

With a built-in versatility

by Lt R. Tracy

What can hover like a helicopter, fly like a plane and is distinctly Canadian?

No, it's not a newly discovered member of the bird family; it's the CX-84, an exciting new aircraft being manufactured at Canadair Limited in Montreal.

And an Armed Forces team of experts has been on hand "from square one" to monitor the manufacture of three of the aircraft for the Canadian Armed Forces.

Development of a radically new aircraft, the CL-84, started in 1963 when the Department of Defence Production joined Canadair to fund the design, manufacture and flight test of a prototype tilt-wing aeroplane. Canadair brought to the program seven years of expertise gathered during research

and development into vertical and short take-off and landing (VSTOL).

From the first flight, in May 1965, until flight testing ended in September 1967, the prototype aircraft was flown by 18 pilots and accumulated 145 flight hours in 305 flights.

The success of the prototype resulted in the production of a new model, the CL-84-1 (Military designation CX-84) for the Canadian Armed Forces, and the establishment of a Canadian Forces group at Canadair. The team will serve on site during the construction stages, and will test evaluate the completed aircraft in a variety of roles.

Senior Project Pilot with the Armed Forces group is Major J. E. "Ernie"

Booth. A graduate of the US Navy test pilot school, Major Booth served for two years on exchange duty with the Aerospace Research Pilots School at Edwards Air Force Base, California. No stranger to the new concept of VSTOL aircraft, he co-authored a VSTOL training course syllabus for the USAF, and has flown some of the experimental craft under development in the United States.

With this background, Major Booth is well qualified to assess the potential of the CX-84.

"It's a terrific aircraft", he says. "It will put Canada well in the lead of other developers in the field. Many VSTOL aircraft have passed through the research and development stage and reached the prototype testing stage, but in the CX-84 we have a

craft that is actually in production, with first roll-out scheduled for the end of March." The remaining two aircraft for the Armed Forces are programmed for completion in mid-June and late August.

But Major Booth is quick to point out that the CX-84 is not designed to replace the helicopter or the short take-off and landing (STOL) aircraft. It does not have the hovering efficiency of the helicopter and because of its size, it will not carry the load of the *Buffalo*. It does, however, have a STOL performance capability which makes it very competitive as neither the helicopter nor the STOL aircraft can perform the one aircraft mission of the CX-84.

He stresses that helicopters and STOL aircraft have been developed to carry out specific roles, and are available for purchase "off the shelf".

The CX-84 combines some of the features of both, a marriage of aircraft speed with helicopter convenience in an exciting new air vehicle package. The CX-84 will not have to carve out a new role, however, for the need for this type of aircraft already exists.

Possible uses for the CX-84 include combat aircrew rescue, where a combat aircraft is shot down over enemy or guerrilla-held territory. Experience has shown that the chances of recover-

ing a downed pilot decrease quickly with the passage of time, and in many cases a helicopter lacks the speed to reach the rescue scene before enemy forces have captured the pilot. With its aircraft speed of 270 mph plus, the CX-84 can reach the scene much faster than "choppers", and after switching to a hover configuration, can pick up the downed pilot. Similarly, search and rescue operations and medical evacuations can be speeded up.

Major Booth explains that aircraft with VSTOL capabilities can be developed along a number of lines. The result can be an aircraft which uses powerful engines to lift itself off the ground by "brute strength"; or "one in which the physical configuration of the craft can be aerodynamically altered to increase performance during transition from stable hover flight to conventional flight." Major Booth and his team follow closely the developments in other countries and the successes and failures of VSTOL aircraft incorporating various methods of motive power, from pure jet and fan-jet to turboprop and rotor.

One outstanding success is the production of a VSTOL jet fighter in Britain. The Hawker *Harrier* is capable of operating practically anywhere, and does not need a long, hard-surfaced runway. Its vectored jets can lift the

aircraft vertically from a standing start and then propel the craft forward at acceptable fighter speeds.

