1954
NACA
INSPECTION

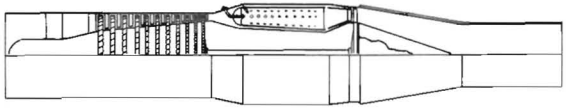
LEWIS FLIGHT PROPULSION LABORATORY
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

This booklet contains reproductions of charts used to illustrate the presentations at the NACA'S 1954 Inspection at the Lewis Flight Propulsion Laboratory. Space has been provided for those who may wish to take notes.

OPERATING PROBLEMS

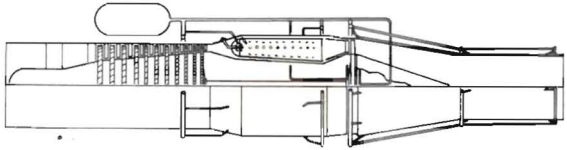
TURBO JET ENGINE

(CUTAWAY)



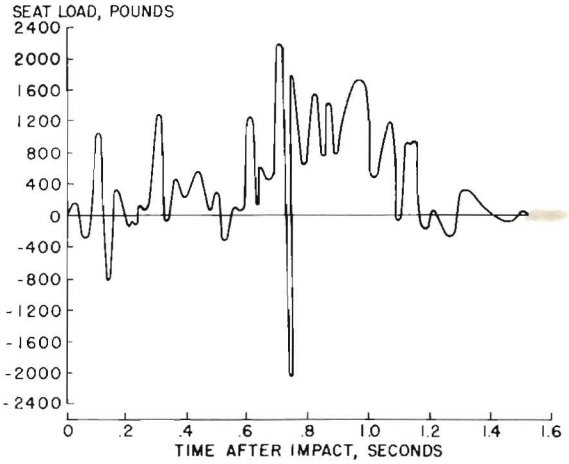
CRASH FIRE INERTING SYSTEM

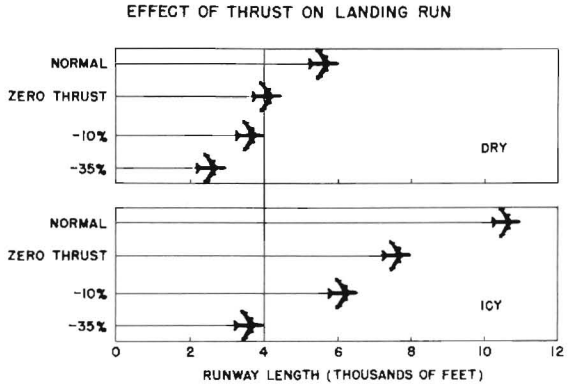
(FOR TURBO JET ENGINE)

