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SUMMARY OF AIRPLANE ELECTRIC FIELD MEASUREMENTS AS PART OF IONO--ETC(U)
MAR 79 R MARKSON N00014-78-C-0500
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Constant altitude measurements of the vertical electric field were made from an aircraft at about 10 km over periods of several hours in the vicinity of balloons drifting at constant altitudes making similar measurements at altitudes near 25 km. Comparison of the aircraft and balloon records will be used to verify the theory of mapping ionospheric electric fields downward into the atmosphere.

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16 March 1979

CONTRACT No. N00014-78-C-0500

Mr. Walter Martin
Atmospheric Science Program (465)
Office of Naval Research
Arlington, Virginia 22217

Dear Mr. Martin,

This letter constitutes my final report under the above contract. During August 1978 we participated in a joint measuring program with the balloon group from Berkeley led by Forrest Mozer at Thompson, Canada. We had two flight crews and conducted as many flights as were possible allowing for the rainey weather. The flights were made to stay under the balloons as much as possible. Most of our data looked good and they were given to Robert Holzworth and the Berkeley group for comparison with their balloon data. At this time the final comparison has not been made because the balloon data are awaiting additional reduction; the aircraft data have been reduced. We will not know the central issue of the experiment which involves comparison of simultaneous records at various altitudes until all the data can be compared. It appears that this will be done in the near future.

The above experiment is unique in being the first time that simultaneous measurements have been made at two balloon altitudes as well as lower in the atmosphere at an aircraft altitude (generally around 9 to 10 km). This will allow mapping of the fields into the troposphere for the first time. Because there was considerable cloudiness during the time of the experiment it is possible that noise will be a significant factor, but sufficient data were obtained that it should be possible to determine how the records correlate and the attenuation of signal strength with altitude. The experiment demonstrated the technical capability to carry out such a joint porgram and I hope we will be able to continue this research in the future.

The enclosed summary of parameters recorded and flights will serve as documentation outlining the data that were collected. Data were obtained on cassette tapes (presently in the custody of R. Holzworth at the Aerospace Corp.) as well as on an 8 channel strip chart record that we have. Plans are to issue scientific papers in the future reporting the results of this experiment.

Very truly yours,
Ralph Markson
Ralph Markson
President

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RECORDING CHANNEL ASSIGNMENTS

Channel #	Potential at Antenna ↓	e_{out} ↓
1. Top probe to aircraft potential	0 to ±200volts	= 0 to ±2volts
2. Bottom probe to aircraft potential	0 to ±200volts	= 0 to ±2volts
3. Top to bottom probe differential	0 to ±200volts	= 0 to ±2volts
4. Altitude		
5. Top probe redundent	0 to ±500volts	= 0 to ±2.5volts
6. Bottom probe redundent	0 to ±500volts	= 0 to ±2.5volts
7. Top to bottom probes differential redundent		
8. Lower relay calibrate annunciator	on = high 2.5volts	
9. Upper relay calibrate annunciator	on = high 2.5volts	
10. Not used		
11. Battery positive +6volts		
12. Battery negative -6volts		

SUMMARY OF FLIGHTS

10 August 78

0459 to 0525 UT run tape on ground before flight
0539:30 to 0824 UT restart clock and collect data during flight

Climb up to 28 kft. and level there for 10 minutes, then fly level at 24 kft. for about one hour. There was no contact with clouds during high altitude level flight. During the period 0715 to 0721 UT, whlie at 24 kft., a high voltage was applied to the airplane to put it into corona for calibration purposes. The flight was terminated when thunderstorms began moving into the Thompson area.

Min. altitude 729 ft. Temp. 24 kft. -28 C
Max. altitude 28,200 ft. 28 kft. -36 C

10 August 78 1113 to 1621 UT

Initially climb to 31.9 kft. and then level at 29 kft. for 10 minutes. Prior to reaching 31.9 kft. and descending below 29 kft. we flew in or near clouds, from 1227 to 1320 UT. After leaving the region of clouds we flew at 27 kft. , in clear skies, from 1344 to 1529 UT.

Min. altitude 729 ft. Temp. 27 kft. -32 C
Max. altitude 31,900 ft. 28 kft. -33 C
29 kft. -36 C
30 kft. -40 C
31.9 kft. -44 C

10 August 78 1937 to 0052 UT recorder input reconnected at 2000 UT
(10-11 local) at about 8 kft., may or may not have been connected . when the clock was started at 1937 UT on the ground

Climb to and maintain 26 kft. for duration of flight until descent is started at 0028 UT. During climb up fly under cirrus deck from 2025 to 2033 UT, no contact with clouds during level flight noted on chart.

Min. altitude 729 ft. or8 kft. ? Temp. 26 kft. -28 C
Max. altitude 26,200 ft.

13 August 78 0137 to 0707 UT
(12 -13 local)

Climb to and initially maintain about 29 kft. from 0245 to 0413 UT. In and out of clouds during the following time periods; 0246 to 0335, 0348 to 0403, and 0434 to 0436 UT. Then cruise at 27 kft. for remainer of flight, from 0425 to 0619 UT. About 0415 UT the skies begin to clear and the aurora is visible.

Min. altitude 729 ft. Temp. 27 kft. -30 C
Max. altitude 30,000 ft. 28 kft. -32 C
29 kft. -34 C
30 kft. -36 C

13 August 78 1646 to 1947 UT

Climb to and maintain 28 kft. during flight, from 1748 to 1843 UT. Comment on chart after reaching 28 kft. is, " clouds around and above ", and then later after clearing , " top of clouds at 26 kft. ". In clouds during the following time periods; 1802 to 1806, 1818 to 1820 and 1835 to 1838 UT. During the descent clouds and rain are encountered.

Min. altitude 729 ft. Temp. 28 kft. -26 C
Max. altitude 28,000 ft.