Detection and Identification Of Unidentified Flying Objects (UFOs) Using Existing Technology

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Abstract

For the past fifty years, civilian UFO organizations have been collecting, categorizing and archiving UFO reports. By using proper investigative techniques they have amassed an incredible amount of information. A major portion of this database is drawn from eyewitness testimony, supplemented by films, videotapes, and electronic signal detection. The various U.S. Government projects (Grudge, Blue Book, et al) used the same techniques. As a result, political and scientific entities have casually dismissed the evidence as inconsequential. All the while, various agencies of the United States government and the governments of other countries were using all sorts of advanced technologies for Cold War purposes. For the most part, few of these advanced technologies were used to address the UFO issue. The purpose of this paper is to urge responsible governmental organizations to reassess their position and to allow all available technologies to be used to eliminate the UFO mystery.

Background

For three and one half decades I worked in the U.S. human space flight program and was exposed to a forward march of classified and non-classified technological developments. Many of those developments could have been applied to solving the UFO mystery, but as far as I can tell, it never happened. For the past five years I have made presentations to various technical and civic groups describing how these new technologies could be applied to the UFO problem and found the audiences to be quite receptive to the idea. Still nothing of significance has resulted from my efforts.

This paper summarizes a number of the technological options available to apply to solving the UFO mystery. Everything that follows was taken from open sources and to the best of my knowledge is non-classified and/or is sufficiently vague so as not to be a threat to national security. I expect that a number of readers will be aware that new extrapolations of the technologies listed below are now in daily use by various agencies. Of course, greater success could be assured by using the latest technologies, but it isn't necessary. Any one of these technologies, applied to UFO research and investigations, could add significantly to the quality of the database and bring us closer to the day when the mystery is solved.

Partnering With Government Agencies

The UFO mystery has been with us for more than fifty years. During this time thousands of individuals and non-governmental groups have spent hundreds of thousands of hours amassing the evidence about the UFO mystery. As several points during this period the United States, France, Russia and several other governments have commissioned investigations and studies, but apparently they enjoyed no more success in eliminating the mystery than the private groups.

According to public opinion polls, the public abhors this lack of progress and sees it as an attempt by governments to cover-up what is really going on. All sorts of conspiracy theories have grown out of this high level of distrust and the public has a low opinion of the government in general, the intelligence agencies and military. This is all coming at a time when our very survival may depend on these agencies. This high level of distrust could be eased if agencies would work with private UFO research groups for an era of openness and cooperation.

Government agencies regularly partner with industry, academia and private research organizations. For example, in 1999, the National Security Agency was selected to spearhead a U.S. Defense Department effort to develop, *with commercial assistance*, joint tactical signals intelligence systems. Similar efforts have been conducted with private think tanks, universities (such as the University of Texas and Texas A&M University) and aerospace corporations. Such joint ventures almost always enjoy a high level of success.

Similar governmental agency partnering ventures with organizations such as the National Institute for Discovery Science, the Mutual UFO Network, and others could result in the resolution of the UFO mystery on the near term and restore a high level of trust in the government in general. All of the partnering could be done in the open, without need to expose any classified information to these groups. However, due to the backgrounds of the various members of these organizations, there could exist both classified and unclassified groups within each of them if necessary. The goal in every case is the elimination of the UFO mystery.

Available Technologies

Any solution to the UFO mystery requires more than rhetoric. The journalistic approach to the problem has failed miserably. It is time to collect hard data and subject it to open scrutiny so we may bring this mystery to a close early in the new century. This can be done through the utilization of technologies and systems already available and being operated by a number of government agencies. In most cases, no new systems would be required. For the most part, all these technologies already have the capability to amass data on UFOs. Protocols could easily be developed to allow certain data streams to flow to the selected groups for evaluation and analysis.