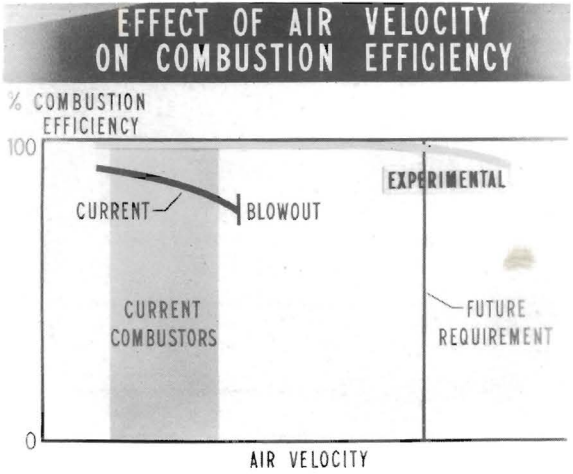


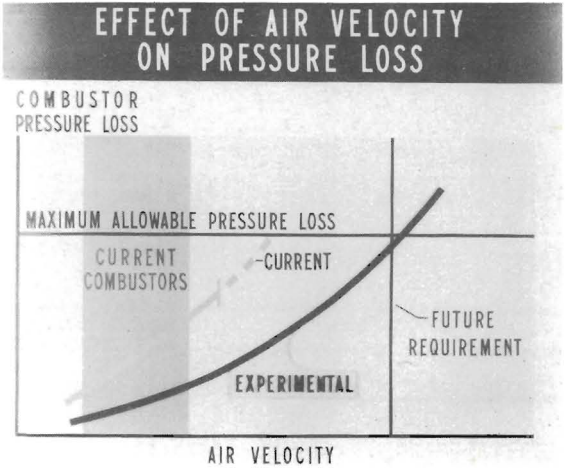
LIGHT AIRPLANE CRASH STUDIES

CRASH LOADS

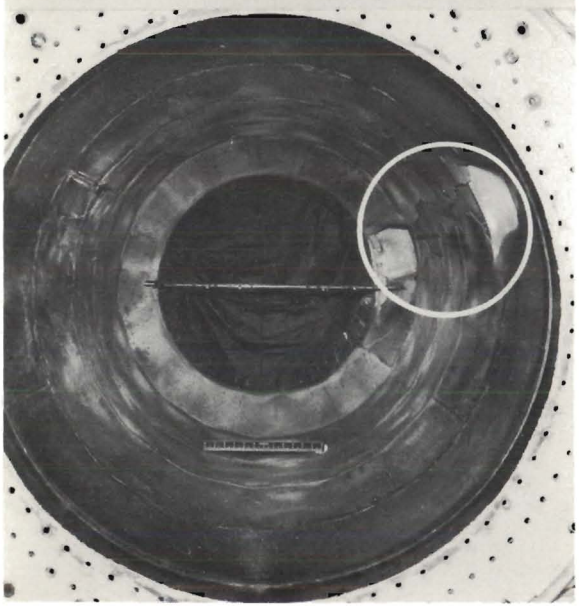



EFFECT OF THRUST ON LANDING RUN
NORMAL
ZERO THRUST
-10%
-35%
DRY
NORMAL
ZERO THRUST
-10%
-35%
ICY
0
2
4
6
8
10
12
RUNWAY LENGTH (THOUSANDS OF FEET)


EFFECT OF AIR VELOCITY
ON COMBUSTION EFFICIENCY
% COMBUSTION EFFICIENCY
100
0
CURRENT
BLOWOUT
EXPERIMENTAL
CURRENT COMBUSTORS
FUTURE REQUIREMENT
AIR VELOCITY


EFFECT OF AIR VELOCITY
ON PRESSURE LOSS
COMBUSTOR PRESSURE LOSS
MAXIMUM ALLOWABLE PRESSURE LOSS
CURRENT COMBUSTORS
CURRENT
FUTURE REQUIREMENT
EXPERIMENTAL
AIR VELOCITY

