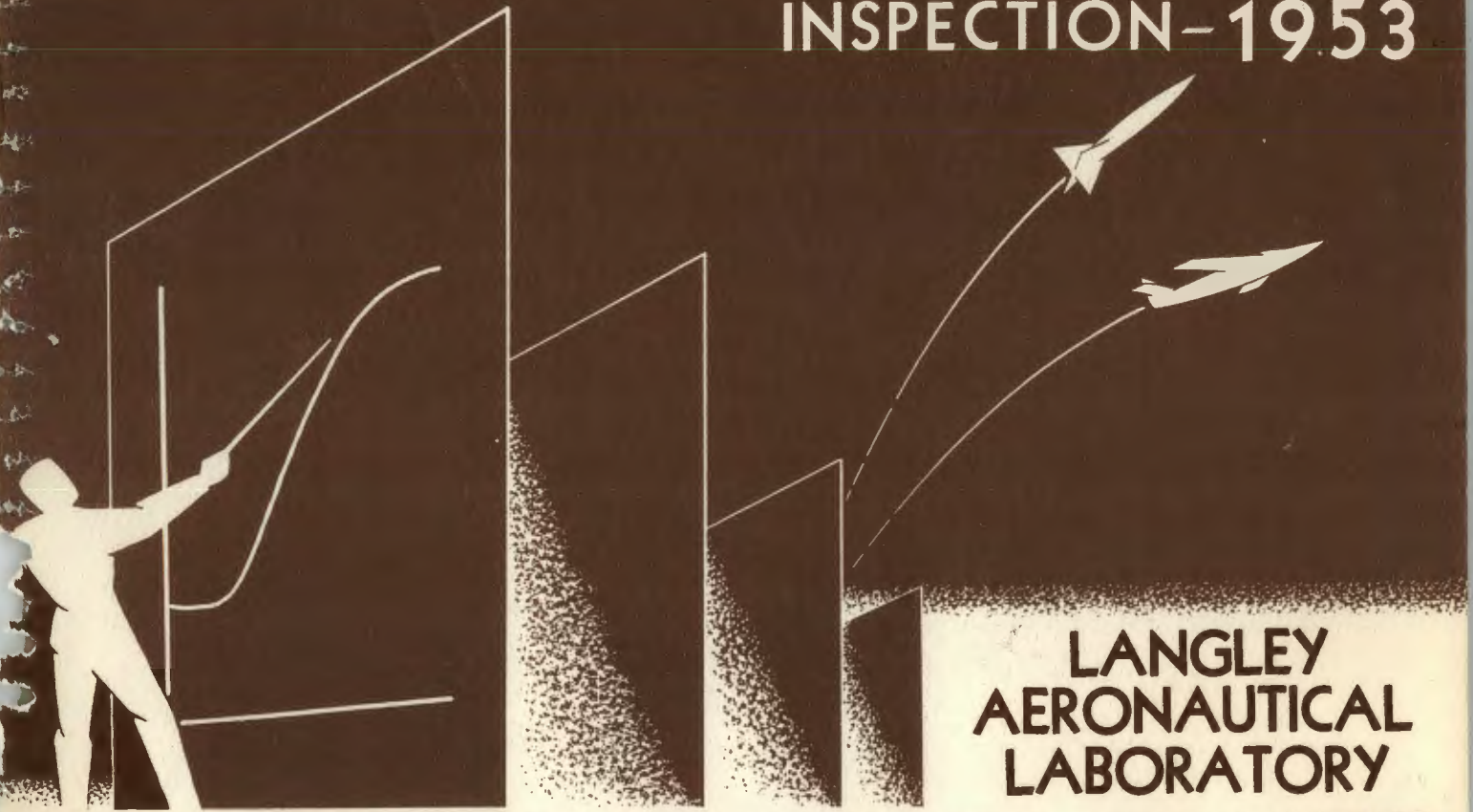
INSPECTION–1953



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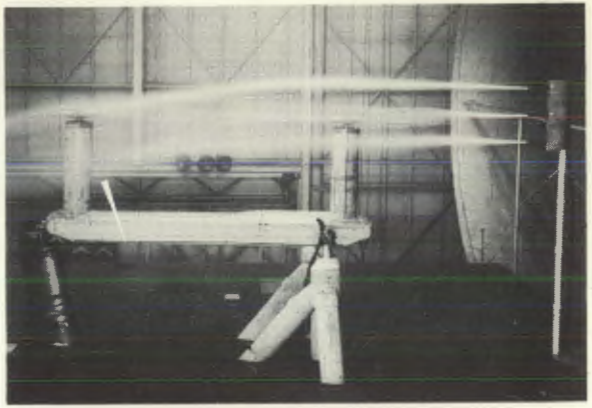
This booklet contains reproductions of charts used to illustrate the presentations at the 1953 Inspection of the NACA's Langley Aeronautical Laboratory. They have been prepared for your use following suggestions that such a device might be helpful to those who attend the Inspection. Space has been provided for those who may wish to take notes.

HELICOPTER RESEARCH



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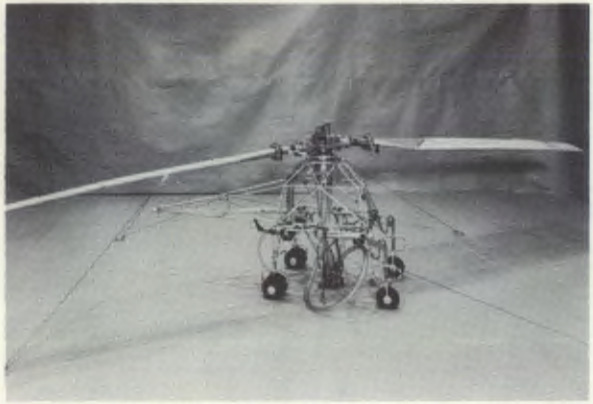
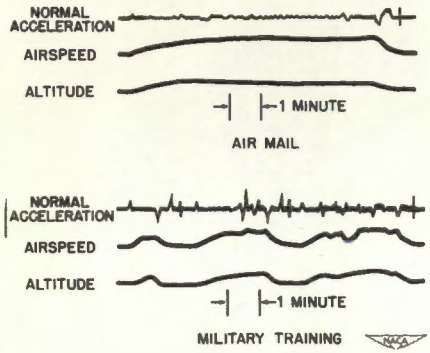
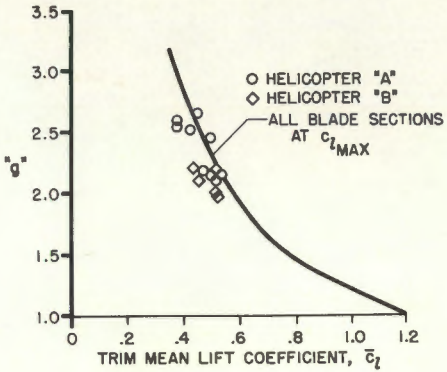