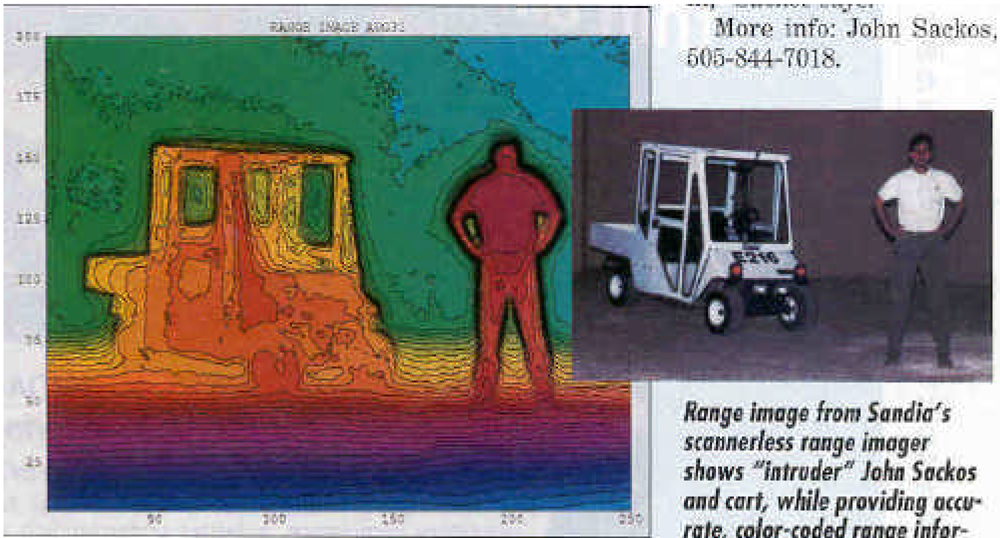
These existing technologies include radar, infrared imaging, optical holographic filtering, image-recognition, sensors, remotely piloted vehicles and more. The following description of technologies that could be applied to the elimination of the UFO mystery is not intended to be an exhaustive list. Rather, it is given as a starting place for a dialog between governmental agencies and private groups. Partnering discussions are the natural place to expand on the list and come to some agreements how the technologies could be used to accomplish the goal. The important thing to remember is that there are hundreds of existing tools that can be applied to the solution of the problem.

LASER RADAR IMAGER

Engineers at Sandia National Labs, Albuquerque, N.M., developed a field-ready scanner-less laser radar system that can resolve differences in range accurately enough to use the data to image the size, shape, and contours of the objects it sees, thus providing image and range information.

The system was developed as part of a program to enable smart conventional weapons to actively seek and identify their targets while discriminating between targets and decoys.

From: R&D Magazine, November 1994


More info: John Sackos, 505-844-7018.

Range image from Sandia's scannerless range imager shows "intruder" John Sackos and cart, while providing accurate, color-coded range information at the same time.

OPTICAL HOLOGRAPHIC FILTER

Researchers at Sandia National Laboratories have defined an advanced technique for optical pattern recognition that provides the capability to detect and identify images of target objects and despite distortions in image scale, rotation, or angle of view.

Older holographic pattern-recognition systems could identify a target rapidly by matching it to information stored in a holographic template. Those systems suffered a basic drawback in that the target images must match the template exactly.

The newer technique, developed primarily for military-target recognition, does not suffer this limitation. It produces *a generalized holographic template that includes all information about a prospective target.*

A special filter is employed to create a "lock-and-tumbler" hologram. This will *identify a target image regardless of the target's position, brightness, or rotation, even if the target is partially obscured by other objects, altered in appearance by reflections or glint, or buried in visual "noise."* These features make the lock-and-tumbler hologram particularly attractive for real-world optical pattern recognition under conditions of less than ideal visibility. It can *recognize the shape of* a particular aircraft, the plumes of enemy rockets, or other *flying objects.*

The hologram is generated from detailed information about a prospective target, which is stored in computer memory. A series of calculations is required to produce a lock-and-tumbler hologram. A spinning optical-correlation filter is employed. The angular harmonics of this device closely approximate those of the target image, which is dissected into a number of fundamental components and recombined in a way determined by a computer algorithm called spectral iteration. This produces the hologram that serves as a unique "key' for the target — a Harrier Jump-jet, for example. The computer-generated key fits no other image, therefore recognizes only the target it has been "programmed" to recognize.

