

Cleveland, Ohio  
May 21, 1956

MEMORANDUM For Those Concerned

Subject: Special duty assignments for Inspection of 10x10' Supersonic  
Wind Tunnel, May 22, 1956 - Willson H. Hunter, in charge.

PROGRAM SCHEDULE:

10:30 Registration - Foyer - 10x10' SWT  
11:00 Assemble in Shop Area - Talks  
11:45 Tour  
12:30 Buffet Luncheon - Shop Area  
1:30 Demonstration of Tunnel & Control Automatic Data Processing  
2:15 Departure

SPECIAL GUARDS: R. L. Demaline, in charge

HANGAR ATTACHES: R. Kravanya, in charge

REGISTRATION: M. L. Gosney, in charge

Alma Wildy	Rosemary Weiss
Carol Lasch	Ann Woollett
Kay Brown	Betty Callaghan

Special Services:

Central Message Center - Room 114 - PAX-6108  
Special Transportation - Room 114 - PAX-6108 - Joe Bullock, in  
Baggage - Room 114 - PAX-6108 charge  
Hotel & Travel Reservations - Lobby - Rosemary Weiss  
Telephones for visitors Room 108

PRESS ROOM: J. S. Brown, in charge  
Room 123 Joe Sikosky, attache  
PAX-6165 George Hack - Press wire service representative  
Anne Luthard - Press stenographer  
Frank Kish - Press packs

SPECIAL TRANSPORTATION: Joe Bullock, in charge  
Room 114 - PAX-6108  
Hangar - PAX-2155

LUNCHEON SERVICE: Ruth Zimmer, in charge  
Serving - Esther Wagner, in charge

PHOTOGRAPHY: Frank Kish, in charge  
Group photo at opening exercises Wm. Bowles  
Candid shots on tour Marj. Hyre  
Candid shots in shop area "  
Record photos of signs, displays, etc. Harry Walton

## 10x10 TOUR

Stop	Minutes stopped	Time to travel (minutes)	Pertinent Remarks
1. Observation Room	3	1	Display model - tell cycle Show location of components.
2. Control Room	3	1	Tell function, explain panels, explain schlieren.
3. DAMPR Room	3	1	Show manometers - show Dampr, explain operation generally, amaze with number of test points.
4. Underside of Test Section	3	1	Tell floor operation - model installation - show model cart.
5. Flexible Wall	2	1	Tell operation - show cams (use helper) - show model with second throat.
Move to Schlieren Show Second Throat	1		
6. Test Section	2	2	Show test section, flexible wall and model.
Walk thru Exhausters			
7. Cooler - 2nd Comp.	3	1	Show coolers and operation Show 2nd compressor casing (explain we'll get better picture later).
8. Exhaust Muffler - 24' valve	3	1	Tell purpose - Demonstrate Show valve in operation.
9. Air Dryer	3	1	Tell purpose, show beds, walk through, show burners, blowers and motors.
10. #1 Compressor	3	1	Show display, tell operation Amaze with numbers.
#1 Motors	3	2	

## 10x10 TOUR

### Stop #1 - Observation Room

1. Explain this is Observation Room with Control Room adjacent. Observation Room used to watch progress of test in control room without disturbing operating personnel.
2. Show 3-dimensional model and where we are.
3. Point out tunnel components
  - (a) Test section
  - (b) Flexible wall (explain precise contour)
  - (c) Compressors (to push or pull air around tunnel)
  - (d) Motors (to drive compressors)
  - (e) Coolers (to remove heat of compression)
  - (f) Dryer (to provide dry air in tunnel)
  - (g) 24" valve (to differentiate tunnel operation)
4. Show airflow path for:
  - (a) aerodynamic cycle
  - (b) propulsion cycle

### Stop #2 - Control Room

1. Explain function
  - (a) to control operation of tunnel under project engineer's direction
  - (b) to control setting of test model conditions
2. Show tunnel operators panel
  - (a) automatic controls to regulate tunnel pressure and temperature
  - (b) controls for wall position
  - (c) communication panel
3. Show model operators panel
  - (a) model angle of attack, fuel controls, various model valve positions, all controls necessary to operate model
  - (b) all indicating devices used to tell position or condition of the model variables
  - (c) schlieren setup to show project engineer and operator functioning of model
  - (d) Explain schlieren by pointing out that it shows the pattern of the airflow into the inlet. Right now they see people, model etc.
4. Show data recording panel
  - (a) Records temperatures
  - (b) Records forces on model
  - (c) Records transient pressure or force measurements
5. Explain that most of our information is gained from pressure measurements and they will see that room next.

