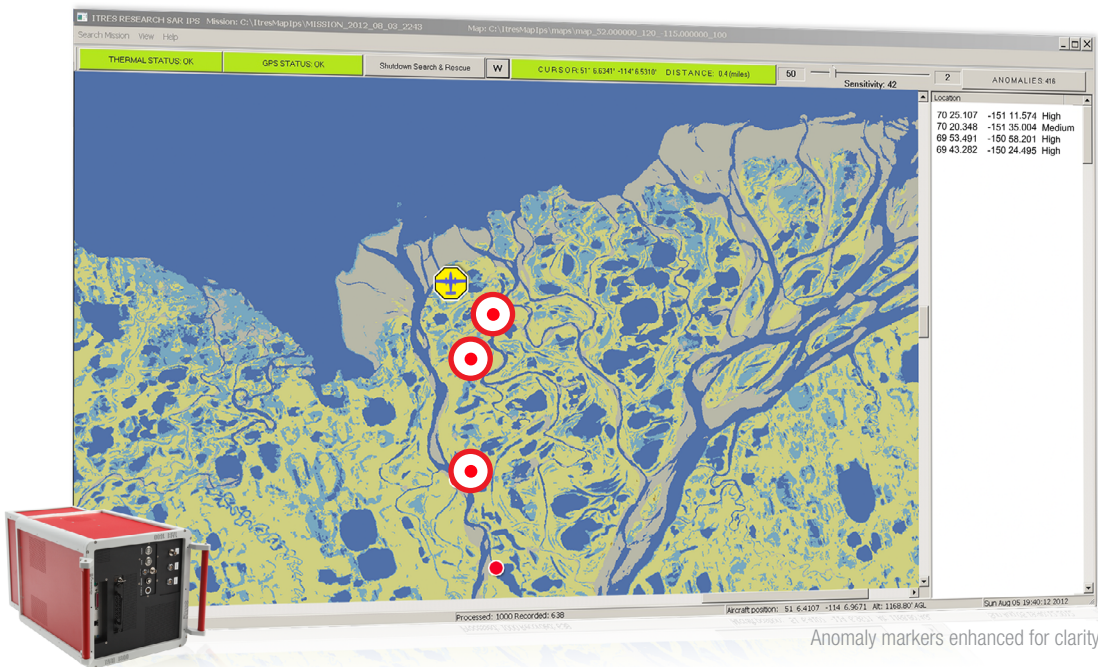Swimming Bodies & Thermal Traces, Pacific Ocean

Boat and colder thermal wake

TSR-1800: THERMAL SEARCH & RESCUE
airborne **automated** search & spotting

Coastal · Ocean · Lake · Tundra Searches

Anomaly markers enhanced for clarity

Search a wider area, faster, at high resolution:
e.g. at 20cm resolution: Cover 344km x 360m (~123km^2) per hour @ 180 knots

High temperature sensitivity

Wide imaging swath from fast-flying aircraft

Auto-detection based on heat signatures (including residual)

Low false-positive detection rate

Easy to use, provides second set of automated 'eyes"

itres
HYPERSPECTRAL & THERMAL REMOTE SENSING

TSR-1800 SNAPSHOT

Automatically detects & reports thermal anomalies / 0.05°C sensitivity / Anomaly detection alerts / On-the-fly detection sensitivity slider / Moving map display with aircraft location / Interactive geo-cursor coordinates show distance to aircraft / Detailed, customizable basemap / Real-time georeferenced, high resolution thermal thumbnails / Waterfall display of entire thermal image
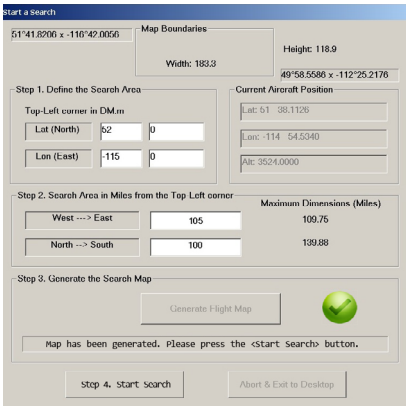
Define custom search area
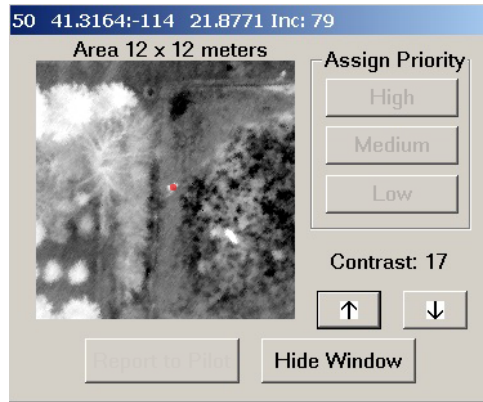
High resolution thermal thumbnails (brighter pixels=warmer temperatures, darker=cooler)

