

UFOLOGY AND EXPERIMENTAL STRATEGY: WHAT HAVE WE LEARNED FROM INSTRUMENTED MISSIONS IN THE FIELD?

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УФОЛОГІЯ ТА СТРАТЕГІЯ ЕКСПЕРИМЕНТУ: ЩО МИ ВИВЧИЛИ ЗАВДЯКИ ДОСВІДУ ІНСТРУМЕНТАЛЬНИХ ПОЛЬОВИХ ДОСЛІДЖЕНЬ?

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Abstract: Since 1947 numerous Unidentified Aerospace Phenomena (UAP) sightings have been documented using diverse measures (e.g. physical traces, radarscope data, photographs, film and video footages, physical effects, and medical records). Nonetheless they have failed to provide sufficiently reliable evidence to convince the scientific community of the existence of UAP. **It is obvious that a change of methodology is necessary and that the UAP phenomenon requires an active investigative response to move toward a scientific solution. To maximize the chances of acquiring reliable and valid data on the UAP phenomenon, instrument observations of UAP are essential.** This paper describes some of the past ufological instrumental studies in the field, from the different schemes and strategies devised, to the field-instrument packages selected and the most important results obtained. It identifies limitations and shortcomings in extant field research, with the objective of refining future instrumented projects.

Анотація: Починаючи із 1947 року численні аномальні аерокосмічні явища (ААЯ) були зареєстровані за допомогою різних інструментів (радіолокація, фотографія та відео, фізичні ефекти та матеріальні сліди, медичні записи). Проте зібрані свідчення не змогли забезпечити досить надійну доказову базу, щоб переконати наукове співтовариство про актуальність вивчення ААЯ. Очевидно, що для якісної зміни ситуації необхідний перегляд методології і активне спрямування вектору досліджень у науковому напрямку. З метою максимізації шансів отримання надійних і достовірних даних щодо ААЯ важливо здійснити огляд наявних інструментів спостереження за ААЯ. У статті описані деякі останні дані щодо інструментальних досліджень у цій області, переваги і недоліки різних схем та стратегій вивчення, з метою врахування їх при проектуванні нових моніторингових комплексів.

Introduction. It is a well-known fact that our knowledge of the UAP phenomenon is almost entirely based on witnesses' verbal and written reports of observations and those reports do not constitute «objective testimonies» of these observations. Accordingly it is obvious that establishing the existence or non-existence of UAP cannot be limited to a review of sightings incidents, but rather directly relates to an implemented plan to acquire hard facts.

Although that numerous UAP sightings have been documented over decades using diverse measures (e.g. physical traces, radarscope data, photographs, film and video footages, physical effects, and medical records), almost all these data have not been acquired under controlled conditions with scientific instrumentation. Even more importantly, they have failed to provide

any sufficiently reliable evidence to convince the scientific community and others of the existence of anomalous aerial phenomena on Earth.

To stimulate the curiosity of the scientific community and to maximize the chances of acquiring clear and unambiguous conclusions on the reality of the UAP phenomenon, it appears essential to acquire instrument observations, hopefully coupled to visual observations. Instrumentation will assist in obtaining this quantitative data both to open up new avenues of research to understand basic physical characteristics of UAP and to complement existing studies.

In fact, such scientific activity has already been undertaken and some field studies are still being running around the world. As early as the 1950s some attempts to detect and analyze anomalous atmospheric phenomena using scientific equipment have been carried out in the field in areas where anomalous aerial events had been reported. By the end of the 1980s, one of the most valuable outcomes of such methodology has surely been to give credence to the idea that the UAP phenomenon could be studied on a rigorous and empirical basis. Certainly these past projects to detect and measure the UFO phenomenon have well paved the way. However, they have also highlighted several shortcomings that need to be considered in order to make progress.

Objectives. In light of the above background and as a contribution to allowing this past fieldwork to guide future projects, the objectives of this research study are as follows: Firstly, to draw a survey of the main UAP field instrumented field studies that have been deployed around the world by governmental agencies, scientists, researchers and associations; secondly to analyze the most important results obtained by these projects; thirdly to highlight the most common problems, limitations and shortcomings of these efforts; and lastly to draw a synthesis of key points identified throughout this study and to formulate specific recommendations for future instrumented monitoring missions of the UFO phenomenon.

Methodology. In order to tackle the above research objectives, the following overall methodology and associated line of actions was followed:

a. Data collection and analysis: firstly we identified all possible UAP field projects throughout an extensive review of the ufological literature, the consultation of official declassified documents, and the assistance of various researchers, organizations, UAP instrumented Projects leaders. First source information and associated photographic documents were gathered, whenever possible.

b. Selection of the sample: following an assessment of the documentation, based on the information reliability and on the level of supporting information available, we selected and analyzed in a second step a total of 26 individual instrumented field experiments, covering the period 1950-2014 and implemented on 4 different continents (North America, South America, Europe and Australia). At this stage there is certainly a lack of visibility of such field works in Asia.

c. Method: in a third stage, we designed a database (EXCEL) for documenting, analyzing and reporting on the following key points for each selected instrumental project:

- the various research strategies devised;
- the scientific instrumentation used in the field;
- the most important results obtained;
- the main common difficulties and lessons learned by the researchers.

Finally, another file was created for documenting all key finding and recommendations that were identified in the study.

