

DEVELOPMENT OF THE MODEL 373 TURBOJET ENGINE

H.F. DUE
TELEDYNE CAE, TOLEDO, OHIO

Abstract

The Model 373 is a 960 lb (427 daN), SLS thrust, turbojet engine developed at Teledyne CAE, Toledo, Ohio during the early 1980's.

The development effort included solving component and system related problems and testing the engine over a variety of conditions tailored to verify that it would satisfy the model specification. Specification requirements were aimed at applications such as cruise missiles, remotely piloted vehicles (for reconnaissance, etc.), and air target vehicles.

The 373 engine has successfully completed qualification testing for several applications. It is currently in production for the U.S. Army/Air Force Air Target MQM-107D. The military engine model designation for that application is J402-CA-702.

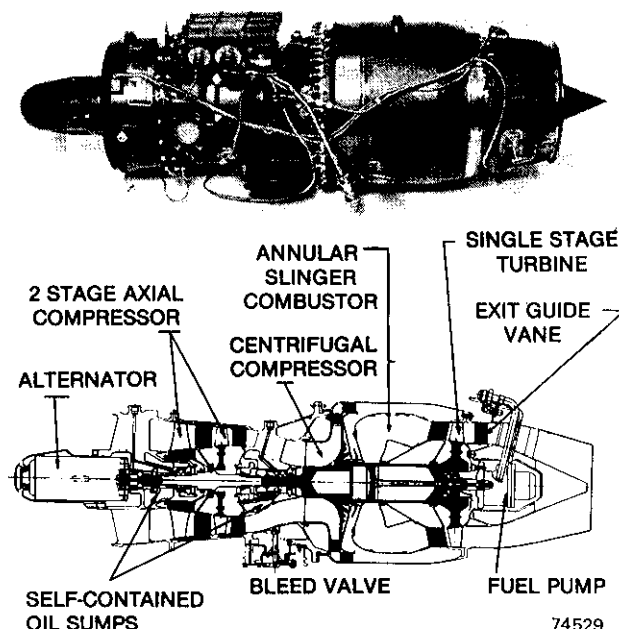
Introduction

The 373 is a zero-staged derivative of the Model 370 (J402-CA-400) sustainer propulsion engine for the Harpoon missile. The 373 has a two-stage axial compressor which replaces the single axial stage in the Model 370. The attendant component changes increase engine thrust by over 45 percent, and reduce specific fuel consumption by approximately 24 percent. A version of the 373-8 is shown in figure 1, along with the engine cross-section with major components highlighted.

Between 1982 and 1986 the engine progressed through development, engineering evaluation and qualification testing and had accumulated a total 668 hours. During the initial development, both four-bearing and three-bearing shaft support systems were evaluated. The three-bearing system was selected since it performed well, cost less, and was more adaptable to the self-contained oil sumps. Somewhat earlier (between 1974 and 1976), the axial compressor was designed and tested and its performance mapped and verified. In 1976 the first demonstrator engine was tested. The demonstrator consisted of the 373 compressor section and a 370-1C (J402-CA-400) turbine section. The demonstration validated the 373 engine objectives and, after a delay, development resumed in 1982.

The development of the Model 373-8 for aerial target and RPV applications was initiated in August 1983. Over 200

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DIMENSIONS: 12.5 IN (31.75 CM) DIAMETER
30 IN. (91.4 CM) LENGTH

WEIGHT: 138 LBS (WITH FUEL CONTROL) (67.6 KG)

Figure 1 Model 373-8C Turbojet — a 960 lb. Thrust (SLS) Variant of the Model 373 Series of Engines.

hours of testing was performed between August 1983 and June 1984. Most of the testing (over 160 hours) was performed in the TCAE altitude chamber to validate the engine at simulated flight conditions within the engine operating envelope (figure 2). The Model 373 has completed qualification testing for several applications (the latest being the U.S. Army MQM-107D target).

Engine Description

The Model 373-8 (figure 1) is a non-augmented, single spool turbojet. The engine employs a two-stage axial and single-stage centrifugal compressor driven by a single stage axial turbine. Fuel is injected into the annular combustor by a centrifugal slinger which is built into the shaft. The engine can be started by impinging compressed air on the centrifugal compressor blades (for ground starts) or by windmilling (for air starts). During starting, an electrical spark igniter plug ignites the fuel from the main fuel supply. The engine has been qualified using JP 4, JP 5, JET A and JP 10 fuels. The engine has also been qualified using a cartridge (pyrotechnic) start system similar to that used in the J402-CA-400 (Harpoon engine). The engine control system