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# ODE TO A STARFIGHTER

by Bill McWilliams

*This year marks the 40th anniversary of the first flight of the Lockheed F-104 Starfighter. Designed primarily by the legendary Kelly Johnson at the Lockheed "Skunk Works" in California, the prototype F-104 made its maiden flight on 7 Feb 1954 with company test pilot Tony Le Vier at the controls. In total, 2,578 Starfighters were produced worldwide including 200 single-seat CF-104's and 38 CF-104D duals operated by the RCAF and the CF from 1962 until 1986. Of these, 110 crashed killing 38 pilots. In this retrospective tribute to a remarkable aircraft, Bill McWilliams, a former Starfighter pilot, gives us an intimate insider's view of the heady days that were the Starfighter era.*



**T**he Lockheed-designed and Canadair-built CF-104 entered RCAF service in 1962 and remained our best liked and most glamorous fighter for more than 20 years. The long, sleek fuselage and small razor wings formed one of the most graceful shapes in anyone's skies and gave truth to the adage, "If it looks right, it is right". It was also proof positive that wings are not really necessary to accomplish heavier-than-air flight.

Although it has been replaced by the eye-watering turning performance and gee-whiz cockpit video games of the CF-18, the Starfighter is faster and is still a contender, as evidenced by the number of countries that were eager to snap up our discards.

We never used the high-altitude role the 104 was designed for. We used it for "strike" – a polite word for nuclear – and reconnaissance, until 1972 when the three remaining NATO-assigned squadrons in West Germany were converted to the attack role. Some thought loading a thoroughbred like the 104 with iron bombs was like delivering pizza in a Rolls-Royce – not economical but certainly classy!

The tiny wings (21-foot, 11-inch span) meant the 104 could be outmaneuvered by any aggressively flown Goodyear blimp, but did give it a strong suit in the low-level environment where fighters have had to live since the invention of surface-to-air missiles. It had blow-the-doors-off speed on the deck, and the small wing area (191.6 square feet) allowed very high indicated airspeeds, even in turbulence that would wrench the wings off ordinary fighters. There are few fighters, even the new ones, able to catch a 104 at low altitude and fewer still that can fly as fast in rough air.

I flew the 104 for more than 1,000 hours in Germany. It was certainly different and, compared to other fighters and trainers I flew, it was in a class of one.

Even the engine was different. The marvellous but antiquated Rolls-Royce

Nene of 5,100 pounds thrust in the Lockheed/Canadair T-33 hummed politely at idle, normal conversation alongside being possible. The Northrop/Canadair CF-5 had two 2,950 pound thrust General Electric J-85s set way back; they made less noise than the turbine start cart which puffed them to life. But the 104's General Electric J-79 of 15,800 pounds with afterburner occupied most of the fuselage, with the intakes right behind your ears. The canopy had to be left open for start and the air in the cockpit crackled and moved. Even at idle, the power had a definite presence. A nudge of power – but not more than 80 percent RPM – moved you from the line. More than 80 percent moved the inlet guide vanes, set up a howl like a wounded moose and caused three things to happen: the aircraft moved smartly forward in a satisfactory fashion for a super young fighter pilot; chocks and ladders moved smartly in the opposite direction; and the boss's eyes rolled heavenward as he reached for the phone to call servicing for the name of the pilot. The engine was a tattle-tale.

Taxiing was like sitting at the pointed end of a spear. Cockpit mirrors were installed for pilot morale; they confirmed that there were indeed semblances of wings, just long enough to keep the tip tanks from bumping against the fuselage. The nose-wheel steering button on the stick became a UHF transmit switch when the weight was off the left main wheel. Many a Tower controller was treated to the anxious breathing of a landing pilot whose left wing was being held up by a crosswind, thereby keeping the weight off the left wheel, and the nose-wheel steering, now desperately needed, wouldn't engage. The solution in a left crosswind was to stuff the stick hard to the left and compress the oleo to let the wheel know it was on the ground.

The engine run-up was a comedy routine. First you advanced the throttle slowly to military power, to the accompaniment of much noise and smoke and the pitot tube nearly stabbing the runway as the nose oleo collapsed. Then, slow reduction for awhile to check the exhaust nozzle, and a chop to idle. Now, just as spectators thought you were coming to your senses and giving up, you slammed the throttle back to full military. Doing that in a T-33 melted the turbine blades and fried the tailpipe. In the 104 it was supposed to prove the engine wouldn't compressor stall, but it never did, anyway. The J-79 was a comfort to pilots. It was able to swallow substantial bolts or birds – if the latter were not sitting on a very large branch – without a tremor. It was as reliable as the "Get a haircut" lecture from the new CO.

