REMOTE SENSING ISSUES AT THE SUPREME COURT OF CANADA

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Introduction

In 2004, the *R.* v. *Tessling* [1] case was heard at the Supreme Court of Canada. This case involved an important *Charter of Rights* [2] issue regarding unreasonable search and seizure. While the Charter is frequently discussed at the Supreme Court, other issues in this case were quite new. The search in question was a result of a type of airborne remote sensing known as forward looking infrared (FLIR) thermal scanning. This technology is increasingly used by law enforcement to detect heat loss from buildings, a common indicator of marijuana grow-operations in homes. The Supreme Court decided that FLIR use for police surveillance is acceptable in Canada. This article will discuss FLIR technology, law enforcement applications, and how the law is responding to developments in remote sensing technology.

Remote Sensing Technology and FLIRs

To review the definition and some basic principles of remote sensing:

- "Remote sensing is the science (and to some extent, art) of acquiring information about the Earth's surface without actually being in contact with it. This is done by sensing and recording reflected or emitted energy and processing, analyzing, and applying that information." [3]
- All objects with temperatures above absolute zero naturally emit a broad range of electromagnetic energy. This energy is a function of the surface temperature of the object.
- The electromagnetic spectrum comprises all energy wavelengths, ranging from the shortest bands (cosmic rays, x-rays), the mid-range (ultra-violet, visible, infrared), to the longest (television and radio). Wavelengths are measured in micrometres (μm).

Most airborne electronic remote sensors acquire data using scanning systems, which employ sensors with an instantaneous field of view (IFOV) that sweep over the area of interest to build up and produce a two-dimensional image. The most common type of scanning systems are multispectral, which sense and record energy in many bands over a wide range of the electromagnetic spectrum, from about .3 to 15 μm.

Airborne forward looking infrared systems use a specific type of multispectral sensor called a thermal scanner. These scanners sense only in the thermal infrared portion of the electromagnetic spectrum, detecting infrared radiation (IR) or heat emissions. Thermal scanners measure relative radiant surface temperatures rather than actual temperatures. The current temperature resolution for thermal scanners is about 0.1 degrees C. While most airborne multispectral scanners view the scene of interest directly below the sensor, FLIR systems produce oblique image views ahead of the aircraft.

A thermal scanner system works in the following way: the system's scanner mirror receives IR radiation from the ground or object of interest. The radiation is focused on an array of thermal detectors which convert the incoming energy to an electronic signal. This signal is displayed on a monitor and recorded digitally to produce a thermal image. The standard convention is to have areas of higher temperature displayed as lighter toned on the image, while cooler areas appear darker. The resulting image provides a heat profile, which depicts areas of heat loss from buildings and other targets.

FLIR systems became commercially available in the late 1960s. Modern systems are lightweight and portable, and can be mounted on ground-based platforms as well as fixed wing aircraft and helicopters. They are used extensively by the

military and in law enforcement activities, fire detection, and electrical utility maintenance. [4]

Law Enforcement Applications

Over the past decade, law enforcement organizations in Canada have increasingly employed FLIR systems for thermal imaging to detect illegal indoor marijuana grow-operations. This is due to the huge growth in recent years of marijuana grow-ops, many exporting to the United States. Law enforcement uses this technology to identify areas of unusually high heat loss from buildings, a common indicator of marijuana cultivation. Heat lamps are used for indoor plant growth, and excess heat produced must be vented to the outside of the building. In these police operations, FLIR thermal images are usually used to corroborate other evidence, such as tips from informants. [5]

Law enforcement organizations also use FLIRs for other activities such as perimeter surveillance, vehicle pursuits, search and rescue, structure profiles, analysis of disturbed surfaces, and locations of hidden compartments and grave sites.