NOTES

SPECIAL RECORDER DEPICTS HELICOPTER OPERATING CONDITIONS



MANEUVER LOAD FACTOR



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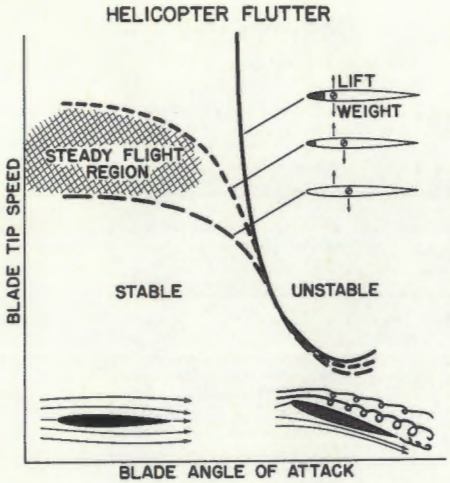
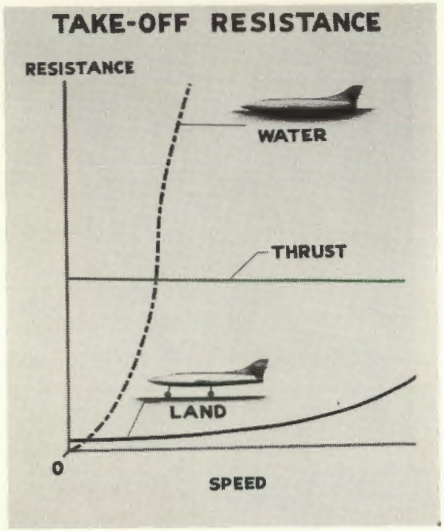
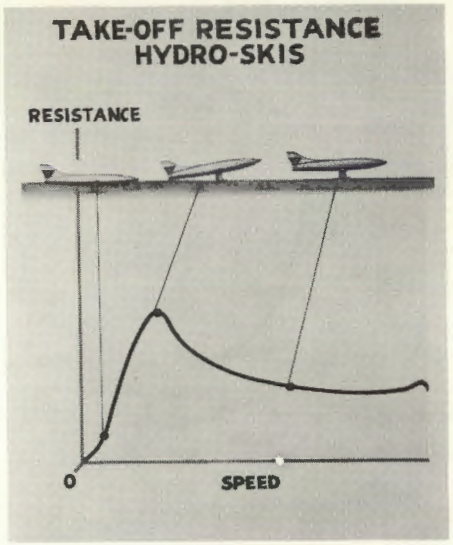

HELICOPTER FLUTTER
LIFT
WEIGHT
STEADY FLIGHT REGION
BLADE TIP SPEED
STABLE
UNSTABLE
BLADE ANGLE OF ATTACK

NOTES

HYDRODYNAMICS





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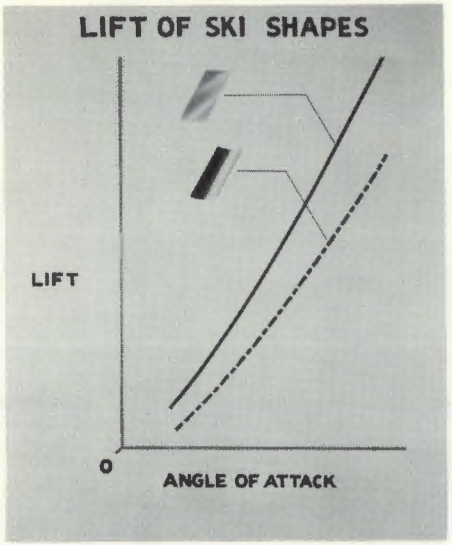
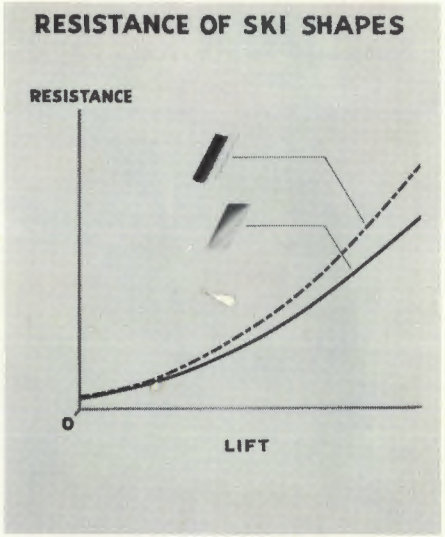
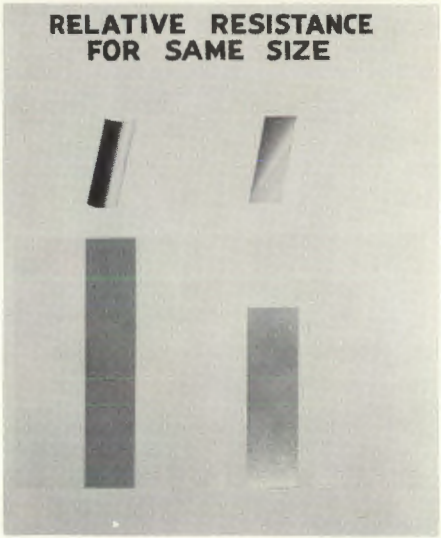