But to operate from remote, unsophisticated areas the *Harrier* will require the same "care and feeding" as any fighter aircraft. This support could be provided by an aircraft like the CX-84 which possesses a light-transport capability. Capable of airlifting over 4,000 pounds of cargo or 16 passengers, the CX-84 can even fly backwards at 30 mph while in hovering configuration. It is ironic that the development and perfection of one type of VSTOL aircraft has created the need for another type of aircraft with VSTOL characteristics.

The CX-84 must prove itself capable of carrying out these and many other operational roles, and for this reason Major Booth heads up a group of two test pilots and four operations pilots eagerly awaiting "roll-out" day of the three Armed Forces aircraft.

In the meantime the Armed Forces personnel at Canadair keep busy familiarizing themselves with every step of the program.

Chief project engineer behind the CX-84 is Canadair's Fred Phillips, a small, dynamic individual who has been nicknamed "Canada's Mr. VSTOL" by his compatriots.

Although completely familiar with

The versatile CX-84 can airlift 15 troops with summer combat equipment and land in operational areas normally inaccessible from the air.



all aspects of the engineering and development of the CX-84, Mr. Phillips is not so engrossed in the slide rule and paper projections that he does not appreciate the problems of the aircrew.

Mr. Phillips points out that one of the important design considerations in the CX-84 was the development of a control system with which the average pilot would feel immediately "at ease".

Heart of the CX-84 flight control system is a mechanical programming unit which provides normal aircraft response from the control column and rudder pedal motions under all flight conditions. Mr. Phillips and his fellow "boffins" may shudder at the thought that the test pilots equate the "little black box" to the automatic transmission of a standard motor car, but the comparison reflects the confidence the pilots have in the mechanical programming unit. "It is a straightforward type of gizmo," stated one pilot, "a mechanical gearbox containing cams, gears and levers."

"Straightforward" or not, the unit is probably the most important feature contributing to the success of the radically new aircraft.

Powering the CX-84 are two Ly-

coming turbine engines, a powerplant that has proved itself under combat conditions in US military helicopters in Viet Nam. Ruggedness, reliability and ease of maintenance are firm requirements for VSTOL powerplants, and the varieties of conditions and terrains in which aircraft of this type must operate dictate that the engines have a minimum of susceptibility to foreign object damage.

The propulsion system is designed so that either engine can drive one or both of the ungainly-looking 14-foot fibreglass propellers. In addition the engines drive the tail propellers which are hydraulically declutched during normal flight.

The three aircraft being built for evaluation by the Canadian Forces will differ somewhat from the prototype CX-84. Additional streamlining and minor exterior surface changes will give the CX-84 an additional 20 mph in performance. Also, the Armed Forces team, by being on site during the initial manufacturing stages, has been able to suggest minor modifications which have been incorporated into the design, an improvement over attempting to make minor changes in a

finished aircraft.

Forces Detachment Commander Major (N) L. T. "Larry" Zbitnew commands a group of three test pilots, four operations pilots, three engineers, five senior NCOs and 18 junior NCO technicians. Major Zbitnew praises the work of his team, and points to the extra hours all must devote to the project. "Canadair works a six-day week and overtime and shift work are the rule, not the exception," says Major Zbitnew, "and our team must work alongside them." Moreover, when the production aircraft are ready for the air, flying time might be available on weekends or restricted on weekdays. As a graduate of the US Navy test pilot school, Major Zbitnew knows how important it is to be "ready to go" at any time during the flight testing or operational testing period.

In support of the program the military group has taken part in a series of joint test team courses organized by Canadair. Starting in late January with a one-week indoctrination course for pilots and flight engineers, the training program includes courses in the electrical, avionics, airframe and aero-engine specialties. At the end of

Production of the three aircraft for the Canadian Armed Forces was on schedule at time of writing, with first roll-out set for end-March.



the training period the team will be working "sleeves up" with the production people and later be participating in the ground and air testing with their Canadair counterparts.

Close cooperation between the Armed Forces personnel and Canadair employees is common at all levels. Marketing manager for the CX-84 is a former RCAF Squadron Leader, Bob Simmons. He talks the same language as the men on the military team and keeps them informed on the progress of promotional activities designed to find other markets for the aircraft.