If many urban police forces in Canada and the United States are now using FLIR systems and other high-tech surveillance tools, how did they acquire this technology? In the United States, several factors combined to produce a steady stream of new technology for use by urban law enforcement -- tools originally developed by the US military. These included joint programs such as drug war operations carried out by the military and urban police, federal programs for purchase of new technology, and the development of police paramilitary "swat" teams. [6] Now produced and distributed commercially, one can assume that these high-tech tools were introduced into Canada at about the same time.

The transfer of remote sensing technology from the U.S. government and military to law enforcement appears to be ongoing. The National Aeronautics and Space Administration (NASA) in particular touts its technology as assisting with crime scene investigations. NASA recently developed an image enhancing system called Video Image Stabilization and Registration (VISAR). This system has been made available to law enforcement through NASA's technology transfer program. [7] In another example, NASA and the National Institute of Justice have joined forces to develop and implement a "teleforensics" feasibility demonstration project using portable x-ray fluorescence systems. [8]

Remote Sensing Legal Issues

Since law enforcement began using FLIRs in the 1990s, many legal cases have been launched in Canada and the United States concerning issues of invasion of privacy and unreasonable search. In 2003, there were about 500 cases at various court levels in Canada involving challenges to FLIR use. [9] Other remote sensing technology of increasing concern is very high resolution satellite imagery, with its potential "snooping" power. Unfortunately there is a lack of law or policy with respect to these legal aspects of remote sensing technology. [10]

There are some existing international and national regulations relating to remote sensing. The United Nations resolution *Principles Relating to Remote Sensing of the Earth from Space* [11] was adopted in 1986. This agreement seeks to promote data sharing and international cooperation. In December 2004, Canada introduced a new statute, the *Remote Sensing Space Systems Act* [12]. If passed, this act will allow the government to license the operation of remote sensing satellite systems and to regulate the distribution of data and products produced by these systems. However, these regulations don't address issues of privacy or legality of searches. In Canada, the *Charter of Rights* section 8 governs unreasonable search and seizure, while privacy issues are still mainly an area of common law.

Legal issues have been addressed in some professional associations' codes of ethics. For example, the *Code of Ethics* of the American Society for Photogrammetry and Remote Sensing stipulates that members should "Recognize the proprietary, privacy, legal, and ethical interest and rights of others." [13]

The *Tessling* Case at the Supreme Court of Canada

The *R.* v. *Tessling* case began at the Ontario Superior Court in 1999, went to the Ontario Court

of Appeal in 2003 [14], and reached the Supreme Court of Canada in 2004. The facts were similar to many other cases before the courts on this issue. The RCMP received a tip from informants that certain persons were producing and selling marijuana from their home. Visual surveillance of the building and a check of electricity records did not reveal any indication of a grow operation. The RCMP then conducted a thermal heat profile of the suspect's home using airborne FLIR technology. The FLIR image indicated high amounts of heat escaping from the roof of the building. Based on this image and the informants' tip, the police obtained a search warrant and later found a marijuana grow-op in the home. Tessling was charged with a variety of offences. He argued in his defense that the FLIR overflight was a violation of his Charter s. 8 rights, making the search of his home illegal.

His conviction at the Superior Court was overturned by the Court of Appeal and subsequently restored in a unanimous decision at the Supreme Court of Canada. The two appeal decisions interpreted the technology issue very differently. The Court of Appeal found that the use of FLIR technology revealed information about private activities carried on inside the home, and therefore constituted an unreasonable search. This decision followed the same reasoning as that in *Kyllo* v. *United States* [15], a 2001 U.S. Supreme Court case on the same issue, where warrantless use of FLIR technology was found to be an unlawful search. The U.S. court's ruling was intended to encompass cruder existing technology as well as more sophisticated technology in development.

The Supreme Court of Canada in *Tessling* found that the FLIR imaging did not constitute a search, but was merely external surveillance. The court said that FLIR technology in use in 1999 was not sophisticated enough to detect activities going on inside the home and so was not an unreasonable search or an invasion of privacy. Technology had to be evaluated based upon its existing capability rather than its potential power.