LIFT OF SKI SHAPES
LIFT
0
ANGLE OF ATTACK

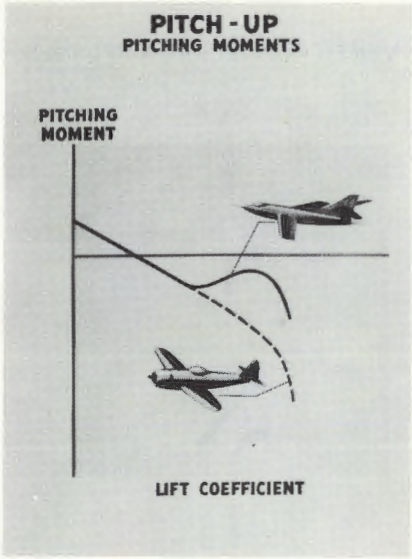

RESISTANCE OF SKI SHAPES
RESISTANCE
0
LIFT

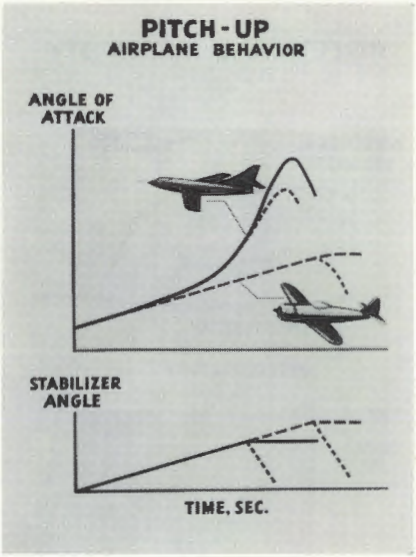
NOTES

RELATIVE SIZE FOR
SAME LIFT-RESISTANCE RATIO

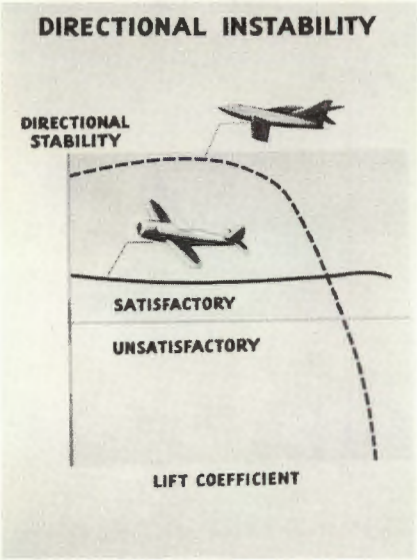

RELATIVE RESISTANCE
FOR SAME SIZE

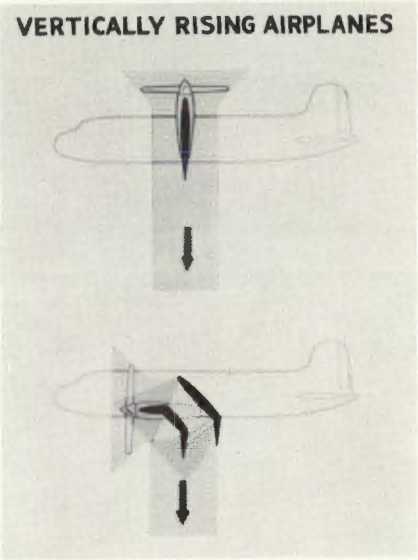
NOTES


PITCH - UP
PITCHING MOMENTS
PITCHING MOMENT
LIFT COEFFICIENT

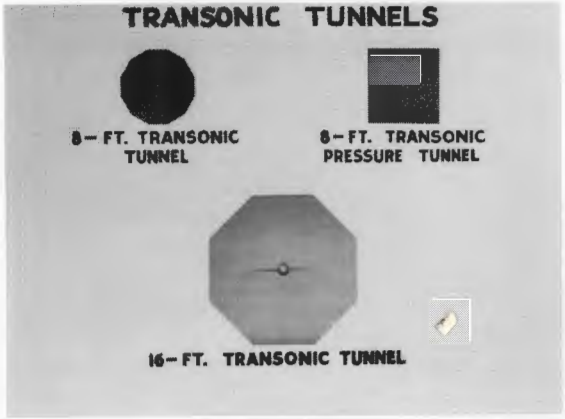

PITCH - UP
AIRPLANE BEHAVIOR
ANGLE OF ATTACK
STABILIZER ANGLE
TIME, SEC.

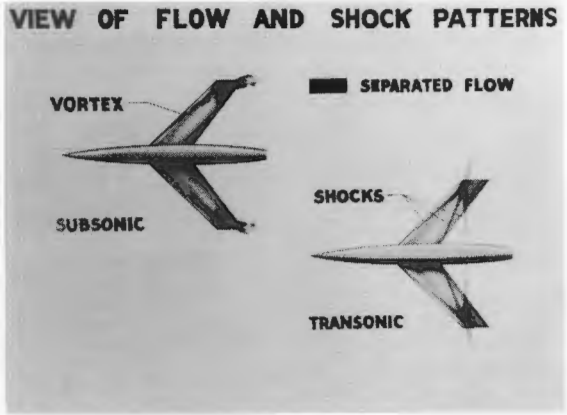
NOTES


DIRECTIONAL INSTABILITY
DIRECTIONAL STABILITY
SATISFACTORY
UNSATISFACTORY
LIFT COEFFICIENT

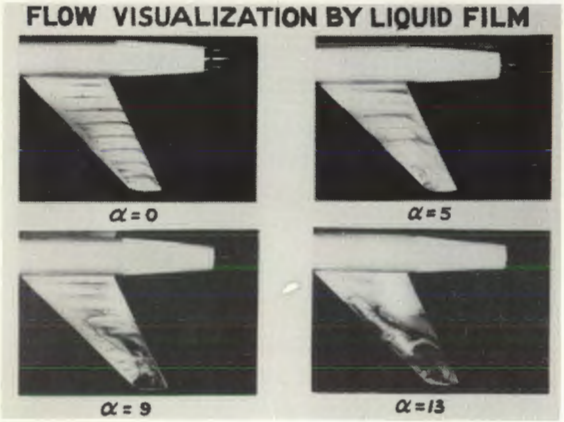

VERTICALLY RISING AIRPLANES

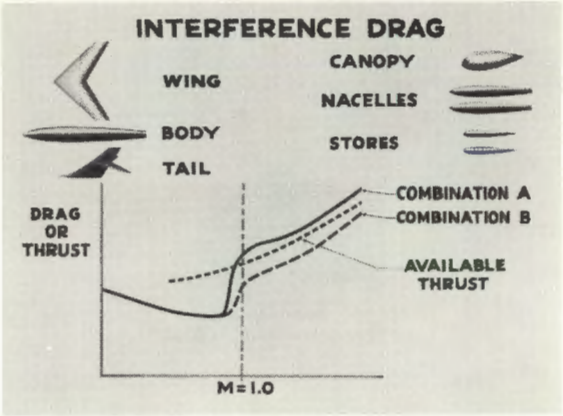
NOTES


TRANSONIC TUNNELS
8-FT. TRANSONIC TUNNEL
8-FT. TRANSONIC PRESSURE TUNNEL
16-FT. TRANSONIC TUNNEL


VIEW OF FLOW AND SHOCK PATTERNS
SEPARATED FLOW
VORTEX
SUBSONIC
SHOCKS
TRANSONIC

NOTES


FLOW VISUALIZATION BY LIQUID FILM
α = 0
α = 5
α = 9
α = 13


INTERFERENCE DRAG
WING
BODY
TAIL
CANOPY
NACELLES
STORES
DRAG OR THRUST
COMBINATION A
COMBINATION B
AVAILABLE THRUST
M = 1.0

