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The Enhanced Polar Outflow Probe (e-POP) on the Canadian Multi-purpose CASSIOPE Small Satellite

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The Enhanced Polar Outflow Probe (e-POP) is a space plasma physics payload for studies of polar plasma outflow and related wave-particle processes, and is one of two payloads on the Canadian CASSIOPE small satellite, the other payload being the CASCADE communication technology demonstration payload. The e-POP mission will be Canada's first mission contribution to the International Living with a Star (ILWS) initiative. E-POP comprises three important and interconnected components: a small-satellite component to investigate atmospheric and plasma flows and related wave-particle interaction processes in the topside ionosphere, a coordinated ground-based component, and a theoretical assimilation component. Its scientific objectives are to quantify the micro-scale characteristics of plasma outflow and related micro- and meso-scale plasma processes in the polar ionosphere, explore the occurrence morphology of neutral escape in the upper atmosphere, and study the effects of auroral currents on plasma outflow and those of plasma microstructures on radio propagation. The e-POP science instrument payload will carry a suite of 8 scientific instruments, including imaging plasma and neutral-particle sensors, magnetometers, radio-wave receivers, dual-frequency GPS receivers, CCD cameras, and a beacon transmitter. The imaging plasma sensors will measure particle distributions and the magnetometers will measure field-aligned currents on the time scale of 10-ms and spatial scale of ~100 m. The CCD cameras will perform auroral imaging on the time scale of 100-ms. The radio-wave and GPS receivers will perform near real-time tomographic studies of the ionosphere in conjunction with ground-based radars, and the beacon transmitter in conjunction with ground receiving stations. The Canadian CASSIOPE small satellite will be launched in 2007 and placed in a low-altitude, elliptical polar orbit (80° inclination, 300 km perigee, and 1500 km apogee. The e-POP will utilize the Ka-band telemetry downlink of the companion CASCADE payload onboard CASSIOPE to downlink its large volume of high-resolution science data (up to 15 GBytes/day planned) at a maximum rate of 350 Mbit/s.

Keywords: Small satellite, ionosphere-magnetosphere interactions, radio waves