NACA - Lewis

Cleveland, Ohio
February 25, 1954

MEMORANDUM For Associate Director

Subject: Proposed treatment of the 1954 Inspection

1. The central theme of the inspection should emphasize NACA's intense concentration on establishing a firm basis for the design and operation of supersonic military airplanes to attain useful speeds up to about Mach number 2.5 using the turbojet engine. The present administration's goal of more defense per dollar and fewer, but far superior, aircraft could warrant mention to emphasize the importance of this research.

2. The nature of the turbojet required to achieve Mach 2.5, the solution of many problems, and the research facilities and techniques available for their solution in the laboratories and in flight should be outlined. Representative examples of NACA's attack on these problems should be highlighted at the various stops.

3. Teamwork among the several research divisions here should become apparent from the breadth of treatment of the representative problems. Coordinated teamwork of the NACA laboratories should be demonstrated by the Ames and Langley participation showing their attack on the central problem. The part played by the important and unique facilities should be emphasized where possible.

4. Development of the central theme, the turbojet-powered supersonic airplane, would logically include NACA research on:

(a) The major engine components, compressors and turbines

(b) Fuels and combustion problems of higher thrust engines

(c) Lubrication and bearing problems of high-speed, high-temperature rotors

(d) Performance and operating characteristics of the complete engine

(e) Integration of the engine into the supersonic propulsion system

(f) Aerodynamic heating of the airplane structure at supersonic speeds

(g) Automatic controls required for safe transonic and supersonic flight

(h) Operating problems inherent in such aircraft

5. Within security limits, much of the background material would derive from the NACA Conference on Supersonic Propulsion held in October 1953, but, of course, presented more simply and qualitatively, with the story carrying more emphasis on the research facilities in which the problems are studied.

6. The relationship of each subject under discussion to the central theme of the inspection should be made clear to the visitors by using an appropriate stylized airplane diagram at each stop to highlight, by location on the diagram, the subject matter. Such a diagram in the background would be an important adjunct to the printed banner heading that commonly identifies each stop.

7. After a careful study of available space in the laboratory and the general problems of handling visitors during an inspection (traffic, security, safety, noise, refreshments), the attached tables indicate the preferred stop locations, the groups they can accommodate, and certain special problems to be considered. An early decision by Ames and Langley as to their portions of the show would help materially to fix a number of the locations.

8. A detailed description of the subject matter proposed for each stop will be submitted later today for your consideration.

Willson H. Hunter
Aeronautical Research Scientist

WHH:mr

Enclosure:
1. Table

CC: J. J. Modarelli, Jr.

Stop	Subject	Organization	Location	No. Groups	Remarks
1.	Compressor & Turbine	C&TD, M&TD	(a) EPRB #4	1 or 2	
			(b) C&T W-1	1 or 2	
			(c) C&T W-2	1 or 2	
			(d) C&T W-5	1	
			(e) C&T W-6	1	
			(f) C&T Ctr.Sect.	2	
2.	Fuels & Combustion	F&CD	(a) CW-5	1	
			(b) HEFL (tent.)	1	Outside noise probl
3.	Lubrication & Bearings	M&TD	(a) JPSTL Spin Pit	1	
			(b) C&T Ctr.Sect.	2	
			(c) M&S Furnace Rm.	1	Security problem
			(d) ERB Old Cafeteria		
4.	Engine Performance	ERD, C&TD	(a) PSL Shop &Access	1	
5.	Supersonic Propulsion	SPD	(a) 8x6' SWT Shop	1	
6.	Aerodynamic Heating	Langley	(a) 8x6' SWT Observ.	1	Air Cond't'd
			(b) Adm. Bldg., 219	1	Ditto
7.	Automatic Flight Controls	Ames	(a) Adm. Bldg., 219	1	Ditto
			(b) 8x6' SWT Observ.	1	Ditto
			(c) FSCB #113	1	Ditto
			(d) Hangar (West)	2	Alt. with #8
8.	Operating Problems	Phys. Div.	Hangar (East)	2	Alt. with #7
		Alternate Stops			
9.	Research, Facilities and Instrumentation (General)	All Divisions	(a) ERB Old Cafeteria	1	3-D Pictures
			(b) Adm.Bldg., #219	1	Ditto
10.	Engine Vibration & Stress	M&T Div.	(a) M&S Furnace Rm.	1	Security prob
			(b) JPSTL Spin Pit Area	1	
11.	Central Data Recording & Computing	Physics Div.	(a) Instr.Bldg. #2	1	Awkward seating
12.	Afterburner, Slurry, Rockets	F&CD	(a) HEFL (tent.)	1	Operate burne in HEFL and adjacent rock
13.	General Assembly after Lunch (various static displays)	Physics, Services, Fabrication	(a) PSL Equipment Bldg.	8	No group talk

Cleveland, Ohio
February 25, 1954

MEMORANDUM For Associate Director

Subject: 1954 Inspection; proposed subject matter and locations

Reference: Memo. for Assoc. Director, Feb. 25, 1954, WHH:mr Enc.

1. The first eight stops listed in the reference memorandum form a logical sequence on the central theme of supersonic propulsion with turbojet engines; the remaining five stops are alternate suggestions somewhat less adaptable to a central theme. This memorandum will give more detailed suggestions on the subject matter of each stop in the order listed previously and will discuss the choices of location.

