Technical Commission 3AF- SIGMA 2

3AF/ SIGMA2:

UAP: an approach to physical observables

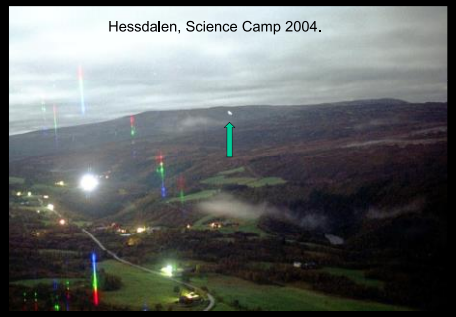
Luc Dini- fellow member of 3AF- chairman of 3AF SIGMA2 technical Commisison
member of GEIPAN college of experts

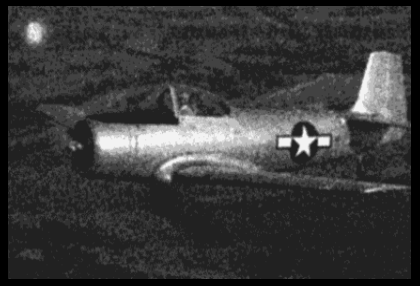
https://www.3af.fr/commission-technique/sigma

UAPs, what do they look like?

How to discriminate UFO/ UAP from atmospheric phenomena, from advanced technologies?

Optical observable can be diverse between UAPs and can vary quickly during an observation (punctual to a shape, several objects fuzzing, changing of shape, ovoid to dart…change of colour, of radiation intensity, slow, floating, moving or stationary, sudden acceleration).





“luminous spheres” “plasmoid”, single or in group: high velocity/acceleration - change of group geometry-

Bright glow, RF EM transmisison,

Hessadalen- Foo Fighter

Some can be confused with ball lightning or similar phenomena in some cases or possible unknown UAVs

However observation of Physical Phenomena over decades (through various aeronautics technologies era) can’t be disputed: what are they?

SIGMA2: a collaborative and multi disciplinary approach to study UAP

- Introduction to 3AF SIGMA2 : from “MOC to UAP” and GEIPAN, SIGMA2 cooperation
- A tour of UAP/ anomalous observables and physical approach by SIGMA2 (collection of optical radiation sources)
- Some UAP cases analysis: complexity of analysis-needs of data
- Recommendations for collecting more data to undertake analysis
- Conclusion
- Bibliography- references

What is 3AF?

The 3AF is a technical and regional organization

About 1500 members, including CNES, DGAC, DGA (MoD), engineering schools, aeronautics, astronautics industry groups….

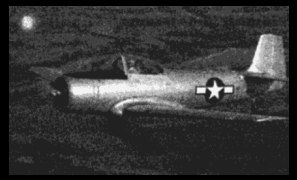
Technical Commissions (TCs)

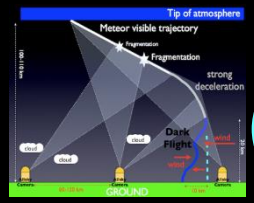
Aerodynamics, Commercial aviation, light air machines et machines, skills and training, Drones, Environment, Flight tests, space observation and exploration, Helicopters, History, Economic intelligence and strategy, Materials, Missiles, IP, aero and space Propulsion, Sigma 2 (UAP), Strategy and international affairs, Structures, Optronics Systems, Space Transportation

A Steering Committee, bringing together experts and the presidents of the TCs, ensures, at the central level, a follow-up and the harmonization of the work.

3AF SIGMA2

Association Aéronautique et Astronautique de France





Documentation research

Data Base methodology

OBSERVABILITY

Σ2

CONTACT COMMUNICATION

PHYSICAL ELEMENTS STUDY

CASES SELECTION

SIGMA2 is a group of multi disciplinary experts (pilots, astronaut, engineers in missiles, UAVs, air defense, AI, optronics, radar, EM, ball lightning, directed energy, physicists, experts on EME on human) gathered in a scientific society to study UAP cases

Instruction concernant l'établissement et la transmission des comptes-rendus relatifs aux Mystérieux Objets Célestes (M. O. C.)

Secrétariat d'Etat à l'Air, n° 267/EMFA/A/BS/DR

Paris, le 22 octobre 1954

A de nombreuses reprises la presse a signalé que des objets mystérieux - habituellement baptisés "Soucoupes Volantes" - étaient apparus au-dessus de la France, avaient survolé des agglomérations, des installations militaires ou des bases aériennes, et parfois atterri en campagne. Quelques-uns de ces apparitions ont même donné lieu à des rapports officiels.

En général, la description très vague des faits observés et le manque de détails essentiels sur les circonstances de l'observation ne permettent pas de se prononcer après coup sur la réalité des objets vus ni sur leur origine.

La plupart des phénomènes signalés par les témoins de bonne foi paraissent dûs soit à des objets connus, mais vus dans des conditions anormales, soit à des effets d'optique ou d'électricité atmosphérique. Telle sont, d'ailleurs, les conclusions d'une enquête de l'US Air Force sur les cas observés aux Etats-Unis et l'opinion de nombreux savants français ou étrangers.