Field experiments. In order to recall the importance of field experiments for the studying the UAP phenomena, a good synthesis can be found in the 1969 final Project Blue Book study report (so called «Condon report»). Physicist Frederick Ayer II wrote in a specific chapter [1] on the instrumentation for UFO searches, explaining the necessity and justifications for information recorded by suitable instruments:

«The need for instrumented observation of UFO phenomena arises from the fact that an observer's unaided senses are not reliable recorders of scientific data. Further, the ability of an observer to supply useful information is affected by his training, his state of mind at the time of the observation, and his suggestibility, both during and after the event. Accuracy requires instruments to measure precisely data such as angles, apparent or real velocities, distance, colour and luminance. Even an observer with optimal training, objective state of mind, and minimal suggestibility is hard pressed when unassisted by instruments, to provide useful scientific information. This is especially true in the case of UFO phenomena, which are typically of short duration, occurring in an unfamiliar environment, and lack points of reference from which reasonable inferences as to distance, size, and velocity can be drawn».

Confronted with the emergence of the UAP phenomenon and many sightings around the world, various field experiments initiatives were undertaken in order to supplement visual observations with scientific measurements. The advantages of using such an approach were obvious: a wider geographical coverage; enabling real time observation/measurements and not anymore a posterior analysis, the utilization of technical parameters to complement human sightings; and finally a more systematic detection as no human observer is required during a UAP event. The following paragraphs describe some of the main UAP field experiments that were selected in this research study.

[1950-1951], USA: Project Twinkle. Starting in 1948, sightings of unexplained light phenomena were reported in the south-western United States in the vicinity of sensitive government research and military installations, such as Los Alamos and Sandia National Laboratory. Due to fact that these phenomena suddenly appeared and were seen many times per month by credible observers (airline and military pilots, security inspectors, special agents of the office of special investigation) near installations that were the backbone of the atomic bomb program, the situation caused considerable concern among security agencies. As the information available was not sufficiently quantitative, it was considered essential to obtain instrumental observations, photographic, triangulation and spectroscopic. The Air Force delegated the study of the phenomenon to the Geophysical Research Directorate, a group that studied the upper atmosphere and other atmospheric phenomena. During February 1950 the frequent reports of unexplained aerial phenomena close to Holloman and Vaughn Air force bases prompted the initiation of a program to gather factual data.



Fig.1. Askania Theodolite



Fig.2. Videon Camera

Between April 1950 and March 1951 a three point instrument observation program called Project Twinkle [2] was initiated. It included the following equipment:

- optical tracking with Askania photo theodolites (see Fig. 1) in order to provide trajectory data and photographic records;
- optical spectra-photography using standard cameras with suitable diffraction gratings;
- electronic frequency measurements using Signal Corps Engineering Laboratory equipment.

The Air force established a number of observation posts in the vicinity of Vaughn, New Mexico, for the purpose of photographing and determining the speed, height and nature of the unusual phenomena referred to as «green balls and discs». A round the clock watch was maintained. The Project Twinkle final report concluded on the overall negative results obtained

from the year of vigilance and inquiry, and that no conclusive opinion on the aerial phenomena of interest had been reached. The overall results were not satisfactory, especially due to a reduction of activity of the phenomena at the equipment's locations. However the final report indicates that on two occasions some objects were photographed with the Askania theodolites during some Bell aircraft missile and V-2 launchings. In addition, the project records and some Blue Book [3] correspondence also confirm that several photos were also obtained in 1950.

The final Project Twinkle report also emphasizes the fact that the planned instrumentation was never fully deployed. Although the photographic theodolites functioned continuously, the grating cameras functioned very little since the military personnel assigned to operate them had been withdrawn due to the needs concerned with the Korean situation. In addition, the facilities for the electromagnetic frequency measurements that were to be provided by the Signal Corps Engineering Laboratories were not utilized due to the fact that the frequency of occurrence of these phenomena did not justify the \$50,000 a year transfer of funds to the Signal Corps which would be required to carry out such a monitoring facility [4]. Despite the fact that no relevant data were obtained from the theodolites at these occasions and that no definitive conclusion as to the identity of the objects was made, the sightings and pictures established that some type of object did exist [5].

1953, USA: Air Force Videon Cameras. As from the beginning of 1952, the US Air Force was confronted with a massive increase of UAP reports across America. In order to determine whether or not reported UAP were actually some new type of aircraft or merely misidentification of known objects, the use of spectrum analysis was suggested as an identification aid. A group within the US Air Force, the Air Technical Intelligence Center (ATIC), developed a camera equipped with a diffraction grating. These special cameras, the commercial model of which was called Videon (see fig. 2), are combines the stereo-camera and the spectrograph principle. It would break down the light received from any object into its various components. This would permit the determination of the element or combination of elements of which an object would be composed. By June 1953, approximately 75 cameras had been distributed to Air Force control towers and selected radar stations operators, in 33 states around the country. Unfortunately it was found out that the light gathering power of the lenses was too low and that the diffraction gratings were deteriorating quite quickly. According to the records only a few worthless pictures were obtained through this approach. During 1958 the possibilities of more extensive instrumentation were also discussed by the Air Force. Other suggestions for more complete cameras, special aircraft instrumentation (e.g. USAF fighters-interceptors aircrafts also equipped with diffraction gratings over the lenses of 16mm gun cameras) and other detection devices were put forward and analyzed. However no further study contract for such instrumentation was ever started, in light of the belief that the cost of such a programme would out-weigh the results.



Fig.3. Topenish Field Study Instruments

[1972-1975], USA: The Topenish Field Study. The first civilian UAP field study took place in August 1972 on the Yakama Indian reservation (7250 km²) in Toppenish, Washington. Due to a noticeable increase of UAP sightings from law enforcement personnel around the reservation area and in nearby towns, Akers, a private investigator, decided to set up an intensive eleven day long field study aimed at capturing instrument recordings of some reported anomalous luminous phenomena. Authorization was granted from the Yakima Tribal council, the Bureau of Indian affairs and the Agency Forestry Division to undertake the project. As underlined in the project's report [6] a primary objective was to determine the feasibility of «staking-out» a scientific observer in an area of high sighting probability, with the purpose in mind of obtaining hard data concerning the UAP. A «hit and run» strategy, of moving the instruments to a location where activity would be observed, was to be followed. The priority was to obtain photographs, including spectrographs and position data, and also to eventually acquire data relating to any magnetic effects which might arise from UAP activity. The field investigation involved setting-up portable observation equipment at selected locations for several days a time. Observation lookouts were established at six different locations in the Yakama Indian reservation.

