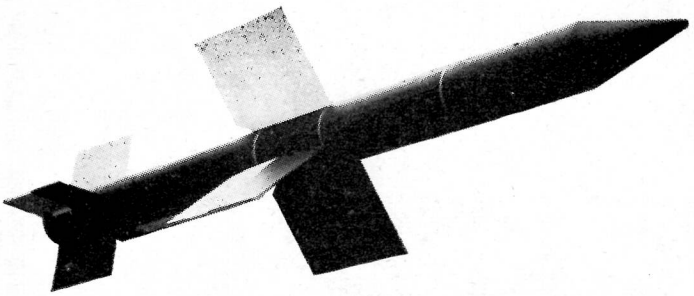
The Weapon That Almost Was



THE VELVET GLOVE, a weapon that almost was but now never can be, was enjoying a high probability of final success when its development was terminated at a critical juncture by a switch in Government policy.

The Government decision: to get out of the guided missile development business and switch to production under license of a fully-developed U.S. missile.

The result: still no missile is being produced in Canada more than a year after the decision was taken to license-manufacture the Douglas-Bendix Sparrow 2.

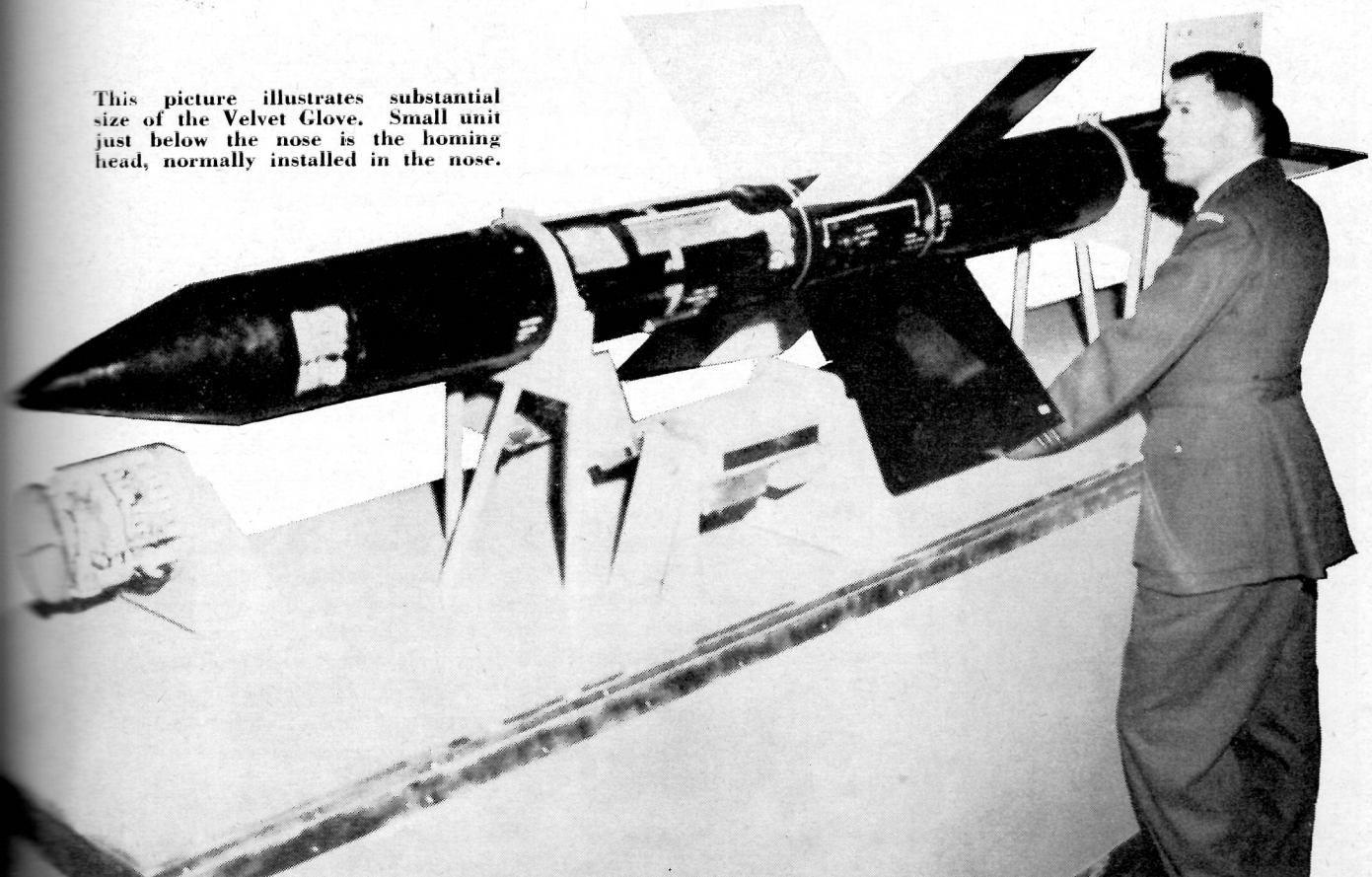
The Facts: What appears to have happened is this. The proponents of license-built guided missile production thought that it would be possible to negotiate the license for the Sparrow and get production rolling within three months. Nearly a year went by before a license was sewed up, by which time it was discovered that it was not possible to get blanket coverage of all the missile's components with a single license. Other concerns were involved besides Douglas and Bendix, and the licenses for some components are not attainable as the items are yet to be fully developed.