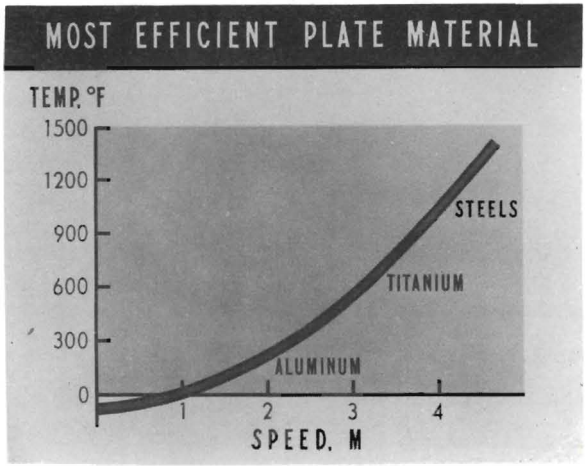
AFTERBURNER LINER DAMAGED BY SCREECH



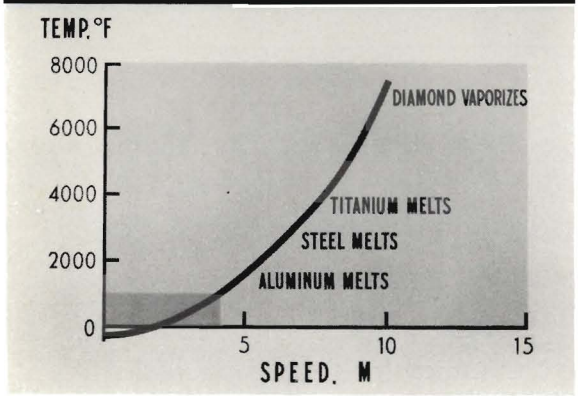
AERODYNAMIC HEATING

ELEVATED TEMPERATURE →
- a. DETERIORATION OF MATERIAL PROPERTIES
- b. CREEP

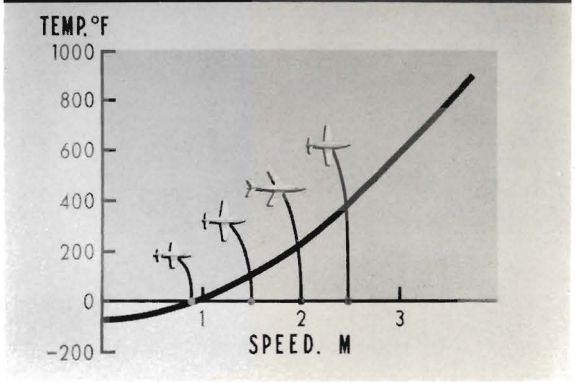
RAPID HEATING → THERMAL STRESSES →
- BUCKLING
- REDUCED STIFFNESS
- FLUTTER

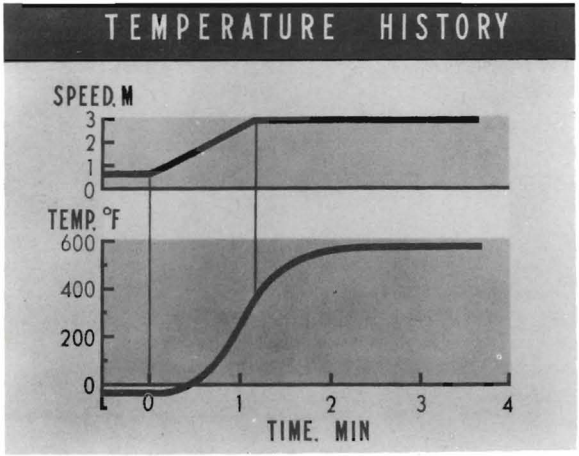


TEMPERATURE ATTAINABLE IN SUSTAINED FLIGHT



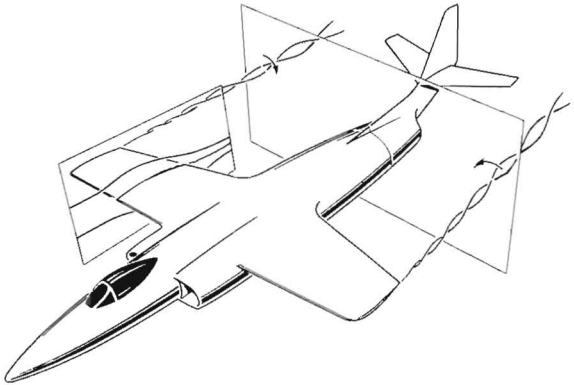
TEMPERATURE ATTAINABLE IN SUSTAINED FLIGHT

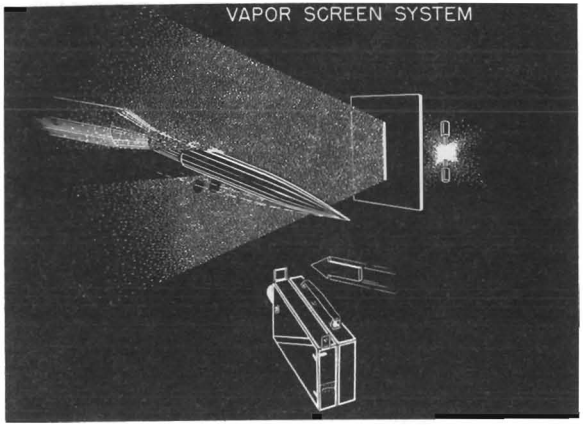



TEMPERATURE HISTORY