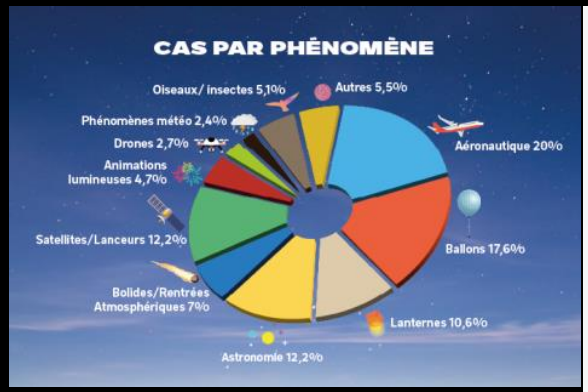
Un certain nombre de faits sont cependant restés inexpliqués, faute de renseignements suffisants, et cette situation peut se reproduire. Il importe donc, tout en évitant de créer ou d'entretenir une émotion injustifiée, de rassembler le maximum d'informations sincères et précises sur les apparitions éventuelles. L'Armée de l'Air peut et doit apporter sa contribution à une appréciation objective des faits.

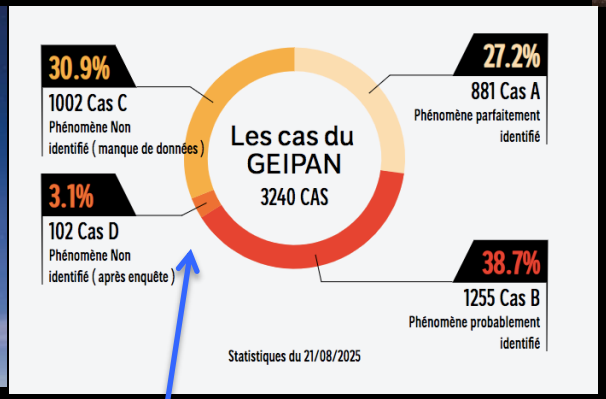
A cette fin, les Grands Commandements demanderont aux Commandants des bases et formations de l'Armée de l'Air placées sous leurs ordres de bien vouloir, lorsqu'un mystérieux objet céleste leur sera signalé :

Mystérieux Objets Célestes (MOC) en France:
faire établir par les témoins, militaires ou civils, un compte-rendu objectif et détaillé,
transmettre ce compte-rendu, revêtu de leur avis, directement à l'Etat-Major (Bureau Scientifique) sous le présent timbre.
Le Général de Corps Aérien GELEE
Major Général de l'Armée de l'Air
/GELEE/
Pour ampliation
directive ministérielle 267

En France: le GEIPAN (agence d'enquête) Complété par SIGMA2 (association)

3AF
Association Aéronautique et Astronautique de France





GEIPAN
(created in 1977)

Gendarmerie
(military police)

French Air and Space Force

Agences étrangères:
CEFAA (Chili), AARO- NASA (US)- CEFAE (Argentin)

Associations scientifiques:
Gallileo (internaitonal) - SCU (US)- UAP-X (US) -VASCO (SUE)-IFEX (GE)

Universités (Harvard-Stanford- Albany- Wurzburg…)

GEIPAN statistcs (21/08/25)

SIGMA2 reports and participation
To GEIPAN college of experts

Foreign cases

Σ2

Selection of D case (relarble, unexplained)

Physical explanation

Observation approach

Study use cases and recommendations

Reports, Webinar
On UAP observables

SIGMA2 collaboration with societies/ institutions

Association Aéronautique et Astronautique de France

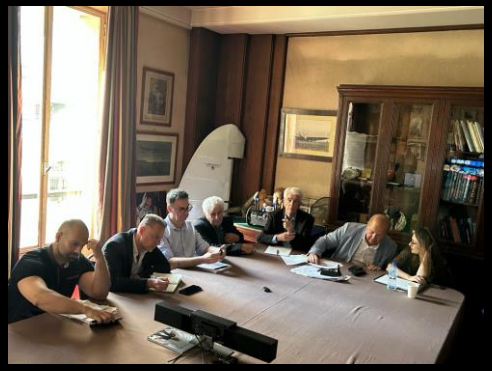
CNES GEIPAN (France)

CEFAA (Chili)

NARCAP US

- **Laboratoire de recherche sur la Foudre (France)**
- **IMCCE (Observatoire de Paris- Institut working on meteorid)**
- **SCU (US)**
- **Others to come : SUAPS, AIAA,…**
- **Webinar 1 on UAP Optical observables (SCU, SUAPS, VASCO, UAPx, Gallieo, Hessdallen project,..) June 2023**

GEIPAN international colloque
CAIPAN 2- SIGMA2 experts (Toulouse 2022)



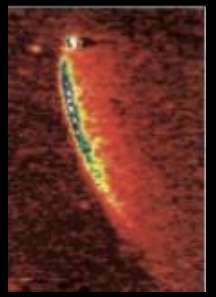
3AF SIGMA2 Webinar 1 on UAP optical observables (June 2023, Paris aeroclub de France)

3AF SIGMA2 meeting with C. Mellon and J. Vallee (aeroclub de France, 3 Nov 2023)

Association Aéronautique et Astronautique de France

UAPs observables and special air vehicles: Triangle shape versus many UAP shapes

Comparaison avec des engins spéciaux : forme, comportement cinématique?



Different shapes/ change of shape during flight?

Specific analysis:
UAS and UAS limit of performance in flight domain- new propulsion
Hypervelocity missiles inventory – flight domain- Signatures and plasmas at high speed

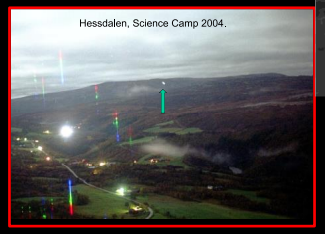
What are they?

Association Aéronautique et Astronautique de France

Revigny case 1975

Unknwon objects
U A P

Foofighters?



