Long Range Jets Forecast Fuel Consumption Improves

DESIGN changes that are making possible substantial reductions in jet engine fuel consumption rates will enable long-range planes of the future to fly on jet power. Recent laboratory and operational achievements are reversing earlier engineering thinking which held that jets' fuel consumption would preclude their usefulness except for relatively short-range work.

The traditionally high fuel consumption of jet engines is already down 30 per cent from that of engines built three and four years ago. Another drop of 20 per cent in the next few years seems likely.

Because percentage of fuel saving can be translated directly into additional flying range — disregarding improvements in engine weight and modifications of the airplane to yield greater distance — jet planes are foreseen that will make the two-to-three-thousand-mile-ranges predicted a few years ago seem very old-fashioned. Progress in development of jet engines has been so rapid, in fact, that it has already speeded up military aircraft procurement timetables. Plane builders are now being asked to consider for new aircraft designs engines that will not be available for one, two or even four years.

In the past, when military technicians were confined to use of conventional reciprocating engines, they were limited largely to asking for planes that could use already proven engines. Otherwise by the time a new engine has been developed to fill their needs, the plane might be approaching obsolescence.

Jets Develop Rapidly

Design of the Navy's first jet-propelled fighter, the twin-engined McDonnell Phantom, was laid down at the same time design on the engines got under way in the Westinghouse turbine engineering offices. The Banshee, double-powered successor to the Phantom, followed the same schedule in relation to design of its engines.

As proof of the rate of development of jet engines, a Navy fighter pilot today can fly 30 per cent farther than he could with engines of the same size four years ago. Besides being able merely to take a plane farther from its base, this basic engine can fly four times as high as its prototype, run three times as long before needing overhauling, and stand up under stresses of heat, cold, speed and manoeuvring that were scarcely even visualized when its design was first conceived.

Although there is obviously a practical limit to the amount of performance that can be achieved from a given engine size, experience to date has shown that an average rate of improvement amounting to about five per cent a year can be expected in terms of the job the engine must do.

The greater performance capabilities of the latest version of this engine model, is due basically to a model-by-model reduction in weight per pound of thrust and in rate of fuel consumption. In five years and eight models of this 19-inch engine, specific weight has dropped more than one third, power has increased 42 per cent, and specific fuel consumption has been chopped 18 per cent.

Mass Carrier Operations

Engines such as these power the planes of the Navy's first carrier-borne jet fighter squadron, Seventeen Able, a group which recently demonstrated the feasibility of mass jet carrier operations aboard the USS Sapain in the Atlantic. In the course of four days of operation, planes of the squadron made 205 deck landings, flew off the deck more than a hundred times, and were launched by catapult more than 100 times.

Such larger engine sizes as the J34 which powers the Banshee, and the new XF-85 "Parasite" Air Force fighter, and which have had more intensive engineering attention, have shown even more impressive gains in the crucial matters of specific weight and specific fuel consumption. These are the two most important qualities of engine performance. Here weight has been shaved more than 40 per cent and fuel consumption has been cut more than one-quarter as compared with the rates for earlier and smaller engines.

Revisions still to come, and new engines not yet beyond the drawing-board stage, promise even greater improvement.

Beyond mere increase in size to get more absolute thrust, reduction in fuel consumption rate and increase in service life will continue to claim major attention from jet engineers in the future. By far the most important single factor in the development of jet power plants will be the reduction in the rate of fuel consumption for a given amount of thrust. As a rule of thumb, it can be said that in future long-range jet planes, the weight of the engines will be only about one fifth that of the fuel they will burn. Hence a reduction in engine weight per pound of thrust of 25 per cent — a virtually impossible order — would be only as valuable as a five per cent drop in fuel rate, which is only a fraction of what is expected eventually to be attained.

Stretch Overhaul Periods

Overhaul intervals on present engines have already been stretched to something like three times the original periods, and a jet engine can now take a plane as much as 75,000 miles between overhauls. This is about the half-way point of what can now be expected from reciprocating engine type, although the jets have been under development for only eight or nine years, and reciprocating engines have had about half a century of refinement.

The very nature of jet-plane operation sets up a whole series of difficult engine requirements in addition to the continuous need for more thrust, longer life, and better fuel economy.

Naturally, aircraft speeds are increasing — a direct result of the use of jet propulsion. But as speeds increase, the temperature and density of the air rammed into the engine also rises, and light alloy parts that were perfectly suitable for ordinary flight speeds must be replaced by steel — which adds weight.

Rigorous Requirements

Modern engines must also devote hundreds of horsepower to auxiliary services such as generator drives and hydraulic pumps, and more hundreds of horsepower are diverted from production of thrust to provide the "bleed air" for supercharging high-altitude cabins. Manoeuvring loads, too — the G's an engine must endure in combat operation — have doubled in the past two years alone, which also means addition of weight to provide needed stiffness.

With the emphasis on global warfare, engines are also required to operate both in very cold and in very hot atmospheric conditions. Ultra-cold air, while an excellent means of augmenting thrust, entails

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Jet Future

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operating problems with fuel pumps and lubrication systems. Hot atmospheric air on the other hand demands more conservative design from the point of view of top turbine temperatures, and thus costs many pounds of thrust.

The principal reason for detailing these factors is to show that it becomes more and more difficult to carve large hunks of weight out of an engine, lower its rate of fuel consumption for the pounds of thrust it delivers, and still meet these special operating conditions.

Jet engines of the future — including those that will be needed for the planes now only in the "paper projection" stage — will certainly be called upon to play a larger and larger role in the tactical functioning of military planes. In fact, companies certainly will be expected to come up with engines that meet these operating conditions and also go far beyond the present position in both fuel consumption and service life.

Those — not mere power — are the real goals of jet engineers.

AITA Meeting

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points in the Maritimes, Quebec and Eastern Ontario, Western Ontario, central area (Lakehead to Manitoba's western boundary), prairies (Saskatchewan and Alberta), and the Pacific Coast.

"The first meeting of a local committee was held at Edmonton on March 27. Then followed meetings, at Vancouver and Toronto. Except at the Vancouver meeting, attendance was slim. At the Winnipeg meeting, only one bush operator was present and it was not possible to organize a local committee. At Moncton on July 8, there were present six members of the Maritime Aviation Association . . ."

Because of failure to appoint local committees, it was not possible to set up a main Air Transport Committee to deal with proposals submitted by operators. The decision was to discuss these in committees at the annual meeting.

Liveliest discussion in the Operators' Committee at the annual meeting concerned contract carriage. The resulting resolution was as follows:

"1. This meeting favors retention of the privilege of licensed operators to enter into contract carriage.

"2. A contract should not be entered into unless it involves a minimum of plane miles, ton miles or hours; also, the contract should be carried out within a specified time limit."

Determination of the minimums for contract carriage was postponed pending further consultation of operators on this subject.

Revision of the voting system to allow one vote per member in place of the present one vote per $50 of membership fee was proposed in a resolution by Bob Kashower. The resolution was defeated. During the discussion of this proposal it was argued that the voting is now weighted in favor of the manufacturers. The counter-argument was that by joining the Association in sufficient numbers, the operators could gain a voting majority.

It was announced that the next annual meeting will be held at St. Jovite, P.Q.