NOTES

PILOTLESS AIRCRAFT RESEARCH

ROCKET MODELS

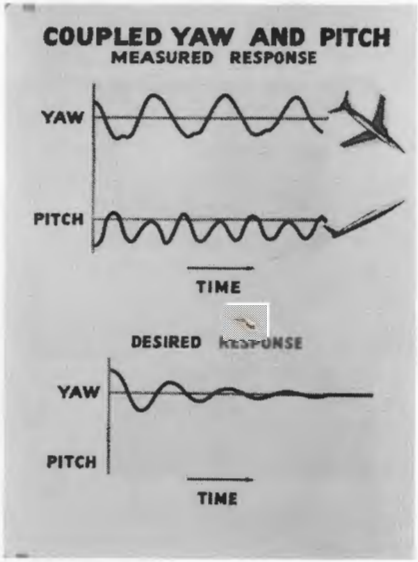
TYPE OF INVESTIGATION

PERFORMANCE
- LIFT AND DRAG
- BOUNDARY LAYER
- INLETS

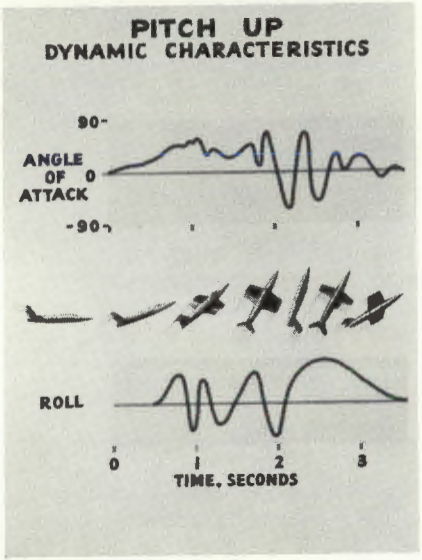
STABILITY AND CONTROL
- CONTROL EFFECTIVENESS
- HINGE MOMENTS
- DAMPING
- FLYING QUALITIES
- AUTOMATIC STABILIZATION
- DYNAMIC BEHAVIOR