The instruments used by Akers, all battery operated, were covering three different ranges: firstly the sound recording (WWV time receiver, crystal controlled reference oscillator, cassette tape recorder); secondly the optical range (two single lens reflex cameras, one equipped with a 55mm lens and replica grating to permit recording of spectral data, a 16mm motion picture camera, a 35mm range finder camera) and thirdly the magnetic and radiation measurements (a compass spin detector, an automatic recording magnetometer, a G-M counter Gamma and beta). The results of the field study were satisfactory. Various observations of suspected anomalous lights were made by the investigator, and several of them recorded on film. Unfortunately all the sightings and pictures related exclusively to round lights situated at far distances (the closest activity had been at eight miles). However and most importantly, Akers had demonstrated for the first time the validity of a placing an observer into an area of frequent UAP sightings and the feasibility of obtaining scientific measurements of the phenomena. In his conclusions, Akers acknowledged the practical experience gained from the eleven day long field study and also that nothing in his nocturnal observations had pointed towards an extraterrestrial source of activity. Still he was persuaded that something unusual was taking place, something which warranted a continuous and objective examination.

[1973-1980], USA: Project Identification. In response to a flurry of UAP sightings near Piedmont, Missouri, then Chairman of the Physics Department at Southeast Missouri State University, decided in March 1973 to lead a field investigation. Assisted by a team of colleague professors, qualified students, scientists and amateur enthusiasts and having managed to secure some funding from one of the three largest metropolitan newspapers in Missouri (the St Louis Globe-Democrat), Rutledge ran a seven years long study. This field investigation of the UAP phenomena, called «Project Identification», had two objectives: firstly to measure the physical properties of the lights and/or objects in the sky and secondly to identify their origin. Rutledge's innovative approach was to study the unknown phenomena while it was in progress, and no longer after the fact. Having read the final US Air force report on UAP (Scientific Study of Unidentified Flying Objects), Rutledge explained the failure of earlier government efforts could be attributed to the fact that the programme administrators did not recognize the need for observation stations in the field, and that instead the official teams responded to reports of sightings in progress, thereby arriving too late on the scene. Rutledge's goal was to obtain data by the use of highly scientific instrumentation such as radar, electromagnetic frequency analyser, high-frequency low-intensity sound detector, spectroscopic camera, Questar astronomical telescopes with cameras attached and photographic equipment. From 1973–1980, Rutledge set up a total of 158 viewing stations in three major geographical areas, during which the sky was watched for 427 h, by more than 600 observers at various times. Having precisely catalogued

different characteristics of the various sightings, Rutledge attempted to calculate the actual velocity, course, position, distance, shape, color, size and behaviors of the UAP. In the final report of Project Identification [24], Rutledge quotes a total of 157 sightings of 178 UAP, of which there were 34 class A sightings (light or/and objects displaying bizarre behavioral and/or physical properties that defied a conventional explanation) of 45 UAP. Unfortunately, out of a tantalizing number of 700 project photographs, not one exposure of a Class A sighting had been obtained. Rutledge was convinced without a doubt that his research had established the existence of a real UAP phenomenon, but also that a very subtle connection had formed between the observers and the phenomenon: *«In that research, more was involved than the measurement of physical properties of UFOs by dispassionate observers. A relationship, a cognizance, between us and the UFO intelligence evolved. A game was played. In my opinion, this additional consideration is more important than the measurements or establishing that the phenomenon exists»*. In his final remarks [7], Rutledge stressed the need for further scientific study of the phenomenon and for additional sophisticated equipment, including devices to record the intensity and spectrum of electromagnetic frequencies including the optical ranges such as infrared, visible and ultraviolet, and automatic tracking devices so that the detectors could be locked on the direction to a moving UAP.

[1973-1985], USA: Project Starlight International. On an isolated hillside on the Northwest of Austin, Texas, Project Starlight International (PSI) and its founder Ray Stanford pushed the challenge of applying scientific methods and gathering evidence a step further. Financed by the Association for the Understanding of Man, PSI supported an active UAP research (instrumented hard-data monitoring and signaling) as a viable alternative to the mere collection and correlation of UAP reports [8]. One of the working hypotheses was that at least some of the UAP were technological devices, the effects of which were subject to detection, monitoring and recording. In addition was the consideration that these devices had some form of sophisticated intelligence associated with them. Therefore besides the primary goal of obtaining quantitative data, PSI expended its efforts towards developing strategies and equipment for attempting communication with UAP intelligences. Inside a four-foot high white brick building serving as an observation area, was the main PSI's equipment: the UFO/VECTOR (UFO/Video Experiment Console for Transitional-Overt Response).