It is expected that several more months will pass before all the necessary additional license negotiations are completed: then further time will be required to organize and set up production facilities. It now seems improbable that any Sparrows will be turned out before another six to twelve months have passed. Then there will be a possible lengthy period involved in marrying the Sparrow to the aircraft which will use it.

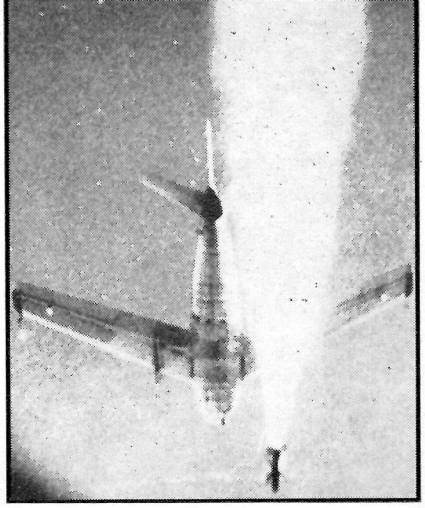
Thus, it will be as much as four years after decision was made to abandon further development of the Velvet Glove before operational Sparrows become available to the RCAF.

The trouble is, guided missiles are such relatively new weapons, that there is no such thing as a fully developed one. The chances are that by the time the model of the Sparrow which Canada is being licensed to build becomes available to the RCAF, it will be hopelessly outmoded. It is now beginning to appear that where guided missiles are concerned, it is not possible to separate production from research and development. The picture changes so rapidly that a missile production program must be backed up by comprehensive research and development support.

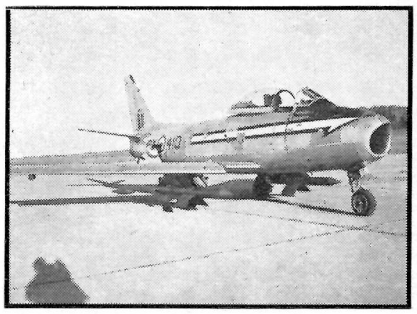
First Life: The Velvet Glove program came to life in 1951, when a small team of four or five scientists was organized at the Canadian Armament Research and Development Establishment, (CARDE), Valcartier, P.Q., to begin preliminary investigations into the field of guided missilry. One of the original team of scientists



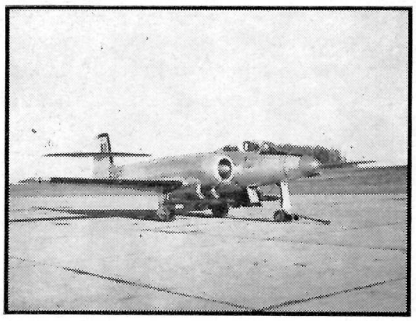
This picture illustrates substantial size of the Velvet Glove. Small unit just below the nose is the homing head, normally installed in the nose.



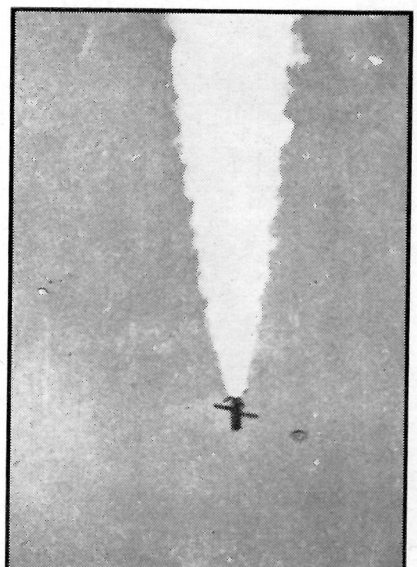
Above, a Velvet Glove being fired from a Sabre. This photograph was taken from a T-33 pacer aircraft which was flying low and astern.