UAS

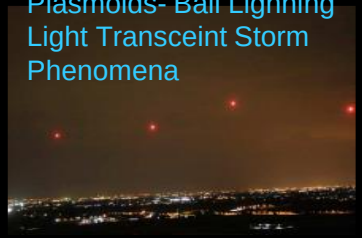
Thai Lantern

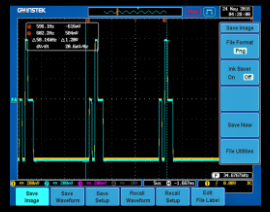
Hypersonic missiles

Mossoul sphere (observation by a Reaper UAV)

Balls of lights – Teheran case 1975
2 F4 fihgters hunting for UFO are EM disabled at 40 km from these balls (simialr to Directed Energy weapons DEW- no airborne DEW available then, ntiher today to generate such effects

Plasmoids- Ball Lighning
Light Transceint Storm
Phenomena





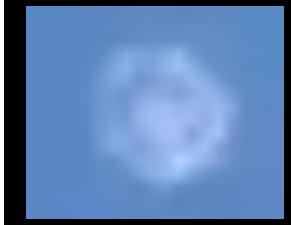
Object with plasma generator

Russia Petrozadvosk UAP case or simulated nuclear experimentation generating X, gamma rays and high energy electrons fall outs inducing light glows

EME effects Toronto case submiyyed by SCU- a flying object in stationnary flight surrounded by a blue stationnary glow engin Webcam and smartphone HS- a cyclic signal is recorded

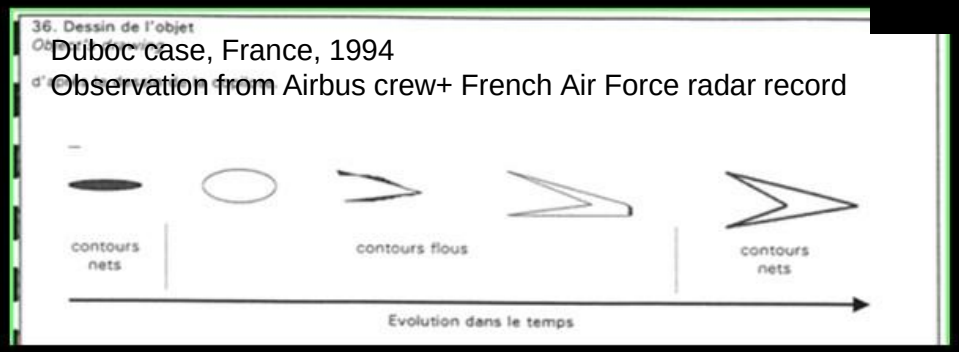
UAPs shapes

Association Aéronautique et Astronautique de France



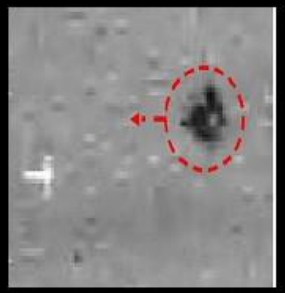
Discrete localized phenomena (orange point), then lenticular or ovoid, bright silver disk (many forms) multiple colors intense flashes even in stationary position – increase of intensity before moving…

Variable phenomena



Duboc case, France, 1994
Observation from Airbus crew+ French Air Force radar record

Change of geometric shape (disc-arrows), blurring effect on the side, static or slow, rectilinear or oscillating movement, sudden accelerations with angles at 90 degrees, reversal, silence or emission of crackling, ultrasound, change of appearance (bright, metallic), change in color and intensity…



IR observations:

Difficult interpretation, requiring other observations, in particular radar remove the ambiguities on the distance (case of a drone? case of an airplane, questions about possible masks along LOS)

https://www.youtube.com/watch?v=OqWEXLj7zMs&feature=related]. (gendarme sighting report 1975, Revigny France

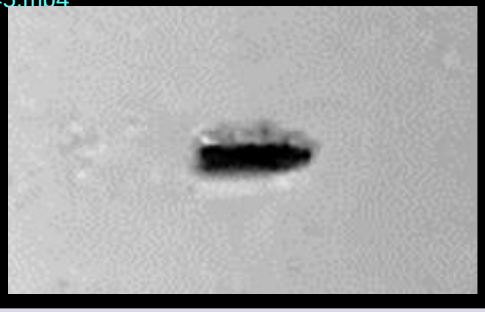
US AARO depicts UAP characteristics

TYPICALLY-REPORTED UAP CHARACTERISTICS		
Appearance	Morphology	Round
	Size	1-4 meters
	Color	White, Silver, Translucent
Performance	Altitude	10K – 30K feet
	Velocity	Stationary to Mach 2
Signatures	Propulsion	No thermal exhaust detected
	Radar	Intermittent, X-Band (8-12 GHz)
	Radio	1-3 GHz, 8-12 GHz
	Thermal	Intermittent, Shortwave Infrared, Medium-Wave Infrared

Middle East Object
Footage taken by an MQ-9 of an apparent silver, orb-like object in the Middle East. Due to limited data, the object remains unidentified.

The appearance of U.S. Department of Defense (DoD) visual information does not imply or constitute DoD endorsement.

https://d34w7g4gy10iej.cloudfront.net/video/2304/DOD_109584445/DOD_109584445.mp4



South Asian Object (Image 1)
Footage taken by an MQ-9 of an unidentified object in South Asia with an apparent atmospheric wake or cavitation, later assessed as a likely commercial aircraft by the All-domain Anomaly Resolution Office. The cavitation is likely a sensor artifact resulting from video compression.

