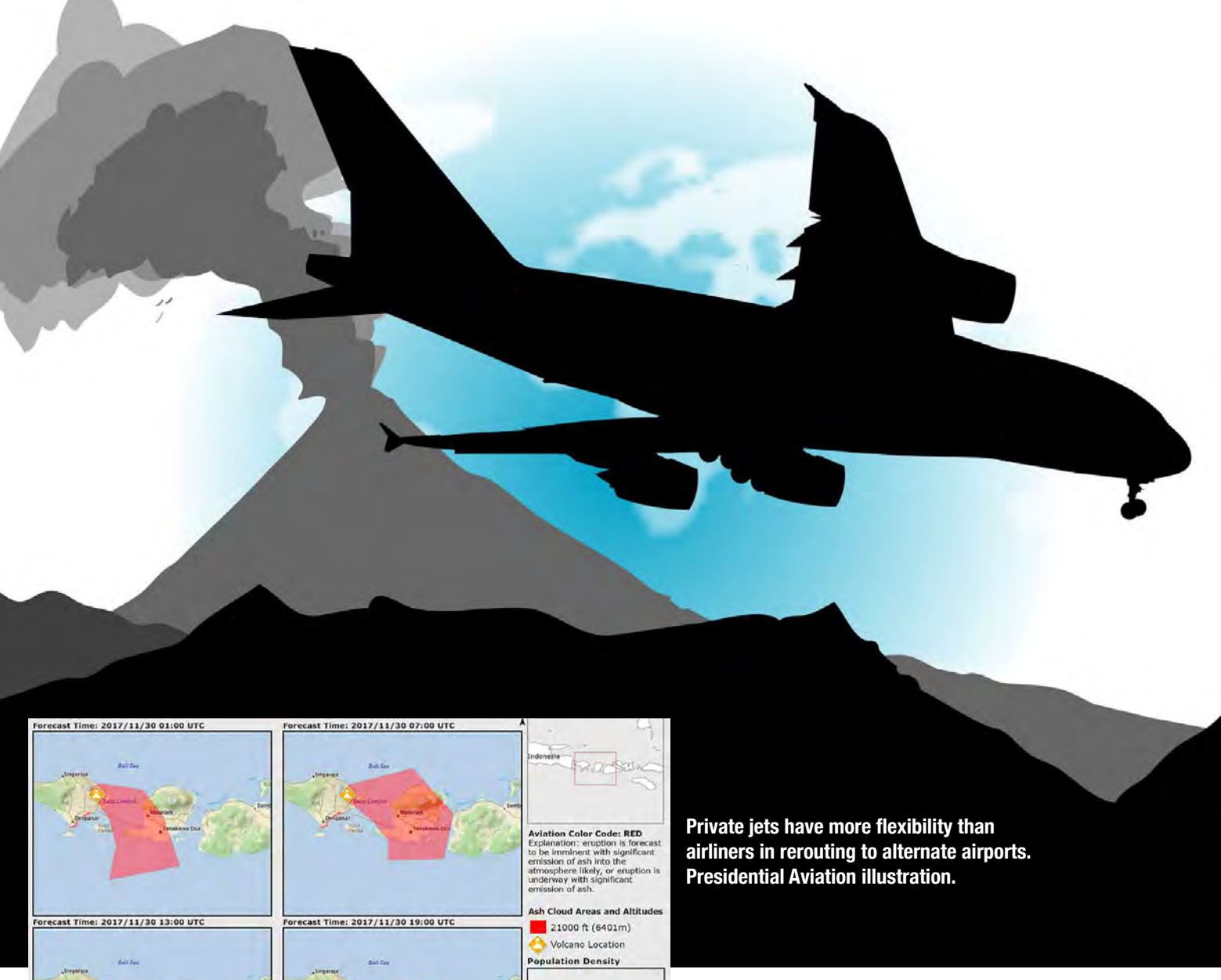
ASH IS A SERIOUS PROBLEM FOR PLANES

Mt Agung is just the latest example of volcanoes interrupting flights in Indonesia and other countries. In April 2010, an eruption of Eyjafjallajökull volcano in Iceland caused disruption to European air traffic for several days and cost the aviation industry an estimated US$250 million per day.

Top: Compressor stability calculations – simple mathematical model to determine time to surge. Rolls-Royce.

Above left: An ash particle just over 0.1mm long erupted during the 18 May 1980 eruption of Mount St Helens (magnified 200 times).

Above: Calculated average return periods for volcanic eruptions of various magnitudes in the Asia-Pacific Region.



Private jets have more flexibility than airliners in rerouting to alternate airports. Presidential Aviation illustration.

Left: Example summary of the volcanic ash advisory from the Darwin VAAC at the beginning of the Agung eruption in November 2017. Ash polygons shown in red. Each picture shows the forecast of ash movement over a period of hours.

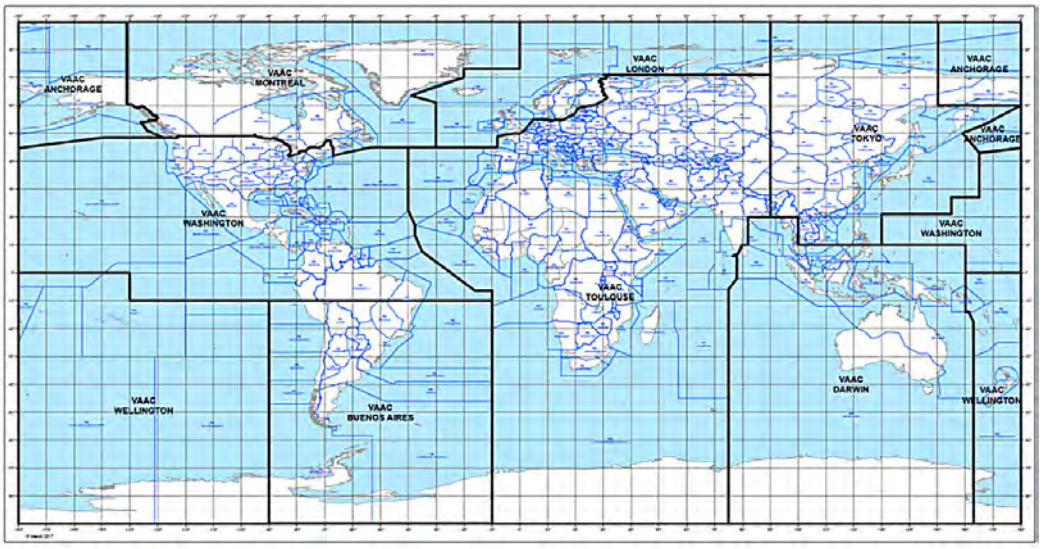
KEEPING WATCH ON VOLCANIC ASH IN THE SKIES

Volcanic ash is made up of volcanic glass, crystals and other rock fragments less than 2mm in size. Ash from explosive eruptions can reach into the stratosphere – 10-20 kilometres above the volcano, which is within the cruising altitude of commercial aircraft – and be dispersed by winds up to thousands of kilometres away.