Fig.4. PSI instrumentation

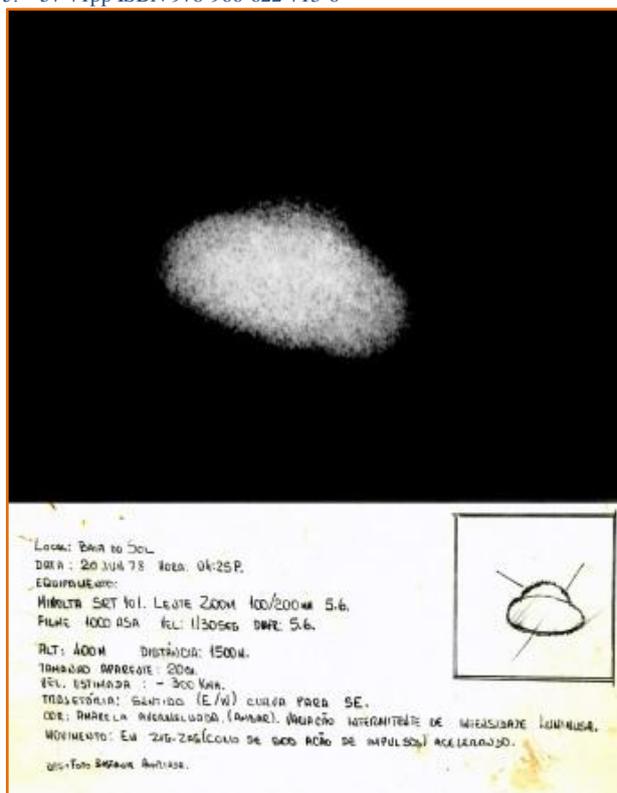


Fig.5. Operação Prato's picture

This suite of sophisticated equipment incorporated a TV-aimed, remote-control console of various instruments and in particular a video-modulated Liconix 605M helium–neon laser, a Criterin Dynamax 8 Schmidt–Cassegrain telescope, a photomultiplier and video amplifier and a Sony video camera. An extreme PSI assumption was that video transmission via a modulated laser beam from the UFO/VECTOR unit might be readable by instruments aboard UAP. PSI had also installed on the ground another experiment attempting communication. It was a circle of spotlights composed of ninety 150W lamps, forming a ring of 100 feet in diameter. These lamps could switch on and off according to various sequences and therefore could serve as communication device (reminiscent of Spielberg's 1977 movie, «Close Encounters of the Third Kind»), where contact was established following a particular musical tone and light activity). Lack of UAP activity and discontinuity of financing eventually forced PSI members to stop their research program.

[1977-1978], Brazil: Operação Prato. Colares, an island on the coast of Pará, North of Brazil, was subject of intense UFO activity in the mid-1970s and had in response a governmental investigation. In 1977, the First Regional Air Command from the Brazilian Air Force (I COMAR) received an official letter from one city mayor reporting UFOs allegedly causing injuries to fishermen and locals. In the months of October, November and December of 1977, and during the first half of 1978, such phenomena had intensified so much that, after a rise in local concern and due to the scars found on the growing number of witnesses, the city mayor requested help from the Air Force, while in parallel organizing night of vigils and using fireworks to keep the lights away. The Air Force decided to send a small platoon to the coast of Pará, with the objective to secretly investigate the UFO phenomenon. Led by Captain Uyrangê Hollanda, who called his mission «Operação Prato» (Operation Plate, as a clear allusion to the popular name «flying saucers»), a small unarmed team of six sergeants spent four months in the Amazonian states of Maranhao and Para, coordinating, observing and recording in every possible way, the strange and inexplicable events reported by the residents. The operation lasted

for only about four months, but it certainly represents the biggest known official military initiative to investigate UFOs in the field.

According to official documentation released, the following equipment was used by the team:

- a. Portable transceiver CBT;
- b. Camera Minolta SRT 101, lens 100/200 mm;
- c. Camera Yashika Eletro35 TLS lens 400mm 1:6.3;
- d. Camcorder 8/16 mm;
- e. Recorder UHER;
- f. Binoculars x 5 zoom;
- g. Meteorological theodolite;
- h. Helicopter UH-1-H (Huey).

The tactic used by Captain Hollanda and his team was to interview all witnesses, draw precise maps where events had occurred, use base camps the locations where sightings had regularly been reported, and in general sleeping by day and working at night for increasing their chances of directly observing a UFO. When the military team arrived at Colares, the local medical center kept getting victims. Some eyewitnesses declared suffering from symptoms of paralysis, superficial burns, intense heat, trembling and tiny holes in the skin. Many locals described the same scenario: bright objects appeared from the sky, chased people and fired into their bodies a kind of light beam such as a laser of two colors. All affected victims thought that they had the ray sucked a little blood, giving rise to an anemic process. A fact later confirmed by blood counts performed by the medical health authority on the island of Colares, Dr. Wellaide Carvalho. During the first two months of Operation Plate nothing substantial in terms of sightings was recorded. However, in the last months, as narrated by Captain Hollanda in an exclusive interview granted to researchers Gevaerd and Petit in 1997, the team apparently succeeded in experiencing and documenting some striking manifestations of unknown nature. Allegedly, Hollanda and his team held numerous observations at close range of UFOs in the outskirts of Belém, and even more importantly succeeded to obtain several hundreds of photos and several hours of super 8 and super 16 mm of UFOs. As revealed in 2009 [9], the National Information Service (SNI), the 1964-1985 military dictatorship's intelligence agency, also participated in the Air Force mission. Classified government documents describe several missions carried out in several Brazilian states. These missions were carried out by secret agents enrolled in the so-called «Operação Prato». Some reports filed by intelligence officers, described “blue lights” that moved at high speed on the water in the Amazonian states of Maranhao and Pará. The documents include sketches of the unidentified flying objects described by eyewitnesses and intelligence officers. After approximately four months, Hollanda and his team managed to reestablish peace and order in the area. The Air Force then stopped suddenly «Operação Prato» without explanation and no information was communicated afterwards. At that time Brazil had a dictatorship government and, because of that, the documents have been kept classified for decades. However, starting from 2009, under the national FOIA (Freedom of Information Act) and pressure of the UFO community, the Brazilian Air Force and the Brazilian Intelligence Agency started opening up and releasing some files to the National Archives.