SPEED, M
3
2
1
0
TEMP, °F
600
400
200
0
0
1
2
3
4
TIME, MIN

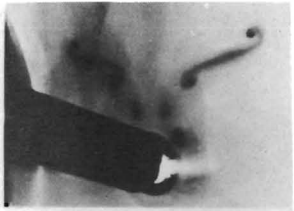
FLOW VISUALIZATION

OBJECTIVES OF FLOW VISUALIZATION

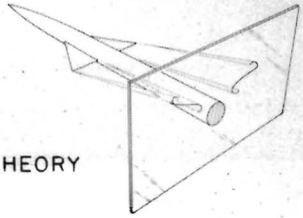




VAPOR SCREEN GUIDES THEORY

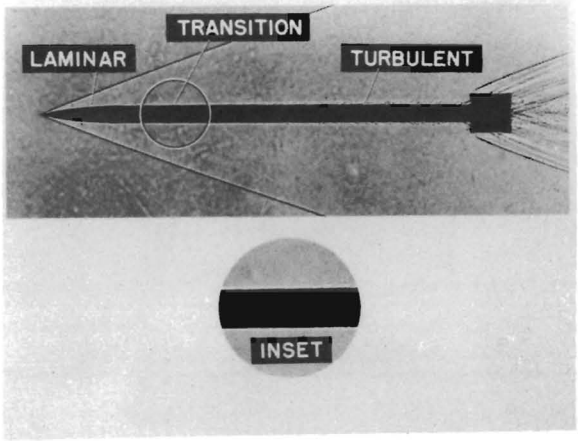


VAPOR SCREEN

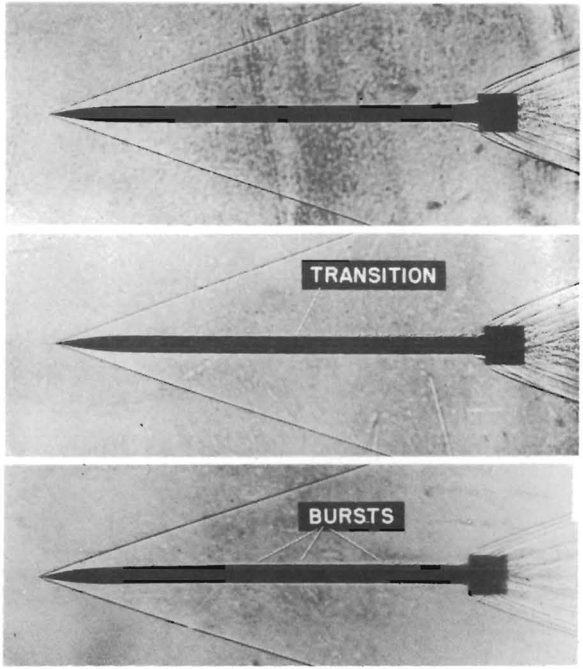


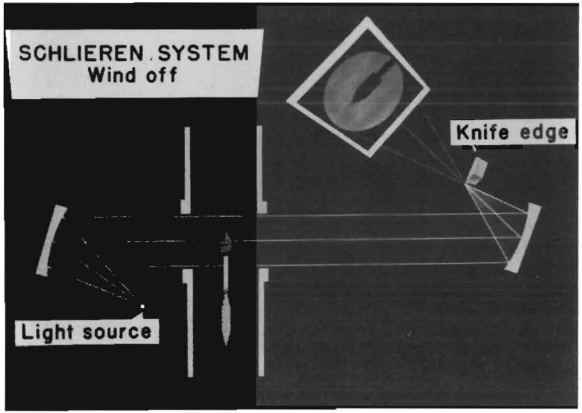
THEORY

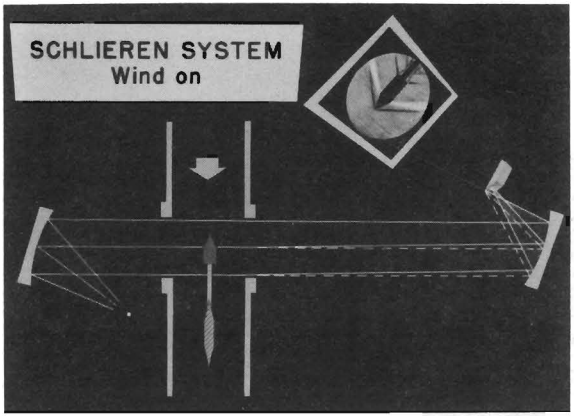
SHADOWGRAPH OF FLOW ON MISSILE MODEL



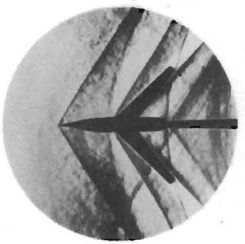
TEMPERAMENTAL NATURE OF TRANSITION

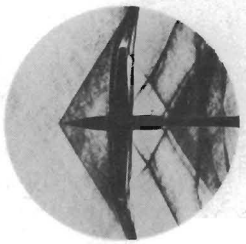


