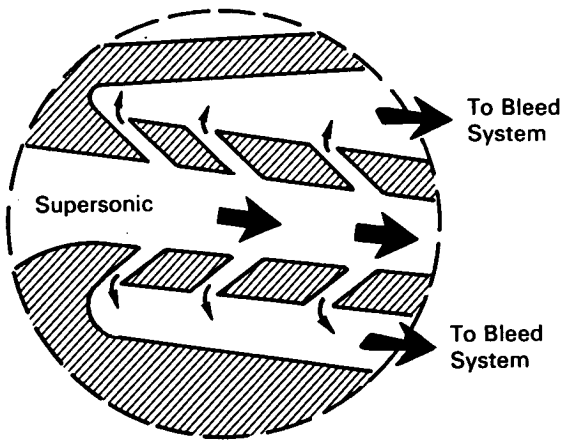
November 1966

Brief 66-10530

NASA TECH BRIEF

Perforations in Jet Engine Supersonic Inlet Increase Shock Stability



The problem:

To match the flow of air to a supersonic jet aircraft engine with the instantaneous requirements of thrust and efficiency imposed on the engine. Properties of the air flow vary widely, especially as to density and pressure, with aircraft speed and altitude and with atmospheric variations.

The solution:

Modification of a conventional jet engine internal compression supersonic inlet that results in increased shock stability and thus, engine instantaneous response to changes in inlet air properties.

How it's done:

Reverse throat perforations are used to change inlet performance to match the optimum engine performance while allowing a variation in engine corrected weight flow. Reverse perforations in the throat region are desirable because during operation at low pressure recoveries with the "normal shock" downstream of the perforated region, the supersonic flow is not easily diverted to go through reverse perforation and the loss in flow is small. Alternately, during operation at high pressure recoveries with the "normal shock" located in the region of the perforations, the reverse flow portion of the boundary layer is aligned in the direction of the perforations and is also at a higher static pressure so more flow is bled off.

Notes:

1. This technique provides a large amount of bleed near the maximum pressure recovery at the expense of minor bleed flow during critical operation. This provides an operating point with a high pressure recovery and a margin for airflow variation (control tolerances) before discharging the normal shock.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Electronic Research Center
   575 Technology Square
   Cambridge, Massachusetts 02142
   Reference: B66-10530

(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

Source: Charles R. Keppler
of United Aircraft Corporation
under contract to
Electronic Research Center
(NEO-8)