Reporting UAPs

Military personnel should report through their command or service in accordance with GENADMIN Joint Staff J3 Washington DC 191452ZMAY23 "Unidentified Anomalous Phenomena Reporting and Material Disposition."

Civilian pilots are encouraged to promptly report UAP sightings to air traffic control. AARO receives UAP-related Pilot Reports (PIREPs) from the Federal Aviation Administration.

https://www.aaro.mil/Portals/136/PDFs/Latest_UAP_Reporting_Trends_Presentation.pdf?ver=2ZJZ6Bg4hNpjiBlRzC-VjA%3d%3d

UAP EM observables reported : any link with plasma?
Tracking Electromagnetic Effects recorded

3AF
Association Aéronautique et Astronautique de France

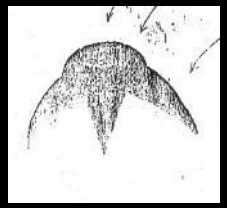
Optical light glow effect (single, multiple in group) (blue, white, color change)
RB47, Teheran, Lakeneath,05/11/90 case…)

Apparent shape shifting

Hovering to hypervelocity
Strong acceleration
Low inertia appearance

Plasma?

MW EM waves pulsed transmission
1-3 GHz, 9 GHz records by RB47, by SAC B52 in 50s.
Large RCS (“707” RCS or low RCS observable/
Instantaneous disappearance of radar plot and glows after hours
Pulsed active EM transmission from UAP sometimes
Many records
RB47 (US) 3 GHz, 1 µs, 600 Hz, B52 (Malmstrom)
B52 SAC crews required to record EM signals at 3 GHz
UK RAF pilots observation in Lankeneath (1956) lights with radar
Flying in groups –geometric

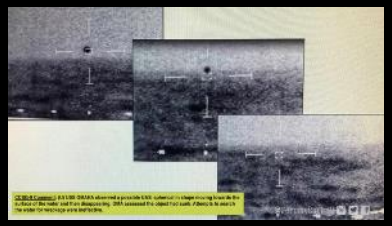


MW Pulse Effects on electronics
Similar to EM weapons
Eg Teheran case (1975)

MW EME Effects human
“heating” burning effect: skin, eye: UV
Acoustical effect (infrasound, low frequency)- cerebral and memory
Similar to EM Weapons

Low to no interaction with environment
Air, water… MHD like? No sonic bang
To compare to MHD EM energy effect on airflow

MW Effects on environment: vegetation
Water boiling



MW High Energy deposit effects on atmosphere (striation)
Petrozadvosk (Russia)
“similar to nuclear radiation induced effect (X, gamma rays)
or artificial stimulation on atmosphere or sprites
Green balls close to US atmospheric tests, Madagascar case…)
US experimentation with electrons guns in the 80s to stimulate
Atmosphere radiation under energy beam

Association Aéronautique
et Astronautique de France

Case Studies

UAP: ground and vegetation tracks
(Cas Geipan Trans en Provence: 09/01/1981)

EME Microwave effects on the ground and vegetation
(Ageing of chlorophilla) and drying of grass proportionally to the range to center

Photos origine Wikipedia

Les différences d'équipement pigmentaire inhérentes au vieillissement (abaissement des chlorophylles, augmentation des xanthophylles) déjà observés chez l'orge (BOUNIAS, Thèse 1972) se retrouvent ici sans équivoque dans les échantillons prélevés à 20 m.

Les échantillons provenant de la périphérie (d=1,5m) montrent un affaiblissement général des teneurs pigmentaires. Quel que soit l'âge des feuilles, les chlorophylles A sont abaissées de 33%, les chlorophylles B de 28% et la phéophytine de 31% : ces trois valeurs montrent une grande homogénéité.

Parmi les caroténoi'des, le plus affecté est le β carotène qui est abaissé de 50 à 57% au voisinage du "phénomène", ainsi que la violaxanthine (-80% chez les jeunes feuilles).

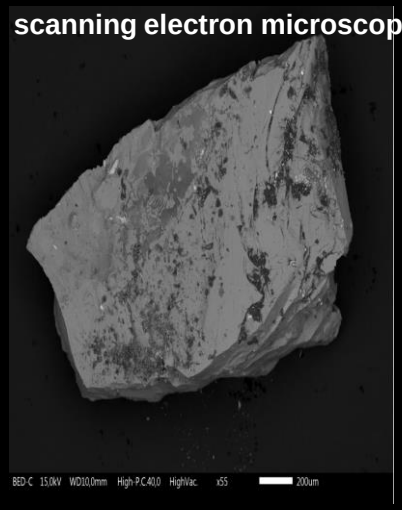
Les perturbations observées au niveau des pigments photosynthétiques peuvent être examinées par comparaison avec celles produites dans les feuilles cotylédonaires d'Arabidopsis thaliana (crucifère) après exposition des graines à une irradiation γ (BOUNIAS, 1973, Arabidopsis inf. serv., 10, 26-27). Les données numériques suivantes montrent qu'il est nécessaire d'appliquer une dose très importante de rayons γ : 10^6 rads, pour obtenir des altérations tout au plus équivalentes ou inférieures à celles observées dans les feuilles de Medicago.