Stop #3 - DAMPR Room

1. Explain this is room where pressures are measured (show copper tubing).
2. Conventional way is to use manometers, photograph boards and computed individually by computers.
3. Show automatic pressure measurement device. Will measure 300 pressures in 10 seconds (show chart).
  - (a) These pressures are measured electrically and signal sent upstairs to be recorded. A number, representing the pressure, is then returned to the test engineer through the flexowriters in the control room.

Stop #4 - Underside of Test Section

1. Tunnel test section, where model is mounted, is above us.
2. Bottom plate of test section on screw-jacks, can be dropped to floor level.
3. Engine is wheeled in from shop, bolted to support strut and raised up into place.
4. Support strut for a large engine is the black section. It can be moved up or down, and rotated to change the model angle of attack.
5. Note the copper pressure leads and the electrical leads, which will come from the engine out through the strut, to the control rooms.

Stop #5 - Flexible Wall

1. Explain this is part of tunnel where supersonic velocities are produced.
2. In order to obtain these velocities, wall must be located in a precise position, the curvature of the wall is very critical and to obtain this, the wall is bent by pushing or pulling on it with jack screws.
3. Demonstrate model  $\longrightarrow$  27 hydraulic jacks located on each side of nozzle.
4. Tell facts and figures, use chart.
  - (a) 75 feet long, 10 feet high
  - (b) weight per wall, 20 tons
  - (c) reposition within .005" or thickness of paper
5. Show second throat operation on model.
  - (a) Second throat reduces power requirements and thereby increases economy of tunnel operation.

6. Walk by schlieren setup
  - (a) Mention 3 cameras, TV, 70 mm still, Fastex
  - (b) Show mirrors.
7. Point out actuating equipment (rods and motors) for second throat as you move toward Test Chamber.

Stop #6 - Test Section

1. Point out direction of airflow and indicate velocity (up to 1700 mph).
2. Show flexible wall and trace to show range of movement (total movement in throat is approximately 2 ft. per wall).
3. Show wall smoothness and joints (finish spec. is 16 microinches).
4. Show model
  - (a) Is a ram-jet engine being tested currently and
  - (b) will be operated later in the day
5. Allow walk around model and show trace of second throat.

Walk-by between Stop #6 and #7 - Exhausters

1. Explain their use; to pull air from tunnel and to maintain constant pressure in tunnel.
2. Explain that they are piston type vacuum pumps and show motors that power them (2000 h.p. motor).
3. If one exhauster is running, show the reciprocating piston on the far side from the motor.
4. Mention that they can pull a total of 106,000 ft<sup>3</sup>/min. (*total for both*)

Stop #7 - Secondary Cooler

1. Orient them as to location.
2. Show cooler and explain use
  - (a) removes heat of compression from air
  - (b) maintains a constant temperature air stream to test models.
3. Explain physical makeup of cooler
  - (a) Each rectangular box contains copper tubing running lengthwise down tunnel.
  - (b) Headers (large circular pipe) bring cold water to the copper tubing or away from it.
  - (c) Air flows through these lengths of copper tubing (show on "where we are" chart) and is cooled by them.

4. Show secondary compressor casing
  - (a) This is compressor which pushes air around tunnel and operates at the higher airspeeds.
  - (b) Mention that they will get a better look at primary compressor later.

