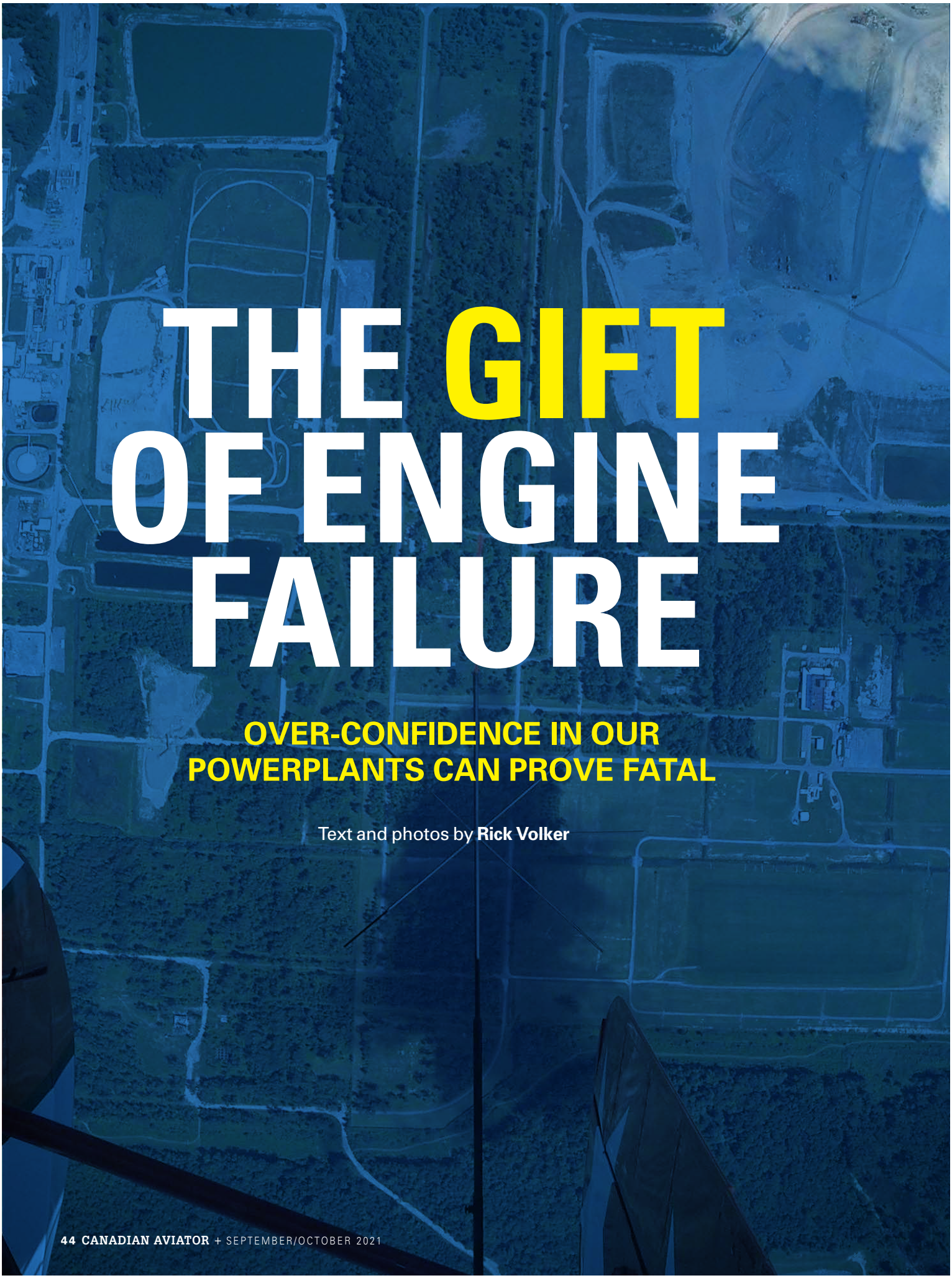


THE GIFT OF ENGINE FAILURE

OVER-CONFIDENCE IN OUR POWERPLANTS CAN PROVE FATAL

Text and photos by **Rick Volker**

From the moment we take flight lessons to the day we hang up our wings, a misplaced confidence in engines grows within us. We are told that engine failure is statistically rare. In fact, a partial or complete piston engine failure happens about once every 3,200 flight hours. After we learn that we can safely control the aircraft throughout its flight envelope, we tend to limit our immediate concerns to mastering navigation and traffic awareness. The normalization of deviance, as has been described by astronaut Charlie Precourt, affects all of us as we come to take the engine for granted. When we endure the risk of engine failure for countless flights without penalty, it is human nature to believe that the risk is somehow diminished. Overconfidence in engine reliability becomes our new normal.

