



100, 110 feet - One for the record.
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In December 1966, my USAF Exchange Test Pilot, Captain Jim Reed, came to me with an exciting idea. It was this: beat the Russians and capture the world's absolute altitude record for Canada in the Centennial year. Over the years, the world's altitude record has been hotly contested by the major Powers. In one year alone, 1959, it was held in turn by the Russians, the US Navy, and by the United States Air Force. In 1961 Colonel Georgi Mossolov captured the record for Russia in a rocket boosted MIG-21, called E-66A, when he attained

113,892 feet. His record still stood in 1967. Beating it by the requisite three percent became our goal!

Our attempt would be based on a three piece keystone. First, we would use our high-speed "Pacer" aircraft CF-104 number 700. It was lighter than a standard Starfighter and it could be easily modified and instrumented. Secondly, we would take advantage of the high-energy jet winds along the axis of the Saint Lawrence River Valley to increase our total kinetic energy. By starting our pull up from within the core of a jet stream, we estimated that we could increase our maximum height by some 5,000 ft for every 50 knots within the jet stream. Finally, we felt that we could improve our zoom profile over that achieved by the Americans in their 1959 record flights. We postulated that by initiating our pull up from 35,000 to 40,000 feet and then pulling only low levels of G, we would carry more energy into the vertical and thus reach greater heights.

Our proposal drew enthusiastic support from Canadian Forces Headquarters and General Allard personally approved the Centennial project on 14 August 1967. We were off and running!

**The Centennial Team
 Ottawa—1967**



Our first task was to get an uprated engine, and it was here that Material Command and Orenda joined the Centennial team. Simultaneously, we begin to modify "700". We had to extend the inlet cones to better position the shockwave across the engine intakes for the higher supersonic speeds. Lockheed Aircraft Corporation helped by lending us the cone extensions and helping us mount them. The electrical system was completely revised as we added two new batteries and a "zoom" inverter. The pressurization system had to be changed out of all recognition. Captured by the spirit of it all, most of us worked well into the night and almost every weekend for five months!

In 1959 when Capt. Joe Jordan of the USAF captured the world's altitude record, the existence of the F-104 "flat spin" was unknown. Since then, however, a number of Canadian and American pilots had to jump out of 104s because of this characteristic. Lockheed studies revealed a stable and deadly spin mode, and it was apparent that if we were not extremely cautious our Centennial zooms could easily get us into a flat spin so we had to approach our task with unique instrumentation. Principally, this meant an extremely sensitive vane to measure angle of attack, and an instrument panel that would allow the entire zoom manoeuvre to be flown on instruments, and a power system that would not arc out in the low density conditions of inner space.

The Flight Research Section of the National Aeronautical Establishment (NAE) came up with the design of an "Alpha" vane to measure angle of attack. They fabricated the vanes, tested them in their wind tunnels and installed them on our Centennial "Bird". NAE gave us a great deal of help!

We needed full pressure suits! The Institute of Aviation Medicine secured these for us through the Surgeon General of the USAF, and in September Major Ron Hayman and I flew down to Tyndall Air Force Base in Florida to pick them up. Later on we obtained valuable assistance and special check-out gear from the Psychological Test Squadron at Edwards Air Force Base.

We finally were airborne in the first week of October, and our first task was to work the speed up to Mach 2.4 and determine engine performance. We progressed cautiously, but even then we ran into serious control and damper problems before we could start perfecting the zoom maneuver. Starting from Mach 2.0 and 25 degree climb angle, we gradually began to increase our Mach number and climb angle. During those days it seemed as if problem followed problem. The team always overcame them, sometimes with almost superhuman efforts, but time began to run out on us. Too soon Ron Hayman had to leave for RAF Staff College in Bracknell. Then on our 29th flight, I got to 96,000 feet from Mach 2.2 with a light following wind. I felt we had it made! But then we began to have engine inlet guide vane problems. We tried everything but it wasn't until we had changed engines and rescheduled inlet guide vanes that we got our thrust back. And low and behold, a light jet stream was still overhead!