Scan lines build from the top
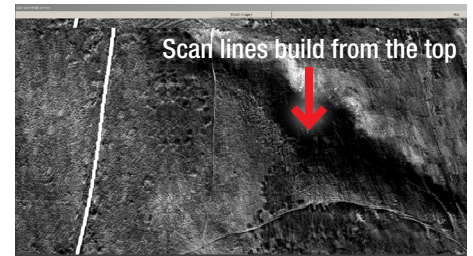
Alternatively view a waterfall display of the thermal image as the data are acquired and undergo first-order, real-time geocorrection

Health Status
(Click for Info)
Thermal camera

GPS (POS AV)

Shuts down Windows on the camera

Launches waterfall display of thermal image

GPS cursor location & distance to aircraft

Anomaly detection sensitivity slider

Anomaly list

Clicking on an anomaly's listing here or on map marker launches thermal thumbnail

Detected thermal anomalies

Aircraft location/altitude
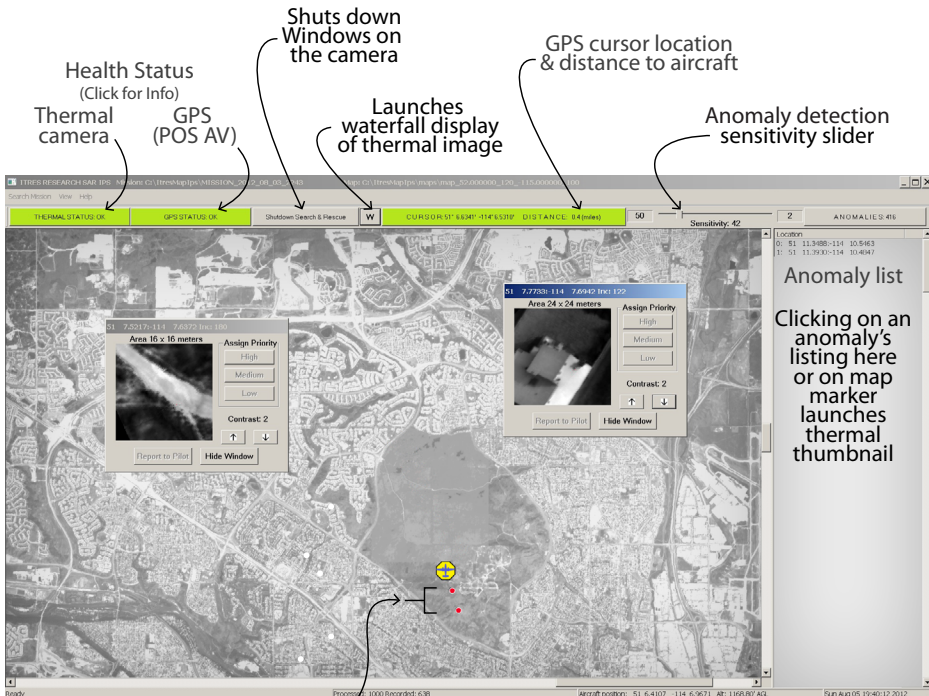
How High and How Fast?

The TSR-1800's automated thermal anomaly detection is made possible by the TABI imager's high temperature and spatial resolution capabilities. Flying low (~500m or 1627 feet above ground level) achieves a small ground footprint (20cm) for each pixel. Flying 150m or 488' AGL leads to 6cm pixels.

Searches can also be conducted at high ground speeds (170-300 knots).

The TSR-1800 automatically adjusts its search parameters every minute based on changing aircraft speeds to optimize target detection.

0.05° C detectable temperature differencess.