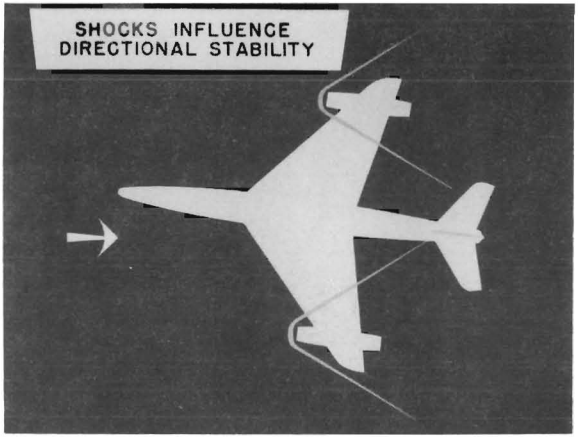


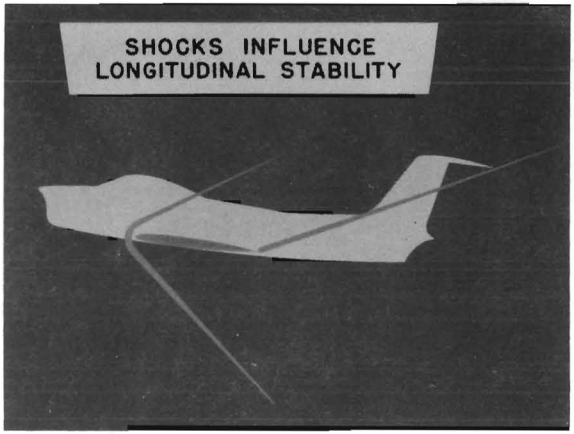


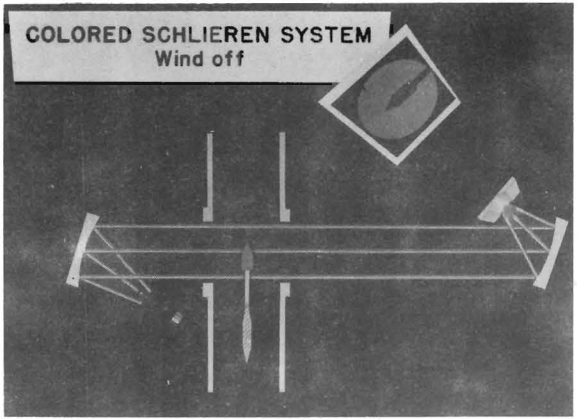
SCHLIEREN INDICATES SHOCK STRENGTH





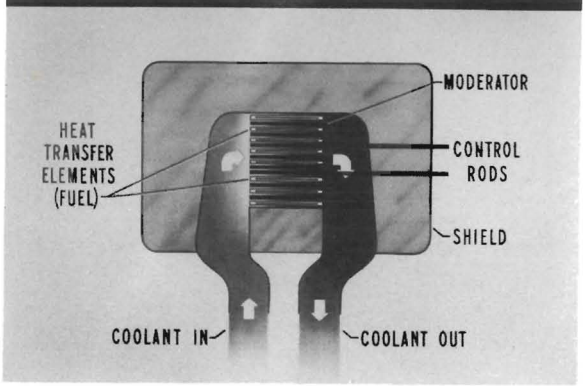

SHOCKS INFLUENCE
DIRECTIONAL STABILITY


SHOCKS INFLUENCE
LONGITUDINAL STABILITY

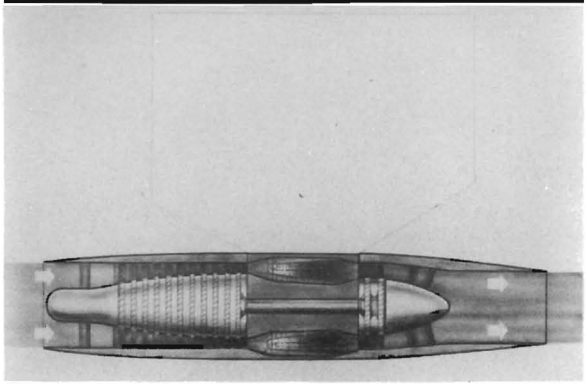

COLORED SCHLIEREN SYSTEM
Wind off

NUCLEAR PROPULSION

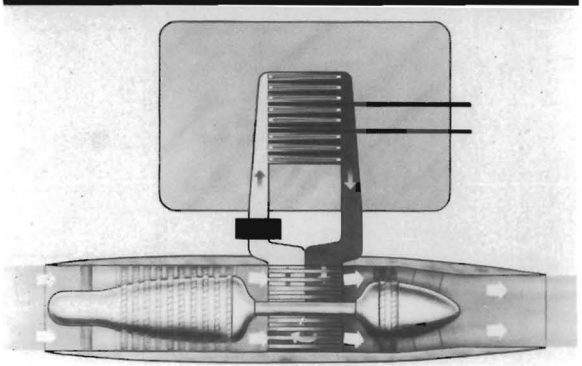
REACTOR



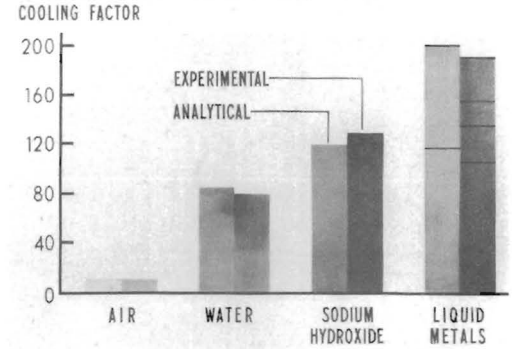
DIRECT AIR CYCLE



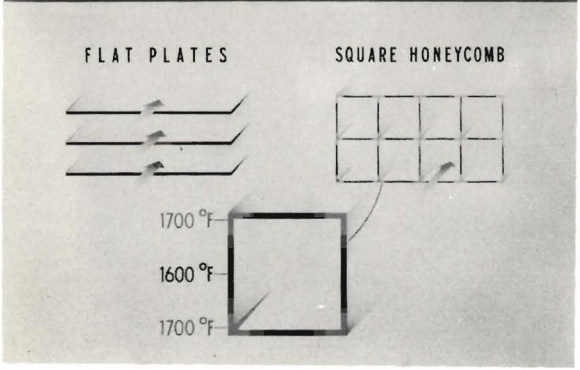
LIQUID COOLED REACTOR CYCLE



