

# REMOTE SENSING

## WHAT IS REMOTE SENSING?

Remote sensing is the detection, monitoring and tracking of oil on the water surface, under the ice, within the ice sheet, or on top of the ice by using sensors mounted on a variety of platforms: satellites, aircraft, helicopters, autonomous underwater vehicles, etc.

## ABOUT THE PROJECT:

The Joint Industry Programme (JIP) is conducting a rigorous test programme that systematically compares the different sensors under controlled conditions, with the aim of identifying the most effective combinations of sensors that can locate oil, as well as identify oil spreading and thickness.

## Experimental Sensors

Several University-led and industry-sponsored development projects are under way to adapt new technologies to further advance detection of oil in ice. One of these programmes recently (2012) led to the development of a Frequency Modulated Continuous Wave radar designed to fly at low altitude to detect oil trapped in or under ice. Another initiative aims to use the known principles of Nuclear Magnetic Resonance to achieve a similar goal of detecting oil in ice with a specialized antenna mounted on a helicopter. JIP supports ongoing research efforts to test both of these technologies in a realistic setting, using crude oil and an artificially grown ice sheet.

## Satellite Platforms

Sensors may include high-resolution optical imagers and synthetic aperture radar. Advantages of using satellites include wide area coverage, and in the case of radar imagery, independence from cloud cover, fog or darkness. Satellite detection of spills is most efficient in water with lower ice concentrations, making this technology most useful in conditions of partial ice cover.

## Surface Systems

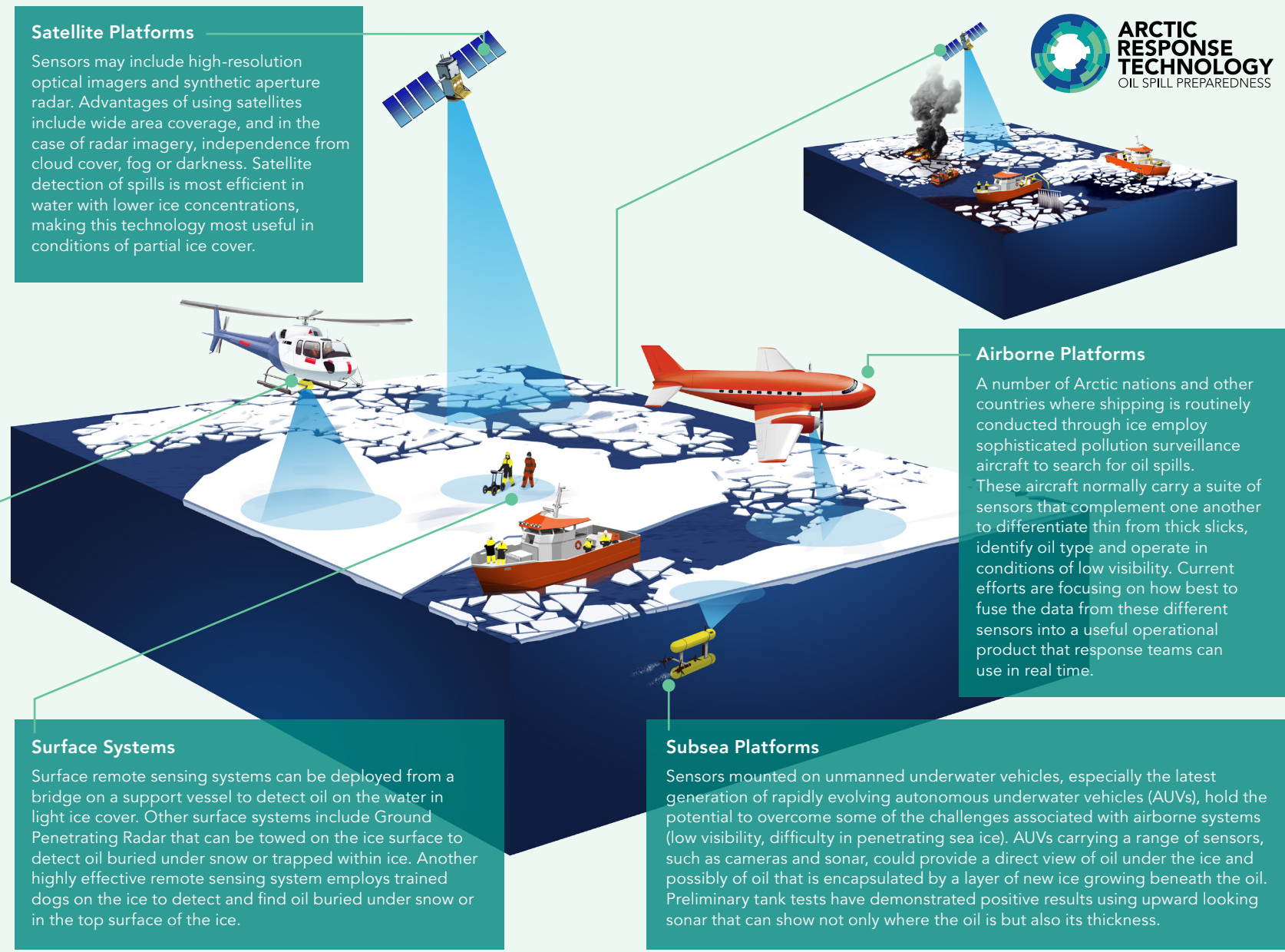
Surface remote sensing systems can be deployed from a bridge on a support vessel to detect oil on the water in light ice cover. Other surface systems include Ground Penetrating Radar that can be towed on the ice surface to detect oil buried under snow or trapped within ice. Another highly effective remote sensing system employs trained dogs on the ice to detect and find oil buried under snow or in the top surface of the ice.

## Subsea Platforms

Sensors mounted on unmanned underwater vehicles, especially the latest generation of rapidly evolving autonomous underwater vehicles (AUVs), hold the potential to overcome some of the challenges associated with airborne systems (low visibility, difficulty in penetrating sea ice). AUVs carrying a range of sensors, such as cameras and sonar, could provide a direct view of oil under the ice and possibly of oil that is encapsulated by a layer of new ice growing beneath the oil. Preliminary tank tests have demonstrated positive results using upward looking sonar that can show not only where the oil is but also its thickness.

## Airborne Platforms

A number of Arctic nations and other countries where shipping is routinely conducted through ice employ sophisticated pollution surveillance aircraft to search for oil spills. These aircraft normally carry a suite of sensors that complement one another to differentiate thin from thick slicks, identify oil type and operate in conditions of low visibility. Current efforts are focusing on how best to fuse the data from these different sensors into a useful operational product that response teams can use in real time.



## ABOUT THE JIP

To further build on existing research and improve the technologies and methodologies for Arctic oil spill response, nine oil and gas companies established the Arctic Oil Spill Response Technology Joint Industry Programme (JIP). The goal of the JIP is to advance Arctic oil spill response strategies and equipment as well as to increase understanding of potential impacts of oil on the Arctic marine environment.

The Arctic Oil Spill Response Technology JIP is sponsored by nine oil and gas companies:



<http://www.arcticresponsetechnology.org>

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