Analysis of samples

Work in progress : cooperation Dr J. Vallée – G. Metchersky- SIGMA2 (L. Dini- Dr N. Niasse)

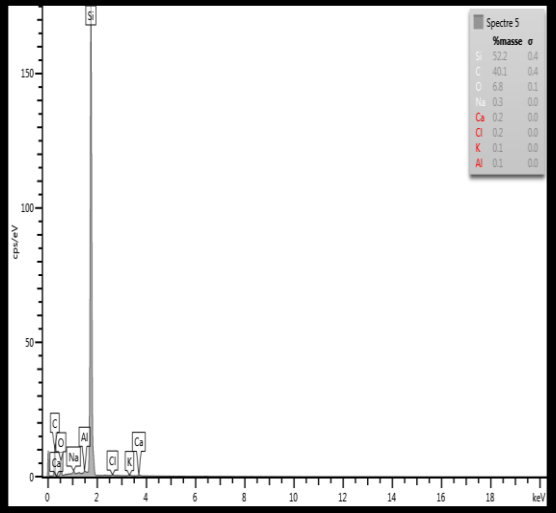
SEM

scanning electron microscope



EDX

Energy-dispersive X-ray spectroscopy



Not altered bark

Charred bark

Charred bark by UAP event – USA 1965- Hainesville case Complementary analysis to Condon commission analysis

Charred bark is irradiated by a very intense source of ernergy (> nuclar plant 600 MW) Producing a thermal flash (use of propagation model of heat wave)- traces of Cesium in the charred bark- no link with records of Nuke

UAP effects on human: MW effects

Non thermal Effects (tested on bacteria)
High level of energy to generate dissociation of water dipoles into H+ and OH- free radicals ions impacting and damaging cells DNA molecules. Impact on cells metabolism (Lethal effect)

Thermal Effects

Above 3 GHz
penetration under skin over 10 mm- Burning sensation
- **10 GHz: superficial effects close to IR effects**

Thermal effects due to H2O heating in tissue without ionization. Heating induces secondary effects

MW
1 GHz to 100 GHz

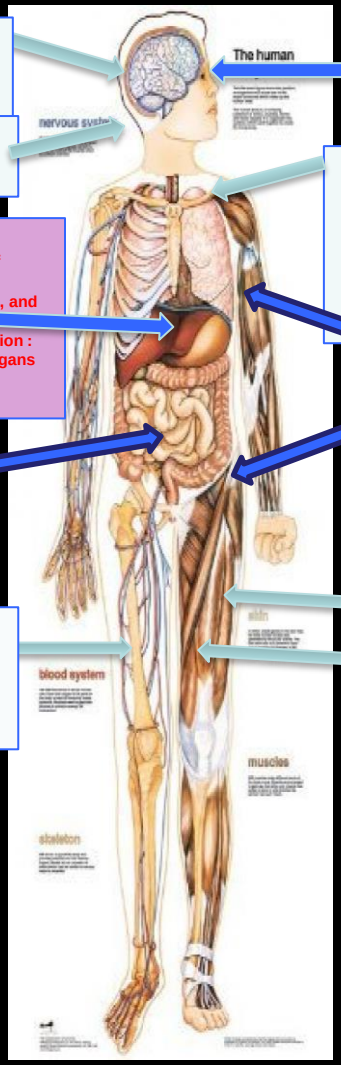
Effects on brain
Bradycardia- hypotension- change of thyroid activity- headache- trouble of

Accousticzl efffect
Bradycardia- hypotension- change of

Vascular lesions- Hypotension- Dilatation of blood vessels- becoming permeable, leakage of serum, and of blodo pressure:
- **Impact on organs irrigation :**
- **kindeys faiulre, other organs**
- **Possible thrumbs wih heartfailure**

Gastric hyper secretion
Intestinal hypermobility due to histamine secretion from cells- possible ulcer

Impact on Peripheral nerves
Diruption on ionic current- interupt electrical impulse- reversible paralysis



Effect on the eyes
limpact on lens transparency- induced catacract- and oeudem of Kornea (induced by effetc of MW at 2,45 GHz

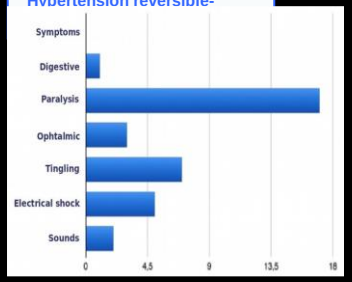
Cutanesous lesions:
Non uniformely distributed deep lesions depending on the body shape (human, animal)
Burning spots will appear on human thorax (erythmeaa with burning

Increase of temperature

Muscle and nerve compression
Subcutaneous effect- intercoastal muscles-
Cooking effect on proteins of muscles (melting)
Compartment necrose of muscle due to serum pressure- pralyysis effect

Effect on vegetative nervous systems
Hypertension reversible- heart rate disorder

Effect on vegetative nervous systems
Hypertension reversible-



Warning: Analysis based on physicist experience of MW effects studies derived like effects from Smartphones MW effects and high voltage lines risks analysis parallel with UAP close encounter is restricted to civilians testimonies, military or civilian plots
No case related to adduction considered
Neuropsychological effects not discussed here