By the third flight on 14 December, the engine was producing the required thrust and an NAE's T-Bird located the jet wind core to the south of Ottawa. Aerofile "David" (after my eldest son) was filed with Air Traffic Control and the countdown for our 41st flight began. Scores of Air Traffic Controllers in Toronto and Montréal began vectoring aircraft around our profile airspace, and Ottawa terminal begin to clear our route. The "David" profile traversed the most densely traveled airspace in Canada, between Toronto and Montréal, at high speeds, and required a most unique arrangement with the Department of Transport. But, by then, we had worked together for two and one-half months and everything went like clockwork!

I took off and began my climb out to the west of Ottawa, while Jim Reed in the chase (a standard CF-104) carefully checked me over. At 35,000 feet I dumped cabin pressure and check out my suit during the climb to 47,000 feet. At 100 miles west of Ottawa, I started a slow turn around to the east, and the DRTE (Defense Research Telecommunications Establishment) satellite tracking system at Shirley's Bay begin to track by beacon. Their tracking data was the vital bit of "proof" that we needed to establish any record of our height. Once DRTE had me on "auto track", I went full power and dove to 35,000 feet. I was supersonic almost at once, and by 35,000 feet was up to Mach 1.4. I continued to accelerate! Bypass on! through T-2 Reset! Mach 2.0! Shirley's Bay told me to switch antennae. Mach 2.35! A gentle ramp up to 39,000 feet! Mach 2.4! Pulling 2.4 G! At 57 degree pitch angle I seemed to be going straight up! My angle of attack "Alpha" gauge was centered, so I was right on the zoom schedule. At 75,000 feet, the afterburner blew out and at 84,000 feet I shut the engine down to prevent it overheating.

From the time I had established my climb angle, at about 70,000 feet, I was just like a fly riding on an artillery shell! I could control the attitude, but I could make almost no change in the trajectory. Attitude control was critical, and with the gyroscopic effect of the still rotating engine, any loss of control could get me into a flat spin! Following my "Alpha" gauge I gradually began to push my nose down as "700" arced over the top. Almost zero "G" and over the top at 65 knots; but I'm still supersonic! Dive brakes out as I start to accelerate downward and a gentle turn towards home. The Mach number continues to rise as I re-enter; even with maximum braking angle of attack, it rises to Mach 1.8 when I reach 60,000 feet and relight the engine. "Relight!!" This is the one word from me that relieves the people on the ground who are sweating it out with me. Then events come to a quick succession as DOT radar vectors me home, my chase catches me, checks me over and we come straight in because of my low fuel.

When DRTE told me I had peaked at 100,110 feet, I was discouraged. It was apparent to me that we were not going to be able to beat the Russians. The following day, I confirmed this on our 42nd flight and terminated the program.

Now that time is eroding some of the pangs of failure. I can see that we did something significant. First, we got to 100,110 feet and proved it to the satisfaction of the Royal Canadian Flying Clubs Association who monitored all our flights for the FAI. We established a Canadian national altitude record that has only been beaten by one other pure jet in the world. And, of the 25 zoom flights, we managed to make 12 flights safely above 95,000 feet. No one has ever spent that much time in a jet at those levels!

But I think the main benefit is that we exercised all of our national aerospace research and development organizations. In the same way that an operational squadron exercises to enhance its combat readiness, we exercised our capabilities and all of us, individually and collectively, gained valuable experience that could not have been acquired in any other way. Moreover we obtained data about the CF-104 that can be directly related to the operational CF-104 squadrons in Europe.

The Sentinel article was followed by a 6-page detailed technical article in the Canadian Forces Observer ([Available on our website](#)). Also there is some background information about the records that were set. Now 54 years later, I'm still being reminded of my failure to beat the Russians and the Americans. I had to explain and confess again to my fellow test pilots in 2019 (just before Covid) in Ottawa & Los Angeles at a reunion we had. And now my own Squadron gets me to confess again by reminding me of the prize that got away. But it was an exciting and innovative period for our amazing team that made all of us proud. Bud White