The afterburner didn't light all at



**Bill McWilliams as a 439 Sqn CF-104 Starfighter pilot at Baden-Soellingen, Germany, in 1973**

once, no matter how roughly the throttle was handled. It ignited, according to the lectures, in a series of steps provided by a smooth bit of engineering that pilots didn't really understand. The power came on nicely, like an expensive bottle of rye. The McDonnell CF-101 Voodoo afterburners, by contrast, were simple enough for pilots to understand. They exploded with fierce, mechanical thumps and all decisions regarding take-off were made: you were going flying!

A 104 take-off was easy. Nose-wheel steering was used to the rotation speed of 170 knots and crosswinds didn't count. You just aimed and went.

My first flight in the 104 was just like conversion to any other type. Stalls were not practised though, as the airplane would pitch up. When the wings stalled, all the lift moved forward over the airfoil-shaped canopy and the nose rose violently. The aircraft tumbled through the air at a frightening rate and the pilot was a passenger as he waited for the nose to finally point down so he could begin flying again. The waiting could take 10,000 or more feet. Stalls were therefore discouraged.

Instead, we did slow flight (160 to 170 knots, depending on weight) at 30,000 feet in the landing configuration. With full flap, 16th stage engine air was blown over the flap trailing edge, delaying flap stall. This air shut off when power was reduced below 85 percent RPM. This always resulted in one flap stalling before the other, take your pick, and the fastest un-commanded half roll you ever wanted to see. As instructed, I pulled off the power and saw the Alberta landscape appear in the top of the canopy and start to get a lot closer real fast. The reason for starting the affair at such high altitude was apparent. So was the practice wise 104 instructors had of locking their left hand behind the throttle to prevent the student from going to idle power before the main wheels were on the ground.

Another lesson that stuck was the "practice forced landing" (PFL) routine in single-engine jets. If the engine failed in a Tutor, for example, you glided to a point directly above the runway, in the direction of landing, and flew a descending 360° turn at best glide speed. This point is called "high key" and a Tutor needs 2,500 feet of altitude at high key. A T-33 needs 3,500 feet. The 104, with the gliding properties of a streamlined anvil, could make the runway from high key if you had 20,000 feet. The chances of being able to make high key at this height were so improbable that PFLs were showed once and dismissed.

A flapless approach in the 104 was an emergency. Even at the minimum speed of 245 knots the nose was high in the air and the aircraft trembled at the ragged edge of pitch-up, which was going to come at 225 or 230 knots. Instructors seemed to stress minimum speed pretty hard; mine had me fly one dual trip and then told me all practice would be done solo. Can't say I blamed him.

The 104 came into its own at high speeds. The controls, heavy at speeds below 400 knots, seemed to lighten as you got faster, and bank appeared as desired with little effort and pleasing rapidity. Take-off flap (half) was used below 400 knots, especially if you wanted to turn inside one province. And flaps could be used up to 520 knots. They must have been strong, because one of my friends tried to do his Mach 2 run with take-off flap and

reached only Mach 1.3 before discovering the reason for lack of further acceleration.

Flying low and fast was pure fun, especially in smooth air. In turbulence, speeds which would jar the fillings from your teeth in a airplane with real wings, were quite comfortable. Unless, of course, you looked at the tip tanks dancing around with a life of their own. The entire tail section flopped and twisted as if attached with rubber bolts, but none of the frightening activity was transmitted to the cockpit and the nose stayed aimed where it was pointed.

The 104 had a huge attitude indicator, incorporating the compass, dominated the panel. The whole affair was driven by the gyros in the inertial navigation system, never toppled during aerobatics, and spoiled us shamelessly. The shabbiest instrument pilot became an ace flying approaches because the attitude indicator/compass was so good and the airplane shrugged off turbulence. We had to fly our annual instrument ride in the T-33 and often found it a humbling experience trying to re-develop an instrument scan which had become somewhat hazy. To be fair, the T-33's instruments dated from WWII and the layout paid only the faintest of lip service to efficiency of scan.

The 104 was easy to land, provided you flew a circuit so wide that any self-respecting Boeing pilot would be embarrassed. The designer worked some sort of magic with the main landing gear which made good touchdowns virtually undetectable and hard ones

ego-stroking smooth. It was hard, at first, to become used to a standard touchdown with crab on. You didn't have to cross-control in a wind, the aircraft simply aligned itself without fuss after touchdown.

The rudder seemed to have no practical use except as a convenient place to paint squadron markings.

