BUILDING 720 COMPLEX,

WHAT DO WE DO NEXT?
AGENDA

I. INTRODUCTION/PURPOSE/FACILITY USE  J. MAYHEW

II. RESEARCH NEEDS AND PLANS  Mike Walsh and B. ANDERS

III. ENVIRONMENTAL  J. MAYHEW

IV. ALTERNATIVES  J. MAYHEW

V. OWNERSHIP OF THE FACILITY  J. MAYHEW

VI. CONCLUSION  J. MAYHEW
INTRODUCTION/PURPOSE

PURPOSE:
DISCUSS THE STATUS OF BUILDING 720 COMPLEX RELATIVE TO:

- UNIQUE RESEARCH CAPABILITY
- CURRENT AND PROJECTED USE
- AIR FORCE CONCERNS - GOOD NEIGHBOR POLICY
- SHOULD NASA REMAIN FACILITY OWNER?
FACILITY USE

THE BUILDING 720 COMPLEX IS COMPRISED OF:

- HYDRODYNAMICS RESEARCH FACILITY (720, TOW TANK 1)
  ACTIVE FACILITY, USED BY NASA AND NAVY

- AIR FORCE OFFICES (720, BRICK OFFICE AREA)
  ACTIVE FACILITY, USED BY AIR FORCE

- EAST AREA STORAGE FACILITY (720A)
  ACTIVE FACILITY, ~3,000 SQ. FT. OF AIR-CONDITIONED
  STORAGE SPACE

- SOURCE EVALUATION BOARD OFFICE (720B, OFFICE AREA)
  ACTIVE FACILITY, BRICK CONSTRUCTION, EXCELLENT
  CONDITION

- VORTEX RESEARCH FACILITY (720B, TOW TANK 2)
  INACTIVE FACILITY
TURBULENT BOUNDARY LAYER RESEARCH ISSUES

- CFD needs experimental data for improved turbulence models.

- Advanced turbulence control requires an improved understanding of turbulence.

- High-quality experimental turbulence data is rare, especially at high Reynolds numbers.

- Providing high-quality turbulence data, useful to modelers, is a high priority goal for EFPB.
WHAT DOES THE TOW TANK OFFER?

- High Reynolds number
- Large models (thicker boundary layers, larger turbulence scales)
- Low free-stream turbulence
- Incompressible
- Availability
- Low cost ($70/hr)
PREVIOUS EFPB EXPERIMENTS IN THE LANGLEY TOW TANK

• Large Eddy Breakup Devices
  - 1986-1989
  - Turbulent drag reduction attainable at low Reynolds number could not be produced at high Reynolds numbers.
  - 737 flight experiment canceled as a result of tow tank experiment.

• Riblets
  - 1988
  - Low Reynolds number drag reduction confirmed at high Reynolds number.
  - Boeing participation in tow tank studies driven by Boeing flight test of riblets.
  - Riblets used in America's Cup competition.
CURRENT HIGH-REYNOLDS NUMBER TURBULENT BOUNDARY LAYER EXPERIMENT IN THE LANGLEY TOW TANK

- Large, flat plate model (8' wide x 21' long)
  - $Re_x = 78 \times 10^6$, $Re_\theta = 74,000$
  - Removable instrumentation panels provide for a variety of experiments.

- Document mean and fluctuating characteristics of high Reynolds number turbulent boundary layer.

- Provide much needed useful turbulence statistics to modelers.

- 2-D and 3-D flows

- Develop LDV/PIV flow-field measurement capability.

- 3 to 4 year program, requiring approximately 50% of available tow tank test time.
ALTERNATE FACILITIES

• David Taylor High-Speed Basin
  - Expensive ($225/hr + travel)
  - Limited support (instrumentation, diagnostics, etc.)
  - Available 2-3 months/yr.

• David Taylor Large Cavitation Channel ($2k/hr + travel)
  - Available
  - Limited support (instrumentation, diagnostics, etc.)

• NTF
  - Generally not available for extended research studies
  - Thin boundary layers on small models
  - Compressibility effects

• 30' x 60'
  - Poor flow quality using tunnel inlet sidewall
ALTERNATIVES (CONT.)

- 16'
  - High backlog.

- 7' x 10'
  - Closed.
NAVY INTEREST IN LANGLEY TOW TANK

- Langley Tow Tank (LTT) is the only large, high speed, high Reynolds number towing facility in the world capable of conducting hydrodynamics research in either fresh or salt water.

- Salt water capability is needed for hydrodynamic technologies which perform differently in fresh versus salt water.
  - Magneto hydrodynamic (MHD) propulsion.
  - MHD TBL manipulation techniques for drag and noise reduction.
  - Polymer and microbubble boundary layer manipulation for drag and noise reduction.
  - Controlled plankton patch studies - noise propagation.
  - Five of ten future Navy research efforts require salt water.

- Salt water testing options available to Navy
  - LTT - $70/hr ($200/run)
  - Open water testing.
    - Buoyant test vehicles - $8k/run
    - Powered vehicles - $75k/run
BENEFITS OF NAVY INVOLVEMENT TO NASA

- Facility operator
  - Continuous maintenance to keep facility operable.
  - Active participation in research effort.

- Low operating costs.

- Use of Navy hardware and models to conduct LaRC tests.
  - Reicherdt Model
  - Load Cells
  - etc.

- Exchange of ideas, technologies, and research techniques between government research Centers.