I. Compressors and Turbines

(a) Progress toward the supersonic engine would be shown by illustrating how research on single-stage transonic and supersonic compressors and the successful compounding of stages is making possible the design of more compact turbojets with smaller frontal area, higher breathing capacity, greater component efficiency, simpler construction, radically fewer parts and potentially less weight and cost per pound of thrust than present-day turbojets. Research on blade and hub shapes; detailed investigations of secondary flows, rotating stalls, and surge phenomena; and an investigation of energy losses of all types at the higher tip speeds of transonic and supersonic compressors and turbines have resulted in higher pressure ratios per stage and improved stability of operation.

(b) The supersonic turbojet requires higher turbine-inlet gas temperatures to produce greater thrust and has emphasized the need for research on effectively and efficiently cooled turbine assemblies together with superior high-temperature resistant materials. Important problems of cooled-blade and disk design and improved blade attachments for brittle refractory alloys are being solved. Vibration and stress problems, imposed by aerodynamic excitation have been studied and remedies tried.

(c) Many good displays of this progress are available or readily suggest themselves. In particular, the extensive and elaborate NACA-developed instrumentation required for the rapid and proper study of a multistage compressor should be shown and described.

Locations: EPRB, Cell 4B and the adjacent shop area are perferred because the NACA five-stage transonic compressor ina modified J-34 engine is the neatest and best-looking engine setup in the Laboratory at present and mounts the largest array of compressor instrumentation to be seen anywhere. The audience would sit in the shop area and, after the talk, would be invited to inspect the engine in Cell 4B; the engine would not be operated during the inspection.

In C&T Wing W-1 it would be possible to feature the eight-stage NACA compressor with two inlet transonic stages, with the assembly mounted on the dynamometer for research. In C&T W-2 an interesting background feature would be the new setup, with two opposed dynamometers, for testing the counterrotating supersonic compressor; this could illustrate a possible future trend in the design of even more compact supersonic turbojets. As a last choice, the C&T Center Section, at the end towards F&L Building, would provide adequate space, would interfere less with research and, of course, would have the added attraction (or distraction) of turbojet engines in various stages of assembly for inspection after the prepared talks. C&T W-5 and W-6 are appropriate locations to discuss this subject and will readily accommodate single groups.

2. Fuels and Combustion

(a) Fundamental aspects of high heat-release rates, high efficiency combustion, operating limits, noise, and higher energy fuels can be outlined and demonstrated by simple chemistry laboratory equipment. The properties of flames, such as flame speed, lean and rich blow-out limits, smoking, laminar versus turbulent flame fronts, flame stability and oscillations can all be shown with simple flames, F/A meters, and shadowgraph techniques; noise due to combustion can be demonstrated by pulling a quiet open burner into a pyrex "tail pipe". These simple demonstrations would be related at each opportunity to appropriate features of full-scale turbojet combustion chambers, afterburners, and also, if desired, to the ram-jet and rocket engines when the combustion problems are similar.

(b) The problem of adding energy to "fossil" fuels for thrust augmentation by mixing them with metal can be discussed and the manner of stabilizing the suspension of metal powders in a slurry can be shown by a simple display. The thrust increase possible with slurry and with slurry-plus-water can be demonstrated with a 2-inch burner and a thrust meter.

(c) The problem of noise due to combustion oscillations in an afterburner can lead from the above-mentioned laboratory experiment to demonstration of screech in a 6-inch afterburner. The importance of preventing screech to avoid burnout of high thrust engines can be discussed but classified solutions would not be shown. A movie showing the screech "mechanism" is available. There are also picture sequences of rocket-combustion oscillations.

Locations:

(a) ERB CW-5 would be an excellent place to perform the experiments because it is well equipped with services, safety devices, and means for isolating fumes and all or part of the noise of the two major demonstrations from the visitors. It would be proposed to perform the fundamental experiments on a stage in CW-5 proper, and the slurry burning and afterburner screech experiments in the adjacent test cell where they can be viewed through the window. Transfer of turbojet burner studies from CW-5 to CE-28 would make the room available without interfering with research.

(b) High Energy Fuels Laboratory is proposed as an alternate location because the major demonstrations can be made there by firing the burners with atmospheric discharge. Visitors have never been taken to HEFL during an inspection mainly because the facilities there will not accommodate a full group. For this occasion, it would be necessary to erect a suitable tent between the rocket laboratory and HEFT so that the visitors can see the firings in Cells #2 and #3; use of a tent would preclude all but the safest Laboratory demonstrations near the visitors and would incur objectionable airport noise if the adjacent runway were in use. These factors automatically suggest this location for alternate stop #12 where slurry, burning, and afterburner screech in HEFL would be followed by demonstration of an unstable rocket in the adjacent rocket test cell.

3. Lubrication and Bearings

(a) The increasing rpm and temperatures of turbojets for supersonic flight will require bold solutions to provide successful bearings. Present-day turbojet bearings have marginal performance and will be very inadequate for future engines. As turbine-inlet temperatures mount and turbine cooling becomes mandatory the temperature of compressor-bleed air, while suitable for cooling the disk and blades, will be too highto keep bearing temperatures to present-day limits. The problem requires fresh examinations of lubrication and bearing fundamentals to find ingenious new answers to the problem; new research techniques to study performance at higher levels.

