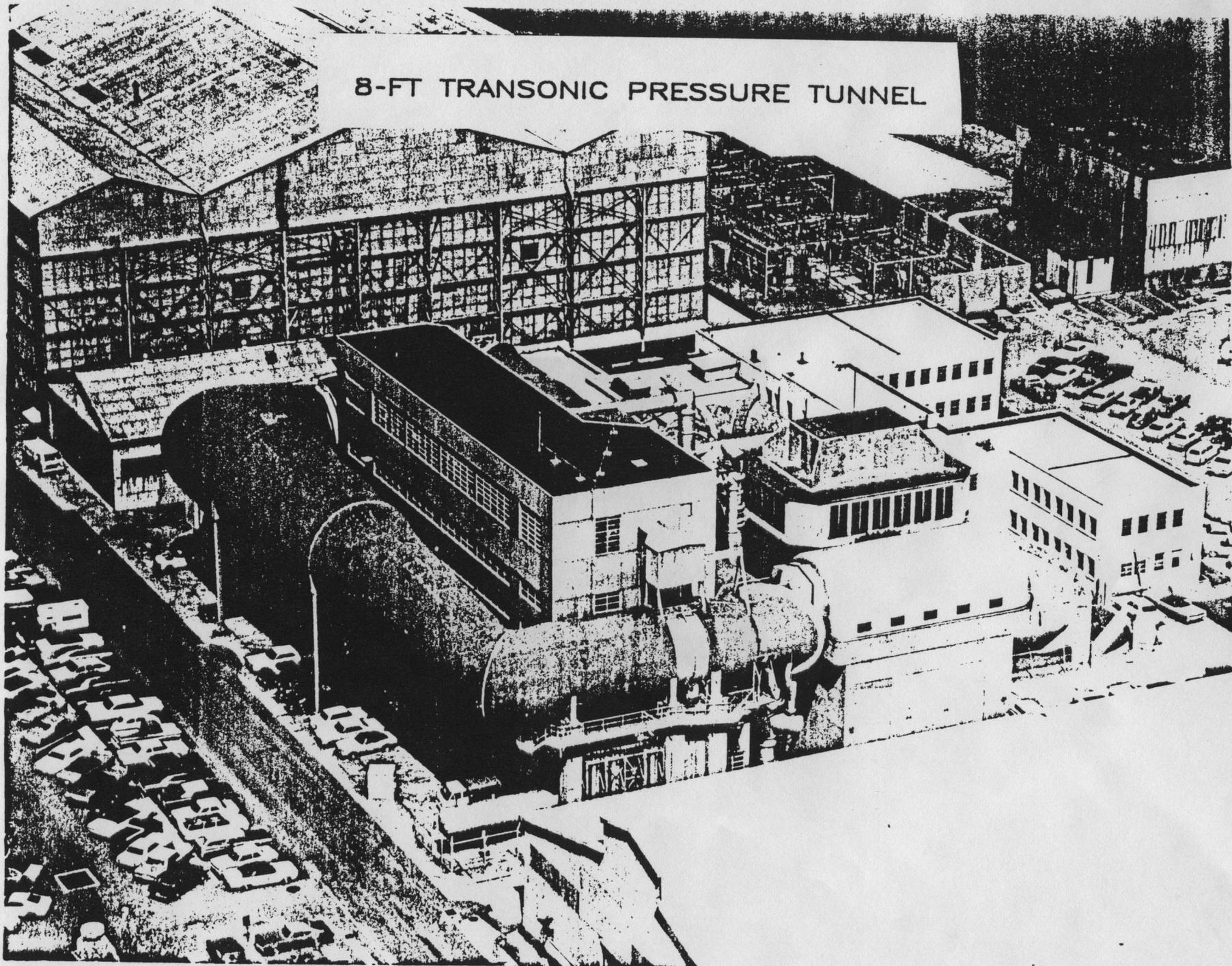


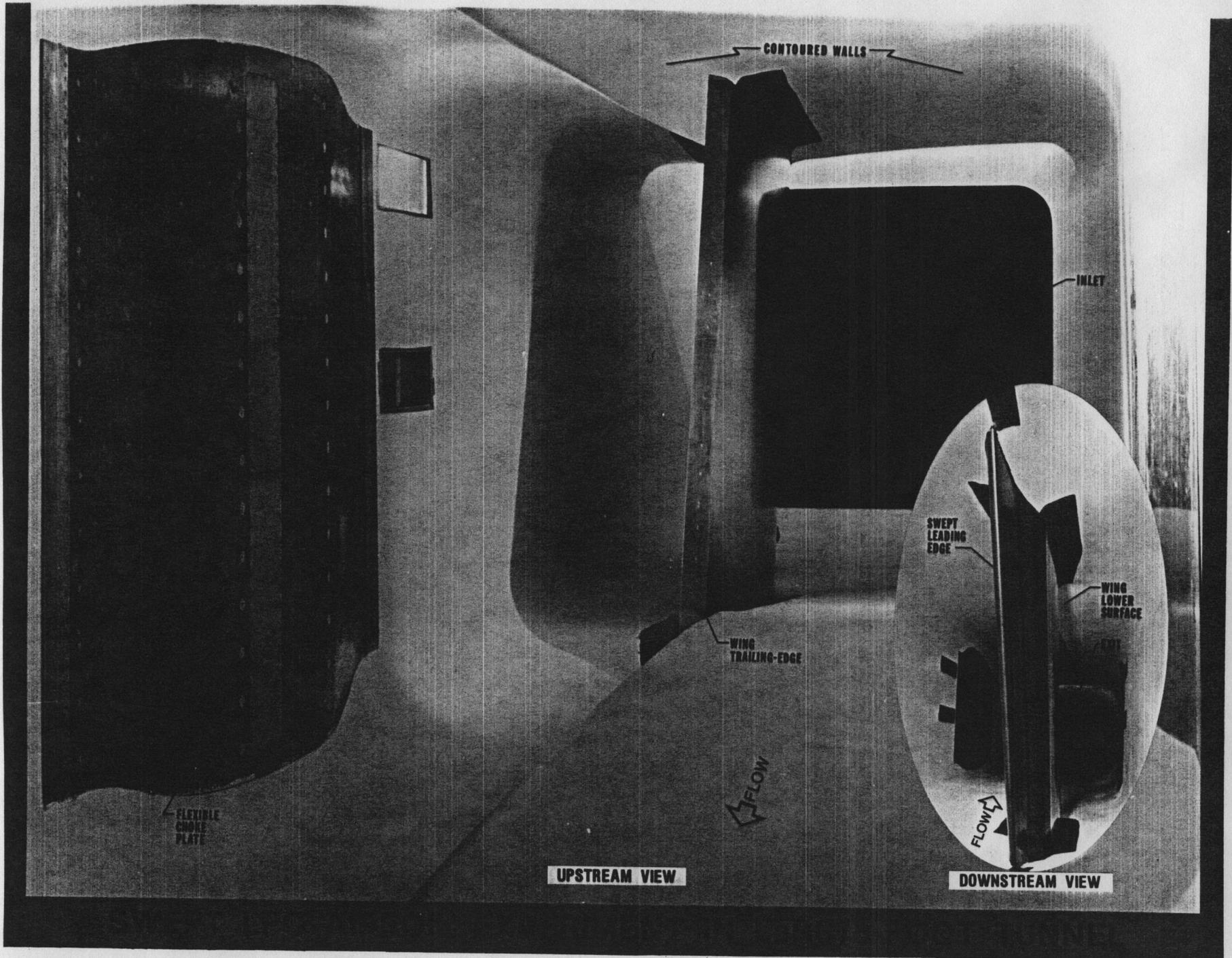
**Modifications To The
8-Foot Transonic Pressure Tunnel**