The 1982 eruption of Mt Galunggung in Java, Indonesia, clearly demonstrated the potential impact of volcanic ash to aircraft. Flight BA009 en route to Perth from Kuala Lumpur flew through ash from the eruption. This caused sulfurous fumes to enter the cabin and the failure of all four engines, which fortunately restarted after a dive to lower altitude.

Following several aviation encounters with volcanic ash in the 1980s, the International Civil Aviation Organisation (ICAO), in collaboration with the World Meteorological Organisation (WMO), established nine volcanic ash advisory centres (VAACs), in Anchorage, Buenos Aires, Darwin, London, Montreal, Tokyo, Toulouse, Washington, and Wellington.

The role of the VAACs is to provide advice to the aviation industry about the location and movement of volcanic ash within their region. The VAACs gather information issued from local volcano observatories, satellite imagery and other available information such as volcano webcams, pilot reports, and online news.



Map showing the nine volcanic ash advisory centres (VAACs) and the regions for which they are responsible. Bureau of Meteorology.

VAACs perform detailed modelling for individual eruptions and issue images in the shape of a polygon ("ash polygon") showing current ash-affected air, and where ash is predicted to move over the next few hours. The Darwin VAAC covers the volcanically active regions of Indonesia, Papua New Guinea and the southern Philippines.

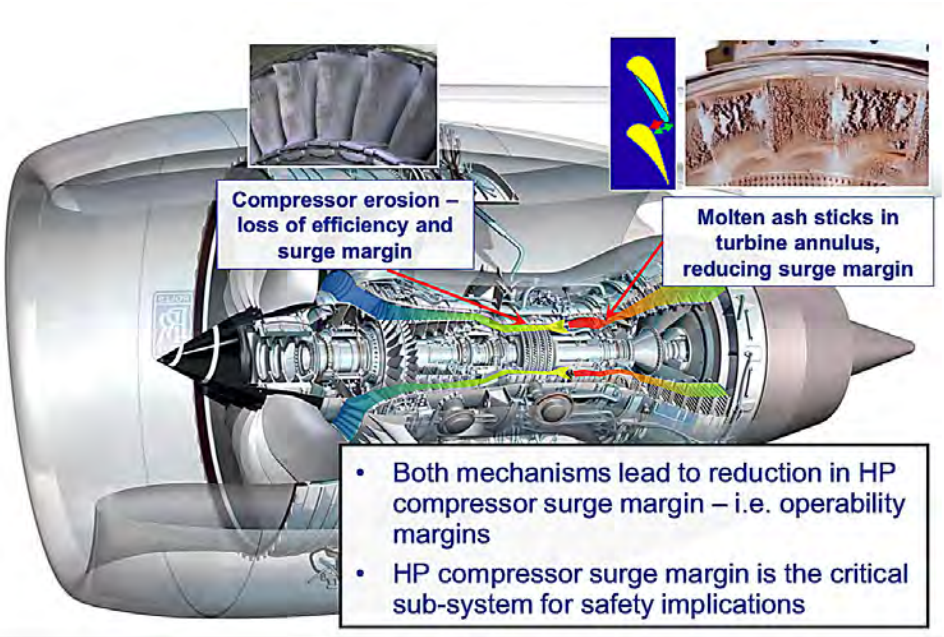
HOW AIRLINES MANAGE RISK

Qantas' Mike Galvin said he makes safety decisions based on information gathered by his team using all available sources. With regards to Bali's Mt Agung, Galvin said getting the timing right is an important aspect of the process. "Here in Australia we might be five to six hours away from the ash in Indonesia so we need to make decisions several hours before the plane departs," he said.

Galvin works closely with the Darwin and Tokyo VAACs. "But we also have our own team of five meteorologists on constant shifts, who utilise information from other sources such as satellite images from the Japanese Himawari satellite," he said.

"If a polygon of ash lies over the destination airport or on its approach or departure path, then we will not land."

Below: Helicopter pilots and mechanics are crucial for monitoring and observing active volcanoes. USGS photo.



Sub-system by sub-system assessment of the damage mechanisms. Rolls-Royce illustration.

Volcanic ash and aircraft engine components. Not a good mix.

HOW SCIENCE CAN HELP

Since the Icelandic eruption there has been increased research into volcanic ash impacts on aeroplane engines and how much ash they can tolerate. While it is possible engines can tolerate low concentrations of ash, experts don't yet know what the precise limit of ash that a particular engine can withstand. Further research is needed to determine accurate 'ash-in-engine' tolerances.

"Science can also assist the aviation industry though better assessment of the concentrations of ash at different altitudes such as at 20,000 and 30,000 feet," Galvin said.

In the longer term, volcano science can help airlines understand more about volcanic ash hazards and risks to particular regions. For the Asia-Pacific region, average recurrence intervals have been calculated for each magnitude of volcanic eruption. This is measured by a Volcanic Explosivity Index (VEI).

To put VEI in context, the eruptions in the current phase of activity at Agung have been attributed a VEI of three on a logarithmic scale that runs from zero to eight. It's estimated there are 1.4 eruptions per year of this magnitude in the Asia-Pacific region.

The 1883 Krakatau eruption in Indonesia and 1991 Pinatubo eruption in the Philippines were significantly larger, VEI 6 eruptions, which have been estimated to recur every 111 years in the region.

This raises the question of how well prepared the aviation industry is, and countries as a whole, for the next even larger VEI 7 eruption, such as that at Tambora in Indonesia in 1815, which erupted 175 cubic km of fragmented volcanic material in just 24 hours.

Recent scientific research on Agung suggests that the molten rock (magma) feeding Agung volcano below may also be connected to the neighbouring volcano, Batur. The connectivity of magma plumbing systems may explain the joint eruptions of both Agung and Batur in 1963 and may present an additional volcanic hazard to consider for Bali. ■

*(**Heather Handley** is Associate Professor in Volcanology and Geochemistry, Macquarie University. **Christina Magill** Senior Lecturer, Department of Environmental Sciences, Macquarie University. This story was originally published at:* ***www.theconversation.com**.)*

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Growing Demand

AME History, Part 2: By Roger Beebe

Aircraft Maintenance Engineer Roger Beebe has compiled a history of the trade in Canada, from which we have taken excerpts and are presenting as a multi-part series. Last issue, Beebe traced aircraft development leading into the First World War—long before the term "AME" was used. Here in part two, we move ahead to the Second World War when political will shaped demand for Canadian AMEs.

CD Howe had big plans for Canada's aviation industry in the post-war years. City of Vancouver archives.

THE WAR WAS A GREAT AWAKENING period for Canada's aviation industry. The expansion of airports, manufacturing and operations made Canada a world power in aviation. The geographic location also helped Canadians become world leaders in air transport…

On March 17, 1944, C.D. Howe, Minister of Munitions and Supply, in introducing the Bill amending the Aeronautics Act, made some interesting announcements as to future policy, including the separation of air services from other ground services so that there should be no monopoly of our air services by the railways. This foreshadows a complete change in the set-up of both Trans-Canada Air Lines and Canadian Pacific Air Lines. He also envisioned the creation of a greatly expanded system of feeder air lines under which young men who had served overseas in the Air Force would play an important part in the orderly and rapid expansion of domestic aviation by the allocation of the valuable franchise for airlines to our returned airmen in the best interests of Canada.