(b) Fretting, as one of the principal mechanisms of failure in moving metal-to-metal contact, can be explained and the Laboratory apparatus demonstrated with the aid of movie excerpts from existing films.

(c) Fatigue of ball bearings can be explained and the new air-jet spin rig apparatus demonstrated; an oversize model using plastic race and balls might make this more understandable. The effect of important variables can be clearly shown and/or discussed.

(d) High-temperature lubricants that may help solve the problem can be explained and demonstrated using a sliding-contact friction tester. By means of frictional torque indicators and noise pickups the high-temperature breakdown of conventional lubricants can be shown; the separate components of new synthetic high-temperature lubricants can be shown to be entirely unsuitable whereas when mixed they perform well; air suspensions of moly disulphides can be shown to be quite effective at elevated temperatures; and the use of certain large-molecule gases such as freon can demonstrate new ideas in lubrication.

Locations:

(a) Since the equipment involved is easily portable and requires few services this stop could be held in many locations but only three will be discussed. The spin pit area in the JPSTL is a good location and would involve little interference with research.

(b) The C&T Wing Center Section has the advantage of the jet-engine overhaul area to add interest to the problem before and after the talks.

(c) The furnace room in the basement of the M&S Building presents somewhat of a security problem (no worse than for the 1951 inspection) but has the advantage of discussing the problem in the headquarters of the division performing the research. This is the only space in the M&S that would be available without a severe security problem. The furnace room equipment, however, is unrelated and may prove distracting.

4. Engine Performance

(a) The need to obtain accurate performance measurements and to learn the operating characteristics of supersonic engines under a wide range of speeds and altitudes requires large facilities such as the Propulsion Systems Laboratory, which was described briefly during the 1951 Inspection. Here, in soon-to-be augmented facilities, the largest turbojets under construction can be investigated. The layout of the PSL being so extensive and its operation in a typical research experiment so difficult to watch, this will be highlighted by a movie showing installation (removal) and testing of the J-73 engine. A speaker from the Service Division could explain part of the movie.

(b) The movie will lead into a discussion of a representative problem discovered in turbojets generally, rotating stall, and show how it is detected and measured. A C&T Division speaker could give the background and interpretation of the problem and discuss means for its control. If desired, an M&T Division speaker could indicate solution by means of compressor blades containing materials with high internal damping, such as plastic-impregnated fiberglas.

(c) Following the discussions, the hatch cover on test Cell #1 could be opened to permit inspection of a typical turbojet installation.

Location: The only appropriate location is on the second floor of the Shop and Access Building between the test cells. None of the equipment would operate. Because of constrictions at the only doorway, it may not be desirable to let visitors inspect the control room; control-room action shots will be contained in the movie. A walk-through from Shop & Access Building to the Equipment Building, or the reverse, is longer and more difficult than desirable.

5. Supersonic Propulsion

(a) Integration of a turbojet engine into a suitable propulsion system for supersonic flight requires special attention to the design of inlets and outlets. After the performance and operating characteristics of the engine alone have been determined in facilities like PSL, the true performance of the engine in the aircraft must be investigated. Errors in inlet and diffuser design that appear minor will cause severe thrust losses; mismatching of the inlet and engine can result in flow disturbances that will prevent engine operation at full power and, thus, will preclude reaching design speeds. In the first turbojet-engine nacelle installation in the 8- by 6-Foot Supersonic Wind Tunnel, problems of inlet matching were studied up to a Mach number of 2.0. Matching of the inlet to the engine at off-design speeds was attempted by use of a bypass door, which permitted excess air to dump overboard ahead of the engine.

(b) Since the turbojet installation will not be in the tunnel at this time and cannot be demonstrated, it will be available to show the visitors, and a movie of its operation in the tunnel will show significant performance changes resulting from altered configuration and fuel flow. Schlieren pictures will show most of the performance effects. Operation of the bypass door and adjustable inlet spike will be demonstrated to the visitors with the actual model.

(c) Like the inlet problem, optimum performance of the turbojet in supersonic flight will demand careful design of the nacelle afterbody and a continuously adjustable convergent-divergent nozzle. Penalties for using conventional subsonic nozzle designs can be indicated.

(d) Since the turbojet installation in the 8- by 6-Foot Supersonic Wind Tunnel is smaller than many being incorporated in production supersonic fighter designs and hence cannot use a comparable engine and since the tunnel size prevents studying the propulsion system at climb and maneuvering angles of attack, it is obvious that bigger facilities are needed to advance the design of our supersonic airplanes. The LUPA facilities will provide a wider scope of test conditions and will accommodate larger engines. This will offer the best opportunity to display and describe briefly the model of the LUPA facility that will be seen in 1957.

<u>Locations</u>:

(a) Because of the size of the turbojet model and the fact that there will be no point in operating the 8- by 6-Foot Supersonic Wind Tunnel, it will be more desirable to seat the visitors in that portion of the shop just south of the tunnel. It will be relatively easy to darken this area and the turbojet model can be hung from the shop beams as it was during preparation for test. Use of the shop area will make the air-conditioned observation and control rooms available to either Ames or Langley for their part in the show.

(b) If desired, visitors could leave the shop area via the test chamber, test section, diffuser and the corner chamber of the acoustical house; they would then board busses at the access door at the end of the diffuser.