Stop #8 - Exhaust Muffler - 24' Valve

1. Orient them as to location.
2. Tell purpose of muffler; to absorb the loud tunnel noise.
3. Explain that air passes through this chamber, through the muffler and is discharged vertically out the room beyond. (That room has no roof.)
4. Demonstrate sound absorbing with siren.
5. Show 24' valve
  - (a) Explain open and closed positions for propulsion or aerodynamic cycle.
  - (b) 15 minutes open to closed
  - (c) Tell weight of valve (25 tons) and air load (450 tons)
  - (d) Show locking pins
  - (e) Compare size to their living room

Stop #9 - Air Dryer

1. Orient them as to location
2. Explain why we need dryer
  - (a) Remove moisture from air to provide dry air for tests.
3. Explain operation
  - (a) Air enters through end.
  - (b) Is forced to pass through 1 bed (3' deep) of activated alumina and thereby dried.
  - (c) Goes through valve and piping to tunnel.
4. Show sample bed of activated alumina.
5. Explain sign
  - (a) amount of alumina (1900 tons)
  - (b) removes  $1\frac{1}{2}$  tons water per minute from about 55 tons of air per minute

Walk-by between Stop #9 and #10 - Sub K

1. Explain that electricity to power motors comes through this sub station. That here all voltages are transformed into usable load.
2. Point out sign and capacity.

Stop #10

#1 Compressor:

1. Orient them as to location.
2. Tell them purpose:
  - (a) used to pump air around the tunnel
  - (b) runs all the time
3. Use chart:
  - (a) Tell capacity, equivalent to over 21 rooms full of air per minute (rooms bounded by floor and tunnel), weight of that air flow is about 2700#/sec.
  - (b) Explain data on sign and air flow path.
4. Explain shaft connection to drive motors
  - (a) 40 feet of unsupported length - point out bearing support column - will get an idea of distance as they move along walk.
  - (b) Requires a 40" diameter shaft.

Stop #10

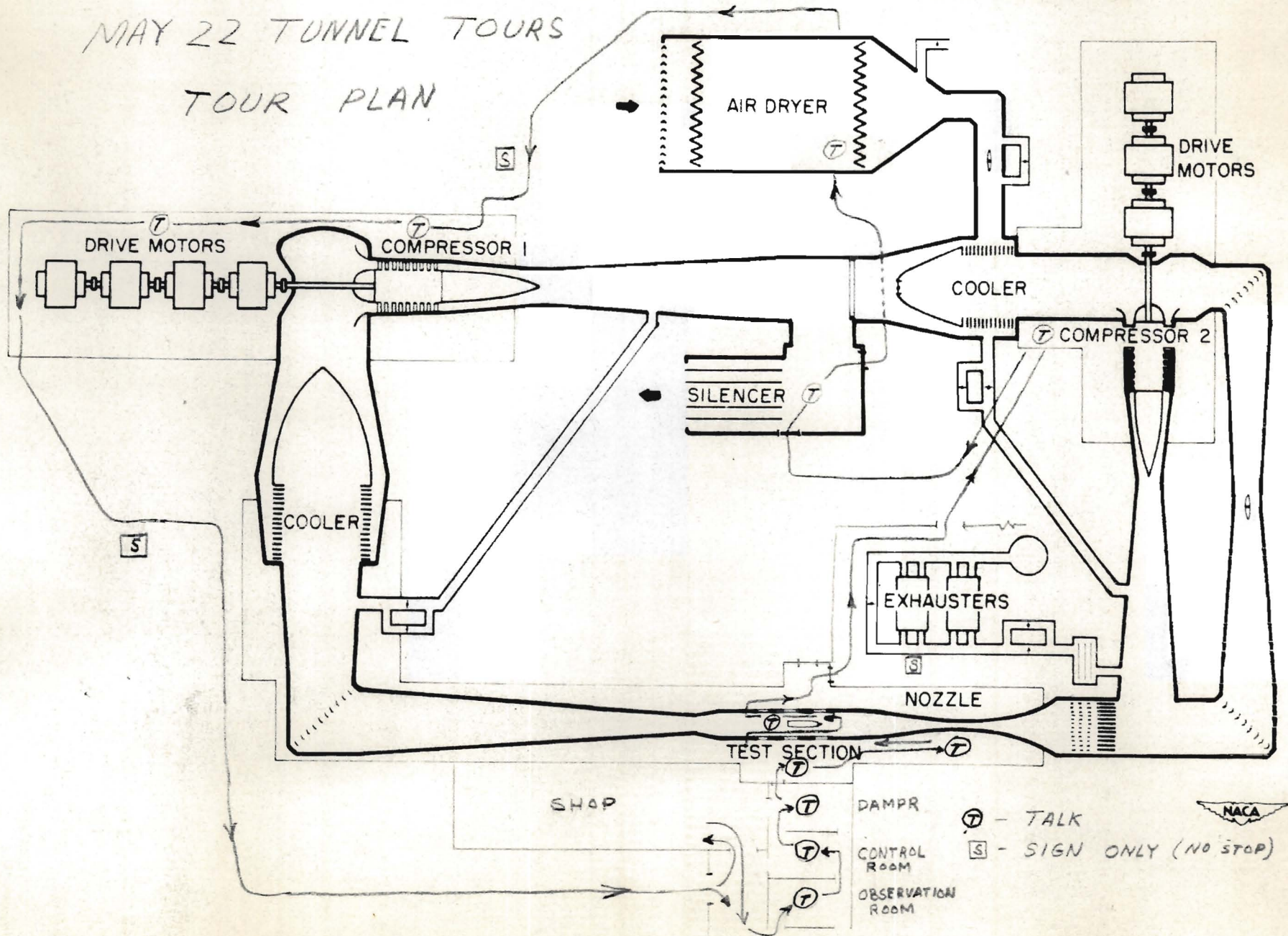
#1 Drive Motors:

