

METEOROLOGICAL AND ENVIRONMENTAL  
INPUTS TO AVIATION SYSTEMS

March 8-10, 1977

Opening Remarks

Walter Frost, Director  
Atmospheric Science Division  
The University of Tennessee Space Institute

Description of Workshop

The purpose of this workshop is to bring together disciplines of the aviation communities, for example, designers, pilots and general service personnel with meteorologists and atmospheric scientists in round table discussions which will establish those areas where environmental data is currently available and useable for engineer and operational applications; where data is available but not useful in the existing format; and where data is unavailable and should be determined. Suggested priorities on the required research will be established. Additionally, attempts to define consistent terminology between the aviation and environmental communities will be made.

The workshop is organized such that morning sessions consist of invited presentations which provide overviews of the general areas selected for round table discussion. Round table discussions will take place during the afternoon sessions where four fixed committees will meet separately with four floating committees. The make up and organization of the committees are as follows.

## Committees and Working Sessions Format.

Committees consisting of a chairman and approximately four members will be assembled to cover the areas of (1) Aircraft Design, (2) General Services, (3) Simulation; and (4) General Aviation. Each committee will address a list of questions pertaining to their topic area and any additional questions generated during the discussion. The personnel making up each committee have expertise in the general topic area. Four additional floating committees consisting of four to five people having expertise in meteorology, environmental factors, flying, accident investigation, navigation, etc. have been organized.

Working sessions where each of the floating committees meet individually with each of the specific or fixed committees are conducted according to the schedule given in Table 1. A suggested list of questions for the individual committees is given in Table 2. These questions are simply to generate discussion and the committee may address all, some, or none of the proposed questions as they deem necessary and appropriate.

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Each committee chairman has written a summary of the proceedings pertaining to his topic area for the final documentation of the workshop. These summaries are given in Section III of the proceedings. The third day session consisted of each chairman presenting a summary of their intended write-ups stemming from the discussions conducted throughout the preceding days. General comments and recommendations from the entire group were called for at this time and these were incorporated by the respective chairmen into their committee reports.

The invited papers presented in the morning sessions are included in the proceedings in Section II. The schedule of

activities and committee **make** up are given in Tables **3** and **4**, respectively.

The organization of the workshop was carried out by the persons listed in **Table 5**.

Section **I** of the proceedings gives the welcoming addresses by Robert L. Young of UTSI, and William W. Vaughan of NASA/MSFC, as well as the banquet address by Mr. Newton A. Lieurance and his bibliography.

Table 1. SCHEDULE OF COMMITTEE MEETINGS

	Aircraft Demom	Simulation	General Service	General Aviation
Committee A	Tues 12:30-2:00 Room #1	Tues. 2:55-5:00 Room #2	Wed. 12:30-2:40 Room #3	Wed. 2:55-5:00 Room #4
Committee B	Tues. 2:55-5:00 Room #1	Wed. 12:30-2:00 Room #2	Wed. 2:55-5:00 Room #3	Tues. 12:30-2:00 Room #4
Committee C	Wed. 12:30-2:00 Room #1	Wed. 2:55-5:00 Room #2	Tues. 12:30-2:00 Room #3	Tues. 2:55-5:00 Room #4
Committee D	Wed. 2:55-5:00 Room #1	Tues. 12:30-2:00 Room #2	Tues. 2:55-5:00 Room #3	Wed. 12:30-2:00 Room #4

Table 2  
Suggested Questions for Discussion

A) LIST OF SUGGESTED QUESTIONS FOR GENERAL SERVICE COMMITTEE

1. How accurate does a 0-30 minute forecast have to be? Should we be bothered with a 0-30 minute forecast?
2. How accurate do Slant Visual Range measurements need to be and do we need SVR systems?
3. What are the problems with the acoustic radar system, and is it reliable; for example, during thunderstorms?
4. Is it worth the cost to maintain a mesonet?
5. What influence will lighter than air vehicles have on meteorological inputs?
6. What is the status of lightning protection and what are the gaps in our knowledge of the lightning phenomenon?
7. Is snow removal a problem and are meteorological inputs needed in this area?
8. Is the trailing vortex problem strongly dependent on meteorological conditions, 1) temperature gradient, and 2) wind conditions?
9. What are some of the meteorological problems that are peculiar to off-shore airports?
10. How accurate can a temperature forecast be made?
11. How much effort should be devoted to forecasting rare events?
12. Would vertical visibility measurement be acceptable over ceiling? If so, over what area should the vertical visibility be quoted, i.e., over the runway, over the approach, etc.?
13. Who should take the lead in doing the research for developing aviation weather service?