6. <u>Aerodynamic Heating</u> (from ltr. NACA to Ames, 2/12/54, IHA.bh)

(a) Sustained flight at the speeds considered attainable with supersonic turbojets will result in aerodynamic heating to temperatures at which commonly used aircraft materials will no longer be suitable and some of the super materials, like titanium and stainless steel, will be marginally safe. Needless to say, the crew of such aircraft and the electronic equipment will require cooling that would appear unattainable by present standards.

(b) Even at intermediate speeds there are structural problems arising from unequal heating of the structure and allowance of these stresses becomes an important factor in design.

(c) At speeds well beyond the capabilities of turbojet propulsion, air friction can become intense enough to melt ordinary materials and this phenomenon becomes a new tool for the study of heat transfer in hypersonic wind tunnels. Progress in such research may be discussed by Langley personnel.

Locations:

(a) The observation and control rooms of the 8- by 6-Foot SWT is one of our better locations for this discussion. How this space would be used will depend on the nature of their models, charts, and projection requirements.

(b) Conference room 219 in the Administration Building may be more suitable than the 8- by 6-Foot SWT location but would be less appropriate. It would interfere less with research to use the Administration Building.

7. Automatic Flight Controls (ltr. from NACA to Ames, 2/12/54, IHA:bh)

(a) Severe buffeting, change of trim, and sudden erratic behavior of existing research aircraft flying at supersonic speeds to which the turbojet may be suitable (Mach no. 2.5) emphasize the need for complete automatic flight controls to assist the pilot and safeguard the airplane. It is probable that Ames personnel will discuss pertinent automatic flight control systems for this regime.

Locations:

(a) Ames and Langley may select either the 8- by 6-Foot SWT observation room or the Administration Building room 219. It would not be possible to assign proper space unless more is known of their proposed subject matter and treatment.

(b) If Ames should elect to discuss control systems in such a way that use of an electric analog would help them, they might make good use of room 113 in the Fuels Systems and Controls Laboratory. They might have their choice of either the Philbrick or Goodyear analogs at this location. The room is air-conditioned and can be darkened.

(c) The Hangar area would be appropriate if Ames elected to bring in any flying equipment or large models, but would be inferior otherwise. At the Hangar, the possibility of noisy demonstrations during the operating-problems stop would suggest having double groups alternate at the two stop locations in the Hangar.

8. Operating Problems

(a) A wide choice of material is available. Crash fire research, while discussed in part at Langley's 1953 inspection, has progressed to where some results on jet-engine fire suppression are available.

More crash data are needed, but results of tests in the trench look good. This would lend itself to discussion with charts, a typical engine, bullet-operated water valves and related hardware, and, perhaps, movies. The work remaining to protect a high-temperature engine in a supersonic airplane can barely be hinted at.

(b) An important offshoot of the crash-fire research has been the measurement of deceleration forces on seats and their occupants during landing or take-off crashes. This research has led to some new concepts on the design of a seat in which the occupant would have a good chance of survival. One research technique employed, after obtaining data in real crashes, is the pendulum or swing tester. A demonstration of this experiment with an instrumented dummy can be made; it may be possible to show the reduction in body forces with an NACA-designed seat.

(c) A topic of great importance is thrust reversal. A pilot of a jet airplane needs the same protection against running off the runway due to bad brakes, or against skidding on icy runways that transport pilots now have in their reversible propellers; and they do not want parachute brakes on service aircraft. NACA research on thrust control for turbojets has resulted in thrust-reversal effects comparable to those attainable with propellers. The principle can be explained and demonstrated with transparent models and tufts or smoke and a live demonstration made on the special nacelle on the C-82 airplane held in place on the Hangar apron in such a way that the amount and direction of thrust can be displayed ona large dial taking its signal from the nacelle force-measuring system. If available in time, it is proposed that the system as installed in an F-84 could be available for inspection, operated cold in the hangar, operated under power with the airplane restrained by a thrust-measuring system on the hangar apron, or demonstrated in a dynamic way by a simulated landing deceleration on our taxi strip.

(d) Turbojet-engine noise, especially the noise made by thrust-augmenting afterburners, is a subject of considerable interest to airport neighbors. The supersonic turbojet will be especially noisy by present-day standards. NACA research on jet-engine noise might be discussed, particularly with regard to demonstrations of the modified C-82 and some presentations made with respect to our outlook on this problem.

(e) At one time it was held to be impossible to ice a supersonic airplane. NACA research now indicates this may be possible at speeds up to a Mach number of 1.4 if ambient conditions are right. This would constitute no problem to a much faster airplane but needs investigation for airplanes that do not exceed Mach number 1.4. The drag and lift effects of icing on the very thin wings needed for supersonic airplanes far exceed those of subsonic airplanes. The drag of a supersonic airplane that encounters icing conditions shortly after take off may prevent its reaching design speed and hence cause the plane to fail in its mission. These problems are now being explored in NACA's new transonic icing tunnel and the probability of encountering icing in various theaters of operation is being studied actively to assist designers.

Location: The Hangar is the best area for these talks and demonstration. The east end of the Hangar facing the wall of the office annex would be best for viewing movies. Plans for demonstrations on the hangar apron, or taxi strip, will determine whether or not the group will need to move to a different location during the stop. They might stand for any final outdoor demonstration.

