

59981

MEMORANDUM
ERM/GOLDER LOS ALAMOS PROJECT TEAM

To: Project File C9450.02B
From: John L. Williams *JLW*
Date: 13 June 1995
Subject: **LANDFILL MOISTURE SEEP INVESTIGATION**

During June 6-7, 1995, Jeff Walterscheid and I conducted infrared photography at the Los Alamos County Airport (TA-73) landfill and associated slope of Pueblo Canyon, in an effort to identify potential locations for moisture seepage from the landfill. A high-resolution radiometric thermal imaging camera (FLIR System Prism SP) with Sony recorder and battery pack was used during the investigation. The attachment details the capabilities and specifications of the camera. The photoimagery was supplemented with a detailed visual assessment of the slope area associated with the landfill.

In summary, no anomalous imagery was detected that may have indicated moisture seepage or gases emanating from the landfill. Also, no visual signs of seeps or areas of vegetation distress were observed. During this investigation, debris was noted downslope (north) of the narrow strip of suspected landfill between the main landfill and the Hot Pad. Also, below the cliffs (northeast of the exposed toe of the main landfill) there exists a tremendous amount of debris (e.g., tires, car bodies, washing machines, wood, etc.) that extends hundreds of feet down the slope. One interesting object noted in this area was a cone-tipped metal cylinder that resembled a testing device (see attached photograph copy). Following a review by LANL classifiers, it would wise to survey the object for radioactivity.

Attachments: As Stated

cc: G. Allen
A. Funk
C. Newton
J. Novak
C. Wilson





High-Resolution Radiometric Thermal Imaging Camera

The F.I.R. Systems Prism SP delivers a pricing breakthrough in full-featured, handheld infrared (IR) cameras. Built on advanced focal-plane-array detector technology, it defines the next generation of IR cameras. Easy to use, its automated features help new users get started fast and seasoned IR users finish their assignments quickly. Even better, it sells for only about half that of other portable IR systems.

The Prism SP combines high-resolution IR imaging with flexible single-point temperature measurement capabilities. Fitted with its standard 25mm lens, the camera provides exceptional image resolution from 12 inches to infinity. Users can select from three measurement modes: live running crosspoint, temperature hold, or peak temperature. Video output is user-selectable color or monochrome.

About the size of a conventional camcorder and weighing less than 8 pounds, the Prism SP camera is free of the burdens associated with bulkier IR cameras. Its compact size, high-quality imaging, and temperature measurement capabilities make it ideally suited for a broad range of industrial applications, including predictive and preventive maintenance, research and development, process control, and other types of non-destructive evaluation.

A range of accessories enable the Prism SP to be configured for specific tasks.

Like other cameras in the Prism family, the Prism SP is based on reliable, fully electronic technology with 78,000 platinum silicide detectors in a focal-plane array. The result is an exceptionally well-defined 320 x 244 pixel color image that won't break up during panning or while imaging fast-moving objects. Prism cameras use an integrated closed cycle cooler that provides reliable, efficient and quiet operation.

In addition to these high-performance features, the Prism SP has modest power consumption requirements, further enhancing its portability. It operates on battery or AC power. Users can comfortably hold the camera, mount it on a tripod, or install it in a permanent location. For ease of operation, the Prism SP incorporates such features as automatic gain and level, time-and-date indicator, and standby mode to extend battery life.

F.I.R. Systems developed the Prism SP camera by drawing on its 20 years of leadership in infrared technology—experience proven in over 6,500 infrared systems installed worldwide. The Prism SP is the most powerful, compact, and reasonably priced radiometric IR camera on the market.



Lightweight and portable, the Prism SP infrared camera provides high resolution images for predictive and preventive maintenance of components, such as this compressor.