Light on fuel, the approach was flown at 190 knots, 170 over the button and about 155 for touchdown. The runway went by somewhat quickly but as soon as the nose was down and steering engaged, the drag chute slowed it down. We hardly ever used the brakes. The chute never failed, except when it was repacked at some foreign bases. The Danes, for instance, always packed it in so tightly it wouldn't come out without a crowbar. It was part of the charm of cross-country flying in Europe.

Cross-country flying at altitude was something we didn't do much, spending most of our time down low. The aircraft was superb at middle altitudes – 25,000-30,000 feet – cruising at Mach .94 or faster. Before the rules were changed in Germany to prohibit VFR above 10,000 feet, we flew Hi-Lo-Hi missions to the north German plain, usually because the weather in the south was bad. (Hi-Lo-Hi was a cruise out for about 200 miles at 25,000 feet, descend for low level (500 ft AGL) cruise for 15 minutes, then home at 35,000 feet). Coming back, we flew at optimum angle of attack, gradually reducing power as fuel burned off. Somewhere around 3,000 pounds of fuel, the fuel flow would match, leading to the happy state of always having an hour's fuel remaining.

Sometimes things got a bit tense if Lahr Approach was busy and you had overstayed your time north. But the controllers were quick to realize when we were short of gas without our having to declare a near-emergency state and were good about expediting the approach. Good thing, too. An official declaration of low fuel won you an interview with the boss who had a sense of humor

**The rudder seemed to have no practical use except as a convenient place to paint squadron markings.**



*The Starfighter was operated by several NATO countries during the 60s and 70s in various roles. This photo-reconnaissance version of the CF-104 from 1(Fighter) Wing, Lahr, Germany, carries a Vicom photo pod slung under the centre-line rack. This particular aircraft, 899, was transferred to the Turkish Air Force in 1986 and is still flying*

*The then state-of-the-art cockpit of the CF-104 Starfighter was “user-friendly” many years before that term came into common usage*

failure when confronted by pilots who broke the rules about reserve fuel.

I got to Germany just after the two Strike squadrons, 421 and 441, had converted to Attack. 439 Sqn converted six months later. Strike pilots had one bomb and a time to drop it, and they spent hours calculating to the nearest second and yard. A joyless bunch, they cared not where they were nor what they saw. They were on time, period. Reconnaissance pilots flitted around like demented rabbits, always knew exactly where they were and recognized every dam, radar installation and missile site they saw. Both groups had flown single ship and were good at what they did. As the experienced squadron pilots they trained the section leads and those of us who were newly arrived, although trained in attack, were relegated to wingman status. There were times when biting one's tongue was best as these former loners tried to adapt to flying around with never fewer than three other aircraft.

Unlike most fighters, the 104's range didn't suffer greatly at low altitude. Carrying one bomb, a strike pilot could fly 400 miles, littering the countryside with fuel tanks as they emptied. The photo pod slung under the belly of the recce aircraft looked rather lumpy but was nicely streamlined and caused little drag. The attack conversion was not as successful because external fuel tanks couldn't be carried, the pylons had bombs or rockets. We lost a little more fuel when the Vulcan cannon was installed, replacing a small fuel cell.

The 20mm cannon soon became a tourist attraction, for wit-

nessing a test firing at the gun butts was a mandatory exercise. Ground shots were limited to 18 rounds, three per barrel, as more would overheat the barrels without the cooling airflow of flight. As it was, the 18 rounds came out so fast it sounded like a foghorn and even with ear protection visitors jumped.

Since its inception and particularly in Europe, the 104 had been unfairly tagged with a bad reputation. A German joke of the 1960s went: “How does one acquire a Starfighter? One buys a small piece of land and waits.”

Touring journalists always got around to asking about crashes and how dangerous the aircraft was. I confess they were often misled at the mess bar. We would fake grim cheerfulness and drop such names as “widowmaker” or, even more ridiculous, “aluminum death tube” and, sure enough we'd be quoted. The clippings were all gleefully passed around the squadrons. Most of us enjoyed the notoriety, at least a little, and felt squarer of jaw and steelier of eye. Only supermen could fly such a killer airplane; it said so right in the Elk Pasture Times Weekly.

In fact, our safety record was comparable to that of any other aircraft in the same role. Most 104 accidents were a product of that role. Low-level, high-speed flying allowed little margin for error, and errors were often catastrophic.

But the CF-104 wasn't a shady lady. She just worked in a tough neighborhood.

*(Ed note: Bill McWilliams is a retired major living in Nanaimo, BC.)*

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She just worked in a tough neighborhood.**