This normalization allows unsafe engine-risk behaviours to blossom throughout our flying careers. Single-engine aircraft can be observed at 2,000 feet AGL over congested cities. Music is frequently piped into pilot headsets. Traffic patterns are extended far beyond the gliding distance to any runway. Private airports are found in the middle of huge tracts of densely forested land. When pilots are convinced that they have everything under their control, their brains seem to shrink into vestigial organs. It takes only one engine emergency to shake them out of their numb comfort. If good luck permits a safe outcome, the pilot has just received the 'gift' of an engine failure. This will hopefully provide the impetus to search for a mindset that will shepherd one safely through future times of heightened risk.

Pilots would be well served to adopt a mindset taught to law enforcement agencies and militaries of the world. Devised by former U.S. Marine Jeff Cooper, this mindset can be adapted to develop different degrees of aviation awareness that will help mitigate risk. It is broken down into four levels:

Condition White: The pilot is unaware and unprepared. With any emergency, denial of the problem occurs, and panic follows. To survive a real emergency with this mindset will require dumb luck. A pilot should never have this mindset during flight. If you want to relax, sit in a chair at the hangar. Throw away your cockpit music feeds. Stop the jovial conversations with passengers after takeoff. Do not even think of texting.

Condition Yellow: The pilot is relaxed, yet alert and aware that there may be a future emergency. A 'radar sweep' of all pertinent information is continuously performed. The mind is not permitted to daydream. This is the default minimum level of alertness that a pilot should allow. Having a good knowledge and awareness of possible high-risk situations is mandatory. This is where one weighs the options available.

CONDITION YELLOW: "THE MIND IS NOT PERMITTED TO DAYDREAM."

Potential landing sights are part of the normal scan.

Condition Orange: The pilot is suddenly aware that something has changed. Focus shifts to deciding whether there is an imminent problem and what course of action to follow. If there is more than one problem, the pilot cycles between them and is ready to execute. Condition Orange is where one needs to be during critical phases of flight that have few good options, such as landing and takeoff, aerobatics, formation flight or overflight of congested areas. It is taxing to stay in this mode for very long. As soon as the perceived danger passes, the pilot can return to Condition Yellow.

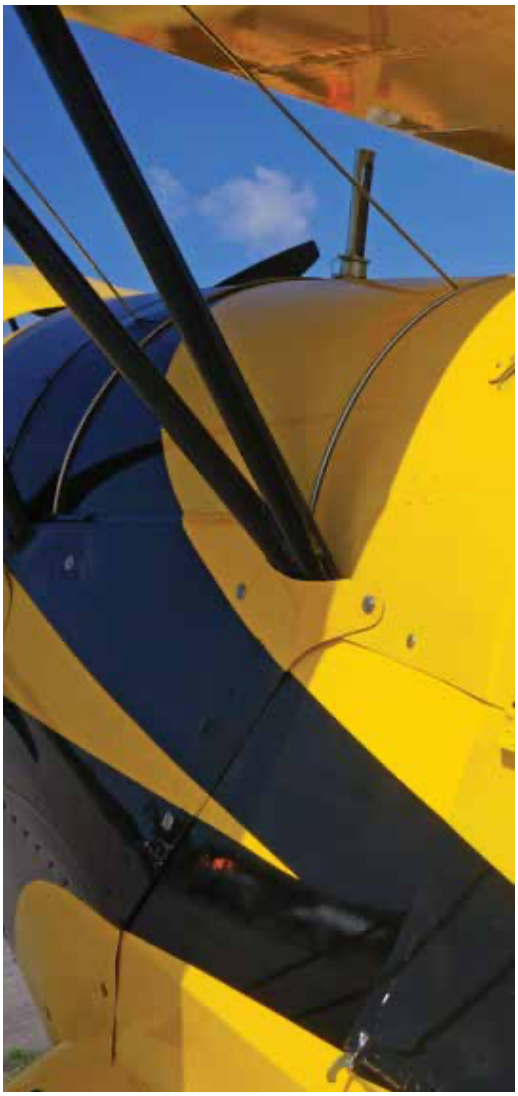
Condition Red: The pilot's planned emergency response has been triggered. There may have just been an engine failure, a bird strike or airframe failure. The fight is on. There is no panic. The pilot has rehearsed every action in his or her mind. This is the execution of the plan.

I speak from direct experience. In my 3,000 hours of flying, I have had four engine failures. I will describe how the above helped mitigate the risk. Fortunately, all had the same happy ending; a dead stick landing in a safe landing area without further damage or injury. There is always some luck involved, but I choose to believe that luck is when preparation meets opportunity.

CONDITION RED: "THE FIGHT IS ON. THERE IS NO PANIC."