- Financial assistance to provide upkeep and maintain operability of facility.
AIR FORCE CONCERNS - GOOD NEIGHBOR POLICY

AIR FORCE CONCERNS (LETTER DATED 3/16/93):
- WEST SIDE OF BUILDING 720 DOES NOT MEET THEIR ARCHITECTURAL STANDARDS
- ASBESTOS SIDING IS BECOMING A HEALTH HAZARD
- REQUEST IMMEDIATE REMEDIATION ACTION

NASA RESPONSE: WE PAINTED THE WEST SIDE OF THE BUILDING

UNWRITTEN AIR FORCE CONCERNS:
- DISLIKE PROXIMITY OF BUILDING TO THE RUNWAY
- CONSIDER THE FACILITY AN EYESORE
- WOULD LIKE TO TURN PROPERTY INTO A PARK

AIR FORCE POSITION

BUILDING 720 SHOULD BE DEMOLISHED
ENVIRONMENTAL

NASA SITE SURVEYS OF THE COMPLEX INDICATE NO ENVIRONMENTAL REGULATORY VIOLATIONS.

POTENTIAL ENVIRONMENTAL CONCERNS DO EXIST REGARDING:

- LONG TERM PERSONNEL HEALTH
- MECHANICAL DISTURBANCES OF THE ASBESTOS PANELS
  - DRILLING, MACHINING, WASHING, PAINT PEELING, ETC.
ALTERNATIVES

NEAR TERM:

I. PAINT THE ASBESTOS PANELS WHENEVER REQUIRED (PROBABLY EVERY 3-4 YEARS) WITH VINYL ACRYLIC PAINT

PROS: INEXPENSIVE, ~$200K, MAINTAINS RESEARCH AND STORAGE CAPABILITIES

CONS: SHORT-LIVED FIX, ACCELERATES PAINT FLAKING, EVENTUALLY REQUIRE REPLACEMENT OF PANELS (DELAYS THE INEVITABLE)

II. PAINT THE ASBESTOS PANELS WITH EPOXY PAINT

PROS: MAINTAINS RESEARCH AND STORAGE CAPABILITIES

CONS: LASTS ONLY 5 YEARS, COSTS ~ $1.15M, ALSO ACCELERATES PAINT FLAKING, EVENTUALLY REQUIRE REPLACEMENT OF PANELS
ALTERNATIVES (cont.)

LONG RANGE:

I. REMOVE AND DISPOSE OF EXISTING ASBESTOS PANELS AND REPLACE THEM WITH ALUMINUM PANELS

PROS: ELIMINATES CONCERN ABOUT ASBESTOS, MAINTAINS RESEARCH AND STORAGE CAPABILITIES

CONS: COST ~$4.2M (FY '94 $s)

II. DEMOLISH THE COMPLEX WITH THE EXCEPTION OF THE OFFICE AREA PORTION OF 720B

PROS: ELIMINATES CONCERN ABOUT ASBESTOS

CONS: DELETES RESEARCH CAPABILITIES, WILL NEED TO REPLACE STORAGE SPACE, COSTS ~$8M
LONG RANGE (cont.):

III. TRANSFER PROPERTY (EXCLUDING THE BUILDING 720B OFFICE AREA) TO THE AIR FORCE

PROS:
- REDUCES CENTER CAPITAL REPLACEMENT VALUE
- ELIMINATES OPERATIONAL AND MAINTENANCE EXPENSES
- ELIMINATES NEGATIVE GOOD NEIGHBOR ISSUES
- COULD SHIFT ENVIRONMENTAL CONCERNS TO THE AIR FORCE

CONS:
- IF FACILITY DEMOLISHED, ELIMINATES LOW COST RESEARCH CAPABILITY
- MUCH NEEDED AIR CONDITIONED STORAGE SPACE ELIMINATED
- POSSIBLE LOSS OF OFFICE SPACE FOR SOURCE EVALUATION BOARD
OWNERSHIP OF THE FACILITY

NASA:

- RESEARCH (NASA/NAVY) WARRANTS KEEPING THE FACILITY OPERATIONAL
- NO REGULATED ENVIRONMENTAL CONCERN NOW - FUTURE (?)
- GOOD NEIGHBOR ISSUES:
  - WE CAN MITIGATE ENVIRONMENTAL CONCERNS
  - WE CAN IMPROVE UNSIGHTLINESS
  - FACILITY WILL REMAIN NEAR RUNWAY

NAVY:

- WANTS NASA TO REMAIN OWNER, WILL NOT ACCEPT OWNERSHIP
- WILL PARTICIPATE IN REPAIRS IF REAL ENVIRONMENTAL CONCERN EXISTS (APPROXIMATELY HALF OF COST FOR BUILDING 720)
OWNERSHIP OF THE FACILITY (cont.)

AIR FORCE:

- THEY MAY NOT TAKE THE FACILITY
- THEY MAY REQUIRE THAT WE REMEDIATE THE ASBESTOS PROBLEM
  - REPLACE THE ASBESTOS PANELS
  - DEMOLISH THE FACILITY
  - RESEARCH CAPABILITY TERMINATED
  - NASA WOULD HAVE TO FIND 3,000 SQ. FT. OF AIR-CONDITIONED STORAGE SPACE AND SPACE FOR SOURCE EVALUATION BOARD OFFICE
CONCLUSION

SUMMARY OF ISSUES:

- RESEARCH NEEDS ARE REAL AND IMPORTANT
- UNREGULATED ENVIRONMENTAL CONCERNS EXIST
- GOOD NEIGHBOR CONCERNS EXIST AND WILL CONTINUE TO EXIST WITH THE AIR FORCE

RECOMMENDATION:

- KEEP THE FACILITY OPERATIONAL (NASA OWNERSHIP ASSURES)
- REPLACE THE ASBESTOS PANELS WITH ALUMINUM PANELS (INCLUDE OTHER MODIFICATIONS AS REQUIRED). PAINT THE FACILITY AS NEEDED IN THE MEAN TIME.