1. Tell purpose
  - (a) to drive compressor
2. Use chart
  - (a) tell horsepower; 37,500 h.p. each, total 150,000.
  - (b) show 4 motors connected by single shaft and then across tunnel to compressor.
  - (c) Point out length of shaft and weight (160' - 550 tons rotating weight) and tell operating speed (818 rpm)
3. Show control room
  - (a) Explain all motor operation governed from here on instructions from tunnel control room.
4. Mention secondary drive as being identical except with only 3 motors.
5. Tell electrical load: This and 2nd combine to 250,000 h.p. Current used in these motors would supply 720,000 homes or at least twice as many homes as in city of Cleveland.

# LEWIS UNITARY PLAN SUPERSONIC WIND TUNNEL

MAY 22 TUNNEL TOURS

TOUR PLAN

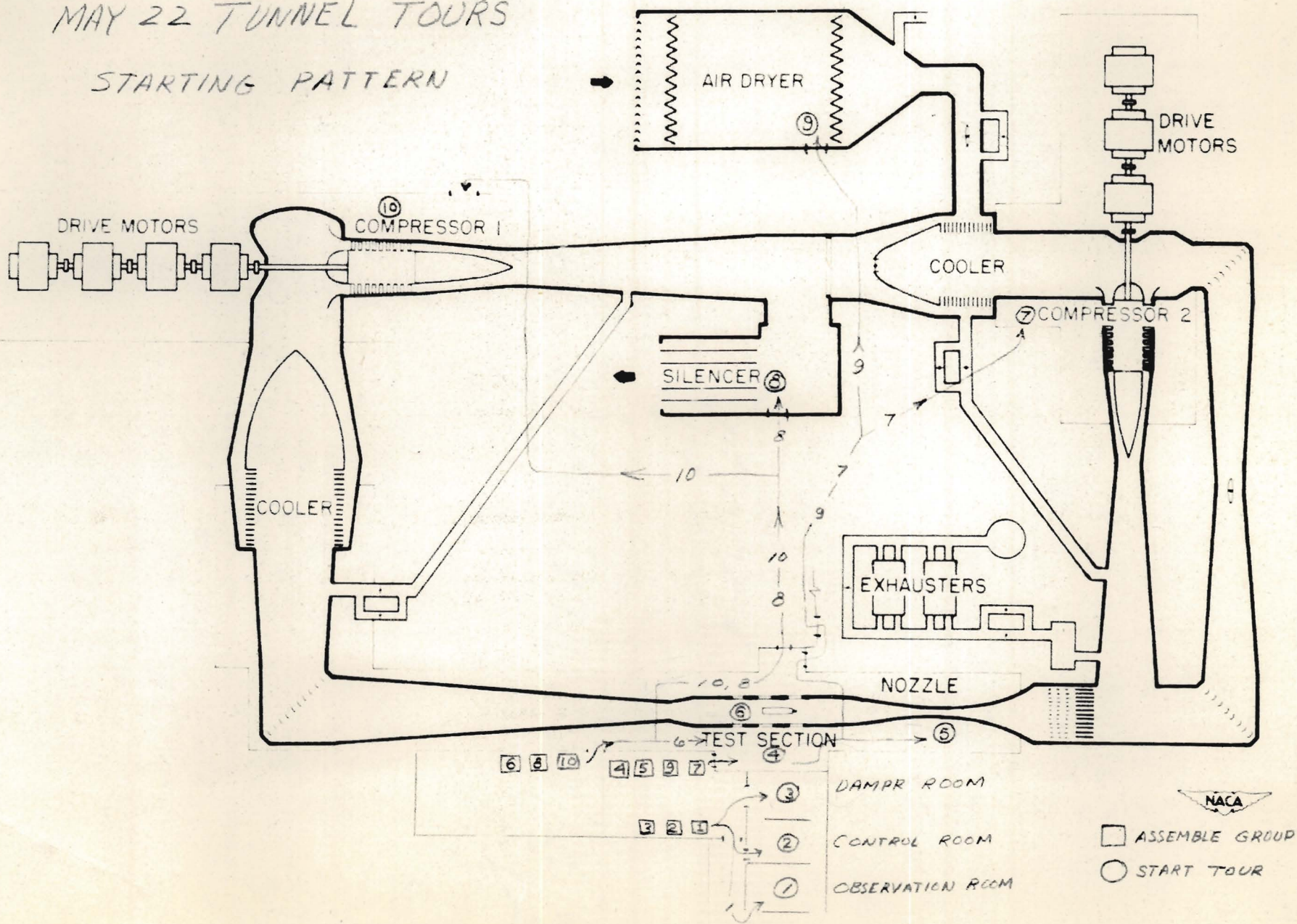




# LEWIS UNITARY PLAN SUPERSONIC WIND TUNNEL

MAY 22 TUNNEL TOURS

STARTING PATTERN



SPEAKERS - Shop Area: Dr. Edward R. Sharp E. W. Wasielewski  
