

# NASA TECH BRIEF

*Ames Research Center*

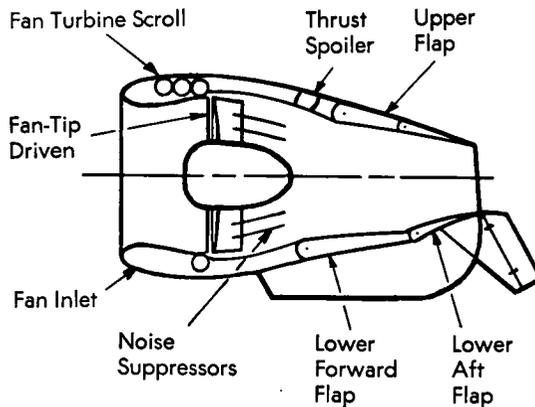
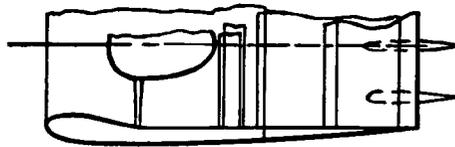


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## Thrust Vector Control for V/STOL Aircraft

### The problem:

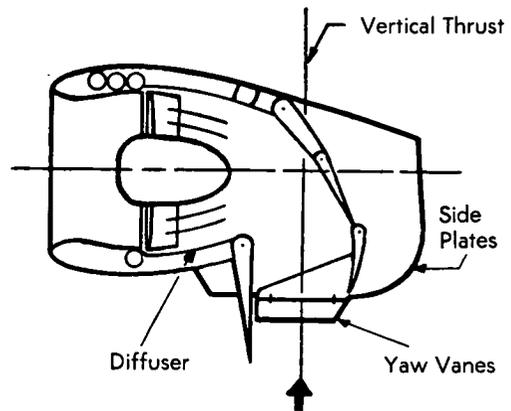
To deflect the exhaust of a V/STOL aircraft fan so that the thrust vector can be directed efficiently during lift or cruise modes of operation.



Cruise Configuration

on the aircraft for V/STOL flight.

During normal operation in the cruise mode, hot pressurized gas from the scroll drives turbine buckets at the tips of the fan blades which also pump air through the rectangular exit nozzle; the upper flap and the lower forward and aft flaps are positioned to form the nozzle and to direct the fan airstream in the aft direction. As indicated in the diagram, no obstructions are in the airstream when the flaps are in cruise position.



Vectored Configuration

### The solution:

Deploy a set of rectangular flaps so that the exhaust stream can be turned as required and then directed through exit nozzles which generate thrust in the appropriate direction; lateral deflection of the exhaust is provided by yaw vanes.

### How it's done:

The arrangement of flaps as shown in the diagram forms the fan nozzle and controls the direction of the airstream produced by the fan. Generally, two or more of these devices are used with other lifting fans

In the vectored configuration, the flaps are positioned to deflect the airstream down for low-velocity flight or for hovering. The yaw vanes (louvres) are in the exhaust airstream, and they can be used to deflect it laterally up to  $\pm 20^\circ$ ; the vanes also provide a modest degree of noise suppression.

The lower forward and aft flaps can be moved to turn the airstream to any position from  $0^\circ$  up to  $130^\circ$ ; the thrust spoiler is opened when it is desired to decrease or terminate thrust. Controls for actuating the flaps may be the usual servo hydraulic actuators, located away from the hot air in the fan duct.

(continued overleaf)

**Note:**

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer  
Ames Research Center  
Moffett Field, California 94035  
Reference: B74-10049

**Patent status:**

NASA has decided not to apply for a patent.

Source: Ernest W. Toney of  
McDonnell Douglas Corp.  
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