From: MACHINE DESIGN, September 25, 1986

Computer Reconstruction of a Delta-wing Aircraft Made
From an Incomplete Set of Image Components

THERMAL INFRARED IMAGING

In the spring of 1993, Dr. Richard J. Pollack, Harvard School of Public Health and Mitsubishi Electronics America, Inc., teamed to utilize thermal imagery to assess the abundance and distribution of deer on Block Island and Prudence Island off the coast of Rhode Island.

Mitsubishi provided a high quality thermal imager capable of detecting temperature differences of 0.1 degrees C. This was installed in a Cessna 206 airplane modified for aerial surveillance and photography.

A penned herd of 35 white-tailed deer was imaged at various altitudes, speeds and light conditions. The researchers were able to identify and discriminate among deer, horses, cows and people. They found the view from 1,000 feet above the ground to be acceptable, permitting recognition of nearly 100 percent of the deer in open areas, more than 87 percent of the deer in brush-covered sites and more than 63 percent of the deer in moderately wooded sites without leafy vegetation.

From: Photonics Spectra, July 1994

Thermal infrared image of deer observed during a nighttime deer census on Prudence Island, R.I., in a low-resolution frame captured from a high-resolution videotaped image. Mitsubishi's IR-M-500 registers energy in the 3- to 5-μm spectral range on 262,000 PtSi detectors in a focal plane array and converts it to a 512 × 512-pixel image in 256 gray levels.

POLE-MOUNTED IR IMAGING

Amber of Goleta, CA., has developed a new infrared imaging system called Radiance 1 that combines advanced infrared camera performance with the operational ease of video cameras. The camera's electronics are centered around a 32-bit digital signal processor and Flash memory, so that tasks that were once complex, manual IR camera tasks, such as calibration, brightness-setting, and contrast enhancement, are now automatic functions. The camera also has additional memory for performing image processing and analysis on its own, so that tasks such as motion detection, autotracking and object recognition can be performed at the camera level.

From: Photonics Spectra, January 1993

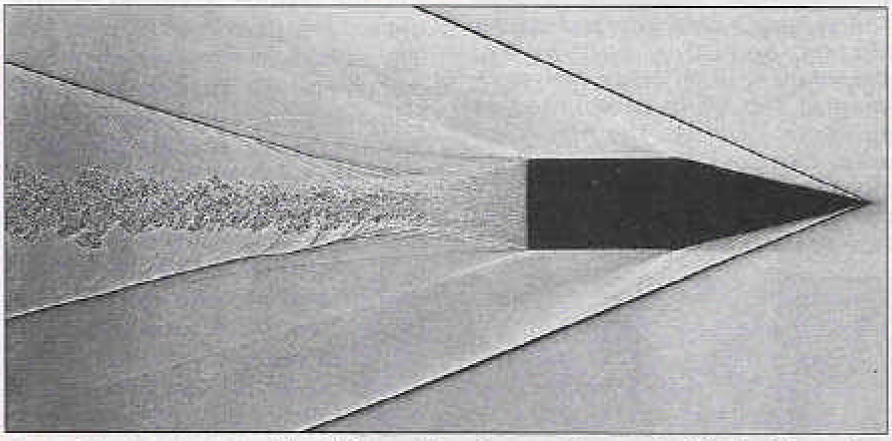
ACOUSTIC DETECTION SYSTEM

An acoustic sensing system can track incoming rifle and artillery fire to provide real-time information on the projectiles' source and trajectory. Known as the projectile detection and cueing system, the small portable unit discerns a projectile's shock wave to extrapolate its path back to the originating weapon.

The system can provide operators with the direction and elevation of the incoming munitions. Military applications use vehicle-mounted or hand-held devices for sniper detection or for locating tanks.

The device seizes upon projectile shock waves instead of on the muzzle blast to determine point of origin. The projectile need only pass by the sensor suite from any direction to be detected and tracked. The projectile size offers no limitation to the system's ability for detection. The projectile must be supersonic for the detection system to function in its primary mode.

From: Signal, November 1994



Acoustic sensors can detect the origin of a passing projectile by discerning the leading-edge shock wave pattern as it fans out from the nose of the object. This shock wave is compared to the weaker recompression shock wave that trails the projectile.

