

THE UNIVERSITY OF MICHIGAN  
COLLEGE OF ENGINEERING  
Department of Electrical Engineering  
Space Physics Research Laboratory

Final Report

DIRECT MEASUREMENTS IN THE IONOSPHERE

Andrew F. Nagy

ORA Project 05671

under contract with:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
CONTRACT NO. NASr-54(04)  
WASHINGTON, D. C.

administered through:

OFFICE OF RESEARCH ADMINISTRATION      ANN ARBOR

October 1965

This is the final report under NASA Contract NASr-54(04)/23-05-904, and it describes the work carried out under this contract.

The contract funding provided for the construction and flight of five Langmuir probe experiments on Javelin sounding rockets from Fort Churchill, Canada. The experimental packages were completed and delivered for integration into the payload shortly after the receipt of the contract. The actual launchings of the payloads, however, did not take place until November 1964 because of the numerous delays in obtaining permission to launch "Javelin type" vehicles from Fort Churchill. This interim period was used to study data from earlier cylindrical probe experiments. This work resulted in a paper which was published in the October 1, 1965 issue of the Journal of Geophysical Research.<sup>1</sup>

The successful launchings of the two Javelins, NASA 8-19 and NASA 8-20, took place on November 5 and 6 respectively. Each rocket carried two Langmuir probe assemblies. The data reduction of the Langmuir probe experiments carried by these rockets has been completed. The electron temperature profiles obtained from the day flight (NASA 8-19) are shown in Fig. 1. The results of the radar backscatter measurements made from the Prince Albert Radar Laboratory are also shown for comparison. These temperature profiles are obtained by drawing a line through a large number of data points. Figures 2 and 3 show the standard deviation of the data points about the curve. The standard deviations of the data points from these flights are higher than is usual for the Langmuir probe technique and is basically due to the high spin rate of the

rocket. The electron temperature results from the night flight, NASA 8-20, are shown in Fig. 4. These results were presented at the 1965 Fall URSI meeting in Dartmouth.<sup>2</sup>

The fifth Langmuir probe unit, which was used as a backup for the Javelin flights, was later made a part of a University of Michigan Radio Astronomy Observatory payload. This payload was flown successfully aboard Journeyman NASA 11-03 on June 30, 1965. The reduction of the electron temperature and density information from this flight is being carried out under Grant NsG-525.

The electron temperature and density results of these three high altitude experiments will be used to study a number of geophysical problems under Grant NsG-525. At the present, the question of the nighttime heating of the ionosphere is being investigated using these results.

#### References

1. Nagy, A. F. and A. Z. Faruqui: "Ionospheric Electron Density and Body Potential Measurements by a Cylindrical Langmuir Probe," J. Geophys. Res., 70, 4847-4858, 1965.
2. Nagy, A. F.: "Direct Electron Temperature and Density Measurements in the Polar Ionosphere." Paper presented at the Fall URSI meeting, Dartmouth, October 1965.