[1978-2000], USA: Copper Medic Famous Ufologist and author Jacques Vallee also came up in the mid-1970s with a concept for attempting to catch the UFO phenomenon in the act, under the form of a system for long-term photographic surveillance of UFO sites [10]. During a whole year, between August 1978 and August 1980, Vallee and his son developed new instrumentation allowing photographs to be taken of remote sites in the field using an automatic camera camouflaged as an ordinary rock. The camera drew power from a separately buried battery unit and took sixty exposures during a six-hour period each day, then went to sleep for eighteen hours, starting again at the same time the next day. The decision to take pictures in daylight was guided by the fact that the UFO sightings by the witnesses had repeatedly occurred

between 10:00 and 11:00 A.M. The camera produced 6mm color exposures using ordinary Kodak film, and the images could be enlarged to give clear three-by-five inch-prints. They installed the device on an isolated slope in California, overlooking a canyon where UFO had repeatedly been observed. In terms of instrumentation they chose to use Bell & Howell pulse cameras using 16mm film in fifty-foot rolls, a 25mm Berthiot lens that could be set from f1.9 to f16, the slowest possible daylight film. The camera was connected to an intervalometer timing circuit to send pulses to the camera. Power source was a set of two Eagle-Picher batteries mounted to give a twelve-volt direct current source. As illustrated by fig. 6, the concrete shell for the camera had been very cleverly produced. It was very hard, shaped like a rock with encrusted bits of wood and leaves so that it would blend in naturally with the hillside. The shell was split in two so that the top could be removed, exposing the camera itself. It was filled with wax to insure a very tight fit, leaving no room for insects and creating a water seal around the device. Although Vallee's experiment did not reveal any UFO and was eventually discontinued, it certainly demonstrated that such technology and tactics could be used on a routine basis whenever there was recurrence of UFO phenomena over a given area.



Fig.6. Vallee's automatic camera camouflaged

[1984-Today], Norway: Project Hessdalen. Hessdalen is the name of a small valley in the central part of Norway, roughly 15km long and 5 Km wide, with only 140 inhabitants. At the end of 1981 strange unknown light phenomena started to appear frequently at numerous locations throughout the valley. Until the end of 1984 these lights appeared up to 20 times a week. Then the frequency suddenly decreased to only once or twice a month. Most of the observations fell into one of the following three categories: A big yellow light that moved slowly around in the valley, or would be stationary for some minutes or more than an hour. The anomalous light could show up in all weather conditions and was seen at different altitudes, either high in the sky, or just over the roof of the houses or even down on the ground. White or blue flashing lights which would last only from a fraction to a couple of seconds and which could show up everywhere in the sky. Several lights were together, with a fixed distance from each other. It seemed like the lights eliminated from a black object. Mostly it was two yellow or white lights and a red one in front. No one could provide explanations for these lights and quickly the Norwegian valley became known as a «UAP hotspot» and internationally known as the «UAP laboratory». As no official institute with government support had shown interest in the unknown lights, five individuals decided to set up their own research project. Project Hessdalen was born in June 1983 and was primarily aimed at identifying the nature of the phenomena through gathering scientific data, and secondly at raising the interest of the mainstream scientists. A first field expedition was carried out from 21 January to 26 February 1984, during which a total of 40 volunteers participated. Various instruments were installed at the headquarters, which

was a trailer located on a hill. Two other groups of participants, equipped with cameras, were located on two of the nearby mountains.



Fig.7. Project Hessdalen Automatic Measuring Station (nicknamed «Blue Box»)

The following instruments were made available in the field:

- camera with gratings, type Paton Hawksley;
- seismograph “MEQ-800 portable seismic system”;
- radar “Atlas 2000”, with a wavelength of 3 cm and a maximum distance of 33 km;
- spectrum analyzer Hewlett–Packard; magnetometer Fluxgate, model FM100;
- laser 633nm Spectra-Physics model 155; Geiger counter including two radiation alert mini; IR-viewer FJW model 80045.

The results of these five weeks of field work were particularly positive [11]. A total of 53 unknown phenomena were observed and corroborated with the scientific instruments. Not only were some pictures with the lights’ wavelength distribution obtained, but also some radar measurements, changes in the magnetic field, recordings on the spectrum analyzer and even more strangely, reactions to laser. The laser had been pointed towards a flashing light, in two different cases, for a total of nine times. In eight of these times, a reaction occurred, through a change in the flashing sequence. Despite the fact that no conclusive explanation for the luminous phenomena could be found, the 1984 scientific campaign had demonstrated its reality and that it could be scientifically measured and studied. Contrary to the majority of projects referenced in the figure 10 below, the Hessdalen’s activity is still running today, 30 years after its inception. Field work and science camps are run, new strategies and equipment are being developed, international alliances sought and established, and efforts for attracting the interest of the scientific community are pursued [12].

[2000-2012], USA: The Marfa Lights investigation



Fig.8. Station «Owlbert»

Starting in late 2000, an investigation was conducted into unexplained nocturnal light phenomena near a small West Texas town by the name of Marfa (population 2400). Infrequent-unexplained lights phenomena are sometimes seen nine miles east of town in a region known as Mitchell Flat. History of these observations predates arrival of European settlers. Native Americans believed them to be stars that had fallen to earth. This investigation was a self-funded study effort by James Bunnell after he and his wife witnessed incredibly dynamic long-duration light activity (seven hours on the first night) that seemed to defy conventional explanation. Purpose of the investigation was to try and determine the source and true nature of the phenomena. The principal challenge of the investigation was infrequency of appearance (about 8 to 10 event nights per year) and unpredictability where they might occur. Three automated monitoring stations, «Roofus 2003», «Snoopy 2004» and «Owlbert 2006» (see Fig. 8) were constructed and used together to capture nightly video [13]. In addition, onsite observations were accomplished on 280 nights using a variety of binoculars, cameras, and telescopes plus a spectrometer, and various meters including magnetometers, EMF meters, gas meters, air ion counter, and a Geiger counter. The investigation began in December 2000 and was concluded in December 2012.