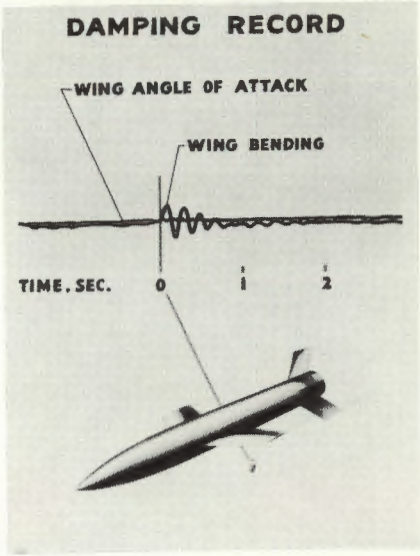
FLUTTER

BUFFETING

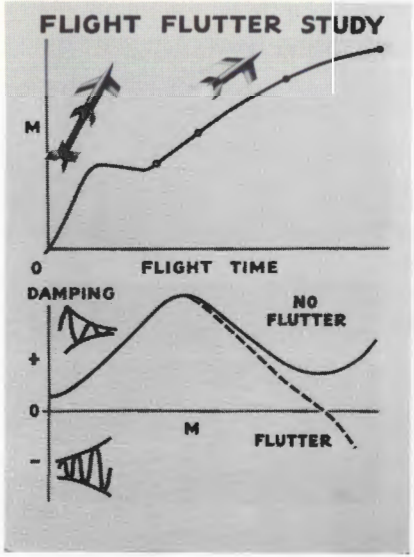


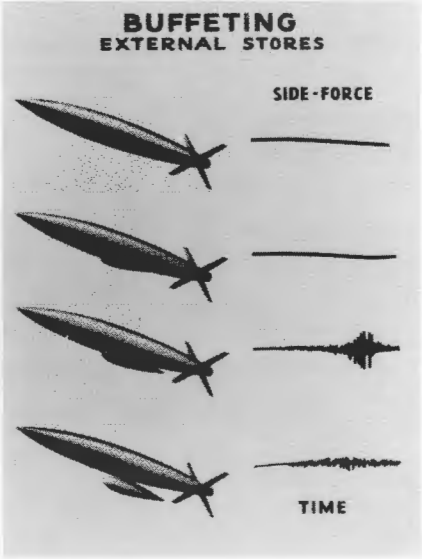
NOTES


PITCH UP
DYNAMIC CHARACTERISTICS
90-
ANGLE OF ATTACK
0
-90
ROLL
0
1
2
3
TIME, SECONDS


DAMPING RECORD
WING ANGLE OF ATTACK
WING BENDING
TIME, SEC.
0
1
2

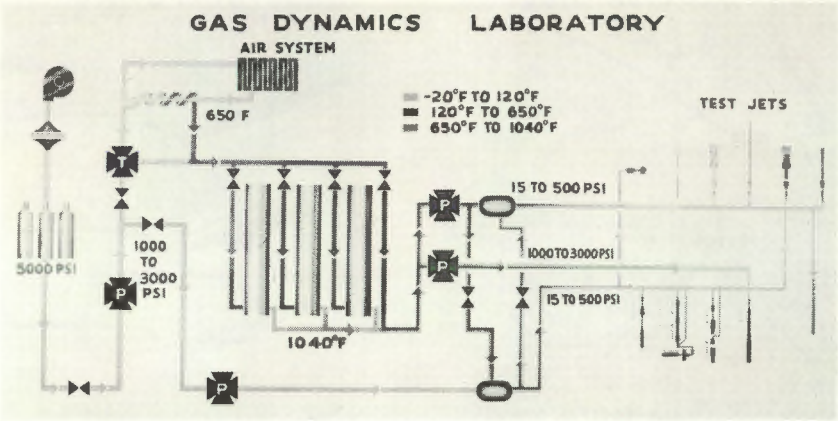
NOTES


FLIGHT FLUTTER STUDY
M
0
FLIGHT TIME
DAMPING
NO FLUTTER
+
0
M
FLUTTER
-


BUFFETING
EXTERNAL STORES
SIDE-FORCE
TIME

NOTES

GAS DYNAMICS



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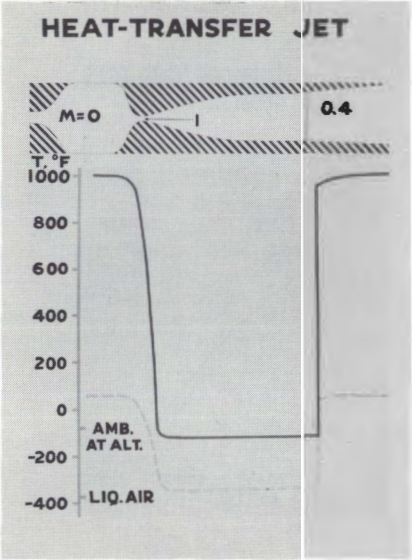
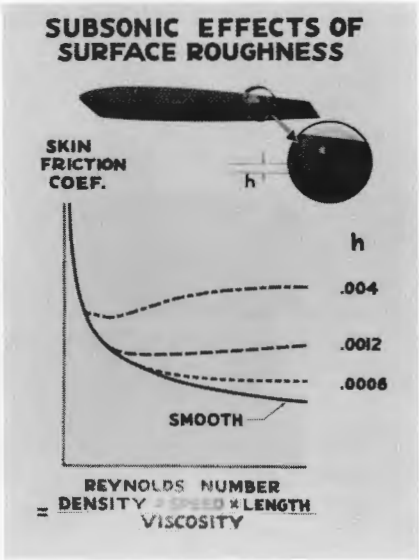
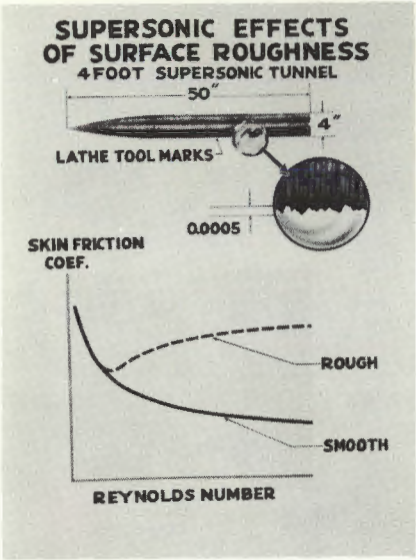
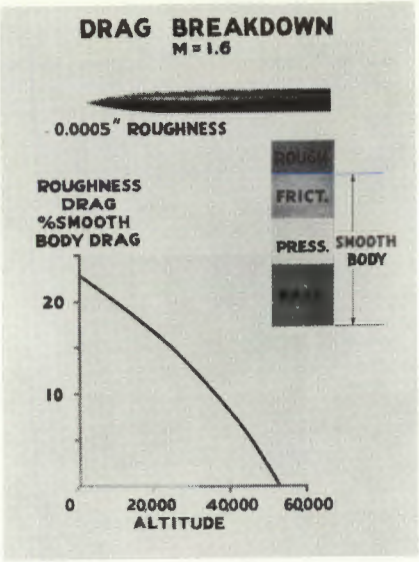

HEAT-TRANSFER JET
M=0
1
0.4
T, °F
1000
800
600
400
200
0
-200
-400
AMB.
AT ALT.
LIQ. AIR


SUBSONIC EFFECTS OF
SURFACE ROUGHNESS
SKIN
FRICTION
COEF.
h
h
.004
.0012
.0006
SMOOTH
REYNOLDS NUMBER
= DENSITY × LENGTH
VISCOSITY

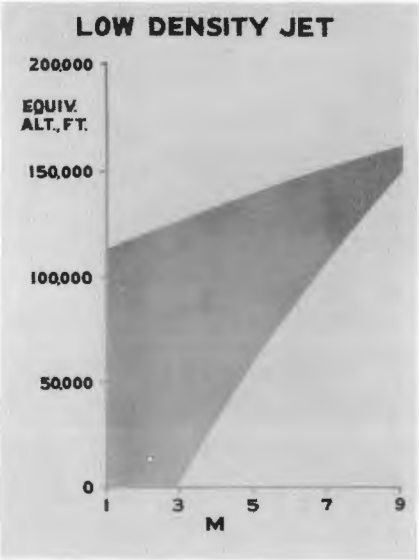
NOTES


SUPERSONIC EFFECTS
OF SURFACE ROUGHNESS
4-FOOT SUPERSONIC TUNNEL
50"
4"
LATHE TOOL MARKS
0.0005
SKIN FRICTION
COEF.
ROUGH
SMOOTH
REYNOLDS NUMBER

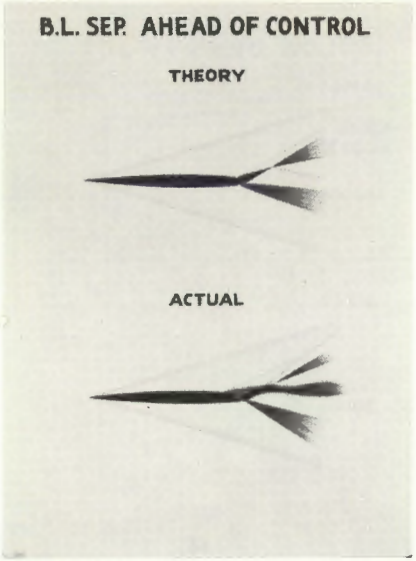

DRAG BREAKDOWN
M = 1.6
0.0005" ROUGHNESS
ROUGH.
FRICT.
PRESS.
SMOOTH
BODY
ROUGHNESS
DRAG
%SMOOTH
BODY DRAG
20
10
0
20,000
40,000
60,000
ALTITUDE

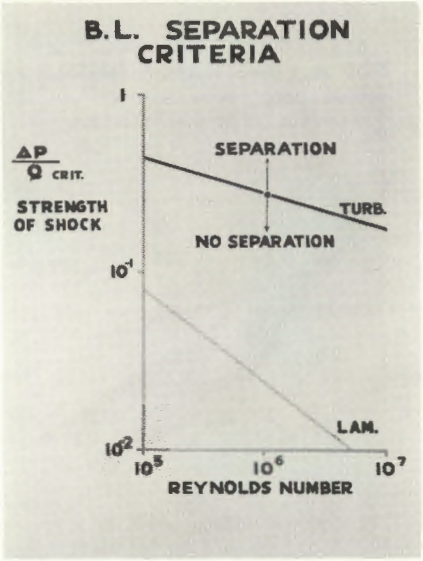
NOTES

ALLOWABLE ROUGHNESS
FOR A LONG RANGE MISSILE
ALTITUDE - 50,000 FT - M = 2.5

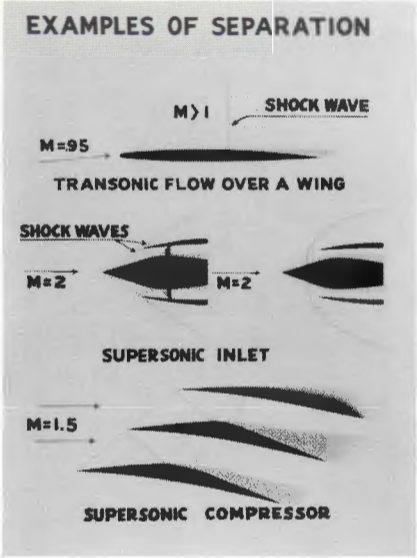

LOW DENSITY JET
200,000
EQUIV.
ALT., FT.
150,000
100,000
50,000
0
1
3
5
7
9
M

NOTES


B.L. SEP. AHEAD OF CONTROL
THEORY
ACTUAL

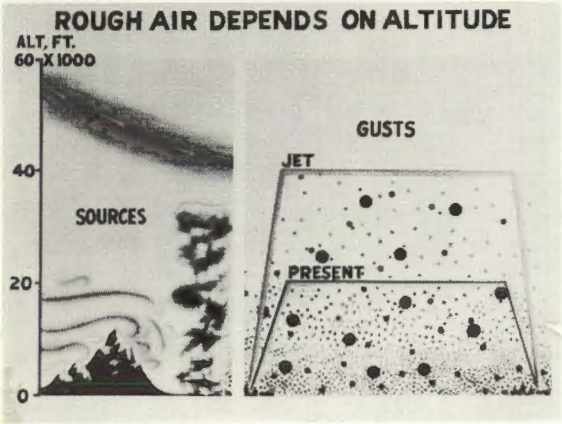

B.L. SEPARATION CRITERIA
1
ΔP / Q CRIT.
STRENGTH OF SHOCK
SEPARATION
TURB.
NO SEPARATION
10⁻¹
LAM.
10⁻²
10⁵
10⁶
10⁷
REYNOLDS NUMBER