"…On a five year replacement basis we may look forward to an annual production for domestic uses alone of at least 10,000 aircraft a year within a decade. Most of these will be 'puddle jumpers' but there will be a proportion, as yet impossible to predict, of medium sized, single engine, four to five seats; a smaller number of medium twin-engine types of from 12,000 to 20,000 pounds; and a still smaller number of giant' multi-engine types."

…So the scene is set for the work of AMEs during and after the Second World War.

The AME profession expanded greatly during the Second World War along with the expansion of the aircraft manufacturing industry, which built the hundreds of thousands of aircraft used during the war. The ingenuity and experience of the maintenance technicians kept the air forces flying in the Arctic cold, tropical heat and the dry, sandy deserts. They learned to cope with the humidity of the South Pacific, the sand of the deserts and the brutal arctic cold. They also learned to main-

On September 1st, 1937 Air Canada's forerunner, Trans Canada Air Lines (TCA), launched its first commercial passenger flight. Air Canada archives.

Right: By 1937-38 aviation companies were advocating a chain of landing strips from Fort McMurray to the Arctic Coast.

tain naval aircraft based on the decks of aircraft carriers and spotter and self-protection aircraft launched from cruisers and battleships.

The experience of the early Licensed Canadian Air Engineers in opening up the airways of Canada and exploring the Arctic and our extensive coasts gave them the practical knowledge to teach the many new recruits. The air forces and naval air of all nations expanded greatly. This of course led to a demand for trained maintenance technicians of all types. The demands of the military lead to a very specialized division of the work.

The work was divided up into many technical specialities, unlike the general civilian method of having one multi-tasked Air Engineer or later known as an Aircraft Maintenance Engineer; maintain the aircraft while in service. There was always some specialization in civilian aviation at the shop level and at the component maintenance level but nothing like the military evolved to cope with the war demands.

The construction of aerodromes in the Arctic and Sub-Arctic opened up the great northern reaches of Canada and provided many opportunities for AMEs to work and prosper. This opening lead to the growth of population in the northern mining camps, the demand for more efficient air services became insistent. On the main traffic routes to the far north the length of the "freeze-up" and "break-up" periods was serious. On the shorter runs where there was little difference in latitude, these periods were short; but as the length of the air routes increased, the stoppage of all flights from this cause became intolerable. Ice melted and disappeared at Edmonton, Alberta, early in April, but Bear Lake was still icebound in July. The increase in traffic called for more regular, efficient and uninterrupted service.

In 1937-38 Canadian Airways advocated a chain of landing strips from Fort McMurray to the Arctic Coast along the MacKenzie River and Yukon Southern Airways had made surveys on their air mail route from Grande Prairie to Whitehorse, with strips at Fort St. John, Fort Nelson, Watson Lake and Whitehorse where Pan American Airways, who had been granted landing rights on their route between Juneau and Fairbanks, Alaska, had already graded a strip, with the assistance of the Territorial Government of the Yukon and the Department of Transport, to accommodate the twin-engine transports.

Saint-Hubert, Quebec, August 1930. Canadian Transport Agency archives.

Similar work had also been done at Burwash Landing, at Dawson, at Mayo Landing, and at several other points on the chain between Whitehorse and Dawson by the Territorial Government. Yukon Southern Airways had cleared and graded strips at Fort St. John and Fort Nelson, while Canadian Airways had made some progress on the clearing and grading of a strip at McMurray on the MacKenzie River Route. Progress was slow, however, owing to the lack of funds and difficulty of moving heavy grading equipment into these remote districts.

In 1939 the Department of Transport, now Transport Canada, was recognizing the future importance of the air route to Alaska from the commercial and strategic points of view. It obtained authority and funds for a complete airway survey of the route from Edmonton to Whitehorse via the valleys of the Peace, Liard and Yukon Rivers. It was the logical route to Alaska and the Orient, and careful surveys had been made of all the alternative routes during the preceding four years. It lay east of the Rocky Mountains, passed over relatively easy terrain and was climatically preferable to any other route, having a moderate snowfall and freedom from fog at all seasons.

Preoccupation with the construction of aerodromes for the Empire Flying Training Plan during the first two years of the war diverted attention from Northern development, but with the entry of the United States into the conflict in December, 1941, the need for action again became most urgent. Fortunately, the Permanent Joint Board on Defence of Canada-United States, appointed in 1940, had given early attention to the need for better communication with Alaska. It had urged the immediate construction of the North West Staging Route from Edmonton to Fairbanks based on the plans of the Department of Transport. By strenuous efforts the main fields on this route at Grande Prairie, Fort St. John, Fort Nelson, Watson Lake and Whitehorse were completed under contracts let by that Department by September 1st" 1941. After that a steady flow of reinforcements to the United States Air Forces in Alaska was comparatively simple.

During the next three years the route was greatly enlarged, new intermediate fields and radio ranges were added, and the difficulties of transport solved by the completion of the Alaska Highway which gave access to all aerodromes. The construction and early completion of the highway was made possible by the existence of the airway. The decision to exploit to the full the Normal Wells oil field caused a similar revolution of the Mackenzie River air route. The demands of the traffic were far beyond the capacity of the seaplanes previously used with such great advantage. The construction of a chain of full scale air bases was rapidly undertaken by the United States Forces with the approval and assistance of the Canadian Government. Then freight and passenger traffic moved into Norman

McKenzie King conceived a plan whereby Royal Canadian Air Force personnel would remain in Canada, training Commonwealth recruits. Canada had the space for a limitless number of airfields and training schools. DND archives.

A TCA crew aboard a Canadair DC-4M North Star, 1950. Canadian Transport Agency archives.

Wells and Yellowknife in D.C. 3's, C-46s and from there is distributed by seaplane to outlying points.

On the Atlantic Coast, similar action was being taken to improve the communications by air across the Atlantic. The Department of Transport was authorized to construct new bases at Montreal, Mont Joli, the Saguenay and Seven Islands, Quebec, Moncton, N.B., and Sydney, Nova Scotia; Torbay Newfoundland; and Goose Bay, Labrador. Gander airport was greatly enlarged. The United States Government was also authorized to build airports for their own services at Mingan, Que., Stephenville and Argentia, Newfoundland. These new bases added greatly to the efficiency and safety of the trans-Atlantic ferry system and the anti-submarine patrols off the Atlantic and Gulf of St. Lawrence Coasts. In addition they served the important purpose of providing staging aerodromes for the service of the aerodromes built in Greenland and Iceland by the United States Forces.

Later in the war the United States Government was given authority to construct with its own forces a further chain of bases in Northern Canada known as the "Crimson" route, a staging route to provide the shortest route from Los Angeles, California, to Northern European points by short hops. At the time the proposal was put forward the Canadian Government could not see its way to divert men and supplies for this purpose from other projects. It considered that the prospect of opening, before the close of the war, an efficient trans-Atlantic staging route through the Arctic Islands as remote.

However it willingly gave authority to the United States Forces to construct bases at Churchill, Southampton Island, Frobisher Bay, Baffin Island and Chimo, Quebec. In the final settlement of the war accounts between the two Governments, Canada paid the United States $76,000,000 for the work done on the "Crimson" route and resumed control of all bases in Canadian territory.