During his research project, Bunnell's principal findings were the following:

- No correlation to sun spots, coronal mass ejections, solar X-Rays or other solar events could be found;
- Marfa Light (ML) events show great variety with each event being unique in appearance and point of origin;
- Mitchell Flat (where MLs are most commonly seen) has underlying tuff (compressed volcanic ash) to a depth of ~1000 meters;
- Triangulated ML points of origin appear to be associated with tectonic fault zones;
- MLs are nocturnal and may occur anytime of night anytime of the year;
- MLs are sometimes stationary but more often travel horizontally at altitudes of 130 meters or less. MLs sometimes shoot high into the sky;
- A small percentage of ML reports are believed to be Fata Morgana mirages caused by temperature inversions. Most are not mirages;
- MLs usually have continuous spectra suggesting chemical combustion processes;
- MLs appear to be completely unaffected by wind;
MLs are silent;

- MLs are usually yellow-orange but sometimes turn bright red and, on occasion, blue or green in color;
- MLs execute step changes in brightness;
- A characteristic common to MLs is turning on and off, even when traveling.

Ultimately, Bunnell concluded that other than infrequent night mirages, ML characteristics were consistent with multi-phase plasma interacting with the atmosphere and that a suspected source of MLs is plasma bubbles generated deep underground by extreme tectonic pressures and/or heat.

[2004-Today], Italy, Project UAP-Italia

Montefiorino, a small mountain village situated at the turn of the Tuscan-Emilian Apennines and the Modenese, lies at an altitude of 790 meters. It is in this remote location that a research program called «Project UAP-Italia» was inceptioned in 1997. Created by Nicola Tosi, an amateur astronomer of the «Centro Ricerche Appennino Modenese», this project aims at monitoring UAP in the low atmosphere of the Apennines [14]. Many testimonies had been collected throughout the years regarding the observation of unconventional flying objects passing over the Tuscan-Emilian Apennines and Modenese. Tosi decided to set up this project because he believed that there was the need to understand what phenomena could be the cause of such sightings, and under what circumstances such phenomena could appear. Nowadays, the project includes various team members, all amateurs, but who accumulate over twenty years of experience in various fields ranging from astronomical photography, geology, earth science, research in long waves VLF (Very Long Frequency) and ELF (Extra Long Frequency).



Fig.9. Project UAP-Italia

The overall research methodology of Project UAP-Italia involves the following main activities:

- Continuous monitoring of the area along the Tuscan-Emilian Apennines and Modenese;
- Analysis of data obtained;
- Analysis in comparison with data from other geographical locations;
- Publication of any report.

Being given the large geographical area to be monitored, it was decided to select not only one location in the field but four different ones. These viewpoints were selected based on their very broad view of the valley, accessibility and high altitudes. In terms of organization, the project currently follows the following method: at least twice a week the research team choose and prepares one of the four locations as base camp. They then check and select a particular observation point in this area, ensuring that the surroundings are suitable for the monitoring.

In order to perform such activity, Project UAP-Italia has at disposal in particular the following equipment:

- high resolution cameras, digital SLR cameras with CCD and C-MOS modified adapted to resume a wide range of frequencies between 300nm and 1500nm;
- CCD cameras cooled sensitive UV-IR;
- apochromatic refractor telescopes of varying aperture and focal targets focal ranges to allow high-resolution images and magnifying lenses with aspheric ED low dispersion to eliminate aberrations and aspherical spurious effects like reflections or astigmatism of light sources;
- special filters to resume in the different lengths of the visible spectrum and invisible;
- spectrograph for Baader readings spectrometric analyzes;
- ELF and VLF receivers longwave band continues 0-30 MHz for long waves;
- radio frequency scanners to 0.1-4.00 GHz;
- geiger counters for the digital and analog emission monitoring radioactive alpha, beta and gamma;
- optical and laser gas of different Power to the environmental stimuli;
- Thermo Infrared Camera model AVIO- TVS.

Therefore and similarly to some previously described projects, this instrumentation allows to obtain optical data in terms of high-resolution images and footages, and also the collection of various data detected simultaneously by other instruments in different wave frequencies. This includes in particular the detection and analysis of light spectra, useful for identifying the chemical and physical properties of the phenomena.

Project UAP-Italia is also seeking collaborations with other specialists in order to refine their instrumentation. Recently, they had the opportunity through the collaboration of Daniel Gullà, to use a new multispectral CCD (cooled) camera. This system allows, through the use of filters interferometer at various frequencies, to take pictures in high definition on frequencies between 200 and 1300nm. These frequencies would have been impossible to reach without this vital collaboration.

For the interest of other UAP researchers, the key features of this sophisticated camera are given herebelow:

- 1048 x 1048 CCD sensor with high dynamic and very high sensitivity (military device);
- Cooling the sensor down to -60 ° C;
- Sensitivity extended to small swarms of photons;
- Optical quartz and calcium fluoride for wavelengths between 200 to 1300 nm;
- Very high quantum efficiency over the entire spectral band;
- Mechanical shutter and wheel holder 8-band filters;
- Acquisition mode Multispectral and Hyperspectral (LCF external);
- Combination and RGB Full Color photos for UV and IR color;
- Various ways of reading and viewing, with subtraction of noise, FFT filters.