HELICOPTER AND AIRPLANE RADAR DETECTION

The countries of Sweden and Germany are using the Swedish-built helicopter and airplane radar detection (HARD) system. The HARD radar is a track-while-scan radar that operates in the X band. The system can automatically monitor 20 targets at up to 20 kilometers.

From: Signal, March 1999

This infrared image of a prize-winning Rottweiler was recorded by an Amber 128 × 128 indium antimonide staring focal plane array. After it was recorded, the image was photographed from a display generated by Amber's Pro-View imaging system. Photo courtesy of Amber, a Raytheon Co., of Goleta, Calif.

HARD Radar Mounted on German MaK Wiesel 2 Surveillance Vehicle

ALL WEATHER SENSOR

A fine resolution, real-time synthetic-aperture radar (SAR) system, developed by the Department of Energy's Sandia National Laboratory and General Atomics, takes photograph-like images in rain or fog, through clouds, and in day or night conditions. Lynx, the 115-pound all-weather sensor, can be mounted on both manned aircraft and unmanned aerial vehicles and operate at a range of 85 km. Flying at an altitude of 25,000 feet, the Lynx SAR produces one-foot resolution imagery at standoff distances of up to 55 km. At a resolution of four inches, the radar can make images of scenes 25 km. away. The radar forms an image that is larger than that displayed, storing it in cache memory. This allows the operator to pan around within the total scene in order to concentrate on a particular area of interest. The sensor can detect small surface penetrations such as footprints in soft terrain. The sensor picks up the slightest change in a scene using a technique called coherent change detection. Not only can the Lynx detect moving targets, but future versions will be able to image seaborne targets, cue other sensors, and take 3D images.

From: Design News, October 18, 1999

BALLISTIC MISSILE EARLY WARNING SYSTEM

To protect North American continent, the USA and Canada cooperate in maintaining a radar shield over their combined land mass which can detect incoming missiles or craft from any direction. This system is operated by the North American Aerospace Defense Command (NORAD), located near Colorado Springs, Colorado. BMEWS is especially strong to the north because of the risk of ballistic missiles coming over the North Pole. To complete the radar shield, there are also radar beams facing West, South and East from the North American coast, so that nothing that is detectable by radar can fly into Canada or the USA from any direction without tripping the system.

From: Tracking UFOs By Satellites, Simon Harvey-Wilson

SPACETRACK

The U.S. Air Force Space Command runes SPACETRACK that provides data on satellites and missiles from its network of sensors around the world, including NASA's tracking system. SPACETRACK gets its information from the U.S. Navy Space Surveillance System (NAVSPASUR) which operates a line of radar stations running from Georgia to California that transmit a fan-shaped radar beam into space to a height of about 15,000 kilometers. The system can detect and calculate the orbital characteristics of any satellite or other object breaking the beam.

From: Tracking UFOs By Satellite, Simon Harvey-Wilson

GROUND-BASED ELECTRO-OPTICAL DEEP SPACE SURVEILLANCE SYSTEM (GEODSS)

The Ground-based Electro-optical Deep Space Surveillance System consists of a worldwide network of nine systems, which are located at White Sands Missile Range, on the island of Maui in Hawaii, Portugal and the Indian Ocean island of Diego Garcia. These systems, which include telescope-mounted low-light-television cameras and infrared sensors, can detect an object as small as a football in geostationary orbit 36,000 kilometers above the ground. This system was used in the 1970s to determine the extent of the damage sustained by the Skylab space station during launch, before the launch of the Skylab astronauts was allowed.

From: Aviation Week & Space Technology, March 15, 1999

NUCLEAR DETONATION DETECTION SATELLITES

U.S. Department of Defense satellites, monitoring for nuclear explosions have the capability to detect bright flashes caused by meteoroids disintegrating in the atmosphere. Sensors provide the exact location by latitude and longitude, peak flash intensity, total radiated energy, number of pieces, and earth impact site.

The DSP satellites are equipped with Schmidt infrared telescopes, nuclear detection detonation sensors, ultraviolet sensors and visible light sensors.