ADVANTAGE
SERIES

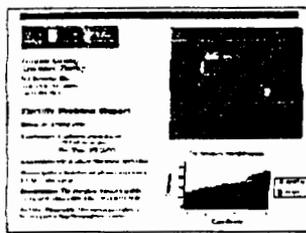
PRISM SP

ADVANTAGE

PRISM SP



The portability of the Prism SP makes it ideal for the rigors of predictive and preventive maintenance. Here an HVAC motor starter is evaluated.



Optional report writing software is a valuable tool to communicate the results of injured assets.



The Prism SP enables rapid and accurate thermal inspection of electrical power lines and substation. Optional lenses may be quickly changed to increase the system's versatility.

IMAGING AND MEASUREMENT CAPABILITIES

System Type	Focal plane array infrared camera
Spectral Range	3.6 to 5 microns
Detector	PSi hybrid silicon FPA array (320 x 244 pixels)
Temperature Measurement Range	-10° to up to 1500° C (with filter)
Emissivity Adjustment	0.1 to 1.0 in 0.01 increments
Field of View	17° (H) x 13° (V) with 25mm lens
Optional Lenses	34° x 26°, 8.5° x 6.5°, 4° x 3°
Focus Distance	12 inches to infinity with 25mm lens
Cooling	Stirling cooled
Scanning Method	Staring, no mechanical scanning
Spatial Resolution	1.0 mrad (IFOV)
Minimum Discernable Temperature	0.1° C @ 30° C
Infrared Lines	244 without microlace
Elements per Line	320
Image Update Rate	60 Hz (50 Hz for PAL)
Infrared Dynamic Range	10 bits
Color/Gray Levels	256
Color Palettes	Color or Monochrome, user selectable
Display Type	Monochrome viewfinder, external color display optional
Image Storage Capability	Video recording

PHYSICAL CHARACTERISTICS

Video Outputs	NTSC, PAL (opt.)
Power	Battery, 4 hour run time
Operating Temperature	-10° C to 55° C
Camera/Viewfinder Weight	<8 pounds (3.6 kg)
Camera Size	9.25 x 5.9 x 5.0 inches (235 x 150 x 127 mm)



