Quarterly Report
September 1, 1996 - December 31, 1996

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Prepared by: David P. Steele
Institute of Space and Atmospheric Studies
Department of Physics and Engineering Physics
University of Saskatchewan
116 Science Place
Saskatoon, SK, CANADA
S7N 5E2

Prepared for: Mr. Glen Rumbold
Scientific Authority
Canadian Space Agency
Space Science Program
100 Sussex Drive, Room 1039
Ottawa, ON, CANADA
K1A 0R6

Part 1:

1. The bulk of my time during this quarter was spent on preparing a proposal to the Canadian Space Agency in response to the Small Payloads Program (SPP) Announcement of Opportunity (AO). The remaining time was spent on science.

2. The project is within budget.

3. The project is free of any areas of concern in which the assistance or guidance of Canada is required.

Part 2:

1. Description of progress:

   1.1 Polar Camera repair

   Laboratory and field calibrations of the Polar Camera performed after its refurbishment this summer confirm that the increase in sensitivity which occurred in October 1995 is stable. The cause of the increase is not known, but cannot be attributed to changes in the transmission characteristics of the interference filters. These characteristics were measured with the filters in place in the Polar Camera filter wheels, and the results agree very closely with the original measurements taken 4 - 5 years ago. Slight blue shifts in center wavelengths detected in the narrow-band filters used for [OI] 557.7 nm and [OI] 630.0 nm actually improve the filters, as they bring the center wavelengths closer to the emission features they were designed to transmit.

   Inspection of a limited quantity of data from the winter's observations at Eureka indicates that high quality data are being acquired. This winter the cameras are operating without moonshades, which were used in past years to prevent image contamination by moonlight scattered within the lens. This contamination is observable, but affects a relatively small portion of each image, and is a small price to pay for the greatly expanded coverage to the south, which will enhance the possibilities for collaboration with the US National Science Foundation (NSF) Polar Cap Observatory (PCO) at Resolute Bay. This collaboration is discussed further in §1.5.

   1.2 Search for alternate funding / permanent position

   In early October I assumed responsibility for Technology Transfer liaison between ISAS and local high-technology companies, which was formerly held by Dr. Israel Oznovich. I saw this service as providing a means to establish contacts with such companies, and to explore the possibilities for permanent employment in industry in Saskatoon. The first meeting between ISAS researchers and local companies has been

delayed until February 1997 by the busy schedule of the University's Associate Vice-President for Research, who is to convene the meeting.

During the preparation of the response to the SPP AO I developed a close working relationship with Mr. Duane Sniezek, Vice-President of Research, Development and Engineering at SCI-TEC Instruments, Inc. I have asked for his help in locating permanent employment, both by networking with prospective employers and by providing a reference for any applications I make.

1.3 Patch signatures

This task has made no progress during this quarter.

1.4 Convection inference study

This task has made no progress during this quarter.

1.5 Faint arc characteristics study

During this quarter simultaneous observations were carried out at the Eureka AstrO Laboratory and at the NSF PCO during the period Dec. 3-10, 1996 as part of a wider campaign to observe polar cap patches. In addition to the Polar Camera, U of Sask. TV ASC and meridian photometer, UWO CADI, and U of Tokyo magnetometer at Eureka, a similar all-sky imager was operated at the PCO together with a frequency-agile coherent radar and another UWO CADI. Good weather allowed observations from both sites of a number of polar cap auroral arcs. The plan is to carry out optical tomography on simultaneous well-characterized images of a common emitting volume of a polar cap arc, to determine the two-dimensional 630.0 nm emission profile in the arc. This will be compared with ionospheric density profiles obtained from the CADI data, and irregularity data derived from the coherent backscatter returns. The Polar Camera acquires simultaneous images at both 630.0 nm and 557.7 nm wavelengths, and it may be possible to provide a further diagnostic of the precipitating electron energy from the red/green emission brightness ratio as measured from Eureka.

In addition to these observations, a manuscript entitled "Tomographic reconstruction of 630.0 nm emission structure for a polar cap arc" was submitted to Geophysical Research Letters by R.A. Doe, J.D. Kelly, J.L. Semeter, and D.P. Steele in early December.

1.6 Magnetospheric topology study

This task has made no progress during this quarter.

1.7 Northward IMF convection study

This task has made no progress during this quarter.

1.8 Mesopause wave spectrum study

This task has made no progress during this quarter.

2. Explanation of Variation

As explained in my previous Quarterly Report, I decided to make a major time commitment to the Small Payloads Program response effort because of the opportunities for professional growth and extended stable funding that it provided me, as well as to support the professional development of a number of graduate students in physics, engineering, and administration.

3. Trips and Conferences

I travelled to Winnipeg, MB on Thursday, November 14, 1996 with Prof. E.J. Llewellyn for a meeting with representatives of Bristol Aerospace Limited and Akjuit Aerospace Incorporated, to discuss our proposal for the Small Payloads Program and to secure their participation. We returned on Friday, November 15. The costs of this trip were not charged to my CSA contract.

4. Major Equipment

No major equipment purchases were made during this quarter. Expenses were incurred in connection with the installation and operation of the Polar Camera at Eureka.