Though never used as a staging route, these bases have been invaluable in the post-war period as stepping stones for further development in the far North. As meteorological stations, bases for the air survey of the Arctic Islands, and as staging bases to aerodromes at still more remote meteorological and scientific stations now being established. This gave more efficient coverage all through the Arctic Archipelago and to similar joint United States and Danish bases in Northern Greenland. Landing strips were built at Baker Lake, Eureka Sound, and Cornwallis Island. It was then proposed to build a strip near all meteorological stations established there thus bringing to completion the ideas originally put forward in 1922 by the Air Board who had sent R.A. Logan to make a reconnaissance for this purpose.

… Each month of the First World War saw a constantly increasing demand for more aircraft, first for observation, then to fight the observation planes, and, finally, for bombing military objectives. Young Canadians flocked eagerly into the new service and acquitted themselves so well

Preoccupation with the construction of aerodromes such as this one in London, Ontario for the Empire Flying Training Plan during the first two years of the war diverted attention from Northern development.

that the Royal Flying Corps established training bases in Canada to enlarge their field of recruitment and supplement their overcrowded home training establishments. Camp Borden, Leaside, Armour Heights, Desoronto, Mohawk and Beamsville were all active flying training schools and Toronto University became the centre of their ground training activities.

History repeats itself when the crisis came in the end of August, 1939; it was natural that Canada should again play an important part in the War in the Air. This time the need was much more urgent. With the expansion of the Royal Air Force, the air space of the United Kingdom was rapidly approaching saturation. Every month saw the creation of

Opening the Canadian north was to be a key strategy in the post-war era, and Dakota aircraft played a major role. DND archives.

new squadrons as the output of aircraft rose. Each new unit required another aerodrome for operations and this, coupled with the expectation or intensive air fighting and the continuous bombing of all aerodromes, made it essential to find other bases where training could proceed without these distractions. Canada was the only practical outlet.

Canada's accessibility, the satisfactory experience of training in the World War and the known enthusiasm of her youth for the air, made it inevitable that she should become a great flying training centre for the British Empire. Missions from the United Kingdom, Australia and New Zealand reached Ottawa in September and, though a final agreement was not concluded till December, the scale and scope of the plan were determined early in October so that preparatory work could be put in hand.

The Royal Canadian Air Force, hampered for many years by lack of funds for aerodrome construction, had at the outbreak of war only five aerodromes ready for use and six under construction. Their auxiliary squadrons were all based on civil airports. The service aerodromes were, of course, required for operations immediately as the war began and were not available for the training plan.

Due to the energetic support of C. D. Howe there had been great activity in the building and improvement of civil airports in all parts of the country since 1936. This was principally along the line of the Trans-Canada airway but included many airports to serve feeder lines as well, the use of this chain of airports, built to a common, up-to-date standard, as a foundation for the plan, was the obvious solution of the problem. The Civil Aviation Division was called into consultation by the middle of October and the decision reached soon after that the responsibility for finding and building the aerodromes required for the program should rest on it.

A quote: "A cataclysm of the magnitude of the present war affects all civil activities. Aviation has no exception. Every phase of flying has been gravely affected by the change-over from peace to war. While meeting the Air Force requirement in all respects, the aim of the Department of Transport, Civil Aviation, has been to ensure that when the time comes to return to normal peace conditions, as much as possible of the war effort and expenditure may be adapted to increasing the

An early model Royal Canadian Air Force Anson as used in the British Commonwealth Air Training Plan. The yellow overall finish, which denoted training aircraft, was typical of many BCATP aircraft. RCAF archives.

The foundation of the cross Canada aviation technical trade system was built during these years as well. Toronto Central Tech had been around for most of the century, followed by places like the Southern Alberta Institute of Technology in Calgary. Gradually the system expanded across Canada and tech colleges can now be found in all parts of the country.

The North American Harvard aircraft was heavily used by the Royal Air Force and Royal Canadian Air Force during the British Commonwealth Air Training Plan in the Second World War. DND archives.

facilities for civil air transport in the Dominion. The aerodrome situation at any rate will be vastly improved…"

The above quote found in some old papers really gives one the scale of the blossoming of aviation in Canada and its requirements for AMEs. Civilian AMEs were employed in the airlines and bush operations that continued during the War. They also found jobs as aircraft and component inspectors in the military production systems. Airworthiness Inspection delegates were mostly AMEs, a tradition which carries on in many of today's delegates from Transport Canada.

The foundation of the cross Canada aviation technical trade system was built during these years as well. Toronto Central Tech had been around for most of the century, followed by places like the Southern Alberta Institute of Technology in Calgary. Gradually the system expanded across Canada and tech colleges can now be found in all parts of the country.

The technology in both aircraft manufacturing was changing as was the complexity of the aircraft systems. This all set the stage for the introduction of jets and turbine power into the post war civilian world. That fact, together with the electronic revolution caused by the war, brought major changes to all later AMEs, including the licensing and oversight system itself.

The effect of the war on aircraft maintenance was felt into the 1970s. When I joined the Ministry of Transport in 1975, we still had maintenance inspectors working there that had been Airworthiness Inspection Division Inspectors during the war at aircraft and component manufacturing facilities. The regulatory system in civil aviation manufacturing and maintenance was very much continued on from the 1940-1945 period. Resident inspectors at facilities were still commonly employed. Much regulatory compliance was simply accomplished by the fact everyone seemed to know everyone else in the industry and workmanship pride was the watch word. The advancing of the use of electronics in aircraft systems was bringing forward a new trade, avionics.

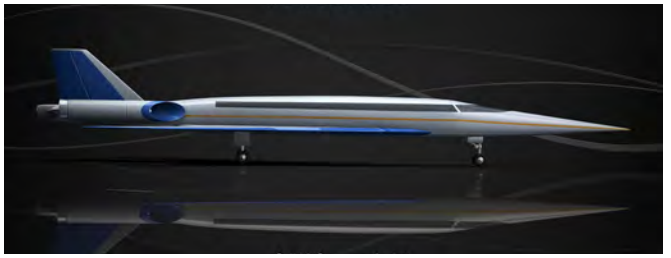
A general move was being made away from personal skill and responsibility to a systems approach. These factors and changing society led to many fundamental changes in the way AMEs were trained and licensed and how the then newly named Transport Canada was to regulate them in the latter part of the twentieth and the twenty-first centuries. ■

*(The entire text of this series can be found at **Roger Beebe's** website, **www.planetalkconsulting.com**)*

PACIFIC

Pacific AME Association

PAMEA is a non-profit association comprised of aircraft maintenance engineers, aircraft maintenance personnel and aviation industry corporate members. PAMEA is an active member of the Aircraft Maintenance Engineers of Canada (AMEC).



Mission Statement

The Pacific AME Association shall always promote and protect the professionalism of the AME, while developing, maintaining and improving our relations with regulatory bodies affecting our industry. We shall represent the views and objectives of our members while promoting proficiency through educational collaboration with other groups on matters of mutual interest.

We shall promote honorable practices among our Members and others in the aviation industry, while remaining non-union, non-sectarian and non-partisan.

www.pamea.ca

CENTRAL

Central AME Association

About Us

The Central Aircraft Maintenance Engineer Association is an organization dedicated to maintaining and enhancing the standards, rights and privileges of all AME members in the central region of Canada.