ALTERNATE STOPS

9. Research, Facilities and Instrumentation

Many activities at the Laboratory are inaccessible or not currently available, or cannot be viewed appropriately during an ordinary inspection stop. These subjects would be carefully selected to tell a coordinated story and the best possible stereo-color pictures taken of them for presentation by projection to the visitors who would view them with special 3-D glasses. A voice-over commentary would describe and explain the picture sequence. Movies and slides, both, may be used. All divisions would participate by supplying their best subject matter.

Locations:

(a) The old cafeteria area in ERB would be a good location because it is easily darkened and near the photo lab.

(b) If the Administration Building room 219 is not used by either Ames or Langley, this would be a desirable location provided complete darkening is accomplished.

(c) As an alternate proposal, it may be possible to present some of the key photos, including the model of the Laboratory, to the entire group in the Auditorium as part of the opening exercises.

10. Engine Vibration and Stresses

(a) It has been proposed that rotating-stall phenomena in a turbojet, say a J-65, be discussed with respect to the different blade vibration the various types of stalls produced, the stresses resulting from such vibrations, and the value of using blades of plastic, or other material, having high internal damping properties.

(b) Cracking of turbojet parts due to cycling of thermal stresses, especially important with newly developed materials and in supersonic turbojets operating over wider temperature ranges, would be discussed and demonstrated by means of NACA quench-cracking tests. The importance of further research on materials to eliminate these weaknesses, or to minimize the problem through better engine design would be discussed.

(c) Notch sensitivity of materials used in turbojets would be shown to be an important criterion in choice of materials, blade-root design, and in engine reliability. The phenomenon of notch sensitivity would be demonstrated with different sheetmetal specimens.

(d) Impact strength, particularly of new, brittle refractory alloys like cermets, would be discussed in reference to the problem of withstanding the impact of foreign particles which might pass through the engine. The NACA research technique involving 22-caliber rifle tests would be demonstrated on heated specimens of ductile and brittle materials. Movie sequence could show internal damage caused by foreign-particle or blade breakage in a typical turbojet; damaged engine parts could also be displayed. The NACA research to determine if the combustor liner can be designed so as to trap foreign particles before they strike the turbine blades, could be mentioned.

<u>Locations</u>:

(a) A logical place would be in the M&S furnace room where facilities exist and where some of this work is normally performed. A security problem exists here, but should be no worse than that for the 1951 Inspection. Low head room and somewhat awkward seating arrangements may prove to be other problems.

(b) The spin pit area of JPSTL would be quite acceptable for this stop.

11. <u>Central Data Recording and Computing</u>

(a) The nearly completed installation of central data recording equipment in its temporary location in the Instrument Research Building, represents a considerable improvement over the equipment demonstrated at the 1951 Inspection. Connected to major research facilities like AWT, PSL, 8- by 6-Foot SWT and LUPA, this equipment, when installed permanently at LUPA, will greatly expedite the recording and computing of research data. How the new system works can be demonstrated and explained. Gains in data computing during trial use of the original system, shown in 1951 and now installed in the 8- by 6-Foot SWT, can be pointed out.

(b) Progress in rapid, remote recording of electrical voltages from thermocouples and strain gages can also be shown and demonstrated.

(c) Not directly related to the subject but of great importance in expediting turbojet-engine research is NACA's latest device to machine compressor and turbine-blade forms from mathematical data on punch cards via magnetic type recordings at speeds that can be made optimum for the cutting tools at hand. This equipment (in the basement of the Instr. Res. Bldg.) might be moved to the second floor for demonstration, or the electronic gear moved and a smaller blade-generating machine of other type used with it.

Location: The second floor laboratory rooms of IRB where the recording equipment is now installed is the only location possible, unless this is done elsewhere using 3-D pictures (see 9 on page 8). Location of the equipment will make proper viewing by a group of 50 people very difficult unless part of the hall partition is removable.

12. Afterburner, Screech, Slurry Burning, Rockets

(a) As discussed under Stop 2, the discussions of damaging combustion oscillations in afterburners and high-energy fuels can be discussed and demonstrated at an outdoor location (but under cover of a tent) between High-Energy Fuels Lab and the Rocket Lab.

(b) Inclusion of rocket research is proposed to show that this engine has problems resembling those in other engines so that research on one will improve our understanding of the other. In this category are the problems of combustion oscillation and the need for high-energy propellants, both of which are of major interest to NACA. It is believed that security problems may limit discussions of afterburners, slurries and rockets to the extent that they could be combined at one stop.

13. General Assembly after Lunch

(a) It would be profitable to the visitors and would probably result in better attention to post-luncheon speakers, if the visitors could use the end of their lunch period to walk to the nearby PSL Equipment Building to inspect various static displays and the huge machinery of PSL. NACA personnel would be stationed at the displays and machinery to answer questions. Busses would dispatch from that point for the first stop in the afternoon. If weather was bad, this stop would be omitted and busses would leave from the cafeteria. The PSL facility is too large to tour during a formal stop but its equipment is very impressive and it would be a shame not to show it. Ample space is available to accommodate the entire group and to display fabrication, instrumentation, noteworthy photographs of other research setups, etc.

(b) The Hangar has been suggested as an alternate location, possibly a one-shot operating problems show, but it would require transportation by bus from the cafeteria. A reverse-thrust landing deceleration by the F-84 out on an airport runway might justify taking all busses to the Hangar ramp as an informal, weather permitting, teaser before resuming the afternoon tour.