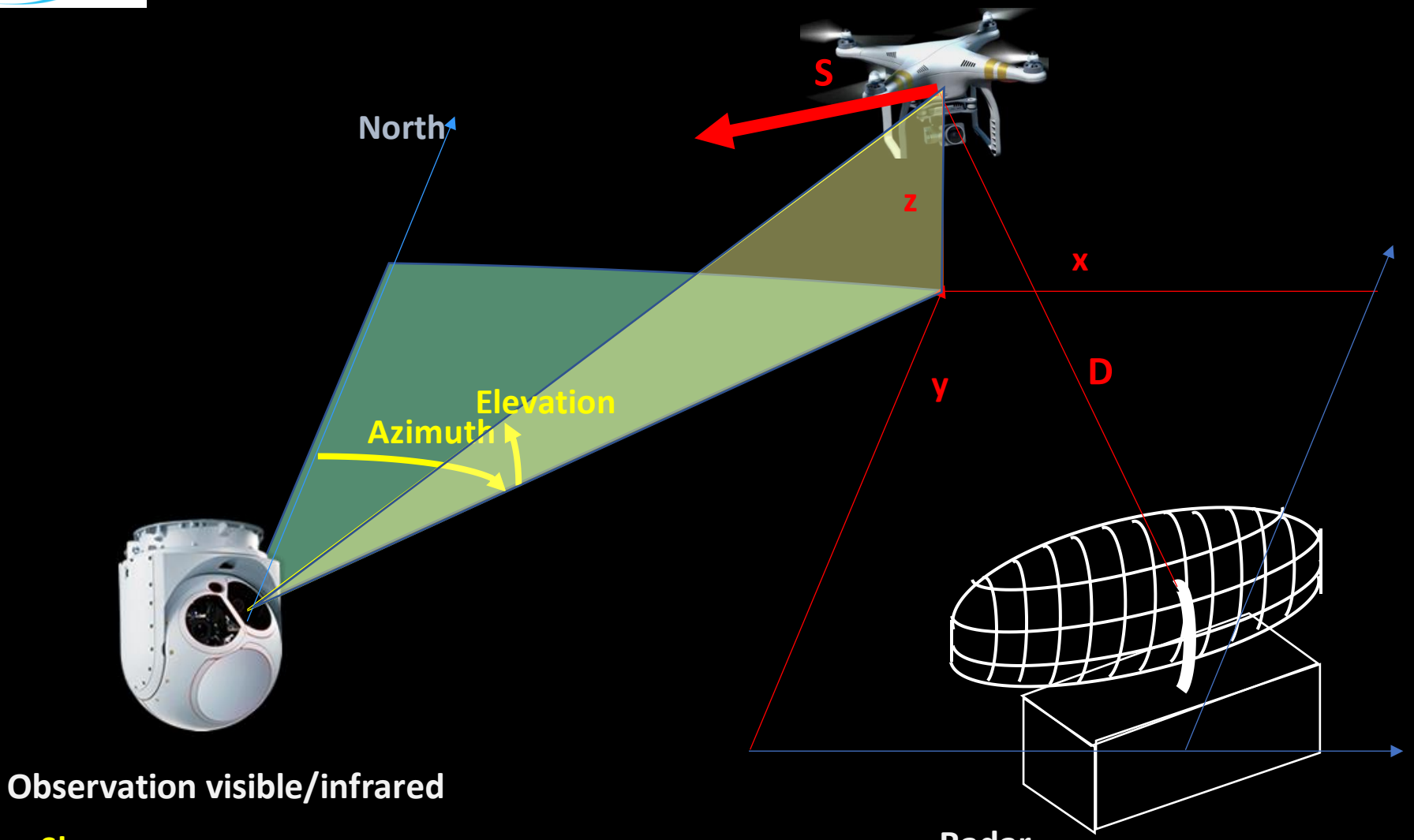
Schuessler catalog of human related physiological Effects with UAP encounter.Houston Texas 1996
For France 31 cases between 1954 and 1983 (70,96% in 1954,)

PAN are real phenomena with remarkable observables :

Visible and optical sightings are the most natural approach for observatio nof UAP by naked eye or with sensors, or simply with a smartphone, by pilots, by astronomers but also simply by ordinary people facing strange unknown phenomena.

Radar and EM sensors are also precious to measure the PAN kinematics (range, velocity, Doppler shift), cross check information with optical and IR sensors, but also to characterize the PAN EM signatures. Beyond, it is also important to gather information on the induced effects from the interaction of the UAP with their surrounding medium (air, earth, vegetation, water) or with the human being in close encounter.