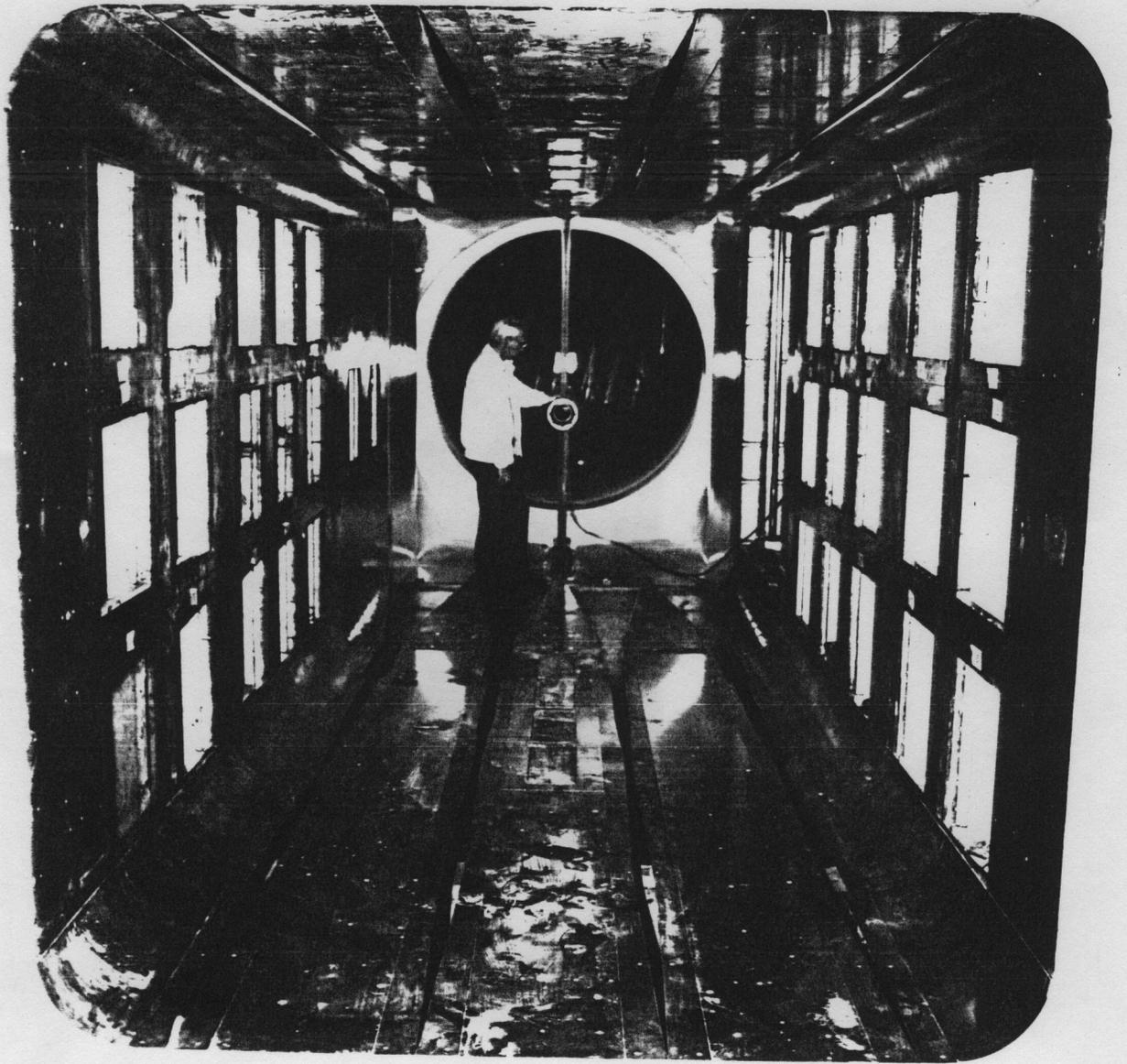
**FY 1991 CoF
Langley Research Center**

