



(McDonnell-Douglas)

one thing, the model aircraft is not really flying — it is held in place in the tunnel by a support, which introduces interference. Also, in some tests, the stores are supported independently of the carrier aircraft model and able to move under control so as to simulate the conditions of free fall. These differences, however, are taken into account in the subsequent analyses.

There are other differences too. For example, forces generated in flight are the result of a number of factors: flight speed, the speed of sound, the size of the stores, and air density and viscosity. The most important quantity required for duplicating flight conditions is the Mach number, which is the ratio of the velocity of flight to the speed of sound in air. Fortunately, this can be exactly duplicated in NAE's 1.2 m by 1.2 m blowdown wind tunnel at Uplands in Ottawa.

Another significant quantity, called the Reynolds number, involves the flight speed, size of the store, air density, and air viscosity. This number is an

The variety of shapes reflects the many tasks modern aircraft can undertake. Canada's new fighter, in U.S. Navy colors, shown with wing tanks, bombs, and other weaponry.

important scaling factor, allowing a researcher to scale up the viscous and inertial forces of air acting on a small model in the wind tunnel, thus providing values of these forces acting on a full-sized vehicle in flight. Because the models used in the tunnel are so small (typically 1/16th of full size), the Reynolds number cannot always be duplicated in the tunnel. However, this is not too serious a restriction, because corrections based on experience can be applied to the experimental results.

How will experimental work in the wind tunnel benefit DND? When the military purchases a new aircraft such as the CF18, it must be used for specific tasks that involve carrying certain stores. As time goes by, the aircraft is certain to be called upon to perform new tasks that could not have been foreseen by its designers. This means

Les variations de formes sont dictées par les nombreuses missions que les avions modernes peuvent accomplir. Le nouveau chasseur canadien, ici aux couleurs américaines, équipé de réservoirs d'ailes, de bombes et d'autres armes.

the military must have a way of determining whether the aircraft can safely do what is intended for it.

An obvious way to get this kind of information is to use the airplane itself and actual-size stores in a series of trial flights. By following the aircraft with chase planes equipped with cameras, it is possible to record, for example, the trajectory of a released bomb. But that would be extremely expensive, because many flights would be required, and dangerous for the pilot if something went wrong.

"With well-conducted wind-tunnel tests," says Dr. Brown, "we can measure and calculate what the path will be if the store is dropped, and we can say with reasonable certainty if the aircraft can carry out a given task safely. The military would still need flight tests, but they would be fewer and safer. In a