Willson H. Hunter

Willson H. Hunter
Aeronautical Research Scientist

WHH:mr

CC: Mr. J. J. Modarelli, Jr.

1954 Inspection

Abe Silverstein's notes 3/3/54 AM

(A) (1) Aero Heating – Langley – 8x6 observation.

(B) (2) Automatic controls –

(C) (3) Views of laboratory – } P.S.L. equipment etc.

(D) (4) operating Problems – Hangar (4 items)

(E) (5) ~~P.S.L.~~ Full Scale Engines

(F) (6) Lubricants

(G) (7) ~~C & T~~ ~~Boron [illegible]~~ C & T

H. (8) Fuel & ~~[illegible]~~ Combustion

Above relayed to Yoderally 3/3
Part to Collins
Part to Lundin, Conrad, Sanders +

action:

1. Write this up for presentation to Div Chiefs
2. Write Ames response (TSCO 113?)
3. Write Langley
4. Prepare tentative schedule
5. Hasten 3-D movie & still tests

W.H.Hunter

NACA-Lewis

Mr. Hunter

Cleveland, Ohio
April 30, 1954

MEMORANDUM For Associate Director

Subject: Personnel Assigned to Preparation and Talks for 1954 Inspection

1. Superseding my memorandum of April 20, I am submitting for your information a new list of persons currently assigned to work on the inspection stops. Speakers designated are tentative until their ability to do the job properly can be determined.

Crash Fire, Crash Survival, Jet Thrust Reversal - Flight Hangar

I. Irving Pinkel	4114	122 IRB	In charge of preparations
I. Irving Pinkel	4114	122 IRB	Speaker: Jet engine crash fire
G. Merritt Preston	4271	201 FR	Speaker: (Alt. with Pinkel)
Gerard J. Pesman	4277	207 FR	Speaker: Crash survival
Dugald O. Black	4277	207 FR	Speaker: (Alt. with G.J.Pesman)
Robert C. Kohl	4276	206 FR	Speaker: Jet thrust reversal
Solomon Weiss	4277	207 FR	Speaker: (Alt. with r.C.Kohl)

Nuclear Propulsion for Aircraft; High Temperature Materials - Room 4 M&S

James J. Gangler	2158	136 M&S	In charge of preparations
Royal N. Schweiger	2135	101 M&S	Preparation of several displays
Donald Bogart	3258	232 M&S	Speaker: Fission, Np cycles, shielding
Frank E. Rom	5192	231 M&S	Speaker: (Alt. with D. Bogart)
Robert A. Lad	3171	121 M&S	Speaker: Materials: corrosion, radiation damage
Burt M. Rosenbaum	4145	120 M&S	Speaker: (Alt. with R.A.Lad)
Robert G. Deissler	4279	220 M&S	Speaker: Heat transfer
W. H. Lowdermilk	4279	220 M&S	Speaker: (Alt. for R.G.Deissler)
William H. Wachtl	5192	231 M&S	Speaker: (Alt. for R.G.Deissler)
John W. Weeton	2216	214 M&S	Speaker: Hi-temp. materials
Richard H. Kemp	4273	138 M&S	Speaker: (Alt. for J.W.Weeton)
Francis J. Clauss	3278	202 M&S	Speaker: (Alt. for J.W.Weeton)

Transonic Compressor - EPRB #2, Cell 4B

Karl Kovach	2140	W120 C&T	In charge of preparations
John C. Freche	5168	263 ERB	Preparations
Harold B. Finger	4174	W119 C&T	Speaker
Francis C. Schwenk	2175	W114 C&T	Speaker
Robert O. Bullock	4125	211 ERB	Speaker
William A. Benser	2136	207 ERB	Speaker

Combustion and High Energy Fuels - ERB, CW-5

J. Howard Childs	3295	200 F&L	In charge of preparations
Maurice H. Proskine	3234	206 M&S	Design of piping and setup
Wilfred E. Scull	2265	225 F&L	Speaker: Hi-output TJ combustor
Warren D. Rayle	2119	219 F&L	Speaker: Afterburner screech
Irving A. Goodman	3260	200 F&L	Speaker: Slurry prep., burning
Richard H. Donlon	2128	227 F&L	Speaker: (Alt. with W.E.Scull)
Leonard K. Tower	5173	102 Cons.	Speaker: (Alt. with W.D.Rayle)
Eugene E. Dangle	3212	232 F&L	Speaker: (Alt. with I.A.Goodman)

Full-Scale Engines and Propulsion Systems - PSL Shop & Access Bldg)

Earl W. Conrad	5233	220 PSLO	In charge of preparations
Martin J. Saari	2169	103 AWT	Speaker: Introduction
J. Elmo Farmer	5212	204 PSLO	Speaker: (Alt. for M.J.Saari)
Earl W. Conrad	5233	220 PSLO	Speaker: PSL engine studies
John R. Esterly	4254	203 PSLO	Speaker: (Alt. for E.W.Conrad)
Leonard J. Obery	4238	104 SWT	Speaker: Propulsion systems
Wm. H. Sterbentz	4219	105 SWT	Speaker: (Alt. for L.J.Obery)

3-D Views of Lewis Research - PSL Equipment Bldg.