Our chapter is one of six similar associations across Canada who collectively support the national body CFAMEA (Canadian Federation of Aircraft Maintenance Engineers Association).

Our organization works with Transport Canada in the formulation of new rules and regulations and provides a collective viewpoint for all AMEs.

CAMEA is a not-for-profit organization run by a volunteer group of AME's. We elect members of our organization to be part of our Board of Directors. Members of CAMEA are comprised of AME's, AME apprentices, students, non-licensed persons working in the industry and corporate members.

www.camea.ca

WESTERN

Western AME Association

About Our Assosiation

The Western AME Association is one of five similar associations across Canada, the others being the Atlantic, Ontario, Central and Pacific associations. These associations represent regional interests as well as concerns of national importance.

The Canadian Federation of Aircraft Maintenance Engineers Associations (CFAMEA) is a national body which is supported and financed by all the regional associations and which represents the associations at the national level.

The Western AME Association is managed by a volunteer group of AMEs who are elected by the member AMEs to the Board of Directors. The membership is comprised of AMEs, non-licensed personnel working in the industry, students and apprentices as well as corporate members.

A separate committee, under the auspices of the association, runs an annual symposium/workshop. This workshop is a two-day event which features speakers on a variety of related topics, as well as an industry tradeshow with over fifty booths from various companies, suppliers, manufacturers and other organizations. Attendance at this and our various other smaller workshops may be counted towards the recurrent training requirements required by Transport Canada.

www.wamea.com

AME Association of Ontario

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tel: 1-905-673-5681 fax: 1-905-673-5681
email: association@ame-ont.com website: www.ame-ont.com

Annual Conference and Workshop

The AME Association of Ontario has decided to go ahead with planning for our Annual Industry Conference. The hotel and conference centre has been booked for October 27 to 29, 2021. At the moment we are planning for a full conference with up to 700 participants.

A backup plan is in place if government regulations restrict attendance to a smaller number. The conference committee is optimistic and sees the need for a possible rapid return to demand for training and support in the aircraft maintenance field. More details along with the registration packages will be available at: www.ame-ont.com

Recovery?

The alphabet groups and airlines all seem to be predicting a "return to normal." Our maintenance industry follows on the coattails of the pilots who are forecasting the pandemic-paused pilot shortage will be felt again by 2023 and back with a vengeance by 2025. Perhaps the maintenance personnel will see a demand for services earlier as there will be a requirement to return parked aircraft back to service.

The industry has created the perfect conditions for an acute shortage by using early retirement incentives to get rid of high-priced personnel. Many maintenance personnel will not return to the industry and they'll be joined by a cadre of mid-career professionals who are tired of the cyclical nature of the business and have moved on to other work. Even in the non-aviation fields we see reports that approximately 25 percent of the workforce has found new career interests. The situation is compounded by the high cost of training and the anecdotal reports of the insecure nature of the job are discouraging young people from getting in.

The looming shortage is one of the greatest threats to the aviation industry recovery. Employers must be proactive in attracting, retaining and training personnel - and the sooner the better.

A major question facing the aviation industry is when will demand return. For passenger recovery, estimates range from early 2022 to 2024 and beyond, however, statistics show the global in-service fleet has already recovered in size to 76 percent of pre-COVID levels. Demand is being driven by aircraft departures and utilization rather than passengers.

What can we do? Continue to invest in training programs and recruitment, including resolving emerging financing challenges. Engage the youth in aviation training colleges and programs. Engage the workforce by recognizing the likelihood of increased competition and actively engage to improve retention. We have an opportunity to shore up our chosen profession.

Submitted by **Stephen Farnworth**, for the Board of Directors
www.ame-ont.com

Atlantic AME Association

ARAMC Cancelled
Attention Members, Delegates and Exhibitors

Due to the current government regulations and restrictions with reference to Covid and the pandemic, we, the Board of Directors of the AME Association and the ARAMC 2021 committee, have made the difficult decision to cancel our upcoming annual conference that was scheduled for April 21-23 at the Westin in Halifax, NS. We did look at trying to do something virtual, but the cost does not make it viable.

For our members

We will still plan to hold our annual AGM, but it will be on a virtual Webex platform, date is April 22nd at 1830 ADT. More details will follow. We are also looking at holding a half-day session on our Webex platform with a possible panel and some speakers. We are just in the planning stages for this. Info will go out to our members as we have more details.

Thank you for your interest in our conference and here's hoping that we will be able to hold one next year. Halifax, NS will be the probable location.

Anneke Urquhart & Neil Harding
ARAMC 2021 Co-chairs
www.atlanticame.com

CENTRAL OHIO

Central Ohio PAMA

Flight Safety Detectives (episode 60)
Expert look at the united airlines engine failure

John and Greg give meticulous attention to information available on the recent United Airlines engine explosion. In this episode, they share their initial expert observations and predict what's next. Learn what the evidence so far really shows from two of the world's most experienced accident investigators.

They explain why the crew and air traffic control personnel who handled the flight were "the ideal scenario for handling the situation." The outcome could have been far worse.

John shares his extensive knowledge of Pratt & Whitney 4000 series engines. He walks listeners through the critical components. The forces the fan blades need to endure are explained. John offers an expert look at the engine components and maintenance procedures.

What's next? John and Greg talk about the implications of mandated inspections. They also have some predictions for potential actions such as declaring blades in service for a certain period of time at end of life.

www.copama.org

SOCAL

PAMA SoCal Chapter

Who we are

The purpose of SoCal PAMA is to promote a high degree of professionalism among aviation maintenance personnel; to foster and improve methods, skills, learning, and achievement in the field of Aviation Maintenance; to conduct local meetings and seminars; to publish, distribute, and disseminate news, technical bulletins, journals, and other appropriate publications dealing with the trade of Aviation Maintenance; to collaborate with other organizations in aviation in the queries of governmental agencies pertaining to maintenance rules and guidelines.

Suspension of Chapter meetings

In light of on-going Covid-19 restrictions, the SoCal PAMA Board Of Directors voted to suspend all Chapter meetings as well as the Chapter Scholarship Program until 2022. The BOD has been meeting regularly via teleconference and will keep the membership apprised of any new developments as they arise.

www.socalpama.org


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Turning The Big 3-0

In the midst of all the bad news generated by the COVID-19 pandemic, a Canadian MRO shop finds reason to celebrate.

CANADIAN PROPELLER has now logged an important entry into its company calendar: as of early 2021, the Maintenance, Repair and Overhaul shop celebrates three decades in the business. Naturally management is excited and eager to share this milestone with their longstanding dedicated team of expert technicians, as well as the many aviation outfits that company services across Canada and the world. Although the last year leading up to this anniversary have been far from celebratory for the aviation industry, Canadian Propeller says it is honoured to be able to continue to support this crucial industry with world-class workmanship, dedicated customer service, and 30 years of experience behind every propeller or component they MRO.