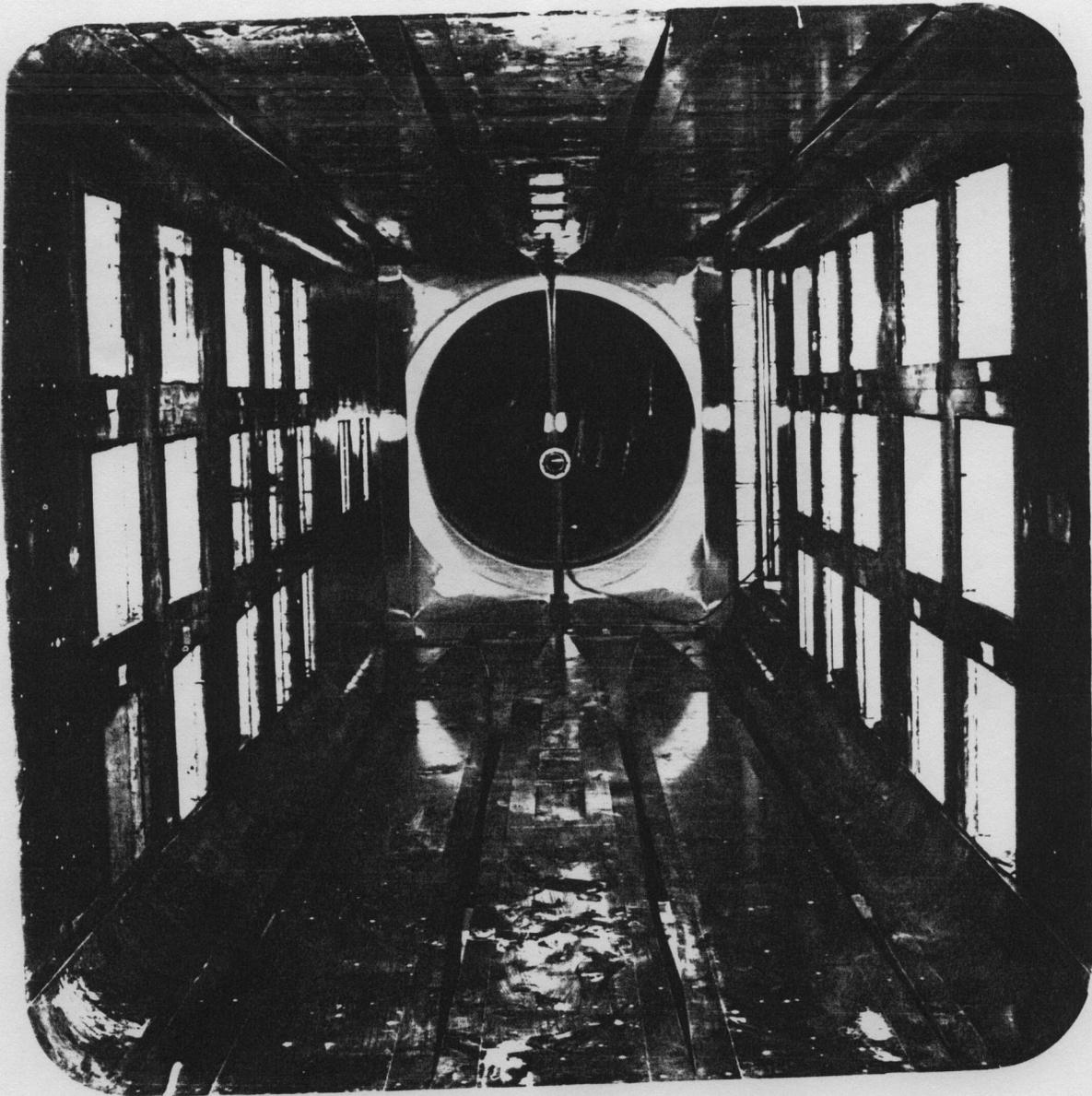
By
Lawrence E. Putnam
Head, Advanced Configurations Branch

