

## **Hyperspectral Initiative**

In 1997 the Canadian Space Agency (CSA) began a hyperspectral Earth Observation (EO) initiative, in response to the demonstrated value of airborne hyperspectral data for forestry, agriculture, environmental assessment and other vital applications, coupled with the then recent general availability of powerful large format two-dimensional CCD and Mercury Cadmium Telluride (MCT) detectors which made hyperspectral technically and economically feasible for satellite EO. Northeast supported CSA from 1999 through 2005. (For a general description of hyperspectral EO see e.g. <http://www.microimages.com/documentation/Tutorials/hyprspect.pdf> ).

CSA's initiative was led by Dr Allan Hollinger and supported by environmental scientists from several disciplines particularly Dr Karl Staenz then head of the hyperspectral section of NRCan's Canada Centre for Remote Sensing (CCRS, currently at U. Lethbridge) and Dr David Goodenough, Chief Scientist for NRCan's Pacific Forestry Institute.

Northeast provided independent technical analyses, cost estimates, schedules, innovative ideas, implementation models and support to the Users and Science Team. Northeast (primarily Mr Buckingham) wrote the initial Terms-of-Reference (ToR) technical document in 2002. Two other senior consultants, Dr Ed Langham and Mr Peter Oswald, worked through Northeast, providing expert support.

CSA let contracts to potential Canadian industry companies including MDA and EMS (subsequently acquired by Com Dev). Mr Buckingham was in contact with these companies, and also with organizations who potentially might partner in a cooperative mission, including the USN Naval Research Lab, NASA-JPL, the Italian Space Agency and European and Australian commercial organizations.

Several implementation approaches were examined. Upon Mr Buckingham's recommendation and in consultation with CSA's Houston office, one option was an inexpensive "pathfinder" version on ISS. Mr Buckingham pursued this on behalf of the

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CSA, interfacing with NASA Marshall and JSC. Unfortunately it didn't materialize because of delayed delivery of the EXPRESS pallet to NASA (unrelated to CSA's work). Another option was a dedicated small satellite for what become known as the Hyperspectral Earth Observation Observer (HERO) project. Northeast again provided technical and implementation support to the CSA. But this option never progressed to Phase B because of CSA's fiscal constraints.

Hyperspectral imaging from space is a valuable new EO tool. It has been used from aircraft for two decades for a variety of applications. For an overview of (then current) hyperspectral imaging from space see, *R. Buckingham and K. Staenz, "Review of current and planned civilian space hyperspectral sensors for EO", Can. J. of Remote Sensing, Vol.34, Suppl.1 pp S187-S197, 2008.*

N.B.: Northeast wasn't involved in either of the following missions, but it's interesting that a hyperspectral imager is now operating from ISS , see

[http://cioss.coas.oregonstate.edu/CIOSS/Documents/HICO\\_Overview\\_Presentation.pdf](http://cioss.coas.oregonstate.edu/CIOSS/Documents/HICO_Overview_Presentation.pdf)

.. also Germany is developing the EnMap mission scheduled for launch circa 2016, see

[http://www.enmap.org/index.php?option=com\\_content&task=view&id=43&Itemid=83](http://www.enmap.org/index.php?option=com_content&task=view&id=43&Itemid=83) .