Canadian Propeller began in 1991 with a 2,500 square foot shop on Brooklyn Street in Winnipeg, Manitoba. Co-owners Maurice and Debbie Wills both realized starting the new company would be a risk, but they found financing to purchase tooling and hire an experienced team to work for them. Cana-

Above: **Highly specialized testing equipment in the MRO shop.**

Left: **Co-owners Maurice (pictured left) and Debbie Wills both realized starting the new company would be a risk, but they found financing to purchase tooling and hire an experienced team to work for them.**

Below: **'Props' to the crew (pun intended) for handling every customer's order with care.**

dian Propeller quickly began establishing a reputation in the industry. Although the shop was once relatively small, right from the start the Wills established a commitment to quality.

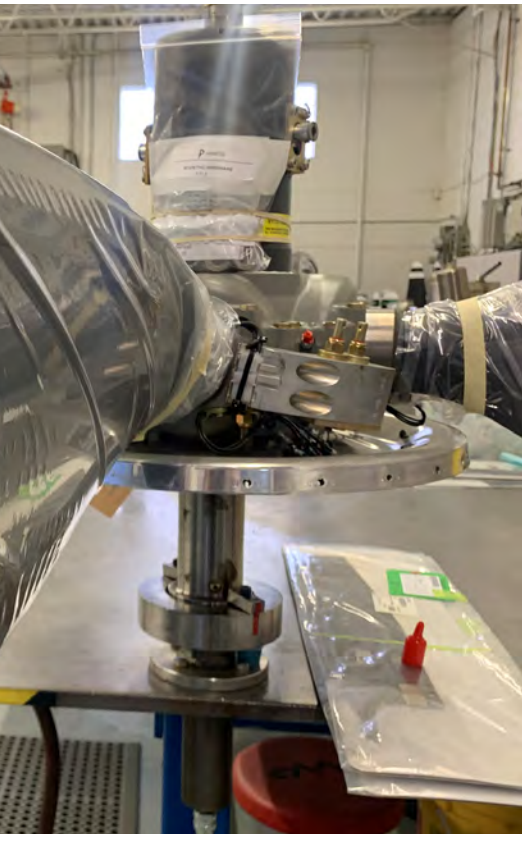
Early into its business life, Canadian Propeller received Approval from Transport Canada, an Authorized Service Facility certification from Hartzell Propeller, MT Propeller, and McCauley in the United States—becoming one of only 26 in the world to receive such a certification. At the time of founding Canadian Propeller, Maurice owned a 1966 Corvette that had to be sold in order to finance some of the initial tooling required to start the shop. Although he still hasn't gotten around to replacing his Corvette, the media blaster on the shop floor boasts a tag that reads "66 Corvette" to commemorate the investment at the start of Canadian Propeller.

Over the past 30 years, the reputation and service offering of Canadian Propeller has grown to meet more of its customer needs and is now servicing propellers from Cessna to Dash-8 and ATR aircraft. And from Beechcrafts to the

Honesty, integrity, and competitive pricing are all pillars to customer experience at Canadian Propeller, operating in its expanded, high-tech 12,000 Sq. Ft. facility.

CL-215T and CL-415 water bombers, "Each time we certify a propeller, blade, or governor for airworthiness we know that the margin of error is zero, and we take that very seriously," says Canadian Propeller. Over the years the size of the shop has increased to a 12,000-square-foot state-of-the-art facility, and has developed technologies that track every single piece of customer's components through the MRO process to maintain strict quality control.

Although the company has grown in size and capability, what has not ever changed says Canadian Propeller is the self-mandated demand for world-class quality and safety standards. To back this, the company offers arguably the most generous warranty in the industry, guaranteeing its work for two years or 2,000 hours, whichever comes



first. "Next to our standards of quality, is the values that we operate with," says Canadian Propeller. "Honesty, integrity, and competitive pricing are all pillars to our customer experience. If something doesn't need work, we'll tell you. We aren't here to get your money, we are here to serve the industry we love."

"Thirty years of serving Canada and the world has meant everything to us. We love aviation, and we take great pride in supporting all of our customers through this difficult time. To all of our customers and especially our dedicated team, we want to say thank you for helping us get to this amazing milestone." ■

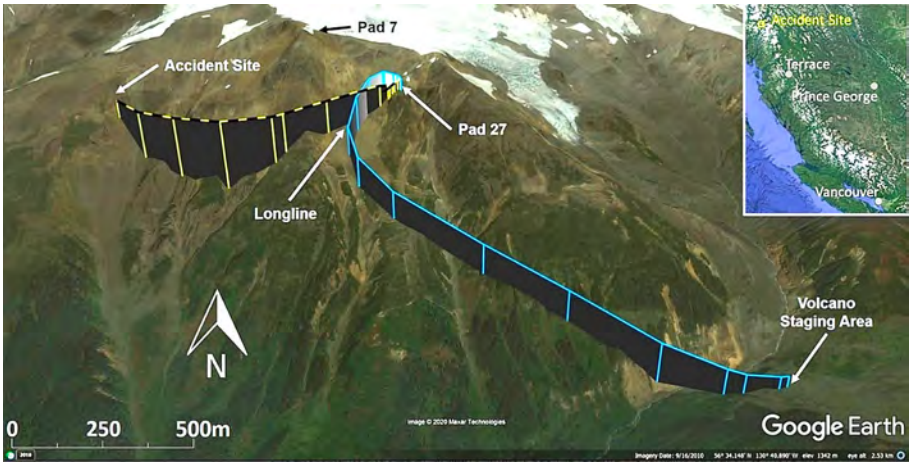
Lost Horizon

Fast-changing weather in mountainous terrain spells trouble during routine movements in support of mining exploration operations

Incident aircraft sits poised on a typical makeshift exploration mining chopper pad in BC's coastal mountain range.

ON **17 AUGUST 2020**, the Aberdeen Helicopters Ltd. (Aberdeen) Airbus Helicopters AS 350 B2 helicopter (registration C-FAHC, serial number 2898) was conducting visual flight rules (VFR) operations in support of a mineral exploration project. The pilot's tasks began at 0652 with flying the day shift crew to their drill sites on Nickel Mountain, British Columbia (BC), and returning the night shift crew to Garibaldi Camp located 9 nautical miles (NM) northwest of the drilling area. The pilot then picked up 2 workers from the camp, dropped them off on the mountain, and, at approximately 0750, landed at a location known as the Volcano staging area, approximately 1 NM southeast of the drilling site at Pad 27.

As the sole occupant, the pilot removed the helicopter's external storage basket, fuelled the aircraft, and attached a 75-foot longline in preparation for the



View of Nickel Mountain with the global positioning system track of the helicopter's path before its final arrival at Pad 27 (solid line) and shortly before the accident (dashed line).

Mining exploration field crew stand by as the support helicopter toes into the steep sideslope.

next task, moving a dismantled drill rig from Pad 27 to Pad 7, approximately 1400 feet to the northwest. The first set of lifts between the pads began at approximately 0800 and continued until approximately 0842, when the pilot returned to the Volcano staging area to refuel.

The pilot returned to Pad 27 at approximately 0854 to resume the longline operation to move the drill rig. During one of the 11 lifts, the pilot communicated that he would have to hover in place due to reduced visibility before he could continue with the lift. The visibility improved and the rig transfer continued. At approximately 1006, the pilot returned to the Volcano staging area to refuel.

