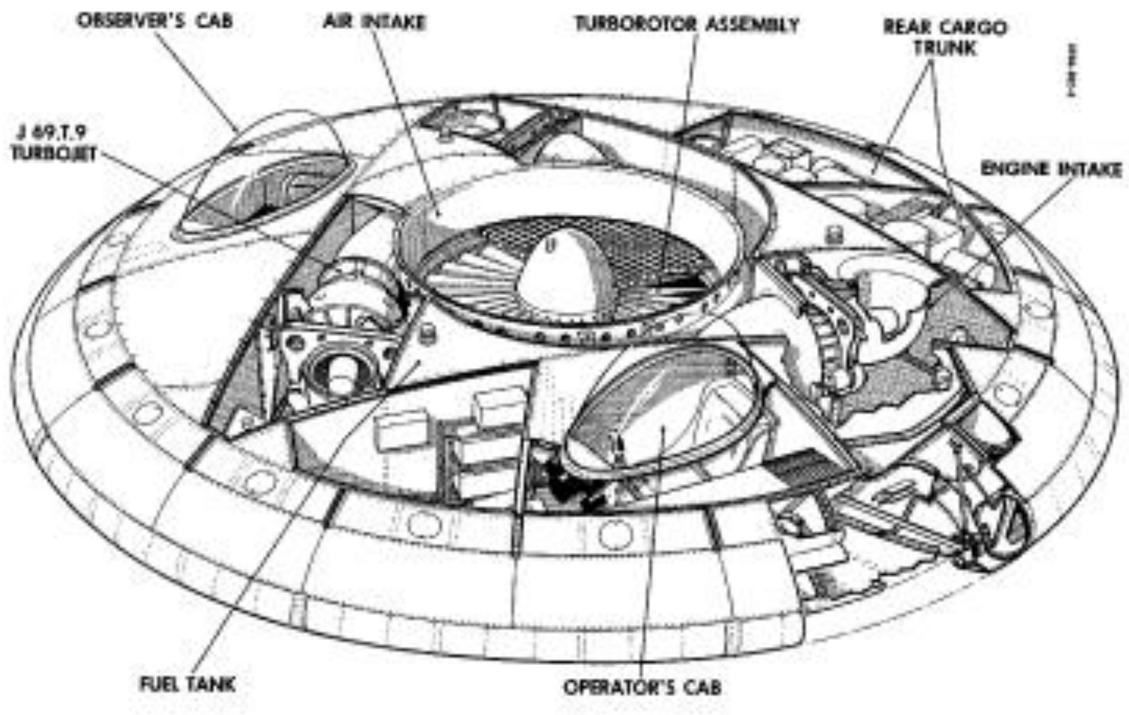
AVROCAR: REAL FLYING SAUCER

DESIRE FRANCINE GOBATO desirefg@bol.com.br **RICARDO GOBATO** gobato@uel.br

Introduction

One of the most unusual V/STOL aircraft programs was the Avro VZ-9 “Avrocar”. Designed to be a true flying saucer, the Avrocar was one of the few V/STOL aircraft to be developed in complete secrecy. Despite significant design changes during flight test, the Avrocar was unable to achieve its objectives and the program was ultimately canceled after the expenditure of over $10 million (1954-61).