Above, Sabre used for Velvet Glove air launching trials; below, CF-100 for same purpose. Sabre could accommodate two missiles; CF-100, four.



Below, the Hulcher camera record of a firing, also taken from a T-33 flying low and astern. Picture at top is the Eyemo camera record.



was Gordon D. Watson, project officer for the guided missile program and at that time also superintendent of CARDE's Ballistics Wing. He is now Director of Weapons Research at DRB headquarters in Ottawa.

The stated objectives of the program were, first, to build up guided missile research and development potential in Canada, and second, to provide an air-to-air guided missile of intermediate performance to weapons being developed in the U.S. and the U.K.

The first objective was almost completely met. In the four years that the program was officially supported, suitable equipped laboratories had been established in DRB and development and test facilities in industry. Test ranges were constructed and instrumented and trials teams trained in the preparation and test firing of missiles.

The first test missile was launched within eight months of approval of the project and more than 300 test missiles were manufactured and fired during the four years concerned.

Big Team: In the same time, the guided missile group grew from the original team of DRB scientists at CARDE to about 400 engineers and technicians, these being scattered through industrial as well as government organizations. By the time the program was terminated, ten agencies were involved: the DRB itself, two DRB labs — CARDE and the Defence Research Telecommunications Establishment, (DRTE), the National Aeronautical Establishment, (NAE), the RCAF, and five industrial concerns — Canadair, Canadian Westinghouse, A.V. Roe, de Havilland Canada, and Computing Devices of Canada.

Initial responsibility for the program was given to DRB's own staff because it was felt that this was the only way to find out all the relevant problems and to develop adequate training for future programs. The plan was to work with industry from the start and to transfer full responsibility to industry about three years afterwards . . . or as rapidly as industry would build up the facilities and staff to take on the development work.

The second objective was also practically achieved. However, the catch here was that the objective itself had shortcomings. In drawing up the specifications for what eventually became the Velvet Glove, the RCAF and DRB aimed at a weapon designed to combat the known threat. What the Board undertook to develop was a guided missile for use on an interceptor with a speed advantage over its target.

High Performance: By the time development of such a missile — the Velvet Glove — was well advanced, it became obvious that the one potential foe with which Canadian fighters were likely to tangle within the foreseeable future, was operating bombers over which no operational fighter in the Western world had any significant speed advantage. At this point, the specification should have been upgraded for use against targets with a performance equal to that of the fighter aircraft; a different thing entirely from the requirement of the first specification.

Why did the RCAF and DRB not foresee in 1951, when drawing up the missile specification, that Red bomber performance would shortly equal that of the Western world's front line fighters? In fairness, it should be pointed out that it was not until recently that Western intelligence was able to confirm . . . at just about the same time the U.S.S.R. was willing to let it be known . . . that the capabilities of Red air power were far in excess of anything that had been imagined by anybody in the Western world.

There is also evidence that in its eagerness to prove to the many doubters that a Canadian guided missile development program was possible, the DRB tried not to set too difficult a task for a start. As one rueful DRB scientist now comments: "By the time we proved it could be done, there was the need to upgrade the performance specification and although DRB was anxious to do this, the decision was made outside the Board that this shouldn't be."

The Switch: It is claimed that the Velvet Glove could have been upgraded by equipping it with a different seeker (the homing head) or by designing the existing one. "But this was not undertaken because the RCAF decided to favour production of an American missile and because of DRB's desire to use the Government people concerned on more advanced research. The weight of opinion in favour of producing designs of foreign origin and lack of confidence in

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VELVET GLOVE

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adian design convinced the Government leaders that development should be terminated in favor of license production."

Since that time, much of the laboriously built up missile development organization has gradually dwindled away. Though most of the industrial concerns involved have guided missile departments, they are dormant. Many of the personnel have been transferred to other work or, tiring of twiddling their thumbs, have drifted away into other fields in order to keep their talents at work. Several who came from the U.K. have returned to await a time when Canada needs them again.