COMPARISON OF POSSIBLE COOLANTS



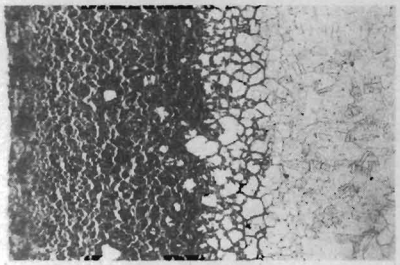
HEAT EXCHANGER CONFIGURATIONS



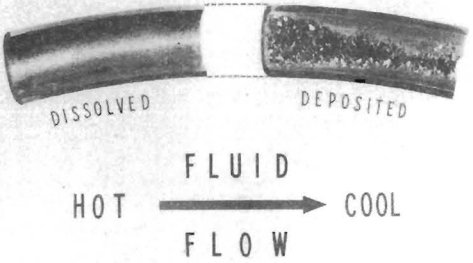
CAPTURE CROSS SECTIONS OF REPRESENTATIVE MATERIALS

STRUCTURAL MATERIALS	ALUMINUM	0.22
	IRON	2.4
	COBALT	36.0
CONTROL ROD MATERIALS	BORON	750.0
	CADMIUM	2400.0
COOLANTS	SODIUM	0.49
	WATER	0.64
	LITHIUM	65.0

CORROSION OF STRUCTURAL MATERIALS BY A COOLANT



MASS TRANSFER OF STRUCTURAL MATERIALS BY A COOLANT



FULL SCALE ENGINE RESEARCH

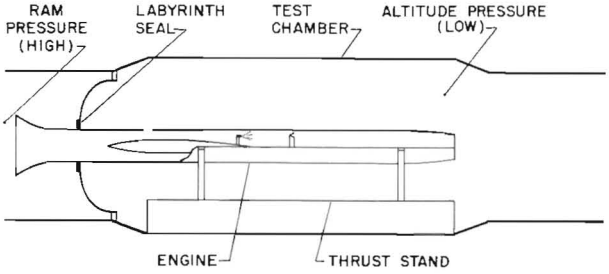
OBJECTIVES OF FULL SCALE ENGINE RESEARCH

