Dr. Neil de Villiers points out some features on a mosaic thermal map of Lake Ontario produced by the scanner.

Monsieur Neil de Villiers et la carte thermique du Lac Ontario, obtenue par le dispositif de détection à distance.

sulphur deposits in the Wood Buffalo Park area of Northern Alberta. Sulphur has been known to burn underground and the ability to detect such hot deposits was suggested as a possibility by a United States firm. The Wood Buffalo Park area will be studied this summer. Plans for the coming year also include a pollution study of lakes around Kenora, Ont., and further tests with the Ontario Lands and Forests Department in animal census taking. This will be done by counting deer near Canonto, 50 miles west of Ottawa.

Installed with the infrared scanner aboard the North Star is an array of three cameras and a radiometer. The radiometer provides precise information on ground temperature while the cameras – utilizing a variety of lenses, filters and film combinations – provide pictures taken at different wavelengths for better photo interpretation.

The infrared scanner makes use of the fact that everything above absolute zero in temperature radiates electromagnetic energy at specific and distinctive wavelengths. The aerial camera records in the .4 to .7 micron range of the electromagnetic spectrum, the same part to which the human eye is sensitive. Infrared film extends the range to .9 microns, the near infrared range. The infrared scanner operates in the 3-5 micron and 8-14 micron bands, the thermal infrared regions. In these regions, objects at normal temperature are radiating strongly. These wave bands are particularly good for surveying terrain, and in addition, allow sensing operations to be conducted at night as well as in the daylight.

Ordinary photographic film is not sensitive to wavelengths in the thermal infrared region. It would be possible to coat a film with a material sensitive to such wavelengths but the problem would arise of protecting the film from the thermal energy being emitted by the camera. Just as the conventional camera must be a light-tight box to keep light-sensitive film from fogging, so a thermal infrared camera would have to have a heat-tight box to keep heat-sensitive film from fogging. The box in effect would have to be cooled to near absolute zero, a practical impossibility for a large airborne sensing device.

Thus a "camera" that translates thermal energy directly onto film is out of the question. However, it is possible to obtain photographic images of thermal sources indirectly, and that is what this scanner does. The device uses a detector that consists of a coating of an infrared sensitive material on the end of an electrical conductor. This material occupies a pinhead-sized area and it is feasible to cool this small detector with liquid nitrogen or even, if need be, with liquid helium.

A rotating mirror focuses energy emanating from the terrain being scanned onto the detector. At any instant the mirror views only a small segment of terrain. Infrared photons striking the detector generate an electrical signal that varies in intensity according to the amount of thermal energy coming from the part of the terrain then being viewed by the mirror. This signal modulates a glow tube the output of which is focused onto a photographic film. The spot from the glow tube is swept across the film in synchronism with the rotating mirror which is scanning the terrain below the aircraft. The film is transported at a velocity proportional to the aircraft velocity and hence an image is constructed on the film which is, in effect, a thermal map of the ground.