Such methodology and tactic have already produced successful results, especially when the team efforts focused on the second observation center, a vantage point close by the Pietra di Bismantova, which is a geological formation in the Reggiano Apennines. In January 2012, a group of researchers of the Project UAP Italy photographed on two different days, an anomalous luminous phenomenon. Few minutes before noon, they first photographed a luminous form apparently stopped on a rock at the foot of the stone, and which stayed there for five minutes. A few days later, in the afternoon, they also noticed the phenomenon in the same area, but this time managed to take a picture of the phenomena in the frequency visible to the naked eye. The images show a spherical shape in motion with a faint colored trail behind it. Overall, Project UAP-Italia has documented dozens of luminous phenomena of unknown origin and intend to proceed in the future according to two lines of actions. The first line is to use in the field some low-bandwidth receivers VLF and ELF and secondly to do some historical research on past

testimonies. However, the researchers emphasize that progress might be slow as the project is entirely self-financed and scientific instrumentation can be quite expensive.

Key findings.

1. General. Contrary to popular belief, there have been many attempts at field measurement/detection of UAP and very few of them were predicated on an extraterrestrial visitor hypothesis. As can be noticed in figure 10 below, field experiments peaked in the 1970s and early 1980s, and then virtually disappeared in the 1990s. The decline may be attributable to different factors, like the closure of the American project «Blue Book», the decrease of UAP sightings, the focus on other topics in the USA (e.g. Roswell, abductions) and even to the fact that the institutional and scientific climate gradually becoming less supportive of studying UAPs. The above table also reflects an obvious increase since the 2000s in the number of initiatives around the world (mainly in Europe). Several long-term field projects continue into the new millennium, including the Project Hessdalen (Norway) which is running since 1984. Civilian UAP researchers have attempted to use scientific instrumentation to measure and assess the UAP phenomenon. They have deployed more equipment and in many more locations than the few government projects that attempted similar research. The majority of the systematic, instrumented efforts have in fact been devoted to the study of «nocturnal lights» (also called «earthlights»). From this survey, it appears evident that that this kind of phenomenon is much more frequent than reported «unidentified structured aerial objects».

2. Field tactics. This study revealed that early projects centered on acquiring photographic evidence and the detection of fluctuations in magnetic fields, on the assumption was that UAP were at least emitting some type of magnetic field (spinning of compasses has been described in some cases). Most projects that used an automatic trigger used some type of magnetic detection, and this often led to too many false positives. Areas where «nocturnal light» activity occurred frequently (e.g. Yakima reservation, Marfa, Hessdalen) became outside «laboratories» for physical research, locations where scientific observations and measurements could be conducted with continuity. Field work often used state-of-the art equipment despite small budgets. As researchers suspected that the UAP phenomenon emitted radiation at several wavelengths and as technology became more powerful and affordable, new sensors sensitive to different wavelengths of the electromagnetic spectrum were added to the optical instruments (e.g. Toppenish, Starlight, Marfa, UAP-Italia).

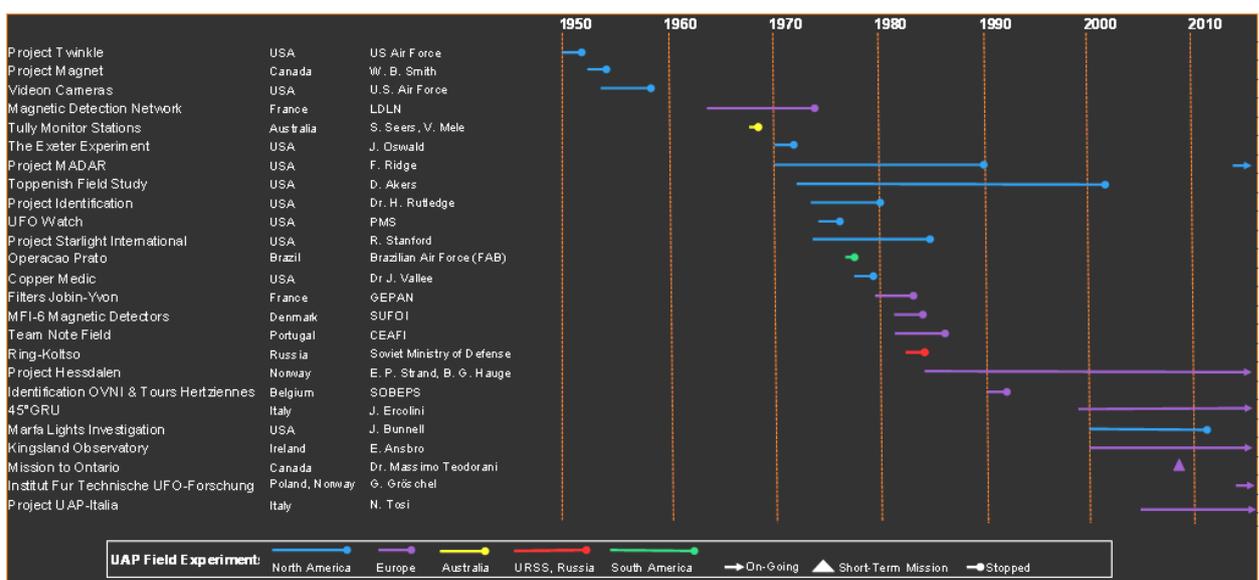


Fig.10. Field experiments timeline

3. Field Strategies. UAPs do not appear everywhere. While some projects placed instruments at spots where UAP are more frequently seen (e.g. Marfa, 45°GRU), others placed instruments where it was convenient (e.g. Exeter, Starlight). The former had more success than the latter. Advances in technology and informatics allowed the introduction of automatic unmanned observation stations (e.g. Hessdalen). A «hit and run» strategy of moving the experts and instruments to a location where activity was previously observed has been successfully adopted by different projects (e.g. Project Identification, Operação Prato). Other innovative approaches have included attempts to «catch» the UAP phenomenon in the act. These have included camouflaging an automatic camera as an ordinary rock (sleeping beauty), quietly pre-positioning a network of observers in strategic places over an extended duration, and, in one case, attempting to trigger UAP activity over a specific location through an increase of military exercises (alleged Russian military operation Ring-Koltso). Increased of cooperation has also been attempted in order to share the resources and maximize the chances of detecting UAP. For example, Project Hessdalen begun in 2000 to build up an international technical cooperation (Norway, Italy, France), for increasing the range of instruments investigating UAP's electromagnetic signature (e.g. using radio astronomy techniques, infrasound array, UHF radar). Similarly, Project UAP-Italia has also started building partnerships with other specialists in order to refine their instrumentation.