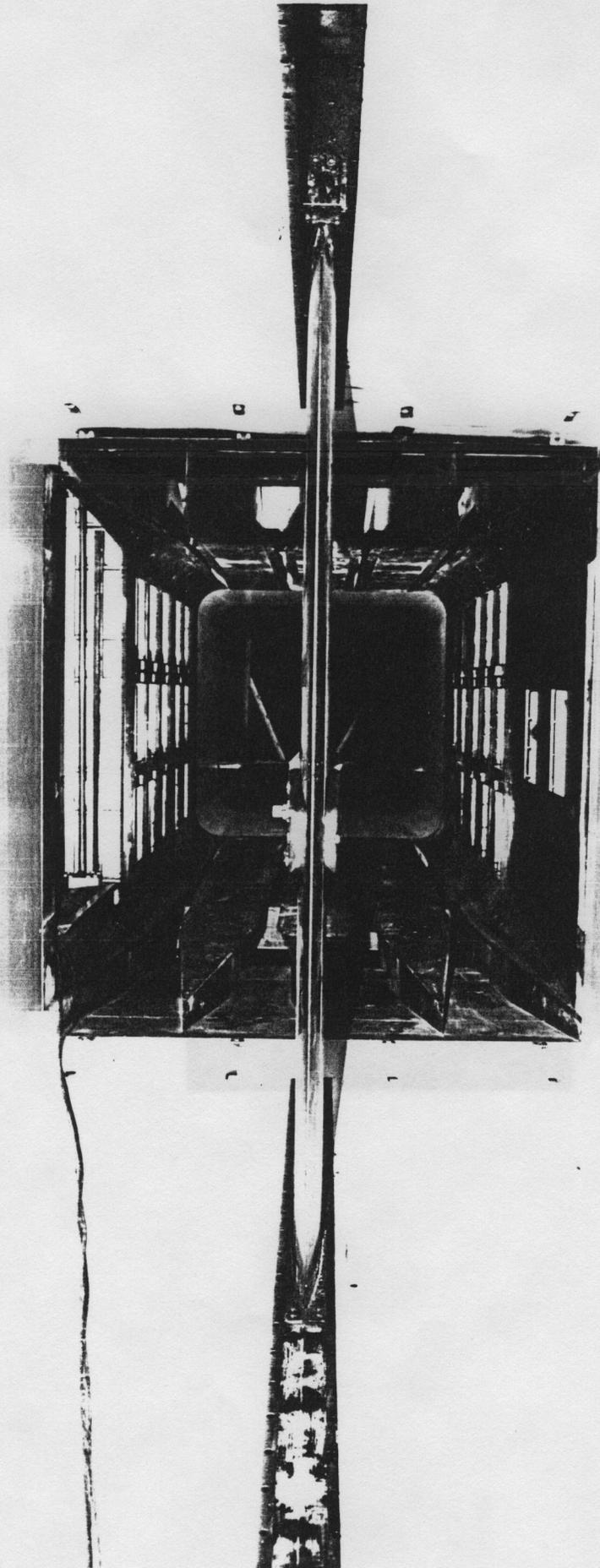
8-FT TRANSONIC PRESSURE TUNNEL











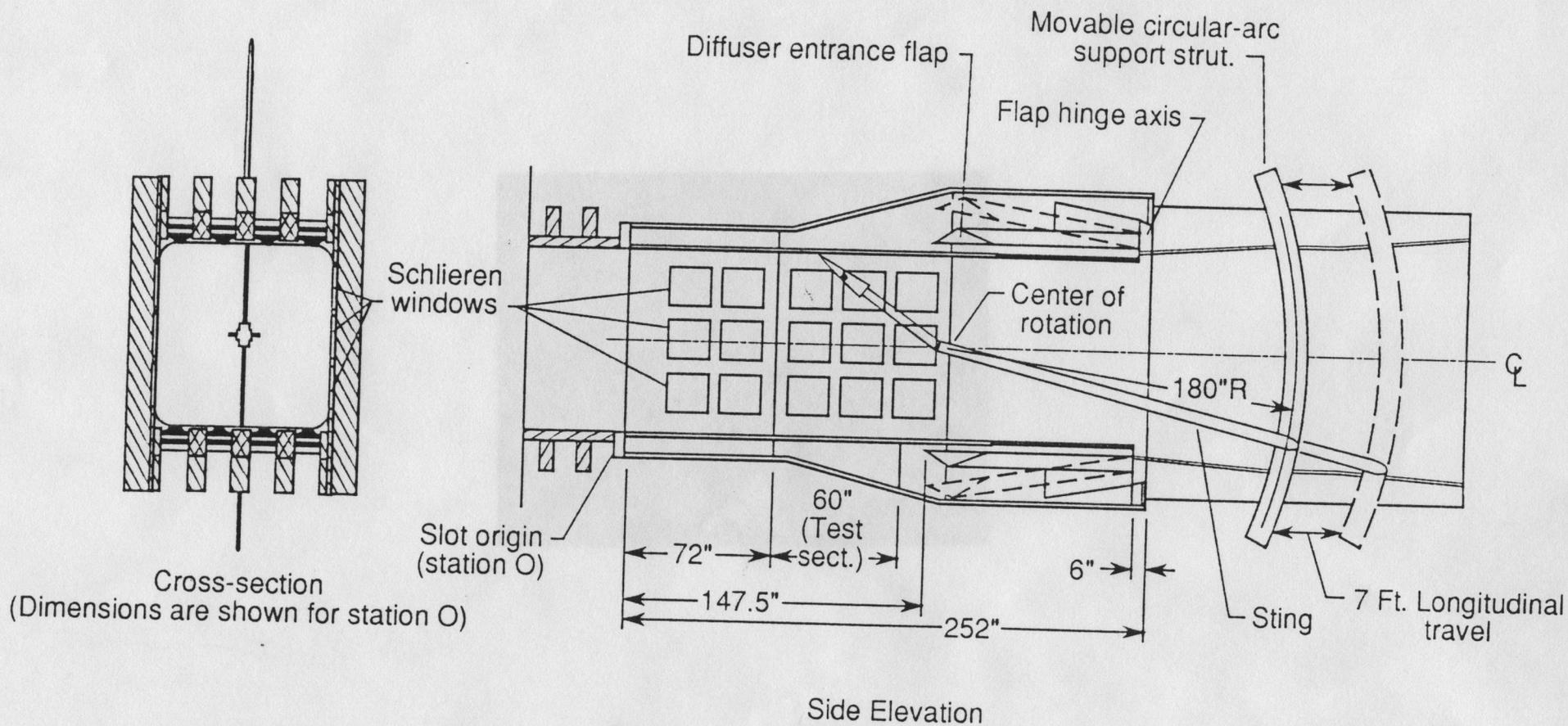
Proposed CoF Modifications

Automated High Angle of Attack Model Support System

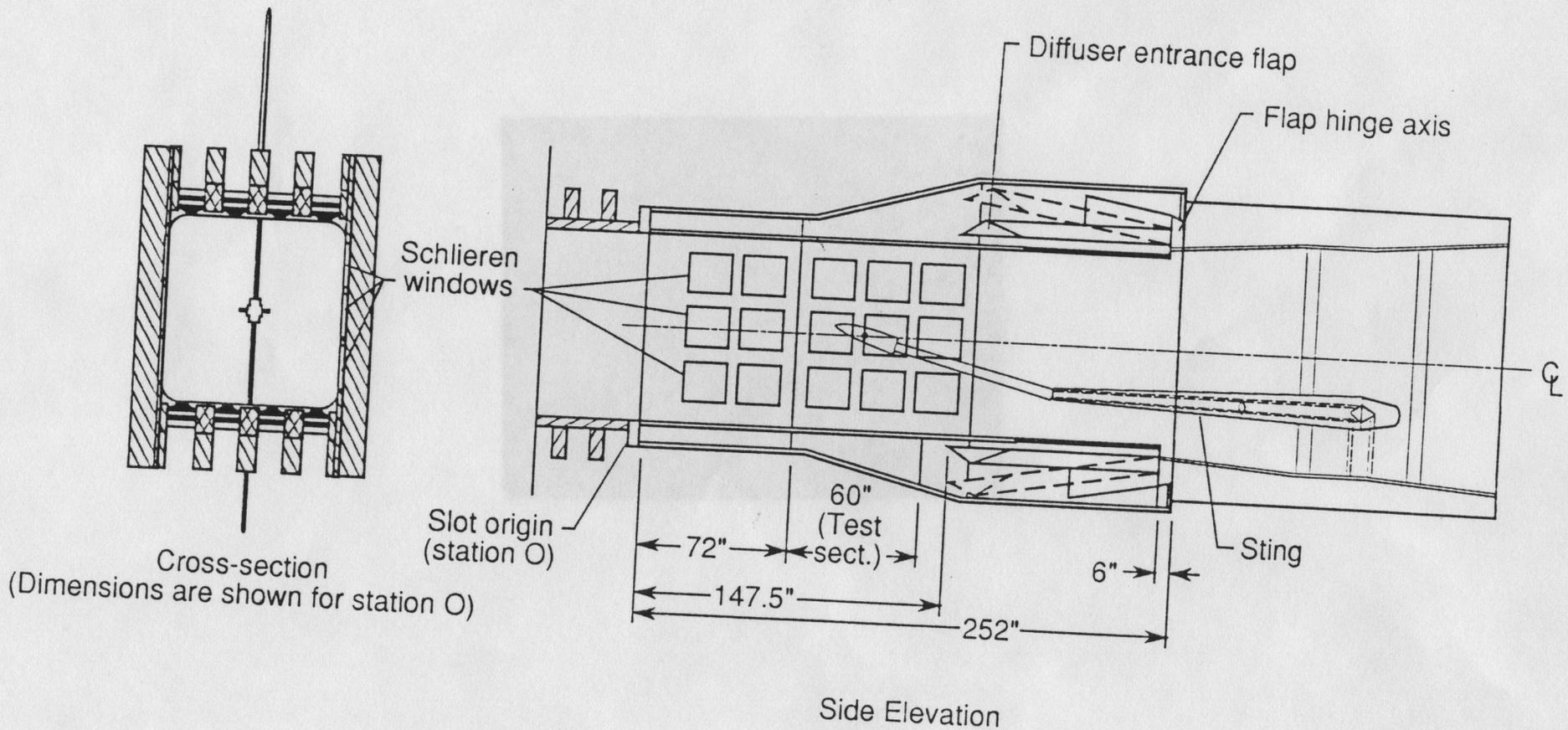
- **Current Model Support System Capabilities**
 - Basic angle of attack range limited to 22° (-10° to 12°)
 - Model position in test section varies with angle of attack
 - Manual knuckle changes required to change sideslip or roll angle
 - Pitch drive rate limited to 40 deg/min
 - Side load limited to 400 lbs
 - Guy wires required to prevent lateral movement
- **Proposed Model Support System Will:**
 - Increase angle of attack range to 35°
 - Provide capability for angles of attack to 90° with knuckles or couplings
 - Maintain model rotation center within 2 inches of the tunnel centerline
 - Provide remote roll capability from -180° to 180°
 - Provide remote sideslip angle variation by combined pitch and roll rotations
 - Increase pitch drive rate to 120 deg/min
 - Increase side load capability to 1000 lbs
 - Delete requirement for guy wires
 - Increase productivity by reducing number of tunnel entries
 - Be automated (i.e. computer controlled)