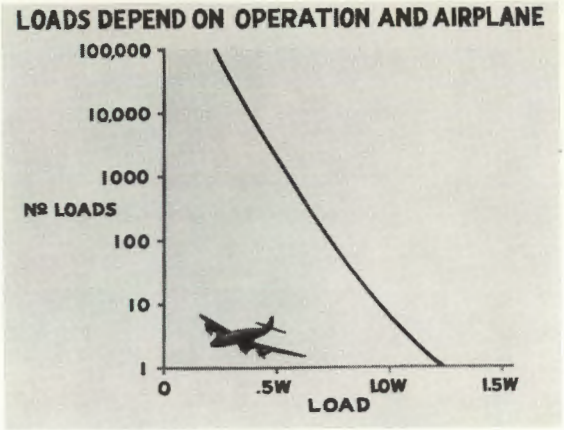
NOTES


EXAMPLES OF SEPARATION
M>1
SHOCK WAVE
M=.95
TRANSONIC FLOW OVER A WING
SHOCK WAVES
M=2
M=2
SUPERSONIC INLET
M=1.5
SUPERSONIC COMPRESSOR

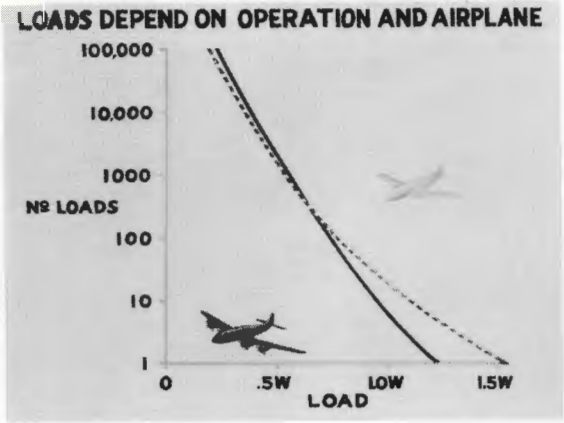
NOTES

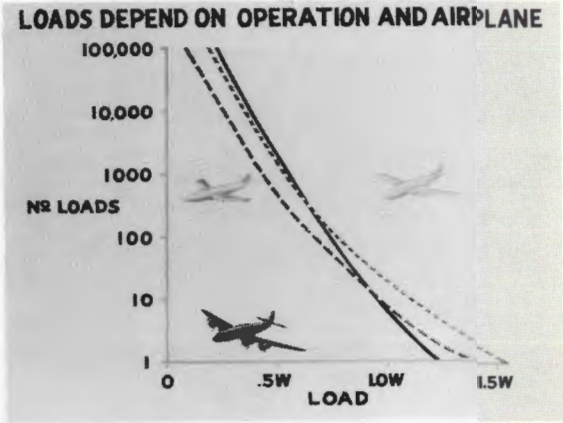
DYNAMIC LOADS



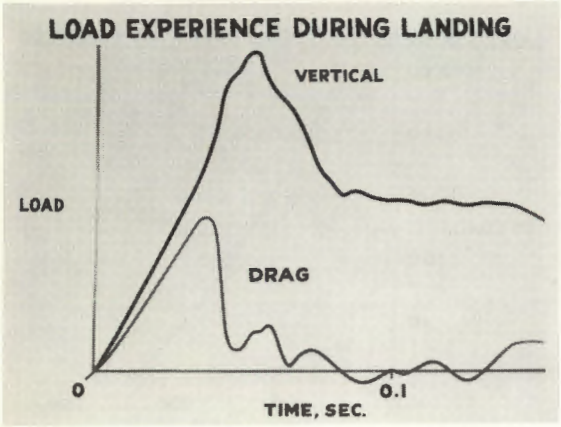


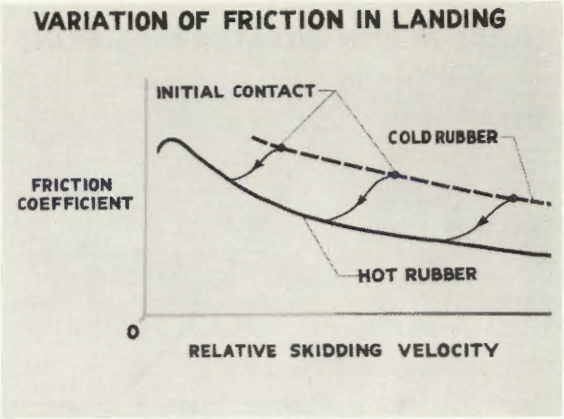
NOTES


LOADS DEPEND ON OPERATION AND AIRPLANE
100,000
10,000
1000
Nº LOADS
100
10
1
0
.5W
1.0W
1.5W
LOAD

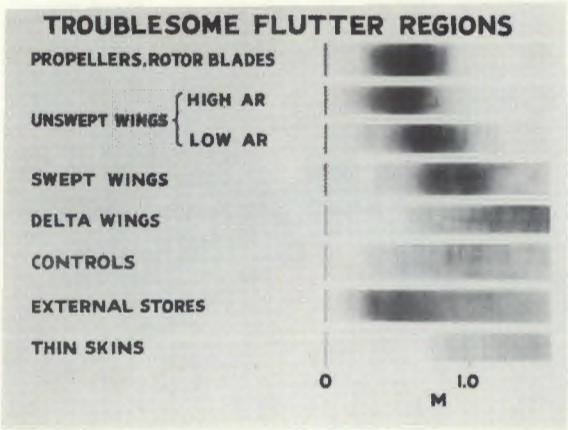

LOADS DEPEND ON OPERATION AND AIRPLANE
100,000
10,000
1000
Nº LOADS
100
10
1
0
.5W
1.0W
1.5W
LOAD

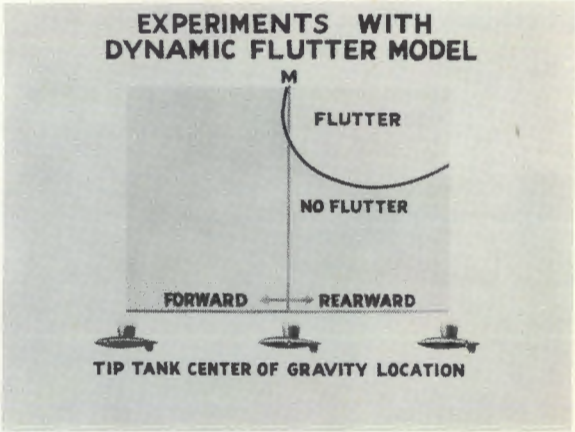
NOTES


LOAD EXPERIENCE DURING LANDING
VERTICAL
LOAD
DRAG
0
0.1
TIME, SEC.


