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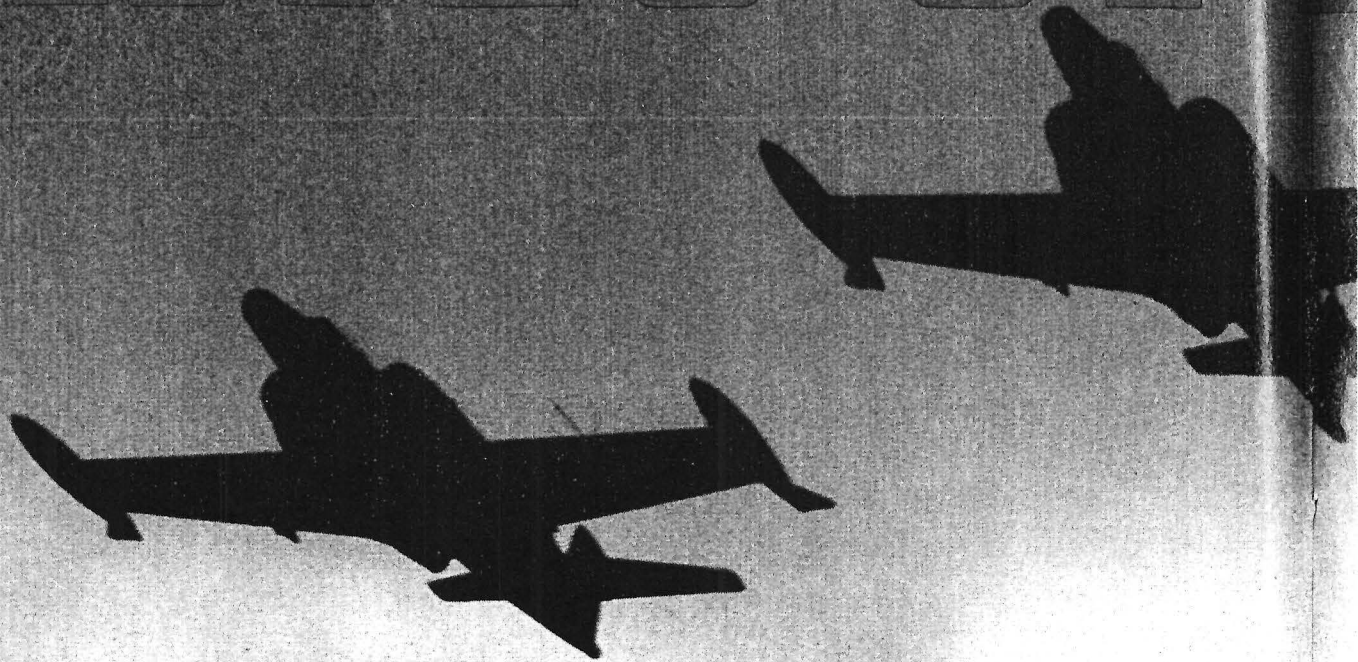
Rites of passage:
the end of
the CT-100

Stormin' Norman:
the dark side
of bush flying
World War II
re-visited
at Rebel Field
Short-field take-offs:
missing the trees



3100

RITES



This December, somewhere in Canada, the great Orenda engines of the last military CF-100 will be shut down forever. When this happens, an era will end and the only fighter aircraft ever designed and built in Canada will pass from service into aviation history after more than 30 years of military operations.

It is fitting that the end of the CF-100 epoch should be marked as an occasion of special interest to the many involved Canadians (numbering about 100,000). To that end, over the years 20 aircraft have been preserved for use or display at locations from coast to coast. In addition, an organization known as the Defunct Clunk Club of Canada has been formed by CF-100 aficionados to pay their respects as the air-

craft leaves our skies.

During the Sept. 12-13 weekend, a reunion organized by the Defunct Clunk Club and supported by Canadian Forces Base North Bay, took place at the base and ceremonies were held in conjunction with Armed Forces Day and Battle-of-Britain celebrations. Clunk fans descended on North Bay from all over Canada and the U.S., the U.K. and, in the case of one ex-officer, from New Zealand. Grizzled veterans of the earliest days of jet flight in Canada were there, serving and retired personnel from airmen to general officers took part, and interested civilians were also present. All had come to take part in nostalgic last rites for an aircraft which began life as a malignant and somewhat vicious

harridan but developed into a grand old lady with the passage of time.

