

THE UNIVERSITY OF MICHIGAN
COLLEGE OF ENGINEERING
Department of Aeronautical Engineering

Quarterly Report

ATMOSPHERIC PHENOMENA AT HIGH ALTITUDES

(August 1, 1958, to October 31, 1958)

red
F. L. Bartman

V. C. Liu

Approved: L. M. Jones

UMRI Project 2387

under contract with:

DEPARTMENT OF THE ARMY
PROJECT NO. 3-17-02-001
METEOROLOGICAL BRANCH, SIGNAL CORPS PROJECT NO. 1052A
CONTRACT NO. DA-36-039-sc-64659

administered by:

THE UNIVERSITY OF MICHIGAN RESEARCH INSTITUTE ANN ARBOR

February 1959

ABSTRACT

DOVAP data reduction has been completed for SML.08 and SML.09 and preliminary data have been obtained for SML.07.

The instrumentation for the Guam rocket-grenade program arrived at Guam and the tracking station setup and checkout was started.

General investigations of the literature were started in regard to basic topics of interest for future research. Collaboration between Professor Chapman and V. C. Liu was initiated to treat the upper-atmosphere diffusive separation problem.

THE UNIVERSITY OF MICHIGAN PROJECT PERSONNEL
(Both Part-Time and Full-Time)

Allen, Harold F., Ph.D., Research Engineer
Barhydt, Peter W., Electronic Technician
Bartman, Fredrick L., M.S., Research Engineer
Billmeier, William G., Assistant in Research
Davenport, Gerald G., Photographer
Edman, Marshall W., Assistant in Research
Gleason, Kermit L., Instrument Maker
Harrison, Lillian M., Secretary
Henry, Harold F., Electronic Technician
Jew, Howard, M.A., Research Assistant
Jones, Leslie M., B.S., Project Supervisor
Kakli, G. Murtaza, B.S., Assistant in Research
Kakli, M. Sulaiman, M.S., Assistant in Research
Lay, Manchiu D. S., Assistant in Research
Liu, Vi-Cheng, Ph.D., Research Engineer
Loh, Leslie T., M.S., Research Associate
McKenna, Keith J., Assistant in Research
Millard, Wayne A., Assistant in Research
Nelson, Wilbur C., M.S.E., Prof. of Aero. Eng.
Nichols, Myron H., Ph.D., Prof. of Aero. Eng.
Pattinson, Theodore R., Electronic Technician
Rock, Allan L., B.S.E., Research Assistant
Samborski, Cassimere, Instrument Maker
Schaefer, Edward J., M.S., Research Engineer
Schumacher, Robert E., B.S., Assistant in Research
Taylor, Robert N., Assistant in Research
Thayer, Carl A., Assistant in Research
Thornton, Charles H., Assistant in Research
Titus, Paul A., B.S., Research Associate
Wenk, Norman J., Research Engineer
Wenzel, Elton A., Research Associate
Whybra, Melvin G., M.A., Technician
Wilkie, Wallace J., M.S.E., Research Engineer
Wurster, John R., Assistant in Research
Zeeb, Marvin B., Research Technician

1. INTRODUCTION

This is the fourteenth in a series of quarterly reports on Contract No. DA-36-039-sc-64659. The purposes of the contract are:

- a. to adapt the rocket-grenade experiment for use in the Arctic during the International Geophysical Year;
- b. to participate in the preparation and firing of the IGY rocket-grenade experiments;
- c. to collect and analyze upper-air samples; and
- d. to engage in the general investigation of problems relating to upper-air research.

2. FORT CHURCHILL GRENADE EXPERIMENTS

The Fort Churchill DOVAP data reduction was approximately 80% complete as of the end of this work period. The status of the work on each rocket-grenade experiment is summarized below.

<u>Complete</u>	<u>Preliminary Data Available</u>	<u>Spin Corrections Being Made</u>
SML.01	SML.05	SM2.06
SML.02	SML.07	
SML.03	SM2.10	
SML.04		
SML.08		
SML.09		

The recently completed data will not be tabulated in this report, as was our practice previously. Instead, the data will appear in a technical report describing all the details of the Fort Churchill data reduction. This report has been begun.

3. THE GUAM PROGRAM

The construction and test of the DOVAP and ballistic camera equipment for the Guam program were described completely in the previous report. The gear was shipped from Ann Arbor in July and arrived at Guam during the first week in October. University of Michigan personnel arrived at Guam on October 7. The first rocket was fired on November 3. The effort of the last three weeks of October was expended on setting up the tracking station and will be described, for the sake of continuity, in the next report which will include a description of the entire operation. During the period that the equipment was in transit, final arrangements were made with the Signal Corps for the combined operation.

4. GENERAL INVESTIGATIONS

Several general investigations of the literature have been made in regard to possible future research. Topics investigated include:

1. Cross sections for ionization of gases by electrons.
2. The shielding of a photo-multiplier tube from solar X-ray, ultra-violet, and stray electron radiation.
3. The counting efficiency for random events of a counter with a given dead time.
4. Photo-electric current from a tungsten collector due to solar X-ray, ultra-violet, and stray electron radiation.
5. Photo-electron emission from a surface because of ion bombardment.

5. GEOPHYSICAL RESEARCH

During the period, collaboration between Professor S. Chapman and V. C. Liu was initiated to treat the diffusive separation problem of the upper atmosphere.

Based on the assumption of turbulent atmosphere, earlier researchers predicted that significant diffusive separation of the atmosphere is unlikely to persist in the region below 100 km. This conclusion does not, however, agree with the experimental results of upper-air sampling analyses made both by the IGY research teams of the U.S.S.R. and of the U.S.A. This disagreement could be the result of, among other things, experimental errors. On the other hand,

it is felt that the present theory of atmospheric diffusion also may not have been well-founded. For instance, the current concept concerning the status of turbulence of the upper atmosphere needs further clarification and re-evaluation in view of the new upper-wind data from recent grenade experiments.

6. LABORATORIES VISITED

U.S. Army Signal Research and Development Laboratories

University of Moscow (for Fifth General Assembly of CSAGI)

University College of London (to consult with British upper air researchers)

Municipal University of Amsterdam (for Ninth Annual Congress of the International Astronautical Federation)

National Aeronautics and Space Agency

7. ACKNOWLEDGMENT

We are indebted to the Meteorological Branch of the U.S. Army Signal Research and Development Laboratories for continued collaboration and support.

UNIVERSITY OF MICHIGAN



3 9015 02229 0020