SLOTTED-THROAT AND DIFFUSER-ENTRANCE REGIONS OF THE LANGLEY 8-FOOT TRANSONIC PRESSURE TUNNEL

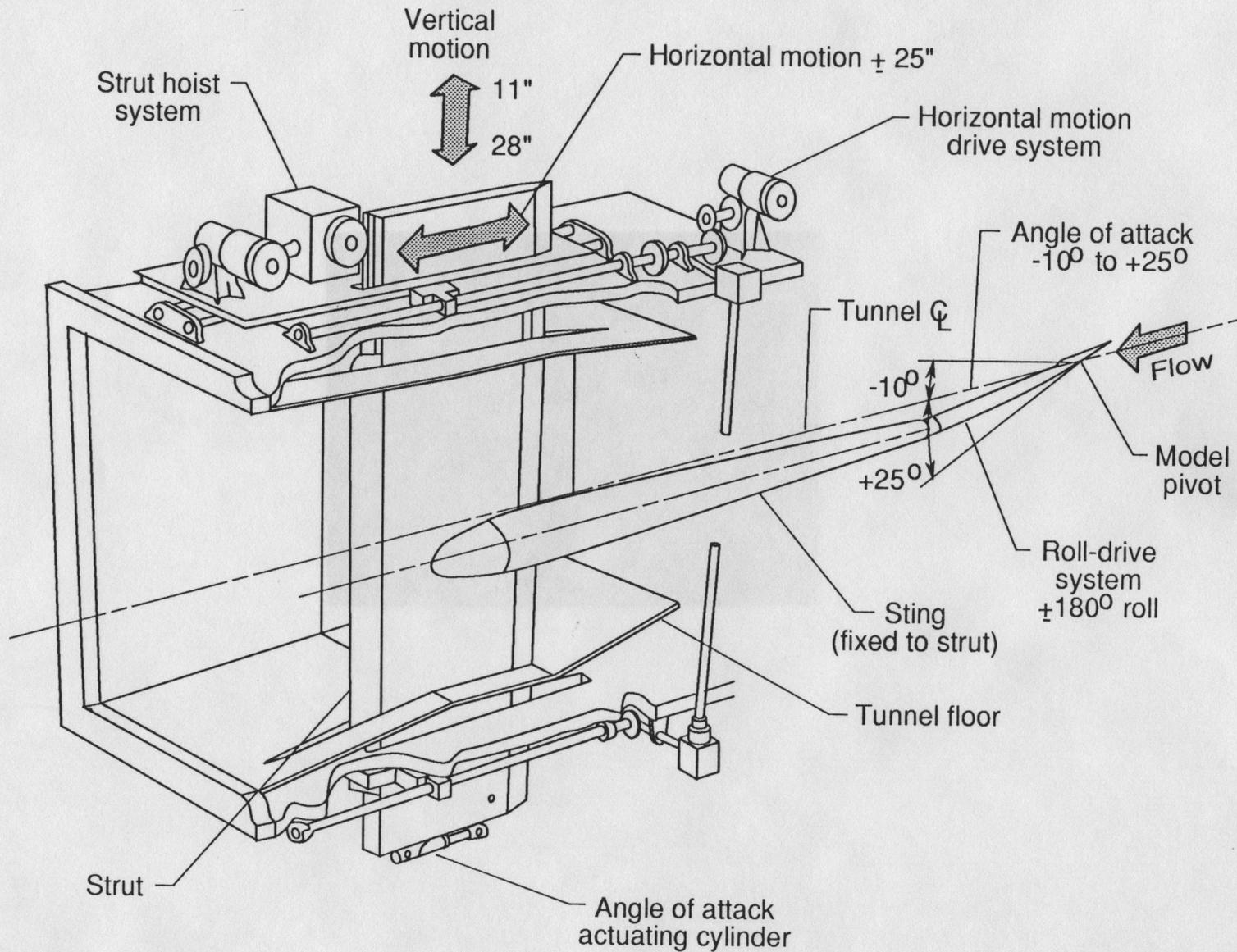
Current angle of attack support system



**SLOTTED-THROAT AND DIFFUSER-ENTRANCE REGIONS OF
THE LANGLEY 8-FOOT TRANSONIC PRESSURE TUNNEL**
Proposed angle of attack support system



SUPPORT ASSEMBLY FOR 8-FOOT TRANSONIC PRESSURE TUNNEL



Proposed CoF Modifications

Automated High Angle of Attack Model Support System

Why Now?

- Tunnel is being restored to original condition following laminar flow control experiments
 - In past primarily used for research on transports
- Increasing emphasis/need for testing to support advanced fighter designs
- Transonic high angle of attack capability required for next generation fighters
- Need to understand effects of Reynolds number on transonic high angle of attack flows.
 - Tunnel provides up to a factor of four variation
- Urgent need to develop fundamental data base for CFD code validation, particularly for high angle of attack flows.
 - Tunnel has excellent flow quality
 - Need to reduce wall interference