The anticipatory "wake" commenced in earnest on Friday afternoon as Air Vice-Marshal E.D. Crew, RAF, unveiled a memorial plaque on the pedestal supporting Mk. 5 CF-100, tail number 18500, which now stands in front of the North Bay Base headquarters. In his speech, the air vice-marshal recalled the early days of CF-100 operations during which he had served as the first commanding officer of the CF-100 Operational Training Unit at North Bay. An aerial salute was presented by a four-plane formation of Clunks and, minutes after the formal ceremony, traditional beer busts were in full swing at the various messes. These affairs easily met the standards of

PASSAGE

**"CLUNK", "LEAD SLED", "CF-ZILCH", CALL IT
WHAT YOU WILL, BUT THE AVRO CF-100 WAS STILL
A WORLD BEATER IN ITS DAY. AND 2,000 FANS
SAID GOODBYE TO THE DEFUNCT
CLUNK IN SEPTEMBER.**

By W.J. Marsh



CF-100 formation makes pass at retirement party. Inset: Aircraft 18757 on the dawn of a cold working day.



RITES OF PASSAGE

the connoisseurs!

Maj.-Gen. D.W. McNichol, the Air Defence Group commander, and Col. P.G. Howe, who commands the airbase, were genial hosts to the crowds that overflowed the mess as an estimated 2,000 participants milled about meeting old friends at every turn. The "hangar doors" were open; reminiscences were exchanged, funny, hair-raising and sometimes tragic memories were talked over, and departed comrades were remembered as the evening progressed.

Naturally, the Clunk itself was central to many conversations that evening. The triumphs and tragedies, technical successes and design failures, handling characteristics and operational problems of its evolution and squadron service were discussed by various experts. For the most part, the nostalgic glow of the occasion warmed people's memories so that criticism was tempered and achievements emphasized. It was not always so, however, and in its early days, the CF-100 was nicknamed the "Clunk" for cause.

This nickname, and those of "Lead Sled", "CF Zilch" and so forth, were initially attached to the CF-100 by irreverent Canadian Sabre Jockeys (among whom I was numbered); significantly, however, CF-100 crews themselves came to use the same names for the aircraft. The reasons were many, but the most important was the speed limitation which imposed serious restrictions on the tactics available in the interception of high speed targets and consequently on the aircraft's effectiveness.

Reinforcing doubts regarding the potential operational effectiveness of the aircraft were serious weapons system problems that plagued the aircraft into the mid-50s and were no secret to Canadian aircrew. While performance shortcomings were perhaps overstated by detractors, some limitations were real enough and highly frustrating to aircrew intent of achieving operational results.

Contributing also to the negative aircrew views about the aircraft, were a formidable number of technical problems that became apparent during its early years of operation. Problems with canopy ejection, ejection seats that repeatedly failed to function, inadequate wind protection for the navigator attempting ejection at high speeds, and misunderstanding of G limitations—which led to failures of the extended wings—were notable and deadly results of design defects.

Although they were far from problem-free, the teething problems of the new Orinda engines were probably no worse than should have been expected, given the state of the art and the lack of experience of major manufacturers. Similarly, other problems with airframes and ancillary equipment are understandable in hindsight.

The fact remains, however, that the CF-100's technical problems, with large numbers of relatively inexperienced aircrew, and the scale and demanding nature of CF-100 training operations, were very costly. At least 99 aircrew officers were killed in flying accidents. Of this number, 97 perished in a 10-year period, the last fatality occurring in 1963.

