TROPICAL WIND, ENERGETICS, REFERENCE LEVEL EXPERIMENT (TWERLE)

Status Report
For Period Ending 30 September 1971

The major activity during this time period has been the preparation for the Ascension Island balloon flights. A status and summary of this preparation is as follows:

Balloon Launch Vehicle

A prototype launch vehicle was built, and after testing the vehicle was painted and disassembled for shipment. It is now on Ascension Island waiting to be reassembled.

Launch Sleeve

A polyethylene balloon was successfully released from a launch sleeve during the test of the launch vehicle. Prior to this a launch sleeve had been tested in the laboratory, but the rip strip which should have released the balloon failed to operate properly. As a result of this test the rip strip was redesigned.

Balloon Fabrication

Thirty 150 mb balloons and ten 200 mb balloons have been built and tested by the balloon manufacturers. Twenty 150 mb balloons and ten 200 mb balloons have been shipped to Ascension Island. The balloon order was split between two manufacturers. The balloons built by the first manufacturer were excellent. The ones built by the second manufacturer had many defects, and in general were of poor quality.

Cutdown System

The NCAR magnetic cutdown system has been improved and adapted for the Ascension flights. The major improvements have been the development of an electronic time delay and a hot resistor cutter. The hot resistor melts a plastic line to terminate the flight. A GHOST package/cutdown combination was flown from Christchurch in September. The cutdown was set to operate at .4 gauss south. The GHOST package was tracked for four days while south of .4 gauss. On the fifth day its trajectory would have

crossed the .4 gauss line. Since the fourth day, it has not been heard by any of the tracking stations.

Thirty-five cutdowns have been manufactured and are ready for shipment to Ascension.

GHOST Packages

Forty-nine GHOST packages have been built. Forty-five are instrumented to measure sun angle for balloon tracking. The other four will be used for making special measurements.

COS/MOS GHOST

COS/MOS GHOST units are GHOST packages that use COS/MOS logic in generating their Morse code identifier. Ten of these units which are battery powered, have been built. Six of them will be used for measuring day/night gas temperature for the purpose of comparing capped and uncapped balloon performance. The remaining four are for other temperature measurements, and for spares.

Digi-GHOST

The Digi-GHOST system transmits digitally encoded data as a Morse code word. It is a four-channel system. One channel is for radio altimeter, and the other three channels can measure either voltage or a resistance. Digi-GHOST is designed to simulate the performance of the TWERLE data encoder, and will be used as a telemetry system for future test flights of sensors for the TWERLE program. One unit is now built and under test, and six more will be started soon. Four of these units will be flown from Ascension.

Radio Altimeter

Eight radio altimeters have been built, and four of these will be flown from Ascension. These altimeters are a new lightweight design. A lightweight antenna has also been developed which uses flexible phosphor bronze strips as the antenna elements. An experimental thermal enclosure for the radio altimeter has been built and tested. This enclosure incorporates an aluminum foil layer for providing a more uniform thermal

environment.

Temperature Experiments

Seven conical shaped enclosures are being designed and built. These enclosures will be flown from Ascension as an experiment to determine if there is a practical way to control package temperature by locking to the upwelling radiation.

Ground Receiving Equipment for Radio Altimeter

Equipment is being assembled that will directly receive the RF pulse-train from the radio altimeter. This equipment is capable of making a radio altimeter measurement independent of the Digi-GHOST telemetry system.

Simulated Antenna

Six conical structures have been built that simulate the shape of a spiral helix antenna. These structures will be flown from Ascension to evaluate the deployment of a collapsible plastic antenna. Temperature measurements will be made inside two of the cones.

Four meetings have been held during this period. Two of the meetings were TWERLE Team meetings. Attached to this status report is a copy of the minutes of the TWERLE Team meetings. Two technical meetings were also held, and a brief outline of the content of these meetings follows:

Ascension Flight Coordination Meeting

This meeting was held on 20 September at Madison, Wisconsin. John Kruse, Ernest Lichfield, Chuck Blair and Bob Oehlkers were present. The purpose of the meeting was to finalize plans for the Ascension Island flight program. As a result of this meeting, it was agreed to include the following experiments in the balloon flight program:

a) The temperature will be measured inside three conical structures to test a scheme for controlling package temperature.
b) The temperature will be measured inside two dummy radio altimeter packages, one white and one black, to determine the range of expected package temperature.

c) Four radio altimeter flights will be flown using Digi-GHOST electronics. Radio altimeter temperature measurements will be made on the four flights.

NASA Seminar

A seminar was held at Goddard Space Flight Center of 21 September. The seminar was conducted and planned by Dr. Rochelle and Al Arndt of NASA. Experts were brought in to make presentations and answer questions on various TWERLE-related topics. A brief synopsis of the topics covered is as follows:

a) Stable oscillator design: information on stable oscillator design was presented by Al Arndt, Ken Farber, Dave Heppler, and Dr. Rochelle. Considerable useful information was obtained and progress was made toward defining a frequency stability measurement technique.

b) Solar power supply: Rick Opensheim was the expert called in to assist on the topic of solar power supply. He evaluated the proposed TWERLE solar panel design and made several useful suggestions concerning techniques for connecting cells, sources for obtaining cells, coatings and types of cells that are available.

c) Thermal design of balloon flight packages: Dr. Milt Schach, head of the thermal physics branch at GSFC, described the way the French increased the nighttime temperature of their battery pack. He also described a way to make experimental measurements to determine the effect of convection on the balloon package.

d) Balloon platform antenna: Dr. Ed Wolfe of NASA made a presentation on balloon platform antennas. His presentation convinced us that the most practical antenna design is the spiral helix. This antenna has the best radiation pattern of all the antennas discussed. In addition, it shows promise of being a lightweight antenna that can be reproduced cheaply.

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Attachments (3) 4 & 6 Aug. & 7 Sept. minutes [illegible] TWERLE Expmt. Team.