Future Technological Developments

Leaving aside the issue of the courts' ability to decide on highly technical issues such as remote sensing, the use of forward looking infrared systems for police surveillance of homes is now legal in Canada. A significant comment from the Supreme Court in the *Tessling* case concerned the detection capacity of FLIRs and other remote sensing technology; as this improves, courts will have to reconsider the legal issues.

So how has FLIR and other remote sensing technology improved since 1999? Research in sensor technology is producing faster, more compact, lower-cost systems with higher frame rates and better resolution, and sensor suites that can work with multiple wavelengths. [16] A quick scan of FLIR producers' websites reveals that technology has likely advanced a great deal since the *Tessling* case first went to court. For example, the commercial manufacturer FLIR Systems produces a wide variety of FLIR models for various uses. [17] Raytheon, a U.S. defense and aerospace systems supplier, has produced advanced targeting FLIR pods for the U.S. military. [18]

Another significant area of remote sensing technology development is the new commercially available very high resolution satellite imaging. The use of this for surveillance and business marketing purposes is sure to create a host of new legal challenges. Remote sensing will likely soon be back in the courts, as the law tries to keep pace with advancing technology.

Notes

1. 2004 SCC 67.
2. *Canadian Charter of Rights and Freedoms*, Part I of the *Constitution Act, 1982*, being Schedule B to the *Canada Act 1982* (U.K.), 1982, c.11.
3. Natural Resources Canada, Canada Centre for Remote Sensing. "Fundamentals of Remote Sensing, s.1.1 What is Remote Sensing?" 20 July 2005. <http://www.ccrs.nrcan.gc.ca/ccrs/learn/tutorials/fundam/chapter1/chapter1_1_e.html>
4. Lillesand, Thomas M., Ralph W. Kiefer and Jonathan W. Chipman. *Remote Sensing and Image Interpretation*. 5th ed. New York: Wiley, 2004: 330-384.
5. Stang, Ron. "Thermal Cameras Violate Charter s. 8: OCA." *Law Times* 14 (March 2003): 3.
6. Nunn, Samuel. "When Superman Used X-Ray Vision, Did He Have a Search Warrant? Emerging Law Enforcement Technologies and the Transformation of Urban Space." *Journal of Urban Technology* 9

(2002): 72-76.
7. NASA, New Science. "NASA Helps Fight Crime" 20 July 2005. <http://liftoff.msfc.nasa.gov/news/2000/news-visar.asp>
8. Trombka, Jacob I., et al. "Crime Scene Investigations Using Portable Non-Destructive Space Exploration Technology." *Forensic Science International* 129 (2002): 1.
9. Stang, 3.
10. Slonecker, E. Terrence, Denice M. Shaw and Thomas M. Lillesand. "Emerging Legal and Ethical Issues in Advanced Remote Sensing Technology." *Photogrammetric Engineering & Remote Sensing* 64 (1998): 590.
11. UN GA Res., UN Doc. A/RES/41/65, (1986) 41st Session, adopted December 3, 1986.
12. Bill C-25, *An Act Governing the Operation of Remote Sensing Space Systems,* 1st Session, 38th Parliament, 2004 (Report Stage 14 June 2005).
13. American Society for Photogrammetry and Remote Sensing. "Code of Ethics, section 7" 20 July 2005. <http://www.asprs.org/membership/certification/appendix_a.html>
14. 63 O.R. (3d) 1, 168 O.A.C. 124.
15. 533 U.S. 27 (2001).
16. Petersen, Julie K. *Understanding Surveillance Technologies*. Boca Raton, Florida: CRC Press, 2001: 7-21.
17. FLIR Systems. 20 July 2005. <http://www.flir.com/imaging/> Path: Airborne Applications; Surveillance.
18. Raytheon. "AN ASQ-228 Advanced Targeting Forward-Looking Infrared (ATFLIR)". 20 July 2005. <http://www.raytheon.com/products/atflir/>

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