PITTS S2B

This was a flight with 12 hours of total time on a top-dollar overhaul from a well-respected engine rebuilding house. My awareness of the heightened infant mortality of this new engine had held me in a Condition Orange mindset, ensuring that I kept an emergency landing field within my glide range, combined with a parachute option if I was not. I was a loaded gun with a hair trigger. At 4,500 feet AGL, the diaphragm ruptured in the fuel servo, plugging three out of six injectors. I continually lost altitude as the engine choked on and off while I manoeuvred toward the emergency field. The engine quit completely at 1,000 feet AGL, di-



rectly over the field. Have I mentioned that I do not trust engines?

SUKHOI 26M

A new carburetor was installed improperly and literally shook loose during a hammerhead at 3,500 feet AGL. The resultant massive intake leak made the engine quit. It would not restart. Flying aerobatics in Condition Orange ensured that I reacted instantly with a correct emergency response, without panic, and dead-sticked the aircraft onto the preplanned emergency runway.

SPITFIRE MARK IX

Unbeknownst to me, another pilot taxied the fighter around the airport and overheated the engine before my flight. This cracked the heads of the engine. While flying a 300-mph, 10-foot-high pass over the runway during an air show practice, the engine blew apart. There was instant IMC from smoke, and instant quiet. The manoeuvre had been performed at a speed that permitted emergency options. A Condition Orange mind-set supported a series of preplanned responses. The engine explosion triggered a Condition Red response to immediately climb to 1,500 feet AGL directly over the airport with a gentle turn to a downwind landing option. A bailout sequence was put into action in case of a fire. With the canopy open and a hand on the belt release, the smoke cleared. Bailout was cancelled. I once again became a glider pilot, landing without further damage.

WATCH THOSE BOTTLE CAPS

When adding oil additives, I always ensure that the complete bottle cap is in my hand. Unfortunately, an extra clear cap liner was present, a defect in manufacturing. I could not see it fall into my oil tank. Five minutes into my air show routine it

This page: The author has experienced engine failure in a variety of aircraft and circumstances.

"THROUGH THE 'GIFT' OF EACH ENGINE FAILURE, MY MINDSET CONTINUOUSLY EVOLVED TO RESPOND WITH MORE CALMNESS, MORE CONFIDENCE AND FOCUS DURING MY CONDITION RED RESPONSES."

blocked the oil pickup in my oil tank in the middle of a Lomcovák at 1,500 feet AGL. Oil pressure immediately dropped to zero and the engine went quiet. Flying in Condition Orange ensured that I expected something to go wrong. I always maintain enough altitude for an emergency recovery from every manoeuvre. The Condition Red dead-stick landing was automatic.

Through the 'gift' of each engine failure, my mindset continuously evolved to respond with more calmness, more confidence and focus during my Condition Red responses. I had practiced simulated engine-out landings hundreds of times. I had enough airspeed and altitude to make a suitable decision. I made sure that I was always within gliding range of an emergency landing area. I wore a parachute in case I could not avoid overflight of inhospitable landing areas. Most importantly, I had rehearsed all these emergency situations ahead of time. I was mentally in Condition Orange before they happened. I was able to execute my plan and share what I have learned.

What are the lessons learned? Never trust an engine, particularly after any maintenance or when anyone else has flown the plane before you. Renters, beware! Always pre-plan an out for engine failure during every step of your flight. If given a choice, pick a higher altitude to stay within reach of more suitable emergency landing areas. Stay over an airport as long as allowed after takeoff to climb to a safe engine-out altitude for the departure route through the surrounding areas. Make the tightest landing patterns that are safely possible to stay within gliding range to the runway. Practice engine-out landings from

every airspeed, altitude and attitude. When performing a low approach, either go slow enough to land with a power failure or fast enough to zoom up for a 180-degree turn to safely reverse course and land, and nowhere in between. Practice every possible departure from normal flight. Be comfortable with flight everywhere in the approved flight envelope. Even if you are a conservative pilot, a mechanical problem such as a cowl that blows off or bird strike damage may force you to fly at the edge of the envelope. Before takeoff, visualize what could happen and consciously maintain the reflex to execute your plan in a second. Continually strive to identify, prepare for, and minimize time when there is no 'out'.

Successful athletes visualize their every move ahead of time. So can we. The pandemic may have increased the time we have spent hangar flying, but these conversations should be encouraged and maintained going forward. Hopefully then, you will not require the 'gift' of an engine failure to develop your best aviation risk-management mindset. Remember the wise words told to pilots at the Reno Air Races, "Your airplane does not love you!"

Rick Volker is an air show display pilot with a background of competition at the highest level. He is known for his displays of Sukhoi, Harvard, Spitfire and Messerschmitt Bf109 airplanes. Rick was a member of the Canadian Heritage Flight team and is an air show competency evaluator for the industry. In his spare time, he is a dentist and a fitness competitor at the world championship level. – Ed.