From: U.S. Air Force web site: http://phobos.astro.uwo.ca/~pbrown/usaf.html

COBRA DANE RADAR SYSTEM

The Cobra Dane Radar System, located on the Aleutian Islands near Alaska can detect a grapefruit-sized metallic object at more than 2,000 miles. In its tracking mode it can simultaneously handle up to 200 objects at ranges of up to 1,250 miles.

From: Signal, September 1990

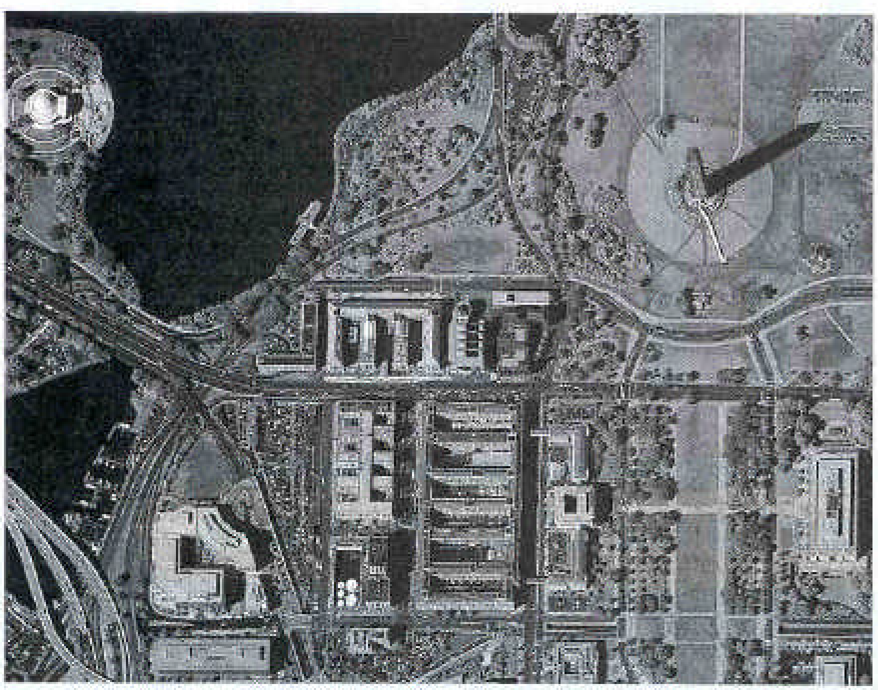
The Cobra Dane phased array radar outpost in the Aleutian Islands, Alaska, will receive new computers and electronics components to improve data collection and processing.

SPACE-BASED REMOTE SENSING IMAGERY

High-resolution remote sensing imagery allows commercial viewers to discern objects smaller than an automobile. An industry-owned system duplicates some of the capabilities of Department of Defense satellites.

The Ikonos satellite, owned and operated by Space Imaging Incorporated, Thornton, Colorado, revolves around the Earth 14 times a day in a sun-synchronous orbit 423 miles high. In addition to 1-meter panchromatic, the satellite's Kodak optical imaging device can generate 4-meter multispectral imagery operating in the same bands 1 to 4 as Landsats 4 and 5.

From: Signal, December 1999



The Ikonos satellite, put into orbit by Space Imaging Incorporated, can provide 1-meter resolution remote sensing imagery such as this view of the Washington Monument in Washington, D.C.