Franklin K. Moore	4216	213 SWT	In charge of preparations
Roger F. Weining	2285	102 SWT	Assistance with preparations

(Speakers not yet assigned)

Aerodynamic Heating (Langley) - 8x6 SWT Observation Room

Dr. John Duberg, Chief of Structures, Langley - In chg. of prep.
Messrs. John Kotanchik, Ross, Heldenfels - Assisting with prep.
(Speakersnnot yet known here)

Flow Visualization Techniques (Ames) - Instrument Res., Room 11

(Ames Laboratory assignments not known here)

Willson H. Hunter

WHH:js

NACA - Lewis

Cleveland, Ohio
May 20, 1954

MEMORANDUM For Those Concerned.

Subject: Tentative Rehearsal Schedule for the 1954 Triennial Inspection.

We know that this first Triennial, 3-lab inspection will prove interesting and educational. It will attract an important audience. And, as always, the success of the inspection depends primarily on the ability of our speakers to get their story across.

NACA takes much pride in the praise visitors traditionally extend our speakers. NACA speakers earn this praise because they characteristically have complete command of their subject, are well-trained to express their thoughts accurately and, thus, have the poise of self-confidence.

Experience has taught us that these attributes of good speakers are acquired through adequate practice, keeping upper most in mind the need to develop clarity of expression so that visitors who are inexpert in research matters will leave here knowing that they have gained a better understanding of our business.

Official rehearsals were started May 17th. Future official rehearsals will follow the attached schedule. All those concerned will receive advance notice of any necessary departures from schedule or any additions that may be required. We would like all speakers to attend all rehearsals of their own stop. We will plan to have all speakers attend either the semi-final or final rehearsal of all other talks so they will be informed as to subject matter covered and the need for proper coordinating remarks in their own talks.

At first rehearsals speakers may read their talks. Alternate speakers should be given practice at the second rehearsal and, where necessary, may also read their talks. All speakers will be expected to know their talks for the semi-final (May 27-28) and final (June 1) rehearsals.

As much of the final graphic and demonstration material as can be assembled should be available for the second rehearsals to permit more accurate checking of time and subject matter. Stops that run longer than 30 minutes at the second rehearsal may be scheduled for a third official rehearsal, before the semi-finals, to insure that appropriate reductions in the length of talks and demonstrations have been made.

All charts, slides, movies, demonstrations, stationary displays, special lighting effects, public address systems and chairs are to be in place, in final readiness, for the semi-final rehearsals which will be attended by NACA Headquarters personnel.

The final rehearsal, June 1st, following the double Decoration Day weekend, will insure readiness and will serve to instruct the group leaders and others involved in taking care of the visitors.

Willson H. Hunter
Willson H. Hunter
Aeronautical Research Scientist

1954 NACA Inspection
Tentative Rehearsal Schedule

Date	Time	Place	Subject	Rehearsal
5/20	3:30 p.m.	Hangar	Aircraft Operating Prob. Res.	1st
5/21	10:00 a.m.	PSLEB	Full Scale Engine Research	1st
	1:15 p.m.	M&S, Rm4	Res. Prob. in Nuclear Prop.	2nd
	2:30 p.m.	ERB, CW-5	Combustion and Fuels Research	2nd
	3:45 p.m.	EPRB # 2	Compressor Research	2nd
5/24	1:30 p.m.	Hangar	Aircraft Operating Prob. Res.	2nd
	----	----	(Other rehearsals as required)	----
5/25	1:30 p.m.	PSLEB	Full Scale Engine Research	2nd
	----	----	(Other rehearsals as required)	----
5/26	10:00 a.m.	Auditorium	Meeting of all assisting personnel except speakers	1st
	11:00 a.m.	Aud. Foyer	Special Instruction of Group Leaders and Bus Guides	1st
	2:00 p.m.	Inst. Res. Rm 11	Flow Visualization Techniques (Ames)	1st
	3:30 p.m.	PSLS&A	Full Scale Engine Research (new location)	3rd
	----	----	(Other rehearsals as required)	----
5/27	9:30 a.m.	EPRB #2	Compressor Research	Semi-final
	10:30 a.m.	ERB, CW-5	Combustion and Fuels Research	"
	1:00 p.m.	M&S, Rm 4	Research Problems in Nuclear Propulsion	"
	2:00 p.m.	Hangar	Aircraft Operating Prob. Res.	"
	3:00 p.m.	Inst. Res. Rm 11	Flow Visualization Techniques (Ames)	2nd
	4:00 p.m.	8 x 6 Obs. Rm.	Structural Effects of Aerodynamic Heating (Langley)	1st
5/28	9:30 a.m.	PSL EB	Views of Lewis Lab (Movie)	Semi-final
	10:30 a.m.	PSL S & A	Full Scale Engine Research	"
	1:30 p.m.	Inst. Res. Rm. 11	Flow Visualization Techniques	"
	2:30 p.m.	8 x 6 Obs. Rm.	Structural Effects of Aerody. Heating	"
6/1	Reehearsals will follow the Green Group Sequence			
	9:00 a.m.	M&S Rm 4	Research Problems in Nuclear Prop.	Final
	9:40 a.m.	Hangar	Aircraft Oper. Problems Research	"
	10:20 a.m.	Inst. Res. Rm 11	Flow Visualization Techniques	"
	11:00 a.m.	ERB, CW-5	Combustion and Fuels Research	"
	1:00 p.m.	EPRB # 2	Compressor Research	"
	1:40 p.m.	PSL S&A	Full Scale Engine Research	"
	2:20 p.m.	PSL EB	Views of Lewis Laboratory	"
	3:00 p.m.	8 x 6 Obs. Rm.	Structural Effects of Aerody. Heating	"

Willson H. Hunter
Willson H. Hunter
5/20/54

Note: For further information call W. H. Hunter, PAX 5258 or 5161.