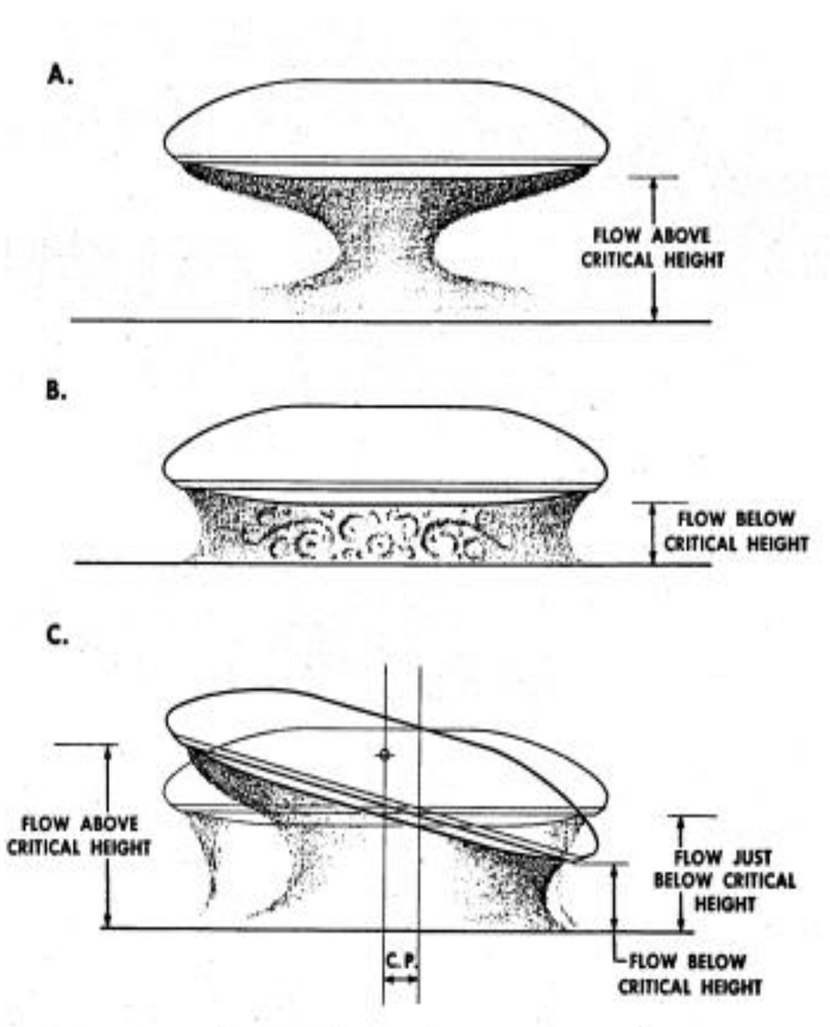


VZ-9 Avrocar.

In 1958, Avro made a series of presentations to the US Air Force and Army, after which Avro began design of an aircraft for the US Army which was given the designation VZ-9 and named Avrocar . The Avrocar was to be a subsonic flying wing of circular planform with VTOL capability. The Army was interested in improved battlefield survivability of its air vehicles and was studying alternatives to its existing light aircraft and helicopters. The Air Force supported the Avrocar program because it would demonstrate many of the design features of the 606A in a shorter time at much lower cost. A $2 million contract to be managed by the Air Force was awarded to Avro to build and test one Avrocar. Additional Air Force funding of approximately $700,000 (unexpended from the 606A program) was applied to the effort.

The Avrocar was 18 feet in diameter, 3 feet thick, and had two separate cockpits. The pilot’s cab was located on the forward left side of the vehicle with the crew cab on the right. A third compartment in the rear of was provided for cargo storage. The Avrocar was lifted by the efflux from a five foot diameter central fan, called a turborotor. Exhaust from three Continental J-69 turbojet engines (920 lb thrust ea) was ducted to the outer rim of the turborotor which had 124 small turbine blades. Driven in this fashion, the turborotor took in and propelled ambient air from a central opening on top of the vehicle. This air, mixed with the turbine exhaust, was ducted to the periphery of the vehicle from which it exited through a four inch high annular nozzle. Separate flush openings on the top of the vehicle provided air for the engine inlets through a short pipe with a 90 degree turn. Each engine was connected to its own fuel and oil tank. The fuel tanks were not interconnected, although this was planned in a later version.

On June 9, 1961, the second and final USAF flight evaluation of the Avrocar was conducted at the Avro facility. During these tests, the vehicle reached a maximum speed of 20 Kts and showed the ability to traverse a ditch six feet across and 18 inches deep. Flight above the critica height was impossible. The flight test report summarized a litany of control problems. For example, a large asymmetry in directional control was present. Five seconds were required to turn the aircraft 90 degrees to the left, while eleven seconds were required for a 90 degree right turn. Avro proposed radical modifications to the vehicle to address the major problems. Frost’s team developed two new designs, one with a large vertical tail and one with a wing with tip mounted verticals . Both designs used two 2700 lb thrust GE J-85 turbojets in lieu of the three 920 lb thrust J-69’s and increased the turborotor diameter from five to six feet. The proposals were rejected, and the program was terminated in December 1961. The second Avrocar had logged a total of about 75 flight hours.



The concept of ground effect takeoff and landing did not die with the Avrocar. In 1963, Bell Aerospace began studies of an Air Cushion Landing System (ACLS) which was later patented. An ACLS replaces conventional landing gear with a large rubber inner tube-like structure which surrounds a region of increased pressure air. In August 1967, the concept was proven by Bell with successful tests on a 2,400 lb Lake LA-4 amphibian aircraft. Further development was funded by the Air Force Flight Dynamics Laboratory, and a much larger system was designed for testing on a Fairchild C-119 (64,000 lb weight). The Canadian government joined the program and a DeHavilland CC-115 (41,000 lb weight) was selected for further tests. Given the US designation XC-8A, this aircraft flew with the ACLS in March 1975. ACLS was considered, but rejected, as an option for the Advanced Medium STOL Transport program that produced the Boeing YC-14 and McDonnell Douglas YC-15 prototypes, the latter evolved into the Boeing C-17 transport.

The concept of a lift fan driven by a turbojet engine did not die either, and lives on today as a key component of the Lockheed X-35 Joint Strike Fighter contender. While the Avrocar was under development, Peter Kappus of General Electric independently developed a lift fan propulsion system which evolved into the GE/Ryan VZ-11 (later XV-5) “Vertifan”.

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