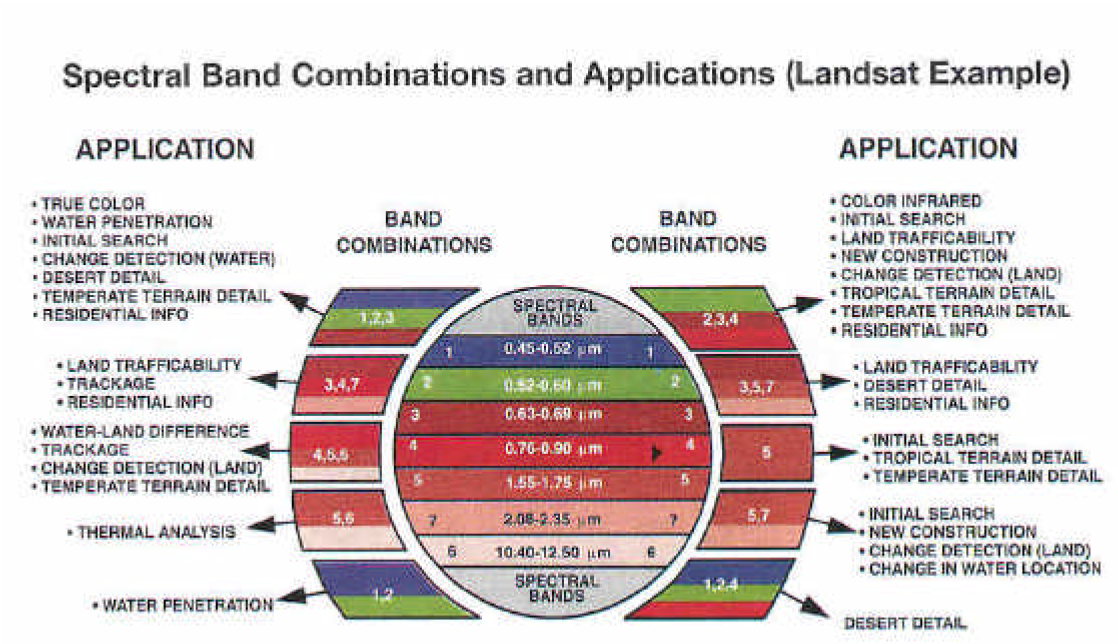
MULTISPECTRAL IMAGING

The Pentagon is offering its combat leaders an additional source of intelligence that springs from its new found ability to quickly collect, analyze and identify non-photographic clues from a target. The data includes unique heat patterns, electronic emissions and previously unused dimensions of radar reflections.

Data can be collected by sensors on aircraft, ships, satellites and the ground. New technology allows specialists to combine the products of several sensors and closely examine thin slices of the electro-magnetic spectrum — a process called multi- or hyperspectral sensing — to **produce distinct signatures of almost anything** of military importance.

There are sensors available that can look through clouds, camouflage and foliage. The technology also examines less obvious products given off by a target such as reflective color, chemical discharges or radar polarization.

From: Aviation Week & Space Technology, August 2, 1999



Pentagon-issued Multispectral Users Guide Shows Intelligence Officers how to Combine Data From Different Frequencies, to Find Targets of Interest

COBRA BALL AIRCRAFT

The U.S. Air Force's 55th Wing operates RC-135S Cobra Balls missile surveillance aircraft, containing long-range optical telescopes, infrared sensors and laser range finders. Rectangular windows house the medium-wave-infrared arrays, six cameras to each side of the aircraft.

From: Aviation Week & Space Technology, December 6, 1999

KEYHOLE SATELLITES

The early generation Keyhole satellites, KH-1 through KH-9, returned canisters filled with film of targets and encompassed 144 satellite launches between 1960 and 1972. The satellites produced over 800,000 images that were recently declassified. Cameras on the KH-1 satellites permitted resolution of objects about 12 meters (40 ft.) apart. That resolution was improved to about 1.5 meters for the KH-4s.

The more advanced, higher-resolution KH-7, KH-8 and KH-9 contributed several million images in the 1970s and early 1980s. The unique KH-9 was capable of imaging tens of thousands of square kilometers in a single frame with a resolution of about two thirds of a meter. The KH-8 and KH-9 programs concluded in 1984.

From: Scientific American, February 1998

GLOBAL HAWK SURVEILLANCE AIRCRAFT

The Global Hawk unmanned, high-altitude surveillance and reconnaissance aircraft can fly for 38 hours and at altitudes of 12.5 miles. Global Hawk is the size of a large business jet and carries high-resolution radar, optical and infrared sensors and a satellite communications and navigation system. Future enhancements will allow the detection of moving targets.

From: Foxmarketwire.com, March 2, 1999

VERTICAL-POINTING RADAR

A ground-based vertically-pointing frequency-modulated continuous-wave radar with a range resolution of one meter can see a common house fly at altitudes to 10,000 feet. It has an output of 200 W at 2.8 – 3.0 GHz. The beam angle is 4.5 degrees. During tests in the California desert, the radar pinpointed swarms of crickets and cabbage hoppers as they flew overhead. The radar has an extremely high range resolution and close minimum range.

