# Thin Wings of CF-105 Influence Hydraulics

Detroit—Designers of the Avro CF-105 Arrow were forced to use a 4,000 psi. instead of the usual 2,000-3,000 psi. hydraulic system because of limited space for elevator actuators in the supersonic interceptor's wings, B. S. Wood of Avro told the annual Vickers Hydraulic Conference here.

Each actuator had to meet a dynamic output exceeding 50,000 lb. at 40 deg./sec. elevator movement and was required to fit chordwise into the restricted space bounded by the trailing section of the thin wing section.

An increase to 5,000 psi. was considered but was felt too far beyond the present state of hydraulic equipment art. As it was, Avro had difficulties in finding equipment for the high pressure system. Wood said most of the equipment is now ready and is being ground checked before flight test of the CF-105. The 20 gpm. pumps used in pairs to supply the aircraft's three hydraulic systems are currently being qualified at Vickers. Though leakage and wear problems have been encountered, Wood said that the pump (Vickers PV-4915) appears airworthy.

Once the higher pressure was accepted, Avro found that it was easier to fit the rest of the hydraulic equipment throughout the plane. For example, transmission line could be one standard size smaller in diameter than a 3,000 psi. system and it was easier to squeeze the pumps on the engine gearboxes. Because of the higher power available, it was easier to retract the landing gears within the four seconds allowed by the supersonic fighter's rapid acceleration.

Three independent hydraulic systems are used on the CF-105: two for the tandem actuator flight controls and one

[illegible] total 300 hp. as against the Avro CF-100's 15 hp., which vividly illustrates the size jump between the two planes.

Because of the CF-105's size and speed, the flight controls are all-hydraulic with no direct pilot control, and the added complications of artificial feel as well as stability augmentation due to speed had to be built in.

The system uses Mil-0-5606 hydraulic fluid operating between −65F and 275F temperature limits.

Contrasting Avro's decision to go to a 4,000 psi. system, Conrad Cooke, of the Martin Co., cited calculations which showed that although a 4,000 psi system would offer advantages, especially that of space saving, he did not think that the amount of the gain justified raising the standard to 4,000 psi.