Table 2 (Cont.)

B) LIST OF SUGGESTED QUESTIONS FOR THE AIRCRAFT DESIGN COMMITTEE

1. Are current procedures for designing structural components with respect to turbulence forcing functions adequate at this time and if not, in what areas is improvement needed? For example, (1) are engineering procedures adequate, (2) is sufficient turbulence data available to do adequate modelling?
2. Are spectral models an improvement over discrete gust models?
3. Under what conditions of aircraft design are turbulence simulations necessary and are these turbulence simulation procedures appropriate or is more meteorological data needed to develop appropriate simulation techniques?
4. What meteorological data is needed to provide more clear cut certification requirements or mil Specs?
5. Is wind shear a consideration in the structural design of aircraft?
6. Is wind shear a consideration in the design of aircraft control systems?
7. Is lightning prevention a consideration in the design of aircraft and if so, is sufficient data available to carry out an adequate design? For example, lightning effects on digital systems, lightning effects on composites, etc.
8. To what degree in the design of aircraft is meteorological data needed relative to (a) temperature, (b) rain and hail conditions, (c) icing conditions, (d) pressure and density conditions, (e) corrosive, abrasive, and other harmful constituents in the atmosphere?
9. How well can the important parameters in question 8 above be forecast or predicted for design purposes?

Table 2 (Cont .)

C) LIST OF SUGGESTED QUESTIONS FOR SIMULATION COMMITTEE

1. In general, are the turbulence models used in current simulators adequate?
2. Are more accurate turbulence simulations models available which have not been incorporated into the simulator program?
3. If more complete turbulence simulation techniques were available, would they be used?
4. Do current simulation schemes give a proper impression of real turbulence?
5. If current turbulence simulation models are not adequate, what data is required for the meteorologists to develop more reliable simulation schemes?
6. What knowledge of the environment is required to conduct appropriate inflight simulations?
7. What information about atmospheric wind speed profiles is required to conduct appropriate simulation for (a) flight crew training, (b) avionics development, (c) aircraft design?
8. Is there any correlation between the wind field turbulence model and conditions of precipitation, fog, etc. that are needed for realistic flight simulation?
9. Is it necessary to simulate the effects of icing, temperature variations, humidity variations, etc., and if so, is there sufficient meteorological data available to carry out a realistic simulation?

D) LIST OF SUGGESTED QUESTIONS FOR GENERAL AVIATION COMMITTEE

1. What education programs are needed for General Aviation pilots?
2. What are some of the meteorology inputs required for General Aviation?
3. How do you envision weather briefings in the future?
4. What are some of the weaknesses of the present briefing system?
5. Should visibility and/or ceiling be the criteria for determining approach minimums?

Table 2 (Cont.)

6. **Why** not employ airborne sensors rather than ground based sensors?
7. **Why** must we orient toward ground based sensors?
8. **What** airborne information is required for the General Aviation pilot to know he's breaking the rule (for example, that he is 2000 ft. from clouds, etc.).
9. **Where** does aviation weather stop and weather start?
10. Are you satisfied with current methods of mass dissemination and if not what are the problems with them?
11. **What** is involved in quality controls on aviation weather and are they adequate?