Wide swath coverage is provided by the imager's 1800 across-track pixels, meaning that while flying at ~1000' AGL (12cm resolution) the imaged track on the ground is ~220m (722').
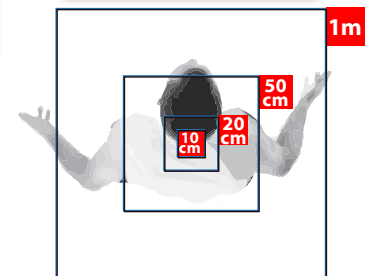
TSR-1800 FLIGHT SCENARIOS

SLOWER PLATFORM SCENARIOS (120 KNOT GROUND SPEED)

Flying Height, AGL	Imaging Swath	# Flight Lines	Time to Cover 15 x 3 km Area	Resolution
814 ft	180 m	24	2.0 hr (120 min)	10 cm
1627	360 m	12	1.0 hr (60 min)	20 cm
2441	540 m	8	0.66 hr (39 min)	30 cm

FASTER PLATFORM SCENARIOS (170 KNOT GROUND SPEED)

Flying Height, AGL	Imaging Swath	# Flight Lines	Time to Cover 15 x 3 km Area	Resolution
814 ft	180 m	24	1.5 hr (92 min)	10 cm
1627	360 m	12	0.76 hr (45 min)	20 cm
2441	540 m	8	0.30 hr (30 min)	30 cm

Assumptions: Calculations based on the following information: search area 15 km x 3 km, zig-zag flight pattern, 30% sidelap between adjacent flight lines, 1 minute turns. Overall time needed for turns will dominate total search time for short search areas flown at high resolution. Search time efficiency based on ground speed changes are more pronounced with longer search blocks. Resolutions below 10 cm possible with helicopter platform use. Faster flight speeds (200+ knots) also possible while maintaining high resolution.

Resolution vs Profile

Linear stretch

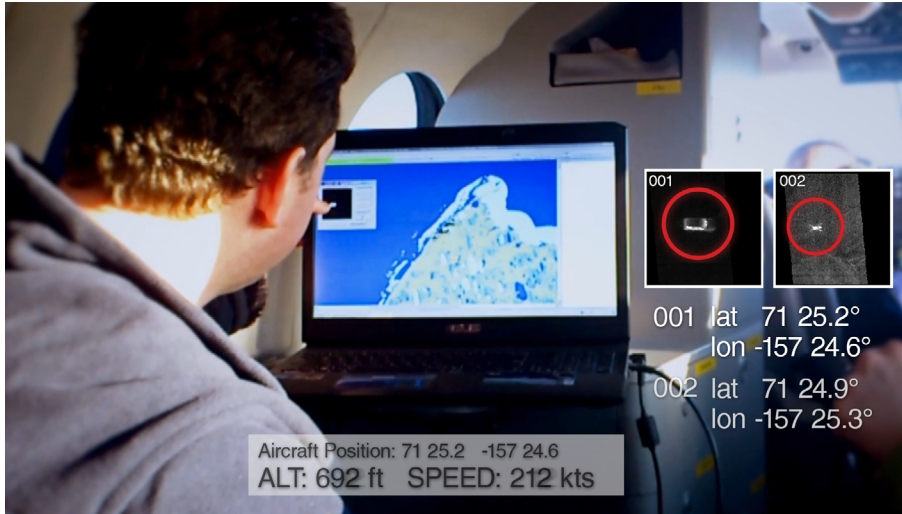2% Linear stretch

Equalization stretch
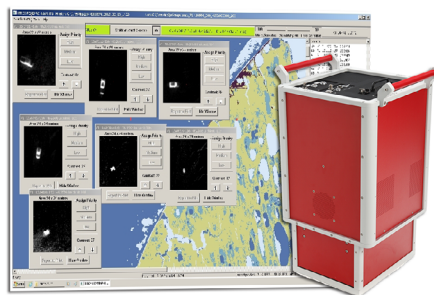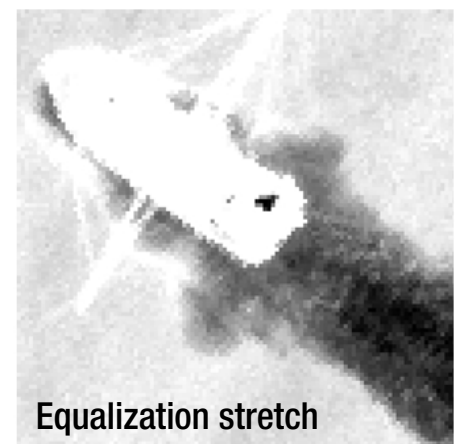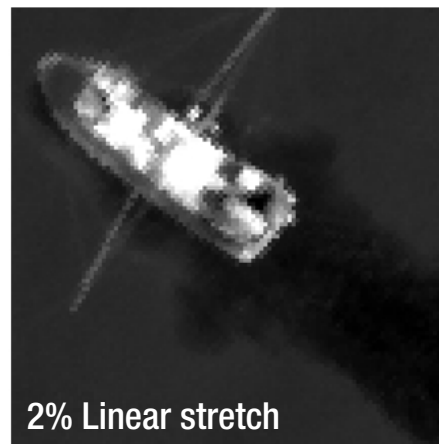
Ocean Search

