Facing a choice in compressor design.

For the YJ101, GE engineers found themselves making an important decision: whether to use a two-spool compressor or a single-spool compressor, based on the engine's operating temperatures and pressures. At a pressure ratio of approximately 20:1, the temperature of the air rises rapidly as it moves towards the back of the compressor, due just to the heat of compression. The aft stages act as though they were operating in a different—less dense—atmosphere and doing less work per stage. Consequently, GE designers faced the choice of having to add more stages—and weight— to get the compressor work level up or put the aft compressor stages on a separate spool that would be driven at a higher speed by its own turbine. Although more complex and costly, the second choice provided a shorter and lighter compressor and was chosen by GE designers. Even with a single spool compressor, GE said, it would have been necessary to use two turbine stages to get the high pressure ratio which was desired, so the cost and complexity penalties for going to a two-spool compressor were minimal.

At a pressure ratio of 21:1 and above, the choice of a two-spool compressor configuration would have been automatic as would the choice of single-spool design at pressure ratios of 16:1 and below. So between these pressure ratios a choice has to be made.

GE engineers believe they made the right choice here and throughout the engine design cycle. In fact, company planners compare the YJ101 to the J85—the engine is good enough to make its own markets.

Three-Engine RA-5 Proposed To Air Force in Interceptor Role

Los Angeles—North American Rockwell Corp. has proposed a three-engine version of the Navy RA-5C Vigilante to be used as an Air Force interceptor.

Internally designated the NR 349, the aircraft is being suggested as a replacement for F-101, F-102 and F-106 interceptors now in the Air Defense Command inventory. North American Rockwell's Columbus Div. submitted the unsolicited proposal to the Air Force Aeronautical Systems Command where it is now being reviewed.

Under the plan, a third engine would be installed in the tunnel or bomb bay, just above the other two engines in the aft fuselage of the aircraft. The latest Navy RA-5Cs are powered by two 17,900-lb. thrust General Electric J79-10 engines, and the three-engine version proposed for the Air Force would use the same powerplants.

The twin-engine RA-5C has a dash capability of Mach 2, and the third engine would increase this speed slightly. The primary purpose of the additional engine, however, is to give the aircraft greater acceleration and climb performance and higher ceilings for its role as an interceptor.

North American Rockwell produced about 140 A-5s for the Navy, and the last of these was completed in November, 1970. Parts are still being produced by the company, however, and testing for the aircraft remains intact at Columbus.

Three-engine version of the North American Rockwell RA-5 proposed by the company to the Air Force as an interceptor is shown in artist's concept.

Supercritical Wing Tests

Los Angeles—National Aeronautics and Space Administration’s LTV Aerospace F-8 fighter modified with a supercritical wing was flown to Mach 1.15 at 35,000 ft. Aug. 18 on its first flight after being grounded for more than two months for instrumentation.

Purpose was to conduct a preliminary wing pressure distribution survey and to evaluate aircraft performance and flutter. The unorthodox shape of the wing, which features a rounded bottom and a flat top, flew eight flights on the F-8 earlier this year in an operational evaluation and preliminary investigation at different airspeeds and altitudes.

The new phase of flight tests will last about six months and will study airflow across the wing, stability and control of the new airfoil design and aeroelasticity of the wing. Pressure sensing transducers were installed in the wing during the time the aircraft was grounded, and researchers hope these sensors will help determine where drag rise occurs on the wing as speed increases.

One major advantage of the supercritical wing is that it allows transonic speeds before the drag rise associated with supersonic airflow becomes significant.

NASA is considering adding stores on the wings of the F-8 to simulate engines as they would be installed on a transport aircraft using the supercritical wing.