At 1022, the pilot returned to Pad 27 to move the last piece of the drill rig. After the drill foreman had hooked the load up to the helicopter's longline, the pilot communicated that poor weather was approaching and that he was unable to take the load. The load was disconnected and the helicopter hovered in place for approximately 1 minute. At 1024, the pilot backed away from the drill pad downslope (southwestward) at a ground speed of between 1 and 2 knots and stopped approximately 200 feet away. He then moved back toward the pad, and the drill crew asked if they should remove the longline. The pilot said it was not necessary, and at 1025:40, he turned and began to accelerate on a southwestward track. Heavy rain began at this time.

Over the next 30 seconds, global positioning system (GPS) data showed that the helicopter continued southwest and accelerated to a ground speed of approximately 70 knots at GPS altitudes of between 5600 feet above sea level (ASL) and 5500 feet ASL. At 1026:02, the pilot released the longline from the helicopter onto the hillside about 800 feet west of Pad 27 and, 9 seconds later, the helicopter began to track to the right in a turn at approximately 5° per second. The change in altitude during this turn was less than 100 feet. The turn continued until just after 1026:27, when the helicopter collided with terrain. The pilot was fatally injured. The aircraft was destroyed in the collision and a post-impact fire.

Search efforts

When the heavy rain began, the drill crew at Pad 27 sought shelter in the survival shack at the drill site. They

Slinging netloads of gear is a routine duty for helicopter contractors supporting exploration mining activities in mountain country.

emerged after approximately 15 minutes and, assuming the helicopter was waiting at the Volcano staging area, attempted to contact the pilot by radio. The crew at Pad 7 also tried to contact the pilot by radio. Neither crew was successful. The drill crews began a ground search in their immediate areas and, at approximately 1111, an air search began with another Aberdeen helicopter that was in use for the exploration project. The air search focused on likely places the helicopter could have set down to wait out poor weather conditions. After this unsuccessful initial search, the Joint Rescue Coordination Centre (JRCC) in Victoria, BC, was notified at 1236, and a search and rescue aircraft was tasked with the search at 1422.

At 1428, the pilot of the other company helicopter, who had begun a patterned search of Nickel Mountain at about 1407, informed the camp that he had located the crash site and that the crash was not survivable. At 1453, the JRCC was informed and the search and rescue aircraft was stood down.

Aircraft information

The occurrence aircraft was a Eurocopter France (now Airbus Helicopters) AS 350 B2 helicopter manufactured in 1996. It was equipped with a Honeywell LTS101-700D-2 turboshaft engine (serial number LE-46088C), installed in accordance with Soloy LLC supplemental type certificate SR01647SE. It was also equipped with an attitude indicator; there was no indication that there was a malfunction with this instrument. At the time of occurrence, the aircraft had accumulated approximately 14,215.8 hours of total air time.

Records indicate that the aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The helicopter had no known deficiencies before the occurrence flight and was being operated within its weight and centre-of-gravity limits. The helicopter was equipped with a Kannad 406AF-Compact emergency locater transmitter (ELT). The Canadian Mission Control Centre did not receive a signal from the aircraft's 406 MHz ELT, and no signal was detected by the company's other helicopter during the search. Due to the nature of the impact and the post-impact fire, it could not be determined why no signal was transmitted.

Wreckage and impact information

The wreckage was found at approximately 5500 feet ASL on a steep mountainside. The damage was consistent with a high-energy impact. Most of the aircraft was consumed by the post-impact fire with the exception of the tail boom and the floorboard area of the cabin.

All 3 main rotor blades remained attached to the rotor head and exhibited impact damage consistent with high rotational energy of the rotor system as well as thermal damage. Impact signatures and markings on the tail rotor and driveshaft were consistent with tail-rotor driveshaft rotation at impact.

Functional continuity of the flight control system and main rotor drive system could not be determined due to the damage from impact forces, but the flight controls were traced from the flight controls and remaining linkages to the main rotor and tail rotor systems. The engine was also damaged from impact forces, and there was fire damage to the outside accessory areas. The first stage compressor showed leading edge damage consistent with the ingestion of dirt or rocks.

> *The pilot ...had accumulated more than 2,800 flight hours, including at least 900 hours on this type of helicopter ...This was his second summer flying in the same area and supporting the same exploration company.*

Nothing was found during the post-accident examination to indicate that an airframe failure or system malfunction occurred either before or during the occurrence flight.

Pilot information

The pilot held a Canadian commercial pilot licence – helicopter, a valid Category 1 medical certificate, and was type rated for the AS 350 B2 helicopter. He had accumulated more than 2,800 flight hours, including at least 900 hours on this type of helicopter and more than 200 hours on the occurrence aircraft. This was his second summer flying in the same area and supporting the same exploration company.

Occurrence site on 26 August 2020, looking northeast.

Aberdeen Helicopters Ltd. was authorized by Transport Canada (TC) to conduct operations with reduced VFR visibility limits of 1⁄2 SM in uncontrolled airspace and the pilot had completed the annual company VFR low visibility flight training.2,3

Based on a review of the pilot's work and rest schedule, fatigue was not considered a factor.

Weather information

The accident occurred in an area known for rapidly changing weather conditions. This is to be expected in a region where mountainous terrain is directly affected by moist coastal air. The clos-

est aviation weather reporting station is Stewart (CZST), BC, located 45 NM south-southeast of the accident site. The weather at 1000 was as follows: wind direction variable at 2 knots, visibility 3 statute miles (SM) in light rain and mist, broken clouds at 700 feet above ground level (AGL), overcast cloud at 6000 feet AGL, temperature and dew point 12 °C, and altimeter setting 29.87 inches of mercury.

There was some weather information available from the Eskay Creek mine camp, located 10 NM east of the accident site, but the data collected by that station was limited to relative humidity, air temperature, and a precipitation gauge. At the time of the accident, the temperature was approximately 12 °C with 100% relative humidity, and light to moderate rainfall.

The graphic area forecast, valid at 1100,5 for the area near the accident site indicated an upper cold front moving northwestward through the area at 30 knots. The forecast included showery precipitation with visibility varying between 2 and 6 SM in light rain and mist. Overcast clouds based between 1,500 and 3,000 feet ASL with tops at 12,000 feet ASL were expected in the area, and patchy (between 25% and 50%) ceilings between 500 and 1000 feet AGL were also forecast. In addition, the forecast called for isolated areas (25% or less) of altocumulus castellanus clouds topped at 16,000 feet ASL with a visibility of 1 SM in rain showers and mist, and local (25% or less) visibilities of 1⁄2 SM in light rain and fog with cloud ceilings of 200 feet AGL.

Garibaldi Camp had internet connectivity, but it could not be determined whether the pilot had accessed online weather information before the flight. To determine current conditions, the camp routinely contacted the night crews on the mountain each morning to obtain direct weather information. On the morning of the accident, the weather was reported as clear and raining. Clear meant that the drill sites were not obscured by cloud.