Above: Illustration of temperature sensitivity range through quick on-the-fly image enhancements (scaling) to bring out unique characteristics of the detected target.

ïtres

HYPERSPECTRAL & THERMAL REMOTE SENSING

TSR-1800 TUNDRA/COASTAL SEARCH

The TSR-1800 has been designed for searches conducted over water, coastline, and tundra.

TUNDRA PROJECT DETAILS

The automated thermal detection capabilities of the TSR-1800 were demonstrated during winter flights over ocean, tundra, and urban areas near Barrow, Alaska. Persons and vehicles were deployed in known overflight locations.

Flights were conducted at multiple altitudes (688', 1425', and 1000' AGL) and fast ground speeds (155, 230, and 246 knots). Day and night searches were performed under both clear sky and ice fog conditions.

001   lat   71 25.2°
        lon -157 24.6°

002   lat   71 24.9°
        lon -157 25.3°

Aircraft Position: 71 25.2   -157 24.6
ALT: 692 ft   SPEED: 212 kts

1. Cold Snowmobile
688ft AGL 155 knots

2. Truck
688ft AGL 155 knots

3. Person
688ft AGL 155 knots

4. Warm Snowmobile
692ft AGL 210 knots
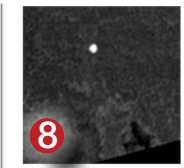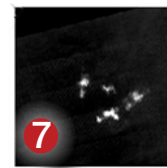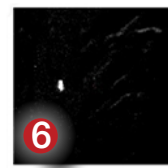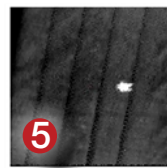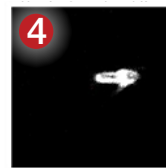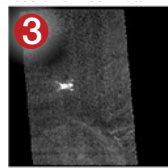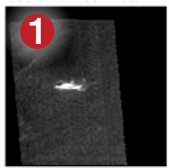
5. Person
1425ft AGL 246 knots

6. Person
1460ft AGL 246 knots

7. Two Persons and Snowmobiles in Ice Fog
1000ft AGL 230 knots

8. Large Mammal in Ocean
692ft AGL 220 knots

The system was shown to be stable and capable of automatically detecting and geotagging people, vehicles, and animals under a range of environmental conditions.

Positional accuracy of the detected anomalies was seen to be 2m, (6.5'), regardless of flying speed or altitude. Few easily filtered false-positives were encountered over the set of flights. Flying over ice fog resulted in blurring of the image thumbnails, but did not affect the automated detection of the ground targets.

AUTO-DETECTION ALERTS - MOVING MAP

The TSR-1800 is simple to use. It features a moving map over which detected anomalies are plotted with coordinates.

The user is free to perform their spotting duties. Power the system and let it run - no aiming or monitoring required. Visual alerts are shown on the map in real-time as anomalies are detected.

As anomalies are detected (the sensitivity is adjustable on-the-fly), they can be more closely examined via high-resolution thumbnail thermal imagery (warm surfaces = bright, cool/cold surfaces = dark). Detected anomalies and thumbnails are automatically saved along with their GPS coordinates for later reference.

SIMPLE FLIGHT PLANNING, INSTALLATION

Only the flying altitude is planned. The system monitors the aircraft speed and adjusts itself to provide very high spatial resolution.

The TSR-1800 is portable, easily removed and reinstalled.

itres

HYPERSPECTRAL & THERMAL REMOTE SENSING

All ITRES sensors are calibrated to traceable standards. Specifications subject to change without notice.

You Tube   Visit our YouTube channel for TSR-1800 Videos.
Search for ITRES Research Limited.