VARIATION OF FRICTION IN LANDING
INITIAL CONTACT
COLD RUBBER
FRICTION COEFFICIENT
HOT RUBBER
0
RELATIVE SKIDDING VELOCITY

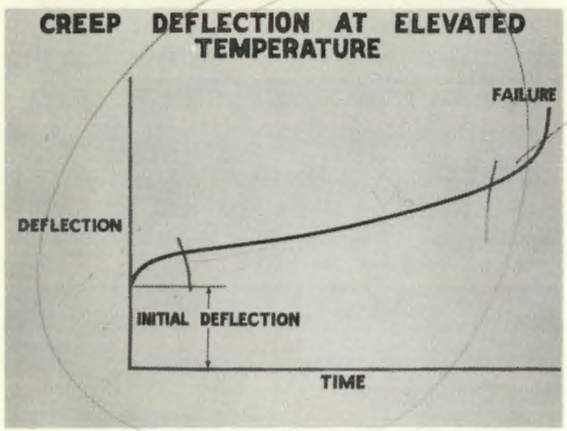
NOTES

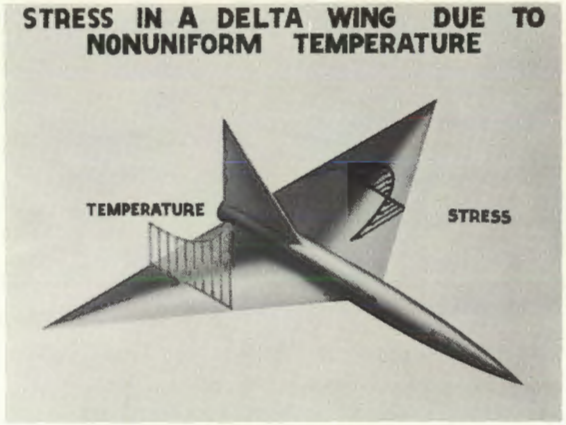

TROUBLESOME FLUTTER REGIONS
PROPELLERS, ROTOR BLADES
UNSWEPT WINGS
HIGH AR
LOW AR
SWEPT WINGS
DELTA WINGS
CONTROLS
EXTERNAL STORES
THIN SKINS
0
1.0
M