- Need to increase productivity
 - Tight manpower situation
 - Expect tunnel to have large workload
 - Receiving many requests for test time
 - Tunnel may also be used to conduct screening tests prior to high Reynolds Number studies in NTF

Relationship to NASA Mission and Goals

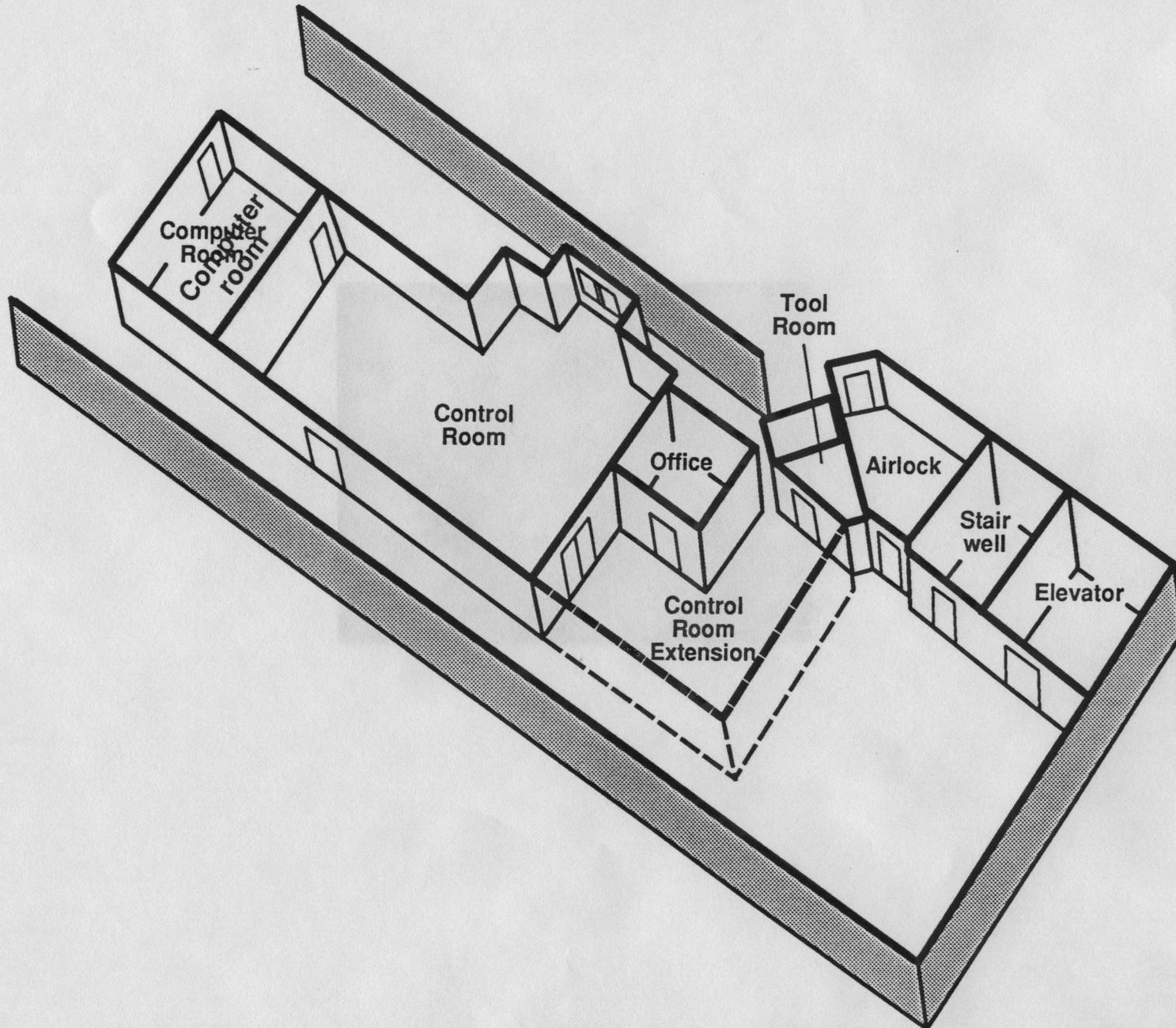
- Will enhance the development of advanced aerodynamic technology for:
 - Military aircraft and missiles
 - Long-haul transports
 - Hypersonic aircraft
 - Space transportation systems
- Will enhance NASA's premier research capabilities in high angle of attack aerodynamics
 - Increased capability at transonic speeds
 - More efficient means of obtaining data
- Will provide the capability to conduct basic research to provide detailed understanding of fundamental physical phenomena
 - Transonic high angle of attack flows
 - Reynolds number effects
- Will provide the capability to conduct applied research to convert understanding of fundamental physical phenomena to practical concepts and technologies
- Will increase capability to provide development support to high priority national initiatives