NACA - Lewis

Cleveland, Ohio
May 20, 1954

MEMORANDUM For Associate Director

Subject: Personnel assigned to speak at the 1954 NACA Inspection.

Superceding my memorandum of April 30, I am submitting for your information a list of persons currently assigned to speak at the inspection stops.

1. Aircraft Operating Problems Research - Flight Hangar (2155)

I. Irving Pinkel (4114) in charge of preparations; V. G. Rollin (2286) assisting.

I. Irving Pinkel	4114	122 IRB	Jet Engine Crash Fire
Solomon Weiss	4277	207 FR	(Alt. with I. I. Pinkel)
Gerard J. Pesman	4277	207 FR	Crash Survival
Dugald O. Black	4277	207 FR	(Alt. with G. J. Pesman)
G. Merritt Preston	4271	201 FR	Jet Engine Thrust Reversal
Robert C. Kohl	4276	206 FR	(Alt. with G. M. Preston)

2. Research Problems in Nuclear Propulsion - M & S Building, Rm. 4 (4108)

J. J. Gangler (2158) in charge of preparations.

Donald Bogart	3258	232 M & S	Nuclear Reactor
Frank E. Rom	5192	231 M & S	" " (alternate)
Robert R. McCready	3258	232 M & S	" " (alternate)
William H. Wachtl	5192	231 M & S	Heat Transfer Problems
Warren H. Lowdermilk	4279	220 M & S	" " " (alternate)
Armin F. Lietzke	3250	216 M & S	" " " (alternate)
Robert A. Lad	3171	121 M & S	Reactor Materials Problems
Burt M. Rosenbaum	4145	120 M & S	" " " (alternate)
Robert W. Hall	5287	110 M & S	" " " (alternate)

3. Compressor Research - Engine Propeller Research Bldg. # 2 (3286)

Karl Kovach (2140) in charge of preparations; John C. Freche (5168) assisting.

Harold B. Finger	4174	W119 C&T	Compressor Aerodynamics
Robert E. English	2171	W220 C&T	" " (alternate)
Francis C. Schwenk	2175	W114 C&T	Rotating Stall & Blade Vibrations
James J. Kramer	5104	254 ERB	" " " " (alternate)

4. Combustion and Fuels Research - Engine Research Building, CW-5 (2239)

J. Howard Childs (3295) in charge of preparations.

Wilfred E. Scull	2265	225 F & L	Hi-Output Turbojet Combustor
Richard H. Donlon	2128	227 F & L	" " " " (alternate)
Warren D. Rayle	2119	219 F & L	Afterburner Screech
Leonard K. Tower	5173	102 Constr.	" " (alternate)
Irving A. Goodman	3260	200 F & L	Slurry Preparation and Burning
Eugene E. Dangle	3212	232 F & L	" " " " (alternate)

5. Full Scale Engine Research - Propulsion Systems Lab., Shop & Access (5109)

Earl W. Conrad (5233) in charge of preparations.

Earl W. Conrad	5233	220 PSLO	Full Scale Research Problems & Facilities
Martin J. Saari	2169	103 AWT	" " " " (alternate)
John H. Disher	4276	206 FR	Free Flight Ram Jet Research
Leonard Rabb	4276	206 FR	" " " " " (alternate)
Fred A. Wilcox	4235	107 8 x 6	Ram Jet Control Problems
Seymour C. Himmel	5284	221 Inst. Res.	" " " " (alternate)

6. Views of Lewis Laboratory (Movie) - Propulsion Systems Lab. Equip. Bldg. (4157)

Dr. Franklin K. Moore (4216) in charge of preparations; Arthur L. Laufman, (3145) Photography.

Willson H. Hunter	5258	202 PSLO	Narrator

7. Structural Effects of Aerodynamic Heating - 8 x 6 Observation Room (4200)

Dr. John Duberg, Chief of Structures, Langley, in charge; Joe Ketanchik, asst'g.

Eldon E. Mathauser	Langley Laboratory	Speaker
B. Walter Rosen	Langley Laboratory	Alternate

8. Flow Visualization Techniques - Instrument Research Bldg. Room 4 (5179)

Victor S. Stevens, Ames Laboratory, in charge of Ames preparations.
John L. Pollack (5182) in charge of Lewis preparations; V. G. Rollin (2286) assisting.

Victor I. Stevens	Ames Laboratory	Speaker
Jackson H. Stalder	Ames Laboratory	"
Alvin J. Sacks	Ames Laboratory	"

Willson H. Hunter

Willson H. Hunter

Copies to those named in memorandum, and:

E. R. Sharp (4)
E. J. Manganiello
J. H. Hall
Research Division Chiefs (2 ea)
M. L. Gosney (2)
J. J. Modarelli
W. T. Bonney
C. A. Herrmann
J. S. Brown