During the same 10 year period, 95 aircraft were destroyed in flying accidents,

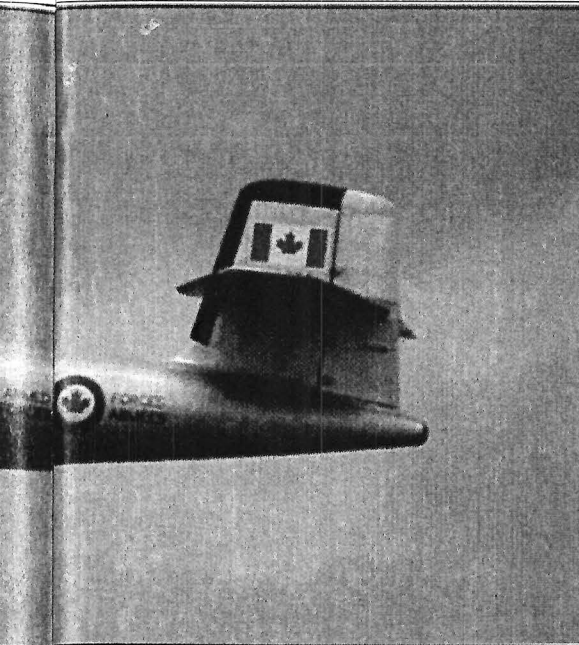
In its prime, the CF 100 Canuck played an important all-weather role for both NATO and NORAD

sometimes killing people on the ground. Casualties and aircraft losses on this scale in peacetime are simply unheard of in today's world and, considering aircrew losses in jet training programs and the heavy casualties also experienced in F-86 operations of the time, they constituted a serious drain on human and material resources. They also affected opinions of the aircraft.

Progress was made in solving some problems. Nothing could be done about speed restrictions and G limitations became even more stringent when wingtip extensions were added to improve high-altitude performance. However, engine problems diminished with experience and both armament and weapons control systems were enhanced. Aircrew also gained experience and training improved. Aircrew skills in working with ground radar controllers grew polished and pilots learned to respect the structural limitations of their aircraft while getting maximum performance from them.

The result of improved reliability and performance became evident in the late 1960s. Increasingly, the CF-100 began to demonstrate its true potential and, gradually, it became recognized as among the best, if not *the best* all-weather interceptor in the world. The CF-100 had redeemed itself by demonstrated performance. Aircrews took pride in their achievements and, although the nickname remained, the term Clunk became one of tolerant affection when used by CF-100 aircrew.

Once retired from the interception role



and assigned to service with the Electronic Warfare Unit, the CF-100 loss rates fell markedly and during its last years in service, only 10 aircraft were lost in 19 flying accidents, the last in 1973. Given the hazards of the target missions flown by the aircraft in the Electronic Counter Measures training role, this must be regarded as a very satisfactory record.

The testimonial "wake" was the most moving part of the weekend's happenings. No one present could doubt the deep respect for the old warbird felt by those who knew her best and had come to honor her passage from the Canadian scene.

The program for Saturday featured the Armed Forces Day air show which included a large static display of Canadian, American and British aircraft. (The RAF provided a Victor tanker for the occasion.) The weather was superb and, to me, the highlights of the unrestricted flying display were a "capability demonstration" by the USAF F-15, and a remarkable air show by the Voodoo team of 425 AW(F) Sqdn. led by Maj. J. Gregory.

Two CF-41s from CFB Moose Jaw put on an aerial display and individual shows were presented by Aurora, Caribou and Sea King aircraft. The air show was capped off by a formation flypast of T-33s, CF-101s and, of course, the vintage CF-100s. The Clunks were especially interesting since one had been painted in the black and white lightning streak that characterized the prototype CF-100; another wore NATO camouflage and the other pair were in the standard markings of 414(EW) Sqdn.

Four of the last six military CF-100s in commission were flown in the formation. Between them, aircraft 472, 504, 784 and

Although its early years were fraught with difficulties, the Clunk will be remembered as a capable all-weather interceptor

785 had a total of over 21,544 airframe hours. The airframes had originally been estimated to have an operational life of about 1,000 hours, but the aircrew assured me those remaining are still fundamentally sound at over five times that life. If only there were more engines . . .

The 414 Sqdn. CF-100 formation was led by Maj. P.A. Growen with Maj. R.A. Walker. Major Growen has more than 3,200 hours on type, the most logged by any pilot. Numbers two, three and four slots were flown by Maj. D. Andrews/Capt. B. Bland; Capt. A.J. Milne/Capt. P.J. Maunsell; and Capt. R. Pennock/Capt. R.G. Chester respectively. The pilots mentioned are, at this writing, the only squadron fliers checked out on the CF-100; the combined experience of the formation crews totals over 15,000 flying hours.

Saturday evening saw an all-ranks dance and hangar party that was attended by over 2,000 people. This occasion was a real success and gave the hard-worked host officers of 414 Sqdn. a chance to relax and join the fun.