Estimated Cost

New Automated Model Support System

\$1500K

CONTROL ROOM EXPANSION



PROPOSED CoF MODIFICATION

Model Preparation Area

- Current Situation
 - Limited space for model preparation outside tunnel
 - No capability for pretest preparation of classified models
 - Model preparation in tunnel takes away from test time

- Proposed new model preparation area will
 - Be a two-story Building with 1600 sq.ft. of space attached to Building 640
 - Have two model preparation bays with model calibration stands, data systems, air supply, and electrical power
 - Bays will be secure for classified models

MISCELLANEOUS TUNNEL OPERATION UPGRADES

- Current Status
 - Old Equipment
 - No Major Improvements in Last 10 Years

- Proposed Upgrades Will
 - Upgrade Main Drive System
 - Modernize Hatch Mechanism
 - Replace Bulkhead Connectors and Wiring
 - Improve Safety by Consolidating and Modernizing Tunnel Alarms, Equipment Monitoring Systems, etc.
 - Replace Test Section Windows

ENLARGEMENT/MODERNIZATION OF CONTROL ROOM

- Current Situation
 - Limited floor space
 - Marginal A/C for electronic equipment

- Proposed MODs will
 - Increase floor space
 - Increase A/C capacity
 - Increase electrical power and circuits

PROPOSED CoF MODIFICATION

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MISCELLANEOUS FACILITY IMPROVEMENTS

- Paint Building Exterior and Touch Up Interior of Tunnel
- Replace Steam Heaters in Plenum with Electric Heaters
- Replace Roofs of Motor House and Main Drive Cable Ducts
- Upgrade Electrical Equipment Control Room
- Replace Lube House Vacuum Pumps, Water Pumps, and Check Valves
- Upgrade Drying Towers
- Replace Motor/Fan in MG Cooler Room
- Upgrade Building Air Conditioning
- Upgrade Restroom Facilities
- Test Section Monorail/Crane System

PROPOSED CoF MODIFICATIONS

Why Now?

- Increasing Emphasis/Need for Testing to Support Advanced Fighter Designs, Advanced Subsonic Transports, and the High Speed Civil Transport
- Transonic High Angle of Attack Capability Required for Next Generation Fighters
- Need to Understand Effects of Reynolds Number
 - Tunnel Provides up to a Factor of Four Variation
- Urgent Need to Develop Fundamental Data Base for CFD Code Validation
 - Tunnel has Excellent Flow Quality
 - Need to Reduce Wall Interference
- Need to Increase Productivity
 - Tight Manpower Situation
 - Expect Tunnel to have Large Workload
 - Receiving Many Requests for Test Time
- Need to Modernize Outdated Equipment

ADVOCATES

- Code RF, NASA Headquarters
- Northrop
- General Dynamics
- McDonnell Douglas Aircraft
- Lockheed
- Rockwell
- Wright Research and Development Center
- Naval Air System Command