1. OPTIMIZATION OF COMPONENTS
2. RECOGNITION AND DEFINITION OF NEW PROBLEMS
3. EVALUATION OF NEW ENGINES

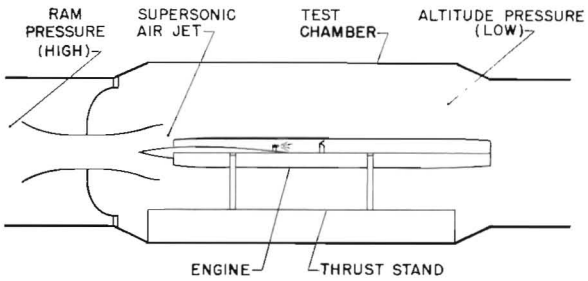
EXPERIMENTAL TECHNIQUES

1. DIRECT-CONNECT
2. FREE-JET
3. SUPERSONIC TUNNEL
4. FLIGHT

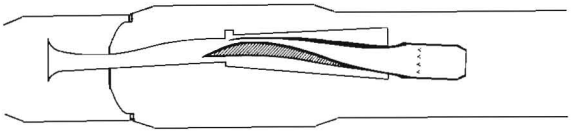
DIRECT-CONNECT TECHNIQUE

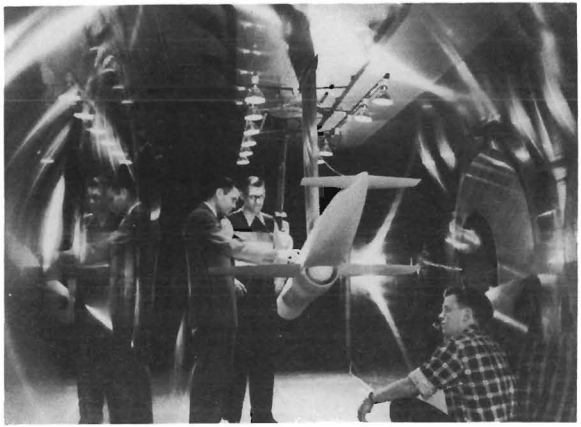


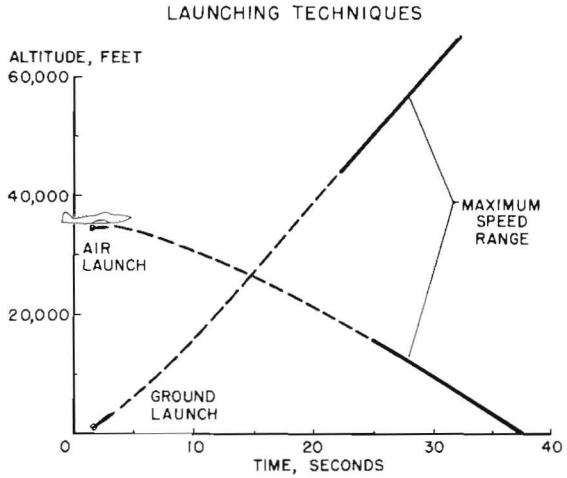
FREE-JET TECHNIQUE



FREE-JET INSTALLATION

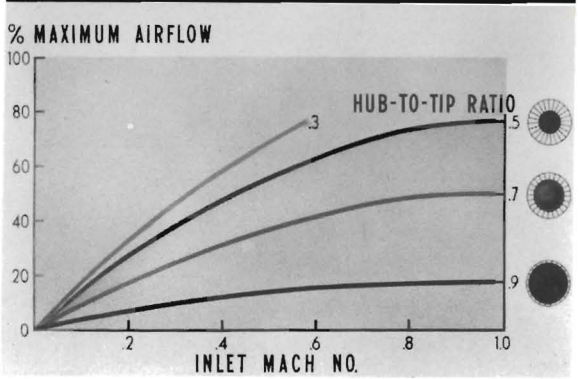




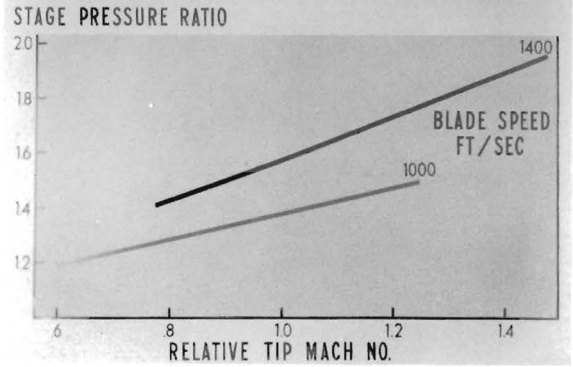

LAUNCHING TECHNIQUES
ALTITUDE, FEET
60,000
40,000
20,000
AIR
LAUNCH
GROUND
LAUNCH
MAXIMUM
SPEED
RANGE
0
10
20
30
40
TIME, SECONDS