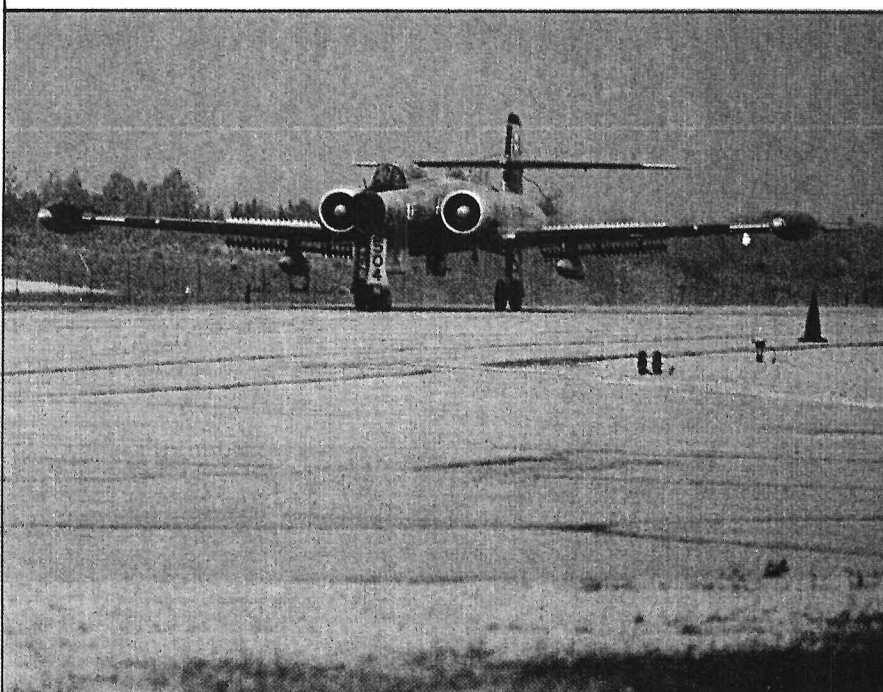
Sunday was bright and clear and morning memorial services were held in the base chapels. A combined Battle-of-Britain and CF-100 memorial parade was conducted in the city in the early afternoon. This ceremony concluded at the site of the pedestal-mounted CF-100 located in Lee Park with an impressive air show by the Snowbirds.

Editor's note: Coincident with this year's retirement of the CF-100 is the appearance of two major books on the airplane. In addition to Larry Milberry's *The Avro CF-100*, a hard-cover, color-illustrated book entitled *Avro Aircraft Canuck*, by Ron D. Page, an ex-RCAF pilot, has been published by The Boston Mills Press. *The Avro CF-100*, published by Canav Books, recently entered its second printing after the first run sold out by late summer.

As an unforgettable weekend came to an end, those Defunct Clunk Club members who remained for Sunday's ceremonies dispersed. A truly representative cross-section of dedicated men had assembled to reminisce about their CF-100 days. If their nostalgic memories tended to be selective and the good times were especially emphasized, it was normal since, for many at least, the years of their association with the old Clunk had been the best years of their lives, despite the inherent dangers and difficulties. The reunion had been a heart-warming celebration of those days and the friendships that formed among the men who had served together during those demanding times.

One sobering note remained, however, which did not escape the more thoughtful airmen; 414(EW) Sqdn. will continue to function with Falcons and T-33s after the last CF-100 is gone and, no doubt, the squadron will continue to make excellent use of the aircraft and equipment available. The loss of the CF-100s will hurt, however: it means six less cockpits for pilots and A1 navigators in the Canadian Forces. More important still: without the CF-100s ECM training capability, the air defence forces of Canada and the U.S. will both lose a significant part of their capacity to exercise various elements of the system under realistic electronic warfare conditions. The importance of these losses is for others to assess but, clearly, the retirement of the CF-100, without replacement, marks another stage of erosion in Canadian military aviation.

Avro CF-100 Mk. 4B	
Engines	2 Orenda 11 turbojets
	7,000 lbs. thrust each
Max. weight	35,500 lbs.
Length	54 ft. 2 ins.
Wingspan	53 ft. 6 ins.
Max. speed	Mach .84
Max. range	1,700 nm
Ceiling	45,000 ft.
Armament	8 .50 cal. machine guns
	58 2.75-in. FFARs



REMEMBERING THE CLUNK

Officially named the Canuck, the 30-year-old twin-jet interceptor popularly known as the Clunk touched the lives of many Canadians during its career and, as it retires from service, it is viewed by many as a Canadian aviation success story.