4. Results. For the most part, photographs and spectra data have been the most useful data collected by these projects, demonstrating unequivocally that aerial phenomena exist which cannot be conclusively identified. Pictures have also been collected automatically (e.g. Marfa and Hessdalen). Some success in recording other anomalous physical data has also been claimed (e.g. magnetic anomalies, radar correlation).



Fig.11. Field experiments location

5. Limitations and shortcomings. The analysis of these instrumentation projects have allowed to highlight some most common problems, limitations and shortcomings faced by the researchers. The following list can serve as a check-list for future initiatives, before any start.

- Problems with financial resources;
- Organizational and logistics capabilities;
- Lack of competent technical personnel constantly available in the field;
- Incomplete familiarity with the instruments;
- Difficulties of a regular and prompt maintenance during hardware or software failure;
- Unprepared governmental teams sent on the field;
- Human observers and researchers are highly suggestible and, particularly in a situation where a novel observation occurs, they are looking for an explanation for what they experienced. The latter can lead to some very erroneous conclusions;

- Results of UAP field experiments efforts have almost never been published (Hessdalen's work has been an important exception since a few years ago).
- Lack of exchange of experience between researchers across the world.

Conclusions. The ultimate goal of instrumented field studies is to ascertain the nature of the UAP phenomenon and which known physical explanations can be extracted from it. In historical retrospect and in relation with scientific methods to search for extraterrestrial intelligence, it can be argued that the UFO phenomenon has opened up a completely new dimension, not fully recognized by science. However progress needs to be made in such explorative instrumented missions. As a contribution to allowing this past fieldwork to guide future projects, the following paragraph draws a clear synthesis of key points identified throughout this research study and formulate specific practical recommendations for future instrumented monitoring missions in the field.

- Field studies should definitely be done where UAP have more frequently been reported, as there is a very small likelihood that a UAP will be detected otherwise;
- The UAP phenomenon, even in areas where it occurs more frequently, is still intermittent in its appearance and so research must continue for many months, at least;
- The most successful projects were those where researchers could be on-site with equipment and could both initiate and visually corroborate instrumented observations;
- Some projects have managed to acquire some preliminary data, albeit inconclusive. It can be concluded that anywhere that UAP appear often enough they can be photographed. In this respect, UAP are literally «real»;
- The past limited success of the past field studies provides support for continued and enhanced field work;
- Whatever UAP are, they can be studied with the right equipment in the right place at the right time. The challenge is not the technology, but the other two components;
- Progressing on UAP physics' working hypotheses is only feasible if field work includes simultaneous measurements with sensors functioning at different wavelength ranges;
- A robust automatic monitoring system appears to be the best trade-off option, and ideally a network of several stations;
- Advances in technology and informatics open up new and more effective options for the detection and analysis of UAP;
- The amount of funds required for field study of the phenomenon is not excessive, as shown by past efforts, but any project requires a sustained effort over time, and thus long-term funding;
- Having a network of observers and a comprehensive UAP reporting network near station locations is very important to coordinate physical measurements with UAP sightings, and projects often had less success with this aspect of the work;
- Field studies require effective collaboration between scientists from several disciplines (e.g. atmospheric physics, geology, meteorology);
- Cooperation between UAP field works specialists should be strengthened;
- Accurately documenting and preserving the information pertaining to field experiments is required for guiding future projects;
- UAP sightings reliable databases/statistics (e.g. from GEIPAN) are indispensable in order to refine instrumentation and research strategies.

References:

1. Condon E. Scientific Study of Unidentified Flying Objects, Dutton, NY, 1969 (Chapter 9)
2. Project Twinkle final report, 27 November 1951. Available on line at:
<http://www.project1947.com/gfb/twinklereport.htm>

Anomalous phenomena: methodology and practice of research: The publication is devoted to the 10th anniversary of Ukrainian Scientific research Center for Analyses of Anomalies «Zond» in a chief edition by PhD, AssProf Bilyk A.S. - Kiev: National Technical University of Ukraine «Kyiv Polytechnic Institute», 2015. – 57-71pp ISBN 978-966-622-713-6

3. Project Blue Book was one of a series of systematic studies of Unidentified flying objects (UFOs) conducted by the United States Air Force (USAF.) between 1952 and closed in 1969
4. Project Twinkle final report, paragraph 2
5. Project Blue Book report no 5 (31/03/1952)
6. Akers D. Report on the investigation of nocturnal light phenomena at Toppenish, Washington, 02/11/1972
7. Rutledge H.D. Project Identification, Prentice-Hall, 1981
8. Harrigan S. Planet X! We are waiting for you!, Texas Monthly, 1976
9. Brazil Intelligence Agency Investigated UFOs in 1970s. Available on line at:
<http://www.laht.com/article.asp?ArticleId=325239&CategoryId=14090>
10. Vallee J. Confrontations: A scientist's Search for Alien Contact, Souvenir Press Ltd; 1990 p181
11. Strand E. Project Hessdalen, Final Technical Report, www.hessdalen.org, 1984
12. Hauge B.G. 10 years of scientific research of the Hessdalen phenomena, 2004
13. Some pictures are available on Bunnell's website: <http://www.marfatxlights.com/index.html>
14. Project UAP-Italia website: <http://www.projectuap-italia.org/English%20version/Project%20english%20version.htm>