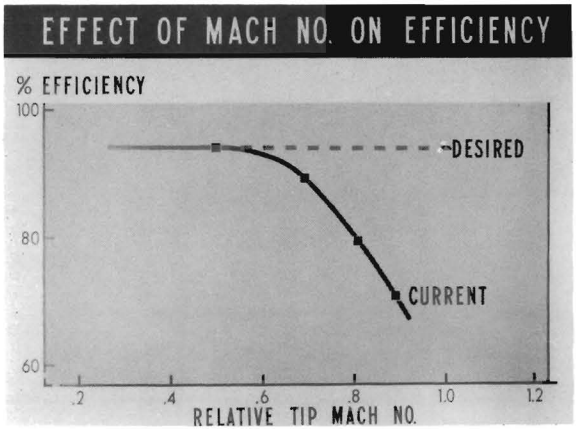
COMPRESSOR RESEARCH

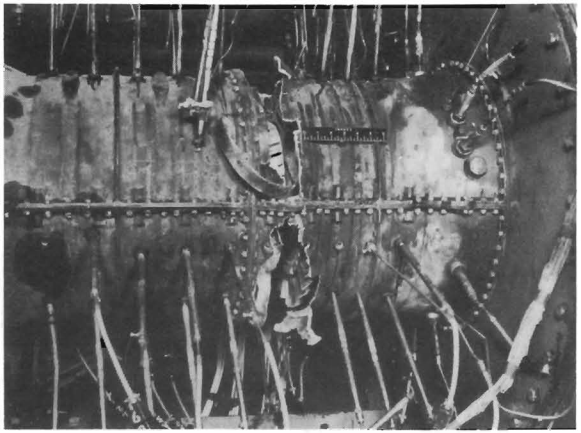
METHODS OF INCREASING AIR FLOW

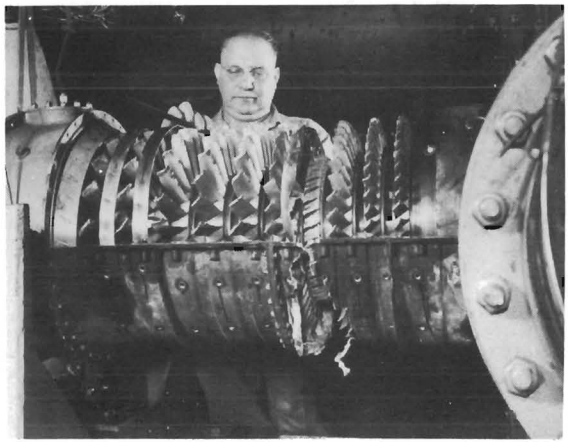


METHODS OF INCREASING PRESSURE RATIO



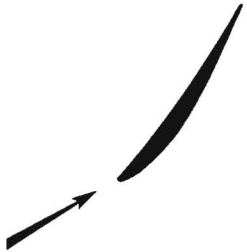

EFFECT OF MACH NO. ON EFFICIENCY
% EFFICIENCY
100
80
60
DESIRED
CURRENT
.2
.4
.6
.8
1.0
1.2
RELATIVE TIP MACH NO.





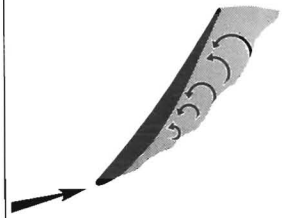
SINGLE AIRFOIL

DESIGN
FLOW



SINGLE AIRFOIL

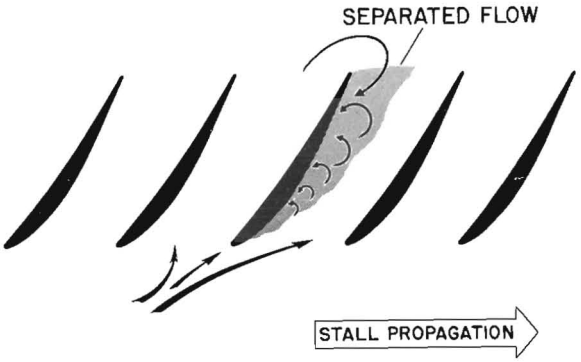
OFF-DESIGN
FLOW



CASCADE OF BLADES

UNIFORM STALL

PROPAGATING STALL



ROTATING STALL