In retrospect, there are many important and alarming developments, as well as stories, both tragic and amusing, that will sustain the memory of the CF-100 even long after it is gone from the skies. Here, Canadian Aviation has reprinted a few such notes and anecdotes about the Clunk—and the men and women who worked with the aircraft—as they appear in the timely *The Avro CF-100*, a 203-page hard-cover book by aviation researcher/writer Larry Milberry. These excerpts recall both the aircraft's developmental pains and its capabilities as an all-weather interceptor.

An excerpt about a less-than-impressive flight demonstration by an early CF-100, taken from the opening chapter:

The year 1950 was a busy one for the CF-100. It flew on demonstrations at Ottawa, Montreal, Washington and Boston. A Toronto-Montreal flight was made at an average speed of 638.5 mph. The USAF evaluated the CF-100 at Wright Field, Ohio

At the Boston air show there were some difficult moments for the CF-100. On one take-off where (Avro test pilot Bill) Waterton was going to rip the plane off in his usual crowd-pleasing way, one engine wound down just as the plane left the ground. Meanwhile, fellow test pilot Bruce Warren was reading a colorful commentary but not keeping an eye on Waterton. As Warren described the CF-100's incredible climb rate, Waterton was staggering along above the runway, just managing to keep airborne.

The Orenda flies:

The first Orenda-powered CF-100 was 18103. This aircraft flew initially June 20, 1951, and was to be used thereafter on many engine test flights. After so much proving both in the test cells and aboard the Lancaster testbed, it was to no one's surprise that the Orenda performed very well on these early flights. Test pilots noted little difference in performance between the Avon and Orenda-powered CF-100s, except for some marginal benefits with the Orenda at high altitude. Within a year, the Orenda was in production at the big new engine plant adjacent to Avro ... One point of agreement among most pilots who flew the CF-100 was that the Orenda engines were the most dependable feature of the airplane.

A note about early crew training:

By mid-1952, the training of CF-100 crews was about to begin, but things were happening slowly. At first, only T-33s, B-25s and C-45s were being used by the Operational Training Unit. . . .

In mid-summer 1952, CF-100s 18109 and 18110 arrived to join 18108 and CF-100 flying began. As these were all early pre-production aircraft, pilots found each different from the other. One pilot remembers 18109 being 20 kts. faster than the other two. Of course, the new aircraft were also fraught with bugs. The nose gear sometimes failed to retract properly, hydraulic pumps failed, fuel transfer valves stuck, and radios were unreliable. Pilots found the lack of nose wheel steering in the early versions a nuisance. An odd feature was the way the control column obscured the compass on the instrument panel. This had to be rectified by canting the control column to the right. Pilots joked that the complicated fuel management system, with dials all across the panel, made an engineering degree mandatory before checking out on the CF-100.

The mysterious retracting undercarriage:

Another developmental problem in 1954 is described here by (Avro test pilot) Jan Zurakowski, "After a routine experimental flight in a CF-100 I realized during my landing run that the undercarriage was retracting. Since my speed was too low to get airborne again, I switched off the engines and the aircraft skidded to a stop, damaging the flaps badly. After an investigation had been carried out in the hangar, it was determined that everything was in perfect order: lowering and raising the undercarriage functioned properly and the indicators were correct. Conclusion: pilot error.

"I was called to the hangar to see for myself. I set all the controls and switches as I had during landing, operated the undercarriage several times and, sure enough, everything was just fine. I was just getting out of the cockpit when the foreman said, 'You see, that's really a good old aircraft,' and enthusiastically slapped the fuselage with his hand. That started it. All by itself, the undercarriage retracted.

"It was later established that the wiring of the master auto-observer switch was mixed up with the undercarriage selector wiring and that a short caused by the vibration of the aircraft as it touched down caused the undercarriage to retract."