Dr. Hugh L. Dryden Carl F. Schueller  
Abe Silverstein Robert R. Godman  
Willson H. Hunter, (after lunch)

During Tour: L. J. Obery G. W. Englert (Assistant)  
J. C. Lovell N. T. Musialowski "  
R. F. Weining J. J. Ward "  
H. E. Zager C. A. Larson "  
J. F. Connors G. A. Bendis "  
E. Perchonok S. M. Perrone "  
D. P. Hearth J. F. Wasserbauer "  
D. N. Bowditch J. F. Kline "  
D. A. Rohde A. L. Beke "  
L. E. Stitt R. W. Cubbison "  
Alternates: E. J. Kremzier G. A. Wise "

During  
Demonstration: R. R. Godman E. M. Sharp  
Kathleen Priem

SPECIAL LIGHTING: Cliff Talcott, in charge

PUBLIC ADDRESS SYSTEM MONITORS: Gene Hoss, in charge  
Observation Room  
Room 200  
Shop Area (after lunch)

TUNNEL OPERATION (after lunch)

Group I	L. J. Obery	R. F. Weining, 1st. Asst.	R. W. Cubbison, 2nd.
Group II	J. C. Lovell	D. N. Bowditch, 1st. Asst.	L. E. Stitt, 2nd.
Group III	J. F. Connors	H. E. Zager, 1st. Asst.	A. L. Beke, 2nd.

Willson H. Hunter