In spite of the fact that he does not believe in the "hard sell" approach, Mr. Simmons finds that potential customers still like to talk things over with a third party. With their extensive background experience and their intimate association with the overall project the uniformed men provide a knowledgeable sounding board for interested individuals or groups. Major Zbitnew, Major Booth and the other military men are frank and objective in their appraisal of the CX-84, and answer all the queries openly.

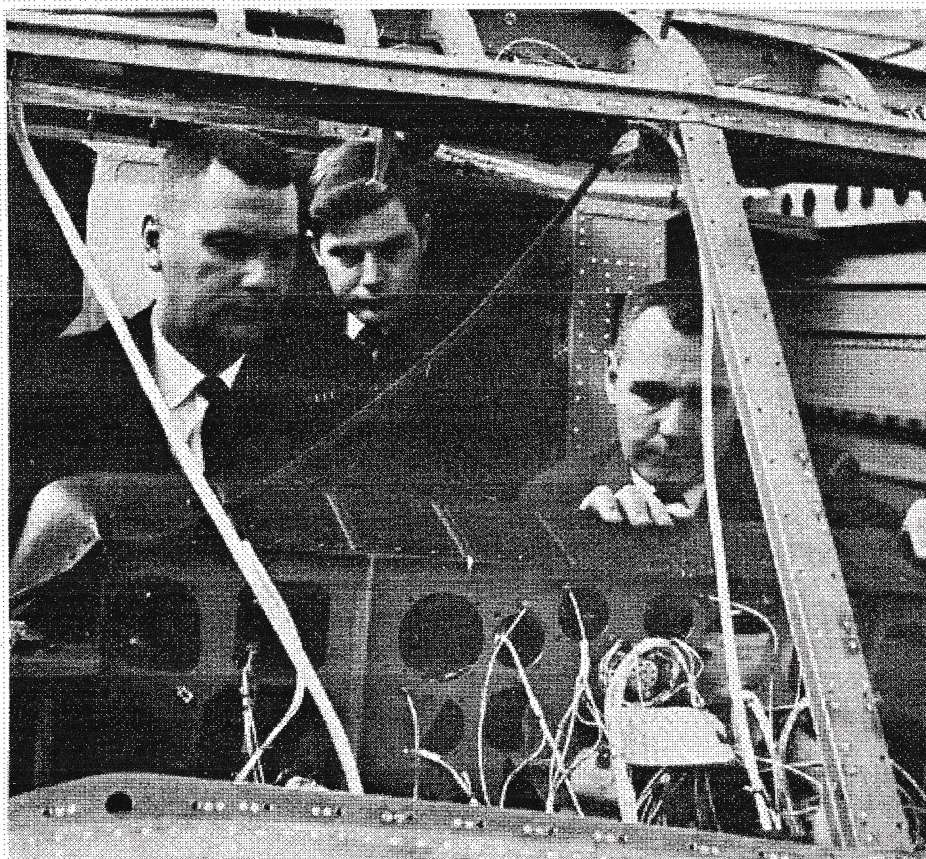
The aircraft has excited the interest of the United States, and it has already financed a 20-hour tri-Service flight evaluation of the prototype by the US Army, Air Force, Navy and Marine Corps. At the time of writing the US Army had decided to attach a flight test engineer to the Canadian Armed Forces team for the testing of the aircraft.

For other than military operations, the CX-84 may represent a breakthrough similar in importance to the development of the helicopter and surface-skimming hovercraft. One of Canada's top civilian aviation writers, who decries the fact that the CX-84 lacks a name which aptly describes its capabilities, toured Canadair recently and discussed the machine with the Forces test pilots. After his visit he said, "I came here trying to find out what this new aircraft could do . . . now I'm trying to figure out what it can't do."

Canadian servicemen may be faced with the same questions when the Canadian Forces detachment at Canadair puts the aircraft through a "no holds barred" operational testing program at military establishments in early 1970.



Of potential use to all three elements of the Canadian Armed Forces, the CX-84 holds special interest for these three sailors inspecting the cockpit layout at Canadair.



Forces detachment commander Lt-Cdr Larry Zbitnew (left) and test pilots Lt. Miller and Capt. Moore (right) discuss minor modifications incorporated during production of CX-84.