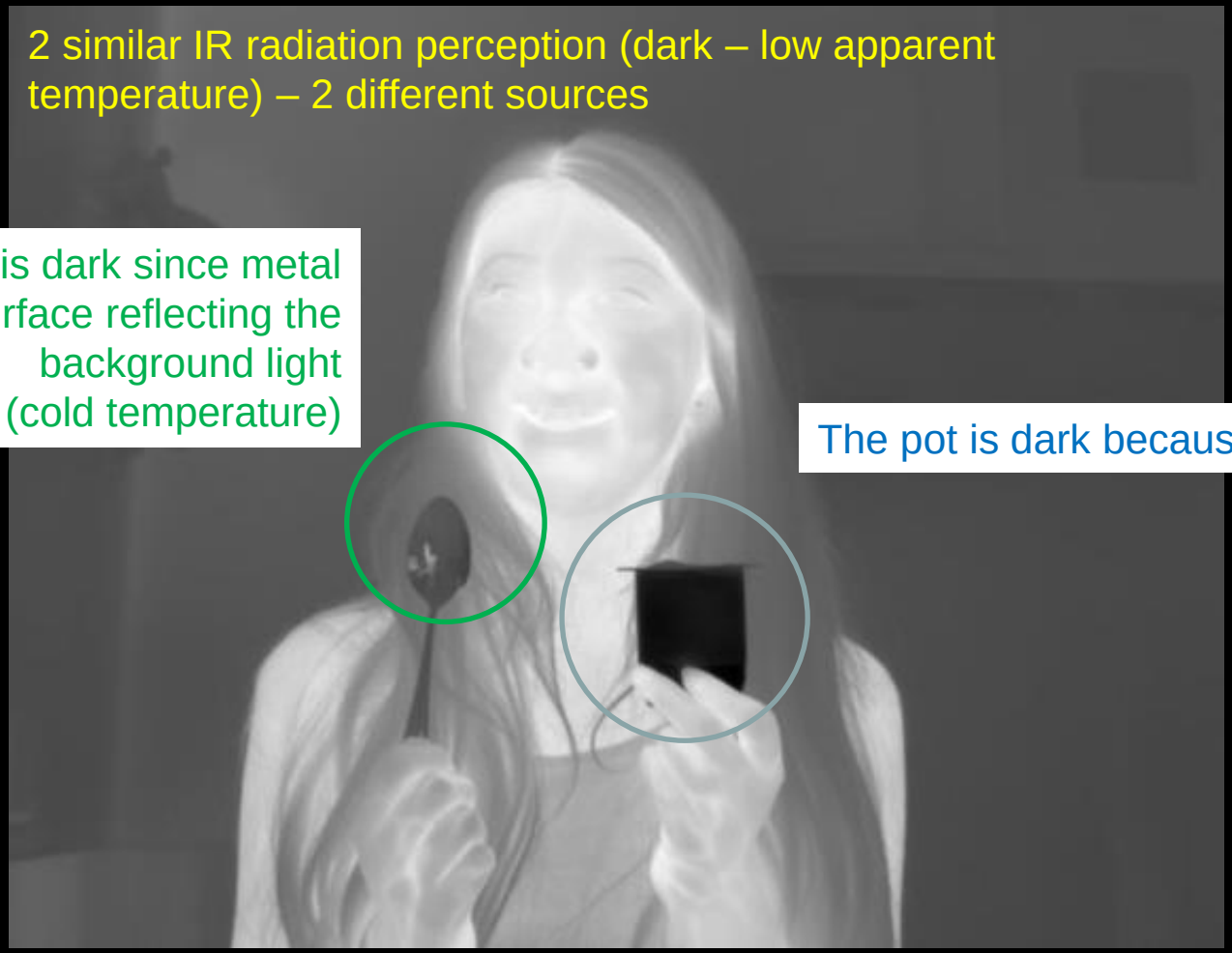
Optical/IR observation radar are complementary