On rivalry with F-86:

For most CF-100 crews these (that is, the European service days) were halcyon days. Every mission was something new and rarely could a CF-100 leave the ground in daylight without getting involved in some

kind of friendly skirmish. Frequent adversaries were Air Division Sabres, which usually carried the day. There was little a CF-100 could do in air combat manoeuvres with a Sabre. It just wasn't built for dogfighting. But there was one possible trick to use against the Sabre. This wasn't recommended procedure in the least and not many tried it. The CF-100 could be pulled up steeply. One engine could be idled, the other slammed to full bore, and the rudder pushed over. The result was supposed to be something like a Zurbatic cartwheel; the plane would rotate around with the nose pointing straight down, presumably at the pursuer. In this way, one Clunk driver claims to have captured a Sabre on gun-camera film, then screened it later in the mess to rub it in.

The CF-100 crews had another form of consolation. Every three months the Sabre drivers had to do night flying training, something they weren't crazy about. This gave the CF-100 crews, night hawks all, the chance to do a bit of ribbing. They'd offer to fly as escorts, lest the Sabres wander astray. . . .

About errant rockets:

There are many stories about problems with the CF-100's rocket armament. . . . Perhaps the best known and wildest incident, though, occurred at North Bay on New Year's Day 1959. A CF-100 was being serviced in the hangar. A technician checking circuits in the rocket pods pressed the firing button assuming that the system was on safety, but someone had goofed. It was live. Both pods fired and 58 rockets went flying through the doors. Outside, a snow clearing truck was parked, its two crewmen enjoying a smoke. As they relaxed, they were rudely interrupted by 2.75s crashing into the truck, in one side and out the other. The tail was taken off a C-45; other rockets passed by a parked TCA Viscount and ended up in a nearby golf course.

Nobody was injured in this unusual New Year's bash.

Practice, practice:

Throughout the 1950s and early 1960s the CF-100 was ceaselessly on guard in Canada. Training never let up with the result that crews were at a peak of competency and, in spite of flying an aging mount with aging systems, they were able to meet all their NORAD requirements. The Clunk's radar system was rudimentary, yet the aircraft somehow did the job as well as or better than U.S. interceptors with better radars. Using a combination of basic radio

compass and dead reckoning, smart navigators regularly guided their CF-100s over long courses—three hours and more to the leg. They arrived at their destinations as surely as much more advanced fighters with their VORTAC, TACAN and other modern nav aids.

The first trans-Canada Clunk:

Being a long-range interceptor, the CF-100 was expected to prove its capabilities in service. Avro was especially keen to gain some publicity from a long-range endurance flight. Such a flight was organized in November, 1953 and an aircraft and crew from 445 Sqdn. were chosen. Number 445 had become the first operational CF-100 squadron that April. The crew for the flight were F/Ls Mike Kobierski, a World War II Mosquito pilot and Doug Turner, and the aircraft was 18136.

On Nov. 5 and 6 Kobierski and Turner flew from Ottawa to Vancouver. They carefully planned their trip and, on Nov. 16, were ready to go. RCAF and Avro support teams were involved to make sure everything was in perfect order. Fuel was cooled using dry ice in order to get every drop possible into the CF-100's tanks. The same day, Kobierski and Turner took off, headed for Halifax.

Taking advantage of high-level winds, pressure ridges and cruise-climb flying, 18136 worked its way across the country. Over northern Ontario there were minor problems with the engines, but the bad news was that Halifax was weathered in. So was Montreal. Over Ottawa, which was also down, Kobierski was forced to turn back and land at North Bay. Flight time had been 4:30 hours. So ended another pioneer jet age flight in Canada.

Avro later reported on the event in *Avro Canada News*, giving the flight time as 3:50 hours, likely to produce an inflated impression of aircraft speed. It also billed the flight as strictly routine, noting that "the fliers were not out to establish a record," another misleading statement.

On the Clunk's unsuitability as a ground attack aircraft:

To determine the usefulness of the CF-100 as a ground attack aircraft, bomb trials were conducted in 1954 at Malton. Aircraft 18105 was modified as a Mk.3 aerodynamically, and 14 bomb-dropping trips were flown over the Lake Ontario range.

In all, 21 1,000-lb. bombs were dropped and 20 100-lb. practice bombs. Problems encountered included bombs fouling each other when released, but the pilot's comments were favorable as far as performance went. "Bomb dropping was satisfactory under conditions tested. Change of trim at moment of bomb or bombs release

was small or negligible." Bombs had been dropped at speeds between 230 and 550 mph.

