TITLE: Low-Level Gust Gradient Program and Aviation Workshop Effort

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SIGNIFICANT ACCOMPLISHMENTS TO DATE IN FY-83:

The Proceedings of the Workshop on Meteorological and Environmental Inputs to Aviation Systems, hosted by the University of Tennessee Space Institute (UTSI), October 26-28, 1982, have been prepared for publication. The Proceedings have been submitted to FAA and will be distributed by August. Also, the proceedings of a one-day workshop devoted specifically to wind shear and hosted during the same time frame have been prepared and distributed as a NASA Contractor Report.

Plans for the 1983 workshop are proceeding extremely well. The workshop theme has been established, the committee topics identified, and all ten (10) committee chairmen contacted have agreed to accept their respective assignments. Additional logistics for the workshop are being carried out. The 1983 workshop is scheduled for October 26-28, 1983.

Data gathered with the B-57B during the JAWS Project in Denver, Colorado, havebeen analyzed. All runs for Flight 6 on July 16, 1982, have been analyzed. Spectra, cross-spectra and probability distributions have been computed for each run. Also, Runs 10-14 of Flight 7 on July 15, 1982, have been analyzed in similar detail.

The extensive tower array data available to provide ground truth have been thoroughly analyzed. A final report summarizing all of these data as it pertains to gust gradients on airfoils and over aircraft near ground level has been documented and submitted for final review to the NASA Contract Monitor.

FOCUS OF CURRENT RESEARCH ACTIVITIES:

The specific goals of the gust gradient aspect of the program are to analyze the data and to develop new theoretical concepts and analytical or empirical models of the turbulence statistics that are important to aerospace vehicle design and flight simulation. The data from the tower array and the preliminary data from the Gust Gradient Program illustrate that new models of cross-spectra require development. The major emphasis of the Gust Gradient Program was to understand the variation of wind across an airfoil and how it affects factors such as bending moments, roll, yaw, etc. Thus, the cross-spectra terms are extremely important in such analysis. Mathematical expressions for gust gradient, that can be used as aircraft design criteria, will be developed. Analysis of the data gathered at MSFC in conjunction with the Eight-Tower Array and at the National Severe Storms Lab (NSSL) at Norman, Oklahoma, will be carried out. The NSSL flights were in conjunction with the Spring Storm Observation Program.

The 1983 workshop will be hosted and the proceedings prepared for publication.

PLANS FOR FY-84:

Continued analysis of the data from the JAWS Project, NASA Dryden, and NSSL flights will be carried out. From these data, mathematical models of the cross-spectra, and other statistical parameters will be developed that can be utilized for aircraft design criteria.

The data will be documented and distributed in the form of NASA Contractor Reports for use by the entire aviation community.

The Gust Gradient data will be analyzed to provide inputs to model being developed for simulation purposes.

LIST OF PUBLICATIONS PREPARED SINCE JUNE 1982:

1. Frost, Walter and Ming-Chang Lin: "Statistical Analysis of Turbulence Data from the NASA Marshall Space Flight Center Atmospheric Boundary Layer Tower Array Facility." Final Report prepared under NASA Contract No. NAS8-34627, May 1983.

2. Frost, Walter and Dennis Camp: "Proceedings: Sixth Annual Workshop on Meteorological and Environmental Inputs to Aviation Systems" NASA CP-2274, October 26-28, 1982.

3. Enders, John H., William W. Melvin, Walter Frost and Dennis Camp: "Summary Proceedings of a Wind Shear Workshop," University of Tennessee Space Institute, Tullahoma, Tennessee, October 25, 1982.

4. Akkari, Safwan H., and Walter Frost: "Analysis of Vibration Induced Error in Turbulence Velocity Measurements from an Aircraft Wing Tip Boom," NASA Contractor Report 3571, June 1982.