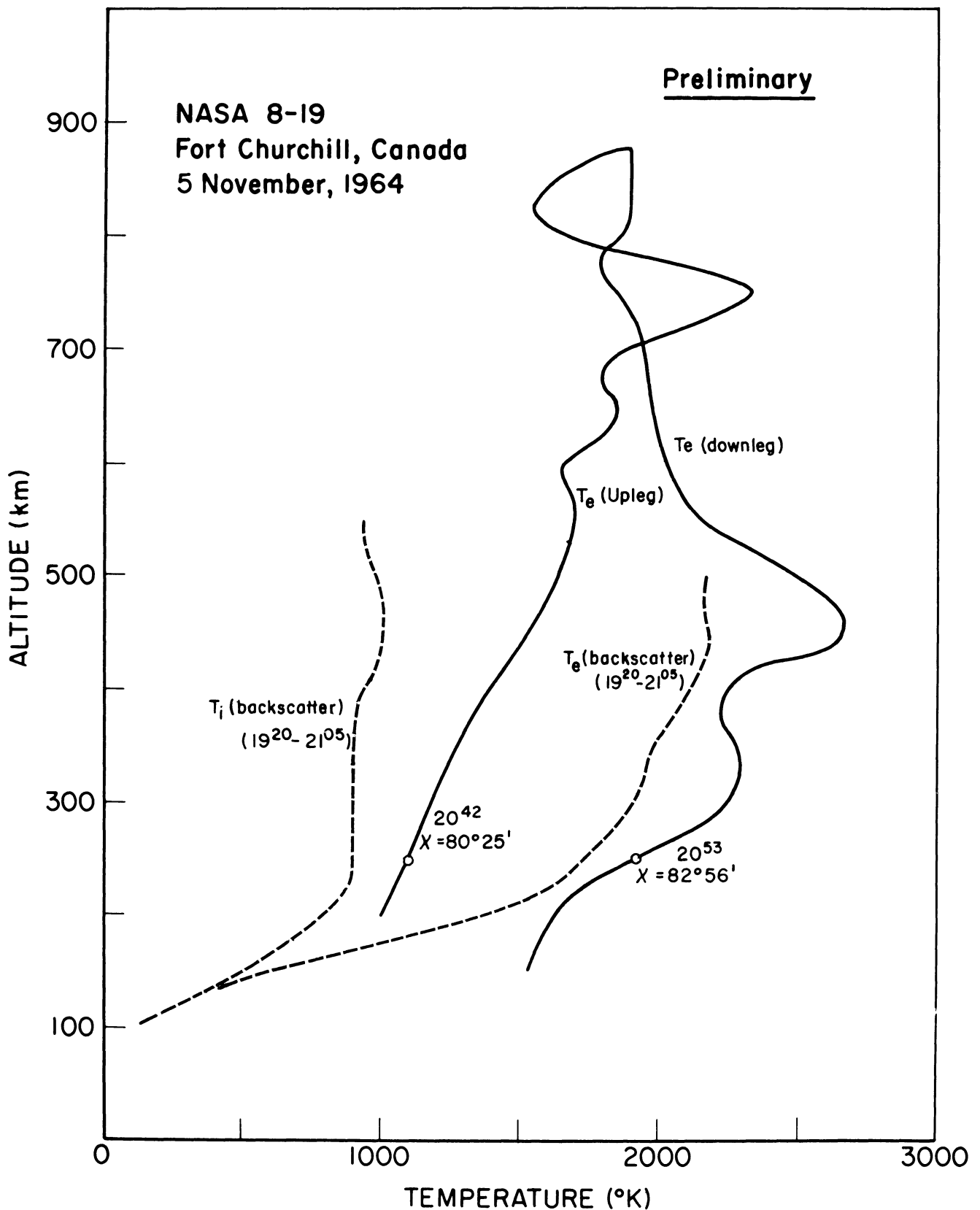


Fig. 1. The electron temperature results from the day flight, NASA 8-19. The results of the radar backscatter measurements made from the Prince Albert Radar Laboratory are also shown for comparison.