The CF-100 was not developed any further in the bomb carrying mode. This was explained four years later in an Avro memo relating to the proposed STOV (Short Take Off and Vertical Landing) CF-100: "At 27,000/30,000 lbs. gross, the CF-100 Mk.4 strength factor is about 7G limit. Between 10/12G limit is recommended for ground attack airplanes . . . Low strength factors and the cost incurred to correct the situation was one reason why the CF-100 ground attack proposal in 1954 was not developed."

Canopy problems:

Canopy ejection trials were another subject of experimental flight test at Avro. For several years the CF-100 suffered from malfunctioning canopies, and there were numerous cases of inadvertent jettisoning in RCAF service. One of these occurred on March 15, 1954, when 18151 shed its canopy after a crew member accidentally hit the jettison lever. The canopy blew, but a malfunction in the system prevented it from clearing the aircraft . . .

Canopy trials at Avro included two flights on June 15, and 19, 1953, with aircraft 18120 flown by Jan Zurkowski. Jettisoning took place at Camp Borden at 260 kts./5,000 ft. on the first flight, and 200 kts./5,000 ft. on the second. Observations from these flights included: "Frost shields on side panels of windscreen: Both shields were sucked out when the canopy was jettisoned, narrowly missing the pilot . . . Trim—No effect on either flight . . . Upon coming loose the (canopy) seal could have gone into the engine intake . . . The seal could wind around the observer's face and neck." So went the learning process.

On early armaments:

Design and development work on the CF-100 Mk.3 and Mk.4 was progressing quickly by 1951. The Mk.3 would become the first combat version, being a gun-armed aircraft. The Mk.4 was required to satisfy the RCAF's new armament thinking. The Air Force was now convinced that rockets were needed to destroy modern jet bombers and the Mk.4 was to be developed to suit this need. It would carry guns, but also a large number of upguided rockets. These would be FFARs—folding fin aircraft rockets, 2.75" in diameter.

Touring Europe:

In March 1955 three CF-100 Mk. 4Bs were ferried across the Atlantic via Iceland to the RAF Central Fighter Establishment. This operation was called Random 12 and was

the first time a Canadian-designed fighter aircraft had flown the Atlantic. After RAF evaluation, the CF-100s, aircraft 18320-18322, were stored in the U.K. at RCAF Station Langar.

That August, Avro decided to display the CF-100 at the SBAC's 16th Flying Display and Exhibition at Farnborough, and after several days of cleaning and servicing, 18321 and 18322 were made ready for flight through the efforts of Avro's five-man service team, led by John Painter. Jan Zurkowski and Glen Lynes were to fly the aircraft.

Both aircraft were flown to Farnborough on Sept. 3. Probably due to the months they had spent outdoors, getting them ready to fly had been arduous, and once at Farnborough there were still numerous snags. Nonetheless, flying got underway Sept. 5 . . .

In its September 9, 1955 edition, (the now defunct British magazine) *The Aeroplane* wrote of Zurkowski's show: "Although far from new, the Avro Aircraft CF-100 Mk. 4B was a welcomed newcomer to Farnborough, and was magnificently displayed by Jan Zurkowski. His imaginative approach to demonstration flying was shown by his sequence of a half-bunt from the inverted position; several rolls; a four-roll oscillary spin; a vertical upward roll; and a most impressive prolonged falling leaf, with the Orenda 11s idling."

On production:

By the mid-50s, the CF-100 was available in large quantities, something which calmed the anxieties of those MPs who had for a few years been grouching about slackness in getting the planes into service. In fact, some claimed that the CF-100 was even being over-produced at this time. The maximum commitment by the RCAF was for 13 squadrons, whereas production was heading for 700 aircraft. Some at Avro and in the RCAF were pushing for re-equipment of several auxiliary squadrons with the CF-100 but, because of the complex requirements of CF-100 operations, AFHQ vetoed such a plan. Altogether, this left existing RCAF squadrons very well supplied with CF-100s.

As CF-100 production peaked at Avro, one aircraft per day was coming off the production line. Life for the work force at Malton of over 10,000 men and women was hectic, with 16-hour days becoming standard. After months of such shifts, one Avroite recalls being awakened for work one morning by his wife. He refused to get out of bed, he was so exhausted, and stayed there for the better part of the next two weeks! Elsewhere, 30,000 other Canadians at 450 subcontractors were busily involved in the CF-100 program.