ACCESSORIES

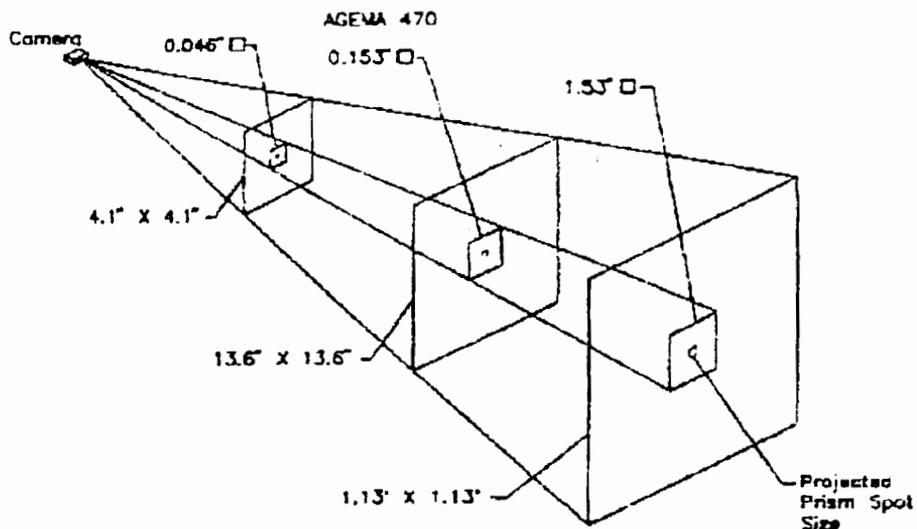
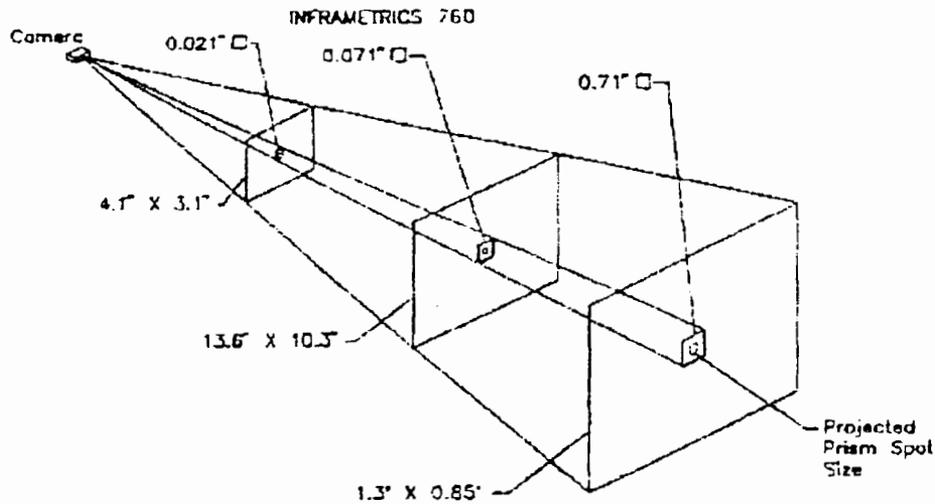
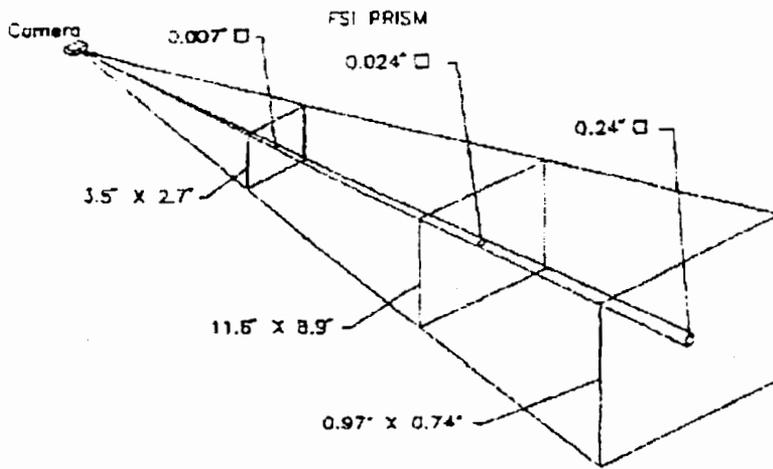
Standard accessories include: monochrome viewfinder, 25mm lens and lens cover, safety strap, battery belt, battery charger, cables, carrying case, and an operator's manual.

Optional accessories include: Lenses; wide angle to telescopic; filters; video accessories: recorders, printers, and visual light cameras; power accessories: batteries, chargers, AC and DC to DC adapters; physical support accessories: tripod and pistol grip; report writing software compatible with Microsoft® Windows.

Specifications subject to change without notice. Microsoft is a registered trademark and Windows is a trademark of Microsoft Corporation.



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NOTE:
For clarity, spot size is presented
at 20X field of view scale.



SALES BULLETIN

#6

August 12, 1994

The two CAD illustrations attached, one in metric units and one in English, illustrate the dynamic difference in resolution of the FJR Systems Prism, the Inframetrics 760 and the Agema 470. Some of your educated customers, in response to the information in Sales Bulletin #1, inquired about the related field of view dimensions since the combination of spot size and field of view determines the resolution of a given system.

This projected image illustrates to your PPM customers that the Prism indeed resolves much greater detail, allowing them to measure a smaller object than the competitors, at the same distance from the target object. Stated conversely, the Prism can measure the same size object from a greater distance than competitive systems. The example to follow should clarify this point. Keep in mind, the system is able to resolve objects that exceeds the spot size, but the recommendation for temperature measurement with an FPA is that the object be at least twice the spot size of the system. General guidelines for scanning systems recommend the object be three to ten times the spot size; we generously assumed the requirement of twice the spot size for all three systems in the following comparison.