Table 3. SCHEDULE

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Tuesday, March 8, 1977

8:30-8:35	Introduction--Walter Frost, UTSI
8:35-8:50	WELCOME--Robert L. Young, Associate Dean, UTSI
8:50-9:05	WELCOME--William W. Vaughan, Atmospheric Science Division Head, NASA/MSFC
9:05-9:25	Overview of NASA Marshall Space Flight Center's Program on "Knowledge of Atmospheric Processes: Dennis W. Camp, NASA
10:05-10:10	Coffee
10:10-10:50	Topic Area AIRCRAFT DESIGN, John C. Houbolt, NASA
10:50-11:30	Topic Area GENERAL AVIATION, James C. Pope, FAA
11:30-12:30	Lunch--UTSI Industry Student Center
12:30-5:00	Committee Sessions
6:00-7:00	Get Acquainted Social Hour, AEDC Officers Club
7:15	Banquet, Speaker--Newton A. Li@urance, Alden Associates

Wednesday, March 9, 1977

8:30-8:50	Progress and Outlook for FAA's Aviation Weather; Research, Engineering and Development, Joseph F. Soward, FAA
8:50-9:10	UTSI Atmospheric Science Program, Walter Frost, UTSI
9:10-9:50	Topic Area General Services, Frank Coons, FAA.
9:50-10:10	Coffee
10:10-10:50	Topic Area SIMULATION, Dwight R. Schaeffer, Boeing Co.
10:50-11:30	Topic Area PILOT'S VIEWPOINT, William W. Melvin, ALPA
11:30-12:30	Lunch--UTSI Industry Student Center
12:30-5:00	Committee Sessions
5:30	Visit to Staggerwing Museum, Tullahoma, Tennessee

Thursday, March 10, 1977

8:30-8:50	Overview of OAST Safety Program, George H. Fichtl, NASA
8:50-9:30	Summary of Aircraft Design Committee, Robert J. Woodcock
9:30-10:10	Summary of General Services Committee, John H. Enders
10:00-10:30	Coffee
10:30-11:10	Summary of Simulation Committee, Richard K. Kurkowski
11:10-11:50	Summary of General Aviation Committee, Wallace C. Goodrich
11:50-12:00	Closing Remarks
1:00	AEDC TOUR

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Table 4. COMMITTEES

<u>Committee A</u>	<u>Committee B</u>	<u>Committee C</u>
<p>Frank Coons Federal Aviation Admin. 2100 2nd Street, N.W. Washington, D.C. 20590</p> <p>George H. Fichtl Environmental Dynamics Branch NASA/Marshall Space Flight Center Mail Code ES43 Marshall Space Flight Center, Alabama 35812</p> <p>Charles A. Fluet Bureau of Technology/TE60 NTSB Washington, D.C. 20594</p> <p>Charles H. Sprinkle W116 National Weather Service 8060-13 St. Silver Spring, MD 20910</p> <p>Andrew D. Yates, Jr. Air Line Pilots Association Washington Office Address 1625 Massachusetts Ave., N.W. Washington, D.C.</p> <p>William L. Olsen FAA 800 Independence Ave. Washington, D.C. 20591</p>	<p>James T. Green Weather Service American Airlines Flight Academy Greater Southwest Int'l. Airport Ft. Worth, Texas 76125</p> <p>Donald H. Lenschow National Center for Atmospheric Research Boulder, Colorado 80302</p> <p>J. Anderson Plumer Manager Environmental Electro- Magnetic Unit General Electric Company 100 Woodlawn Avenue Pittsfield, Mass. 01201</p> <p>Charles L. Poccock AFISC/SEF Norton Air Force Base, MO 97409</p> <p>Rance Skidmore Air Weather Service Scott AFB, IL. 62225</p>	<p>Edward M. Gross Domestic Aviation Weather Service National Weather Service 8060-13 St. Silver Spring, MD 20910</p> <p>William Horn, Jr. Air Space/Air Traffic Control Suite 401 NBAA 425-13 St. N.W. Washington, D.C. 20000</p> <p>Jean T. Lee NSSL/NOAA Norman, Oklahoma 7300E</p> <p>Hubert McCaleb TE 30 Bureau of Technology NTSB Washington, D.C. 20594</p> <p>J. Van Ramsdell Pacific Northwest Laboratories Battelle Blvd. Richland, Washington 99352</p> <p>Joseph W. Stickle Flight Research Division NASA/Langley Research Center Hampton, VA 23665</p>