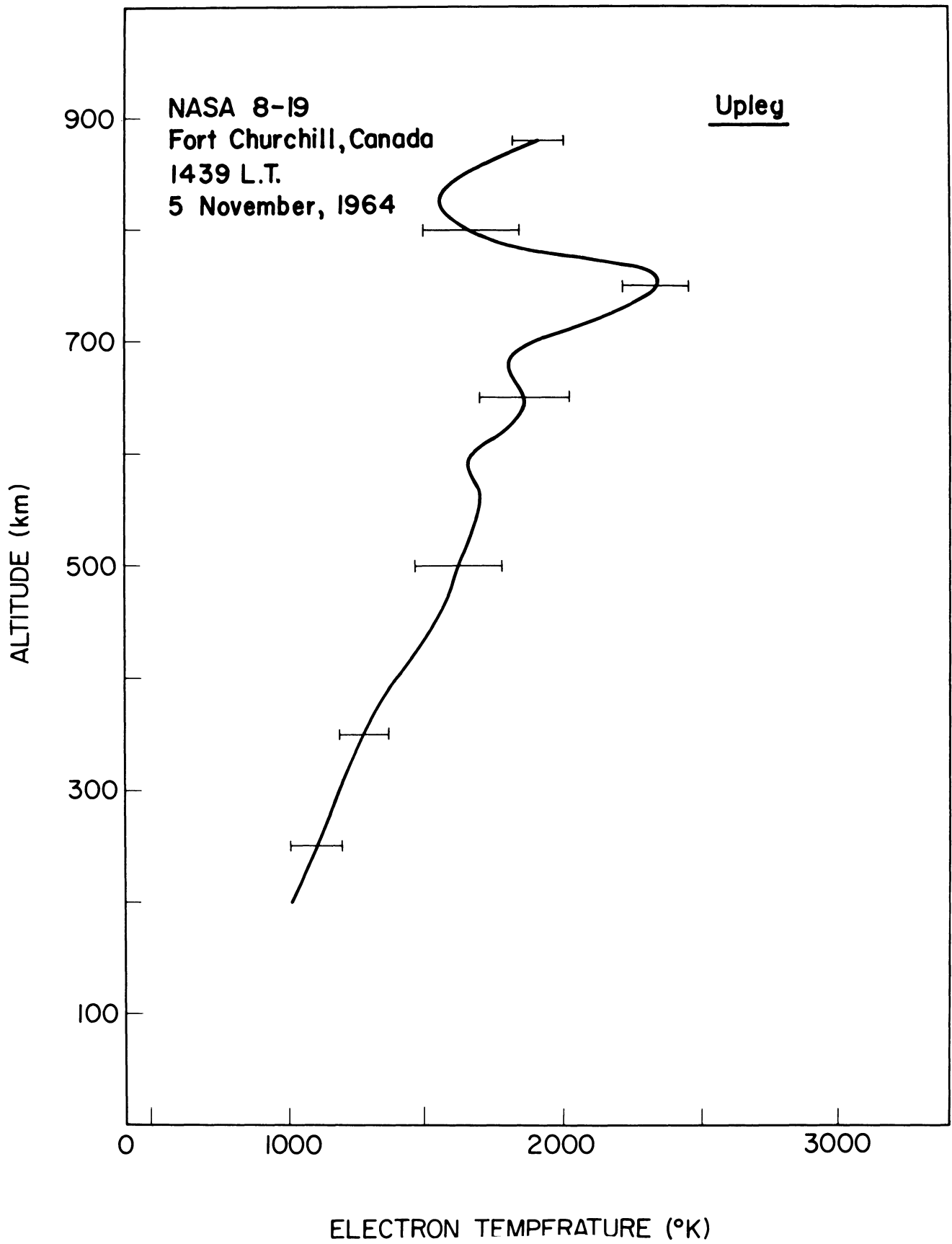


Fig. 2. The upleg electron temperature profile from NASA 8-19. The flags indicate the standard deviation of the data points.