EXPERIMENTS WITH
DYNAMIC FLUTTER MODEL
M
FLUTTER
NO FLUTTER
FORWARD
REARWARD
TIP TANK CENTER OF GRAVITY LOCATION

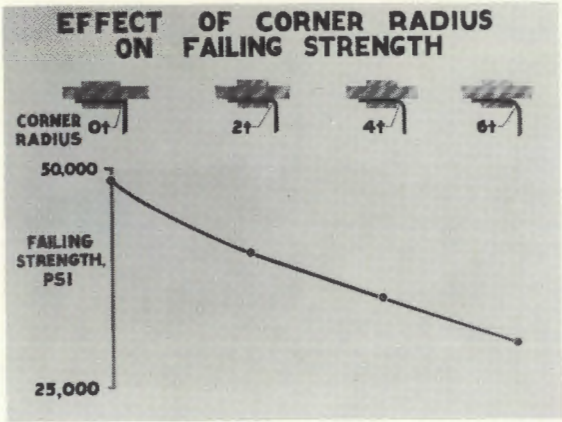
NOTES

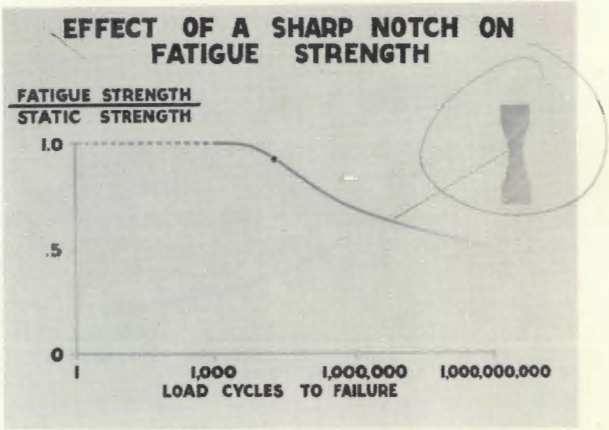
STRUCTURES RESEARCH



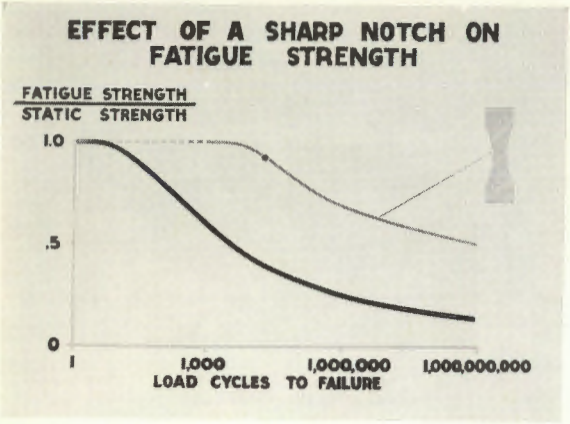


NOTES

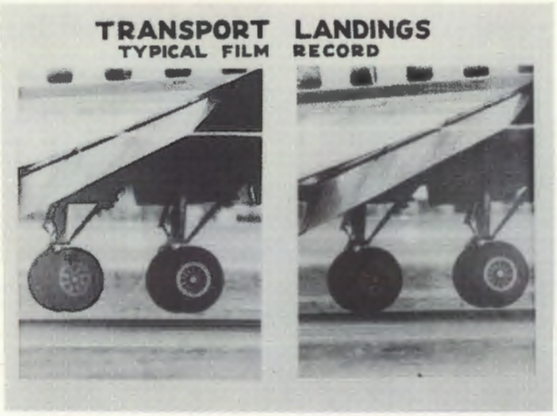

EFFECT OF CORNER RADIUS ON FAILING STRENGTH
CORNER RADIUS
0t
2t
4t
6t
50,000
FAILING STRENGTH, PSI
25,000

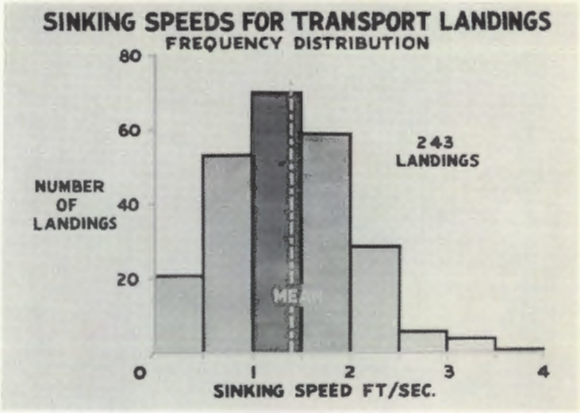

EFFECT OF A SHARP NOTCH ON FATIGUE STRENGTH
FATIGUE STRENGTH / STATIC STRENGTH
1.0
.5
0
1
1,000
1,000,000
1,000,000,000
LOAD CYCLES TO FAILURE

NOTES

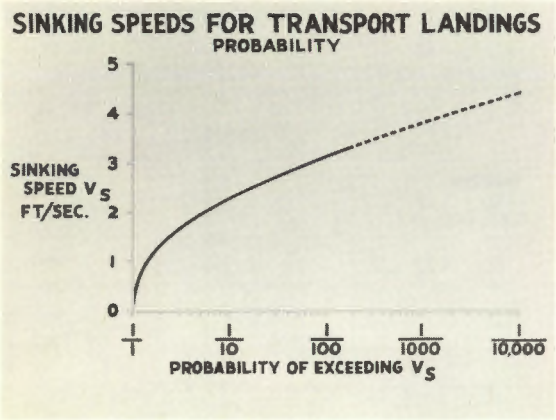

EFFECT OF A SHARP NOTCH ON FATIGUE STRENGTH
FATIGUE STRENGTH
STATIC STRENGTH
1.0
.5
0
1
1,000
1,000,000
1,000,000,000
LOAD CYCLES TO FAILURE

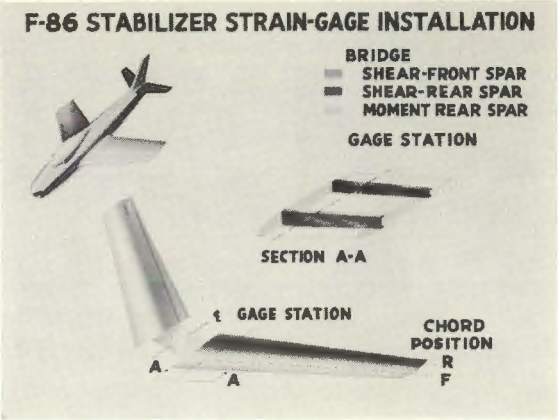
NOTES


TRANSPORT LANDINGS
TYPICAL FILM RECORD

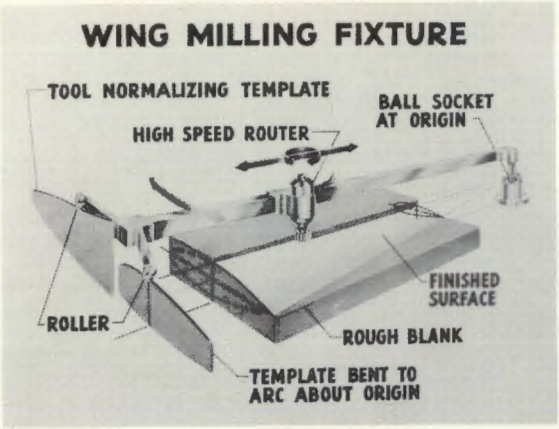

SINKING SPEEDS FOR TRANSPORT LANDINGS
FREQUENCY DISTRIBUTION
NUMBER OF LANDINGS
80
60
40
20
0
1
2
3
4
243 LANDINGS
MEAN
SINKING SPEED FT/SEC.

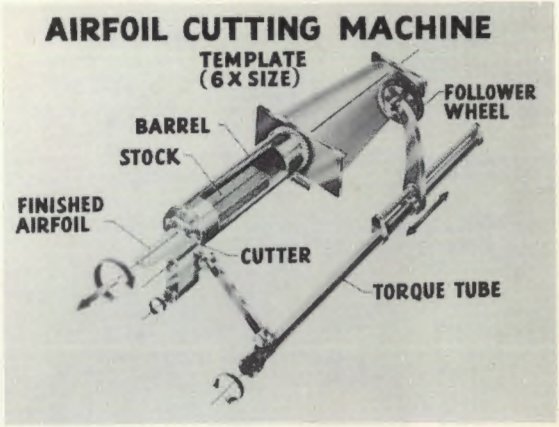
NOTES


SINKING SPEEDS FOR TRANSPORT LANDINGS
PROBABILITY
SINKING SPEED V_S FT/SEC.
5
4
3
2
1
0
1/1
1/10
1/100
1/1000
1/10,000
PROBABILITY OF EXCEEDING V_S

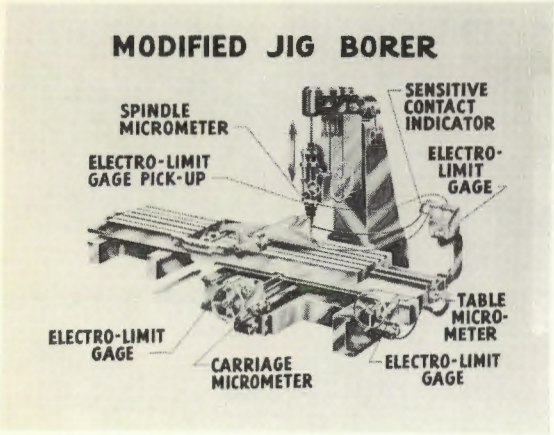

F-86 STABILIZER STRAIN-GAGE INSTALLATION
BRIDGE
SHEAR-FRONT SPAR
SHEAR-REAR SPAR
MOMENT REAR SPAR
GAGE STATION
SECTION A-A
℄ GAGE STATION
CHORD POSITION
R
F
A
A

NOTES


WING MILLING FIXTURE
TOOL NORMALIZING TEMPLATE
BALL SOCKET AT ORIGIN
HIGH SPEED ROUTER
FINISHED SURFACE
ROLLER
ROUGH BLANK
TEMPLATE BENT TO ARC ABOUT ORIGIN


AIRFOIL CUTTING MACHINE
TEMPLATE (6 X SIZE)
FOLLOWER WHEEL
BARREL
STOCK
FINISHED AIRFOIL
CUTTER
TORQUE TUBE

NOTES



NOTES

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