Flight operations in rain

In regard to flight operations in rain, the Transport Canada Aeronautical Information Manual states the following:

An error in vision can occur when flying in rain. The presence of rain on the windscreen, in addition to causing poor visibility, introduces a refraction error. This error is because of two things: firstly, the reduced transparency of the rain-covered windscreen causes the eye to see a horizon below the true one (because of the eye response to the relative brightness of the upper bright part and the lower dark part); and secondly, the shape and pattern of the ripples formed on the windscreen, particularly on slop-

ing ones, which cause objects to appear lower. The error may be present as a result of one or other of the two causes, or of both, in which case it is cumulative and is of the order of about 5° in angle. Therefore, a hilltop or peak 1⁄2 NM ahead of an aircraft could appear to be approximately 260 ft lower, (230 ft lower at 1⁄2 SM) than it actually is.

On-board recording devices

Following a fatal accident with no survivors or witnesses, an investigation may never be able to determine the exact causes and contributing factors unless the aircraft is equipped with an on-board recording device. The benefits of recorded flight data in aircraft accident investigations are well known and documented. Following an occurrence8 on 13 October 2016 in which a privately operated Cessna Citation 500 collided with the ground and fatally injured the pilot and three passengers, the Board recommended that the Department of Transport require the mandatory installation of lightweight flight recording systems by commercial operators and private operators not currently required to carry these systems.

In its September 2020 response to this recommendation, TC indicated that it agrees with this recommendation and that it has developed a draft Notice of Proposed Amendment to the regulation mandating the installation of lightweight data recorders in existing aircraft and their installation in newly manufactured aircraft. In its December 2020 assessment of TC's response, the TSB stated that TC's progress on the development of lightweight data recorder regulations is considered to be positive. However, until the regulations are finalized, the risks associated with the safety deficiency identified in Recommendation A18-01 will continue to exist. Therefore, the response to Recommendation A18-01 was assessed to be Satisfactory in part.

Safety message

VFR flight in reduced visibility conditions, whether they are caused by precipitation or obscuring phenomena, is hazardous, particularly in mountainous terrain. In areas where weather changes rapidly, it is important that pilots and air operators establish operational limits and procedures to maintain visual contact with the terrain at all times. ■

(This report concludes the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 24 February 2021. It was officially released on 09 March 2021.)

Aviation Services

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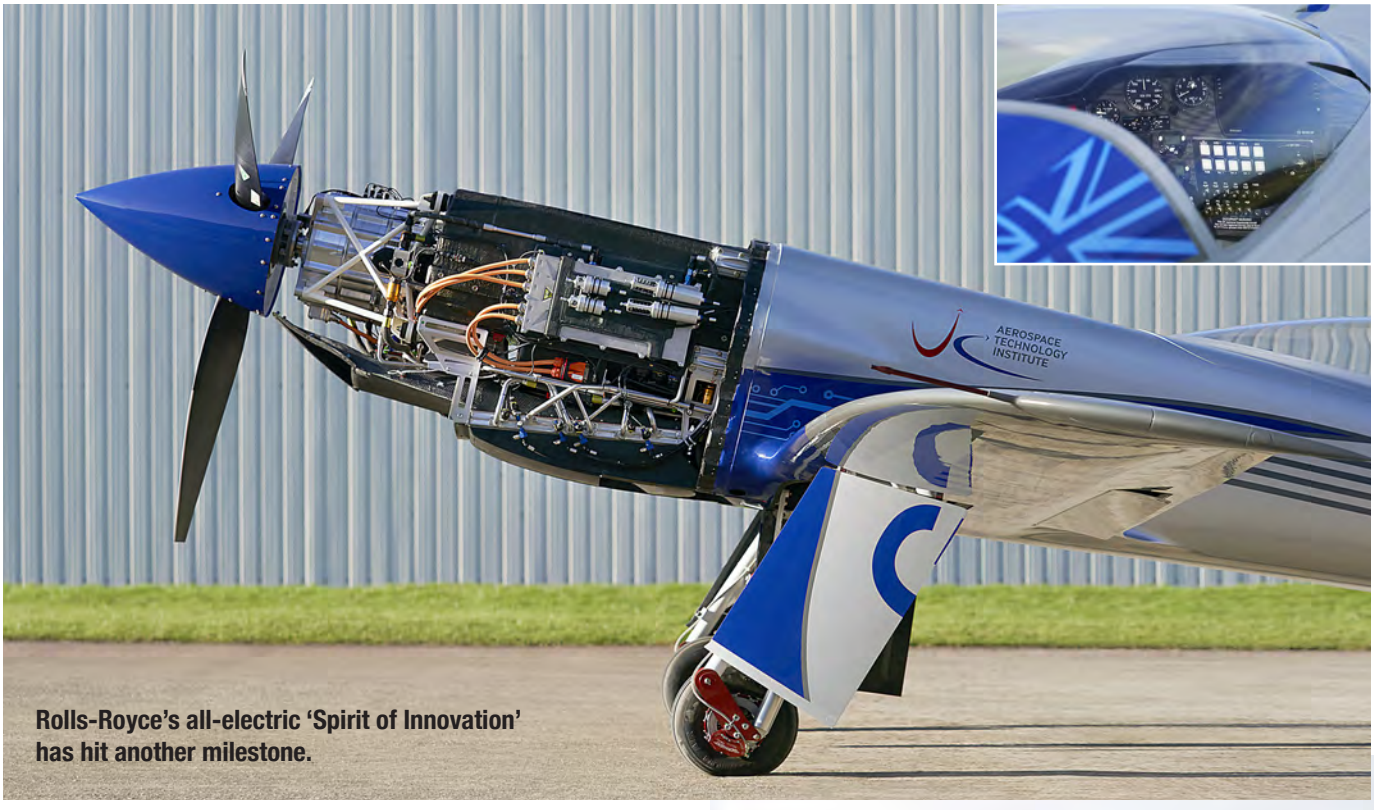
Accelerating Electrification



Rolls-Royce's all-electric 'Spirit of Innovation' has hit another milestone.

ROLLS-ROYCE has now completed the taxiing of its 'Spirit of Innovation' aircraft, the latest milestone on its journey to becoming the world's fastest all-electric plane. For the first time in its development, the plane powered along a runway propelled by its 500-hp (400-kw) electric powertrain and Rolls-Royce's latest energy storage technology. The taxiing of the plane is a critical test of the integration of the aircraft's propulsion system, ahead of actual flight-testing.

The first actual flight is planned for this spring and when at full power the combination of electrical powertrain and battery system will power the aircraft to more than 300 mph, says Rolls-Royce, which expects the aircraft's performance will set a new world record.

"Electrification of flight is an important part of our sustainability strategy as we aim for net zero carbon by 2050," said Rob Watson, director – Rolls-Royce Electrical. Taxiing of the Spirit of Innovation is an incredible milestone for the ACCEL team as we progress to first flight and the world-record attempt later this year." Rolls-Royce's Accelerating the Electrification of Flight (ACCEL) program includes partners YASA and aviation start-up Electroflight.

Rolls-Royce will be using the technology from the ACCEL project and applying it to products for the market. The company hopes to bring a portfolio of motors, power electronics and batteries into the general aerospace, urban air mobility and small commuter aircraft sectors as part of its electrification strategy.

It is also looking to inspire young people, through the ACCEL project, to consider careers in STEM (Science, Technology, Engineering and Mathematics). Rolls-Rolls-Royce has developed downloadable materials aimed at primary school children around the project. These are linked to the UK curriculum and everything can be downloaded from the website. ■