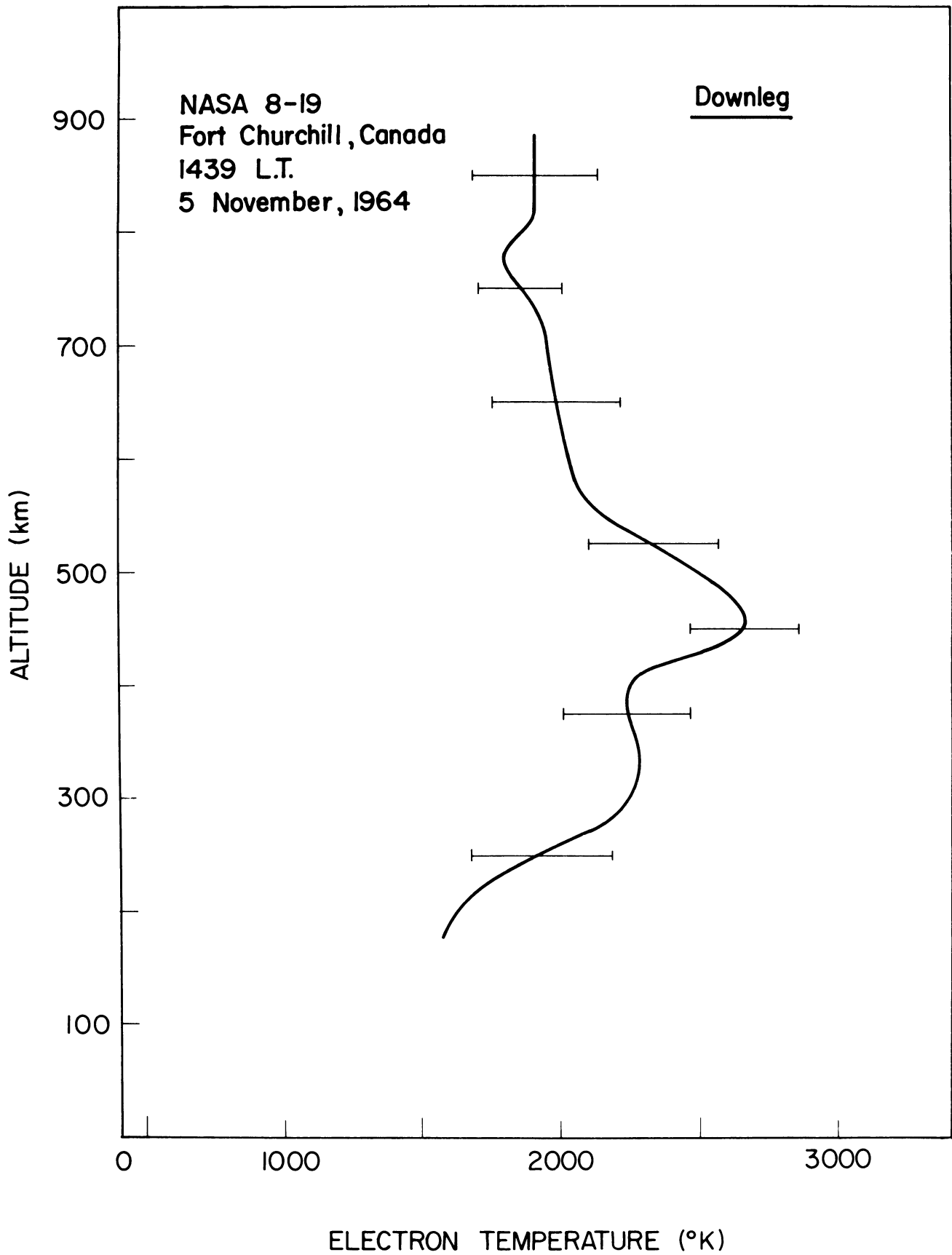


Fig. 3. The downleg electron temperature profile from NASA 8-19. The flags indicate the standard deviation of the data points.

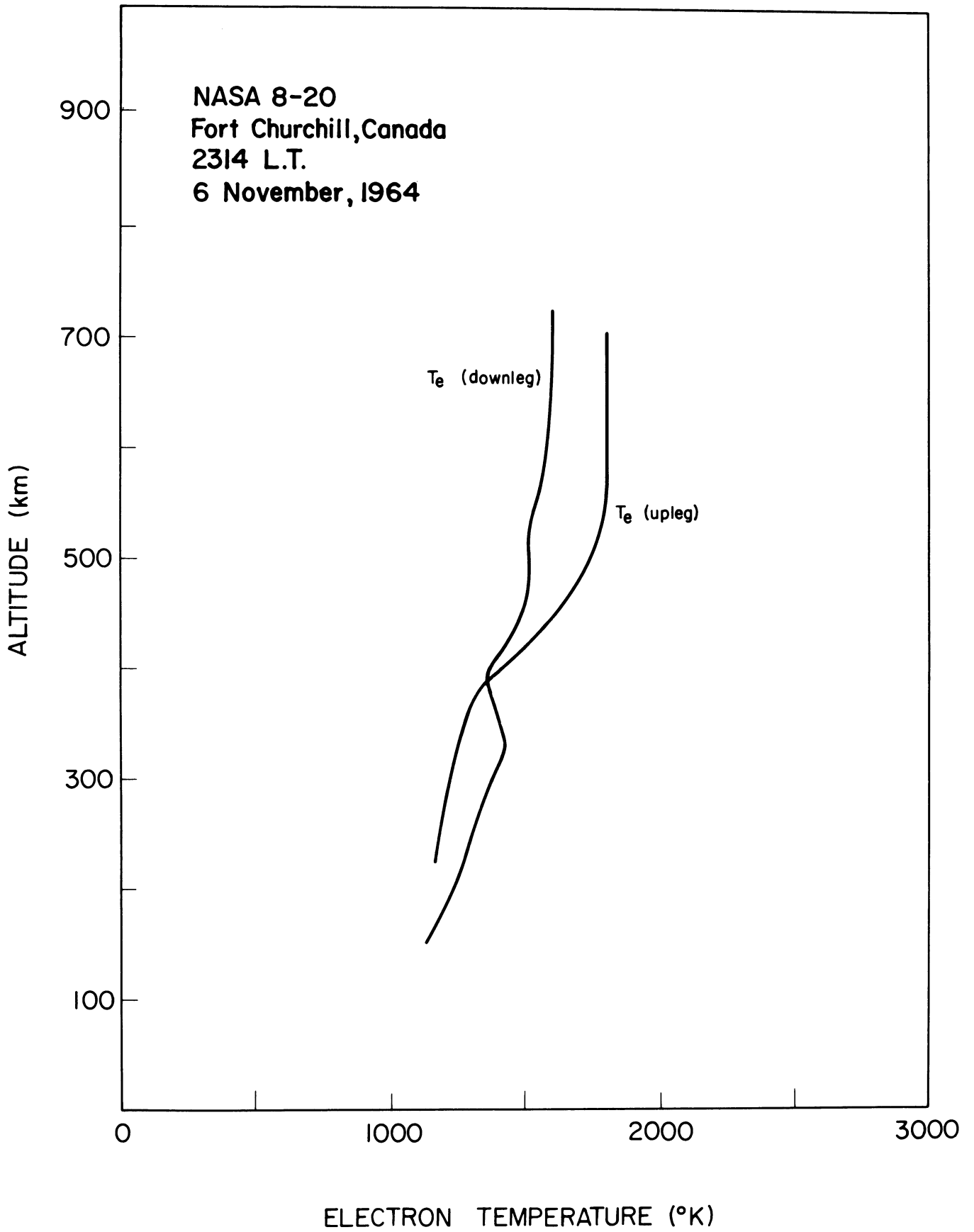


Fig. 4. The electron temperature results from the night flight, NASA 8-20.