Conversion to still non-existent production was at the expense of destroying much that had been built up.

Missile authorities in the U.S. and U.K. held Canadian achievements in the field in high regard. They were particularly impressed at the enthusiasm and hard work of the Canadians and the way so much was accomplished in such a short time, starting from scratch. DRB officials claim that the Velvet Glove development had reached the stage where some of the tests being carried out were in advance of those for similar projects in other countries and that the Velvet Glove development program was a better base on which to build for the future than the Sparrow production program. When the development program ceased, some components of the Velvet Glove were rated as being ahead of comparable components in the U.S. and 18 months later some of them still are.

Expenditures: Approximately $24,000,000 was expended altogether on the Velvet Glove program, and of this amount about 90% was spent in Canada. Because the development organization is being allowed to crumble, it appears that some of this money must be written off. However, not quite all is waste. About a third of the expenditures were on facilities which will be of use in other fields for years to come and the DRB personnel are fully employed in examination of missiles for Navy and Army requirements, and in the examination of weapons for the CF-105 and for defence against the ICBM. The industrial teams have been hardest hit.

It is the opinion of some Canadian scientists that nearly two years have been lost in addition to a great loss of morale. It does seems that a longer term plan for development and production of guided missiles is in order.

INDUSTRY R & D

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bines; AC generating system and ancillary equipment including actuators, booster pumps, hydraulic devices, navigation light flasher units to operate at altitudes in excess of 60,000 feet, for use in the Avro CF-105 Arrow.

Sperry of Canada: Though Sperry has mainly been concentrating on the production of items for aircraft instrumentation which have previously been developed by the parent Sperry company in the U.S., or Kollsman, it has recently received a U.S. development engineering contract to redesign and repackage an existing airborne radar indicator. The contract calls for Sperry to improve and modify existing circuitry, repackage the entire equipment using sub-miniature techniques, and to provide improved performance under certain flying conditions.

Jarry Hydraulics: Considerable development work in the field of aircraft hydraulics and undercarriage systems is performed by this Montreal organization. For example, it is responsible for the development of the CF-105 nose undercarriage, complete with steering system. Development work in connection with this aircraft also includes control actuators of size and power hitherto unknown, in this country at least. To enable it to carry out development work on undercarriages, Jarry has recently installed a large drop test rig capable of accommodating landing gear for aircraft with all-up weights up to 200,000 lb.

Canadian Marconi: The Aviation Dept. of the Canadian Marconi Co. operates its own group of development engineers solely occupied with aviation products. It has specialized in designing and producing equipment to the various Canadian and U.S. specifications dealing with form factors, engineering practice, environmental testing, performance characteristics and airworthiness certification. It is the first company in Canada to develop and produce a piece of civil airborne radio equipment as a private venture.

The three major products developed by the department to date have been the CMA-301 ADF, the CMA-402 Loudnailer, and the CMA-101/201 HF Transmitter/Receiver. Nearing the final stages of development is an interesting line of transistorized equipment, notably power supplies for dynamotor replacement, and a complete system of aircraft audio control panels, cockpit and cabin loudspeakers, isolation amplifiers and passenger-address power amplifiers, all being fully transistorized with the accompanying great saving in weight, size, and power requirement.

Canadian Westinghouse: Developmental activities embrace complete aircraft power generation, regulation and protective systems for AC and DC requirements; AC and DC electrical aircraft motors of all sizes and types; rectifier units; electrical instruments, temperature control relays; electrical apparatus for ground service; airport and aviation lighting and distribution equipment; pneumatic valves and anti-skid equipment; ground and airborne electronics equipment of all types; communication equipment; radar. This company was active in the Velvet Glove program.

Canadian Westinghouse maintains a comprehensively equipped environmental laboratory facilities at Hamilton, where they are set up in quarters separate from the main plant.

Cossor Canada Ltd.: This Halifax firm specializes in the development and production of such advanced electronic items as airborne radar defence equipment; aircraft inter-communication systems, underwater equipment, test gear including industrial oscilloscopes, logarithmic amplifiers, signal generators, advanced display systems (radar and computers).

Phoenix Engineered Products: Phoenix has devoted most of its research energy towards the development of electronic and electromechanical devices, which it regards as the "brain" content of automatic controls and instrumentation associated with high speed aircraft and guided missiles. The firm is, however, interested in any sort of development or work where precision is paramount.

An outstanding line of telemetering equipment has been developed which