From: Microwaves, February 1973

HOLOGRAPHIC RADAR

France announced a ground-based military holographic radar system designed to provide broad, precise coverage of airborne targets. The VHF radar network gives continuous coverage from horizon to horizon and out into space. The installation routinely tracks meteorite trails in the Earth's upper atmosphere.

The radar's holographic technique reconstructs amplitude and phase distributions of wave disturbances caused by targets moving through its coverage zone. The radar network uses a number of omnidirectional transmitters and receivers distributed over a wide area. Each transmitter operates continuously to illuminate the coverage zone.

From: Aviation Week & Space Technology, August 8, 1983

LASER RADAR

Laser radars combine some of the advantages of conventional radar and video imaging. Video provides finer resolution but no range information; conventional radar provides distance but no shape information.

Laser radars produce real-time images of a craft and it provides the distance it.

From: Machine Design, November 9, 1989

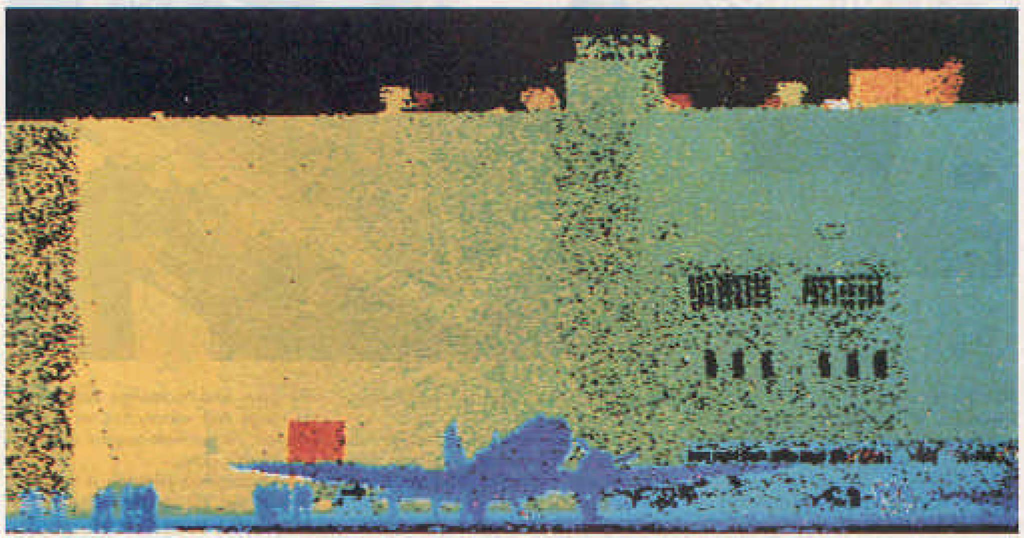


Image of a DC-3 against a hangar was made at a distance of 1 km. from data gathered by a new U. S. Air Force/Loral heterodyne detector operating with a Marlow thermoelectric cooler in the Raytheon Tri-Service Laser Radar.

ADDITIONAL SYSTEMS

An exhaustive listing of existing systems of possible use in detecting UFOs could number in the hundreds. Some of the more obvious ones include weather radars, military tactical portable radar units, fire-sensing systems, aircraft gun camera films/videos, NORAD's uncorrelated targets, air traffic radar control systems, and more.

Summary

Sufficient systems and equipment exist to positively identify every UFO sighted anywhere in the world if a way could be found to apply available technology. Two categories of technology exist — Current and obsolete. The use of current technology is preferable, but most of it is classified, making access more difficult. Even obsolete technology is still better than nothing.

Existing technology can detect anything that enters U.S. air space or flies anywhere in the world, gives off electronic signals, or is measurable by a variety of techniques. Historically, data has been recorded that could be beneficial gaining new insights into the UFO mystery. In real-time, the systems exist to positively identify characteristics of UFOs that would lead to resolution of the mystery.

Private organizations stand ready to partner with governmental agencies to collect, analyze and archive UFO-related information. The goal is to serve science and humanity.