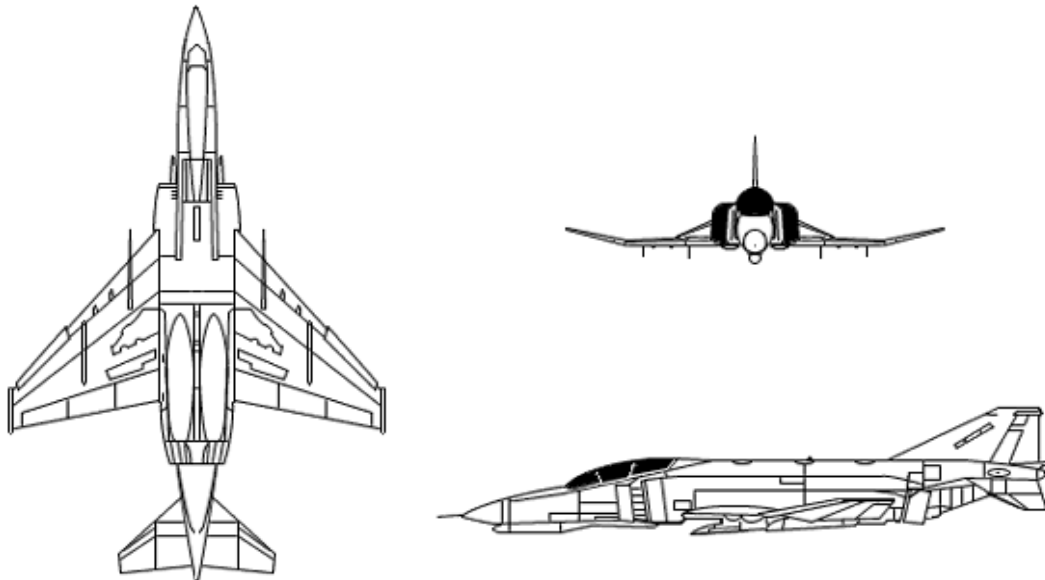
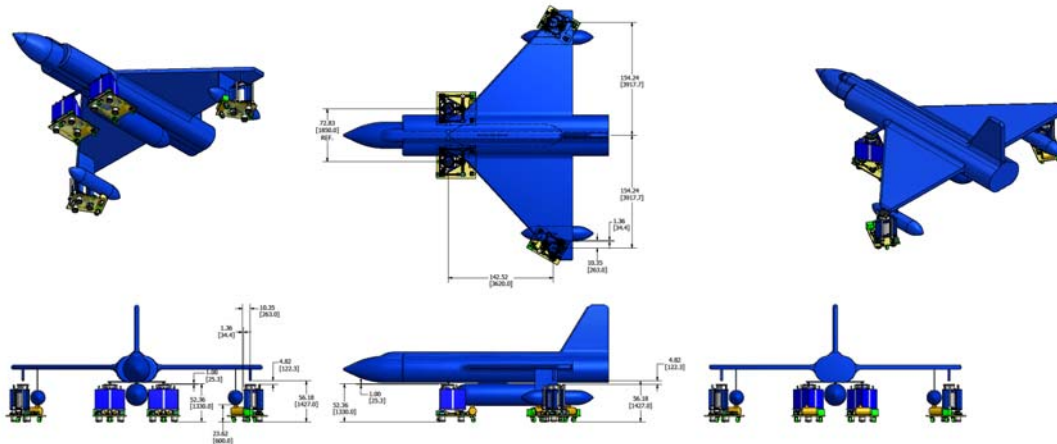


## Soft Support System for Ground Vibration Testing On a F4 Phantom Fighter Aircraft



The Turkish Aerospace and Defense Department modifies and modernizes the McDONNELL DOUGLAS F4 Fighter Aircraft on a regular base. Due to the exchange and addition of equipment, like onboard electronics or weaponry, which changes the air frame and wing mass, a modal analysis of the aircraft is required. This modal analysis is performed in a GVT (Ground Vibration Test), which requires mounting the aircraft using a Fabreeka Soft Support System (SSS). This mounting simulates the “Free-Free” condition during regular flight operation.





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The SSS includes four (4) low frequency, pneumatic isolators with self levelling servo valves, and an electric driven spindle jacking system, which allows to jack the aircraft from the floor and retract the landing gear to simulate real flight conditions. Above drawing details the arrangement of the SSS, 4 isolators are required due to the location of the main auxiliary tank directly under the front jacking point of the aircraft.



The pneumatic isolators support and "float" the aircraft during modal testing using the jack support points on the wings (2) and at the nose above the main aux tank (2). The SSS isolators were first placed under the respective jack points, then the aircraft was lifted on the mechanical jacks simultaneously, finally the isolators were inflated allowing the aircraft to move very smoothly during the modal analysis.



The SSS for the F4 Phantom aircraft consists of total four PAL133-24P pendulum isolators (as shown above in use to support the aircraft nose), located on an electrically driven, mechanical spindle jacking system. Each isolator can support and lift 6.000 Kg. The vertical and horizontal natural frequencies are well below 1.0 Hz while still offering reasonable damping and giving the activated system mechanical and dynamic stability.

An electrical / pneumatic control unit is an integral part of the complete SSS unit. From this unit the jacking process is controlled (either all 4 jacks simultaneously or each jack individually for aircraft levelling). Gauges are integrated to monitor the actual vertical position of each jack, the actual working pressure is displayed and allows the calculation of the weight distribution of the aircraft during GVT. Furthermore various safety features can be found which allow the system to operate in a very safe manner (as is standard in the aircraft industry).