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<u>Committee D</u>	<u>Aircraft Design Committee</u>	<u>General Services (continued)</u>
<p>John H. Bliss 2740-Graysby Avenue San Pedro, CA 90732</p>	<p>Robert J. Woodcock (Chairman) Air Force Flight Dynamics Lab/FGC Wright Patterson AFB, Ohio 45433</p>	<p>Robert Curry Headquarters Air Weather Service/DNP Scott AFB, IL. 62225</p>
<p>C.L. Chandler Delta-Flt Control Atlanta, GA 30320</p>	<p>Jack Hinkleman SRDS, ARD-451 Federal Aviation Administration 2100 2nd Street, N.W. Washington, D.C. 20591</p>	<p>Rodger Flynn Air Transport Association of America 1709 New York Ave., N.W. Washington, D.C. 20006</p>
<p>R. Craig Goff ANS-430 NAFEC FAA, Department of Transportation Atlantic City, N.J. 08405</p>	<p>Arthur E. Kressly Stability and Control Aerodynamics 36-81 Douglas Aircraft Co. 3855 Lakewood Blvd. Longbeach, CA 90801</p>	<p>William W. Vaughan NASA/MSFC ES-81 Huntsville, AL 35812</p>
<p>William W. Melvin Airworthiness &amp; Performance Comm. Air Line Pilots Association 1101 W. Morton Dennison, TX 85020</p>	<p>John C. Houbolt Chief Aeronautical Scientist NASA/Langley Research Center Hampton, VA 23665</p>	<p>Newton A. Lieurance Alden Electronics and Impulse Recording Equipment Co. Westboro, Mass.</p>
<p>William R. Durrett Kennedy Space Center Florida, 32899</p>	<p>Douglas E. Guilbert AFAL/WE Wright Patterson AFB, OH 09033</p>	<p><u>Simulation Committee</u></p>
	<p><u>General Services Committee</u></p>	<p>Richard L. Kurkowski (Chairman) Simulation Office NASA/Ames Research Office Moffett Field, CA 94035</p>
	<p>John H. Enders (Chairman) Office of Aviation Safety ASF-30 FAA Headquarters Washington, D.C. 20591</p>	<p>Charles R. Chalk Calspan Corporation P.O. Box 235 Buffalo, N.Y. 14221</p>
		<p>James K. Luers University of Dayton Research Institute</p>

Table 4. (Continued)

<u>Simulation (Continued)</u>	<u>General Aviation (continued)</u>
<p>Dwight R. Schaeffer Boeing Commercial Airline Company P.O. Box 3707 Seattle, Washington 98124</p> <p>Paul L. Jernigan Douglas Aircraft Company 11245 Leffingwell Rd. Norwalk, CA 90650</p> <p><u>General Aviation Committee</u></p> <p>Wallace C. Goodrich (Chairman) AOPA 7315 Wisconsin Ave. Bethesda, MD 20014</p>	<p>James C. Pope Industry and Government Liaison Div. AGA 200 Office of General Aviation FAA Washington, D.C.</p> <p>Bertha M. Ryan Naval Weapons Center P.O. Box 1982 Ridgecrest, CA 93555</p>

Table 5. ORGANIZATION COMMITTEE

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Dennis W. Camp  
Aerospace Engineer  
ES43  
NASA/Marshall Space Flight Center  
Huntsville, Alabama 35812

William A. McGowan  
Aviation Safety Technology  
Branch ROO  
NASA Headquarters  
Washington, D.C. 20546

John W. Connolly  
U.S. Dept. of Commerce  
NOAA  
Rockville, MD 20852

Joseph F. Soward  
Chief, Aviation Weather  
Systems Branch, SRDS  
2nd and V St., N.W.  
Transport Building  
Washington, D.C. 20591

Walter Frost  
Director  
Atmospheric Science Division  
University of Tennessee  
Space Institute  
Tullahoma, TN 37388

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