

North American Tri-Sonic Wind Tunnel

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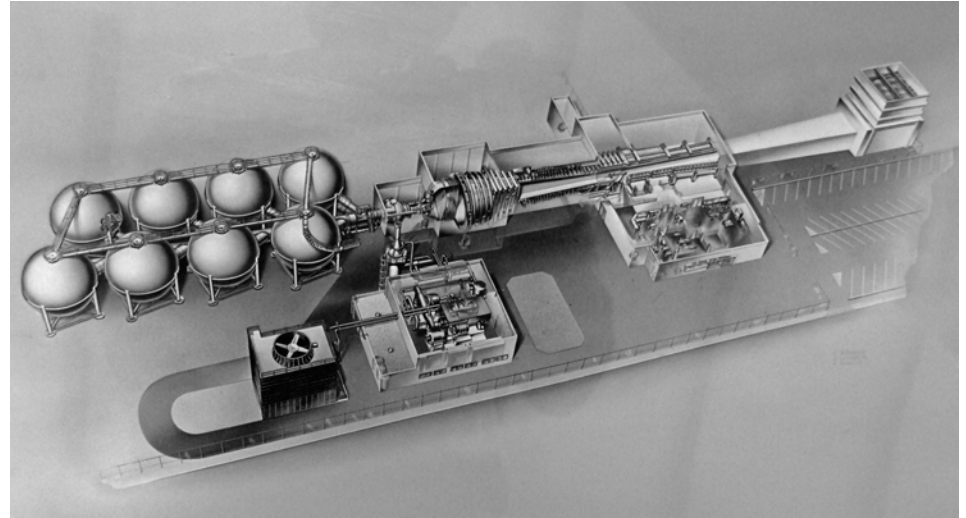
Several months ago, the leaseholder/ operator of the (formerly North American Aviation) Tri-Sonic wind tunnel facility announced cease of operations, marking the closure of a little-known but important segment of Southern Californian aerospace history. The milestone event did not go unnoticed by former NAA employees who worked in the facility, however. Terry Hughes and Rusty Russell are two such veterans of wind tunnel test operations who also happen to be volunteers of the WMoF. In addition to donations adding to the Museum's wind tunnel artifacts collection, Terry and Rusty have contributed the following description:

In the early 1950's, in response to USAF programs, the people at North American Aviation could have been considered visionaries when they planned a company funded, large, high speed wind tunnel on a 3.5-acre parcel. The tunnel is unique in that it utilizes a 7-foot by 7-foot tandem test section with a Mach range capability of 0.2 to 3.5.

Since its earliest days it has had an excellent reputation for producing quality data from force, pressure and propulsion models while staying competitive in operating costs as compared to other large test facilities. It has been a valuable development tool for numerous domestic and international customers in development of aircraft, missiles and various aerodynamic systems such as high speed fin deployment, flutter and ejection testing. Many of the early aerospace programs such as Apollo, XB-70, Space Shuttle and the B-1 bomber program were developed and refined using this facility.

The Tri-sonic Wind Tunnel is an intermittent blow-down facility capable of operation at Mach numbers from 0.2 to 3.5. This is accomplished using air stored at a pressure of ten atmospheres in eight interconnected spheres with a capacity of 214,000 cubic feet. An eight-foot diameter valve controls the flow of air from the spheres to maintain a pre-selected pressure in the settling chamber. From the settling chamber the air passes through a rectangular nozzle to the test

section. The floor and ceiling of the nozzle are made of one-inch thick steel plates, seventy feet long by seven feet wide, which can be moved using a system of hydraulic jacks to form contours for supersonic Mach numbers up to 3.5, Transonic and subsonic Mach numbers are produced by means of a downstream three-section variable diffuser.



Two test sections, each seven feet wide by seven feet high, are permanently installed in a tandem arrangement. The supersonic section starts at the end of the flexible nozzle and is used for testing between 1.4 and 3.5 Mach number. The downstream section has 19.7% porous walls and is enclosed in a plenum chamber. This plenum can be vented to diffuser through a variable gap at the end of the test section side walls. This section can also be used up to 3.0 Mach number.

The basic model support system is comprised of a circular sector mounted on a movable carriage which is located in the sector pit below the test section floor. The carriage serves to locate the test article at the desired location in the tandem

test section. The sector is designed to rotate the test article around a fixed tunnel centerline location. Depending on test conditions, the length of the "blow" can be anywhere from about 60 seconds to less than 5 seconds. During this time frame a complete pitch or yaw sweep can be achieved in which to record force and pressure data. The pitch rate can be var-

ied based on the anticipated loads and limited so as not to damage the model or the test facility.

Downstream of the porous test section is a three-section variable diffuser and a vertical strut with Mach controller flaps. A combination of the diffuser wall sets, the Mach controller settings and the upstream nozzle setting determines the Mach number in the porous test section.

Construction on the tunnel was started in 1953 and completed in 1954. Initially, the only projects tested were for the benefit of North American Aviation and its various divisions around the country (Rocketdyne/ Canoga Park, Space Division/ Downey, Columbus Division/ Columbus, Ohio, etc.). In 1965 the first of many outside customers were allowed to use the facility for test and development of various systems.

Over the years the facility came into its own as an outstanding example of what the Aerospace Industry came to represent in terms of technical achievement. This was only achieved by the fact that the crew which ran the facility was dedicated and hard working; willing to go the extra step to get the job done right and on time.



The Museum has a number of wind tunnel artifacts on display.