If a PPM customer wished to measure the temperature of a bushing measuring $\frac{1}{2}$ " square, the Prism could resolve this object and indicate the temperature at a distance of 30'. The smallest object the Inframetrics user could resolve and measure at that distance is 1.4", the user would have to stand approximately 9' from the object to image the $\frac{1}{2}$ " object. The Agema user would have to stand approximately 4' from the $\frac{1}{2}$ " object to resolve and measure the temperature. If the Agema was positioned 30' away from the object (the distance at which the Prism can resolve the $\frac{1}{2}$ " object), the smallest resolvable element would be about 3".

IR System	Distance required to image $\frac{1}{2}$ " bushing	Size of resolvable object at 30'
FSI Prism	30'	$\frac{1}{2}$ "
Inframetrics 760	9'	1 $\frac{1}{2}$ "
Agema 470	4'	3

As illustrated above, there are two distinct methods of illustrating the higher resolution of the Prism, generally one will seem more natural to you. Either compare the distance needed to image an object of a defined size, or place the systems at the same distance and determine the minimum size of a resolvable object. If you would like to work through a few of these calculations with me to become more comfortable in a variety of situations, please call me, NOW!



SALES BULLETIN

#1

July 1, 1994

PRISM RESOLUTION PROVIDES GREATER MEASUREMENT PRECISION

The superior resolution of the FLIR Systems' (FSI) Prism is a result of several technological innovations. The detector is a focal plane array (FPA) consisting of 78,080 individual detectors on a single substrate. Each detector functions independently, staring at a single location and gathering detailed information. The result of the staring FPA is the ability to resolve and measure temperature of significantly smaller objects than competitive systems, setting a new standard in the commercial infrared industry.

When compared to Inframetrics and Agema, the Prism offers nine times and thirty-six times the resolution, respectively.

SRF SPOT SIZE COMPARISON

Distance from imager to target of 1 meter (3 feet)

**FLIR Systems
Prism-SP**

**Inframetrics
760**

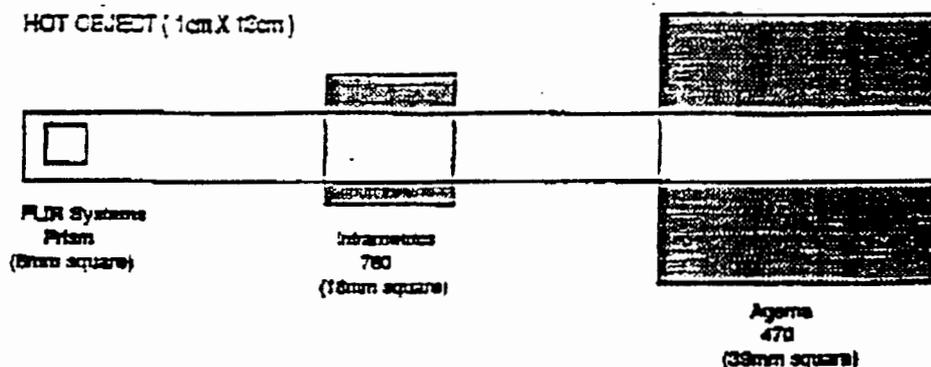
**Agema
470**

0.6mm square

1.8mm square

3.9mm square

To more clearly illustrate the implications of this difference in spot size, assume a 100°C object measuring 1 cm x 13 cm is to be imaged. The imager is placed 10 meters from the object and the surrounding ambient temperature is 25°C. If the object is smaller than the spot size, the object will not be resolved clearly and the resulting temperature measurement will be an average of object and background temperatures.



The FSI Prism will measure the object temperature of 100°C.

The Inframetrics will measure approximately 60°C, averaging the object and ambient conditions.

The Agema will measure approximately 45°C, averaging the object and ambient conditions.

This information is based upon manufacturers' published specifications of SRF @ 90%. This is a laboratory-demonstrated, repeatable value that expresses the ability of the camera to receive detail and measure temperature.