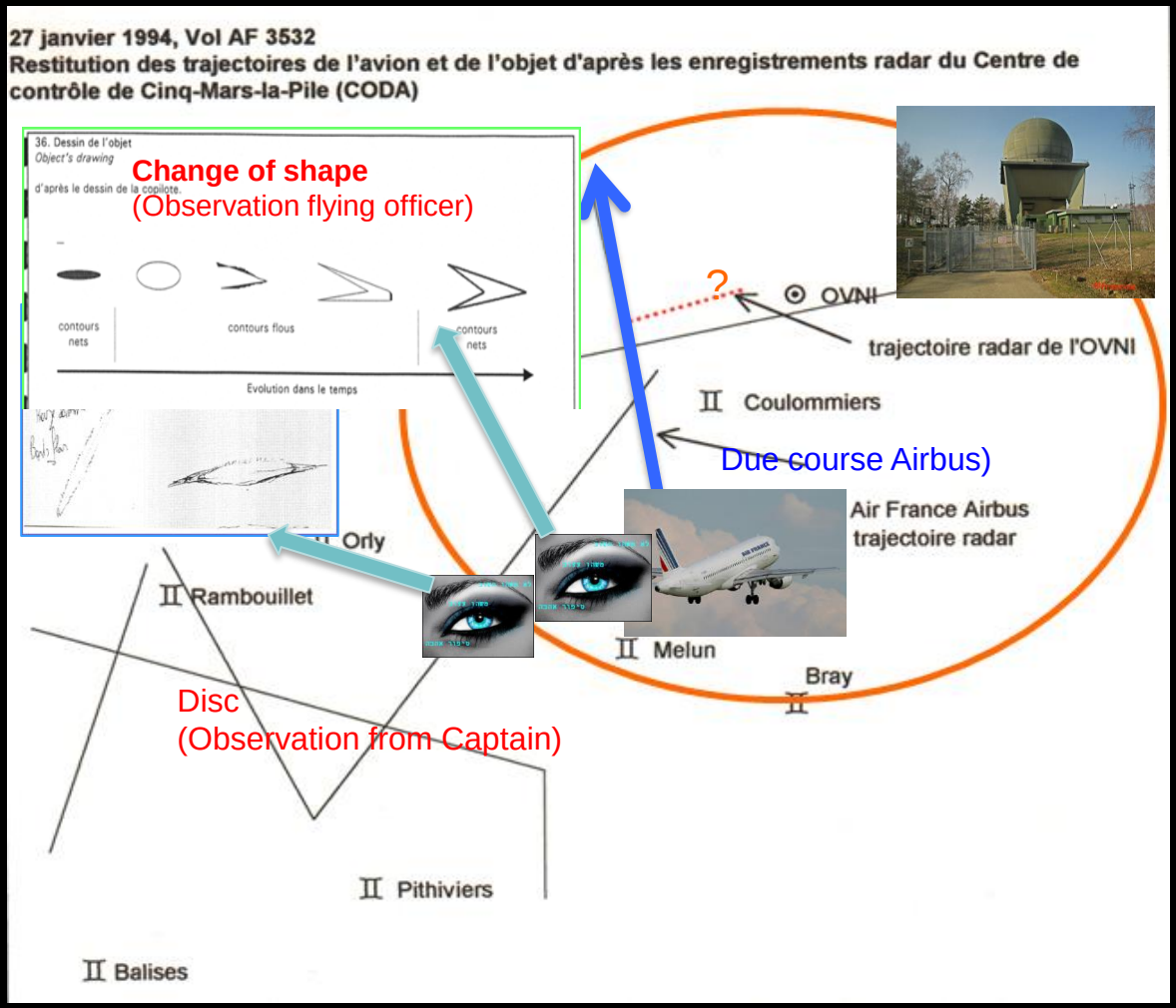
Perception of IR signature

Consequence in the IR spectrum

- It is harder to analyze an IR picture than a visible picture (because tje contracts whithin the picture can come from the temperature variation or the skin emissivity radiation, and also from the environment radiation)



French « Aéro » case of Flight AF3532 (Nice-Londres) 27/01/1994
Visual sighting (optical)+ radar



Optical/ visual sighting: object round, change of shape (disk to triangle) left sector
Simultaneous radar track on right side of the aircraft
(different localization of the optical object “center” and the Radar phase center)
Both disappeared (visual sighting and radar track) simultaneously

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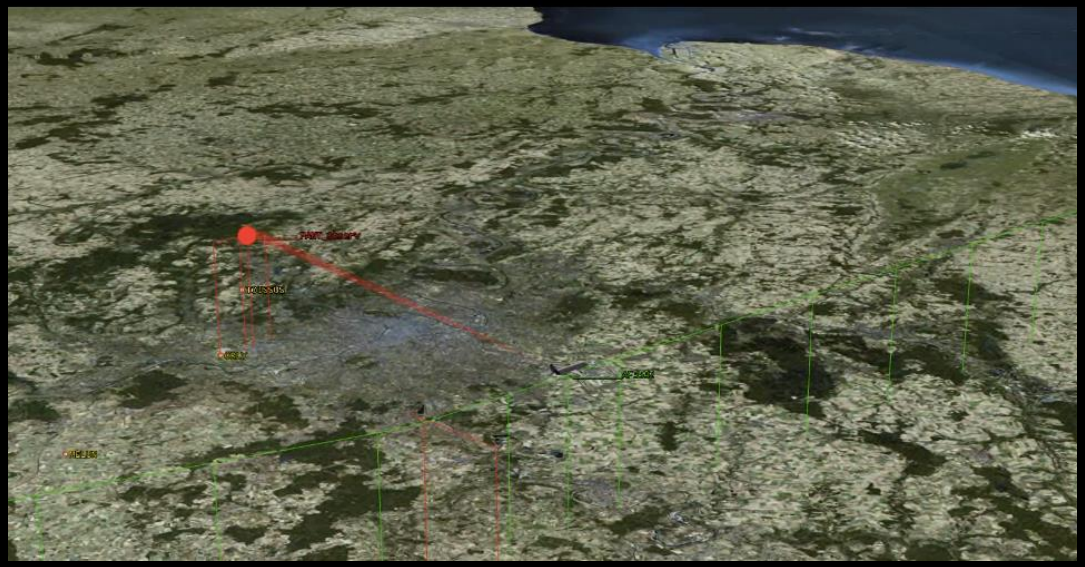

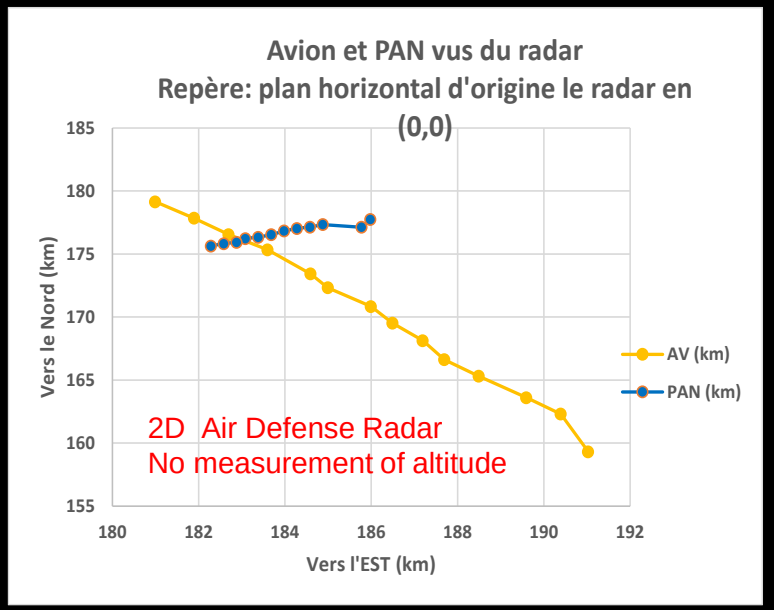

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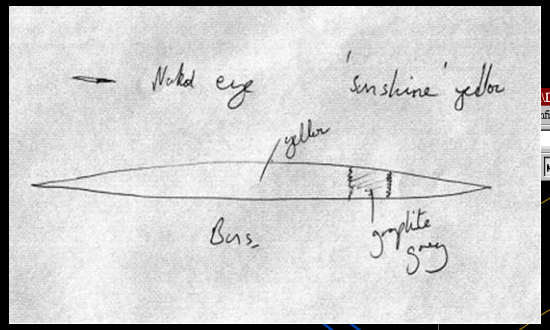
Jersey case : Trislander inbound Alderney airport – April 23 2007

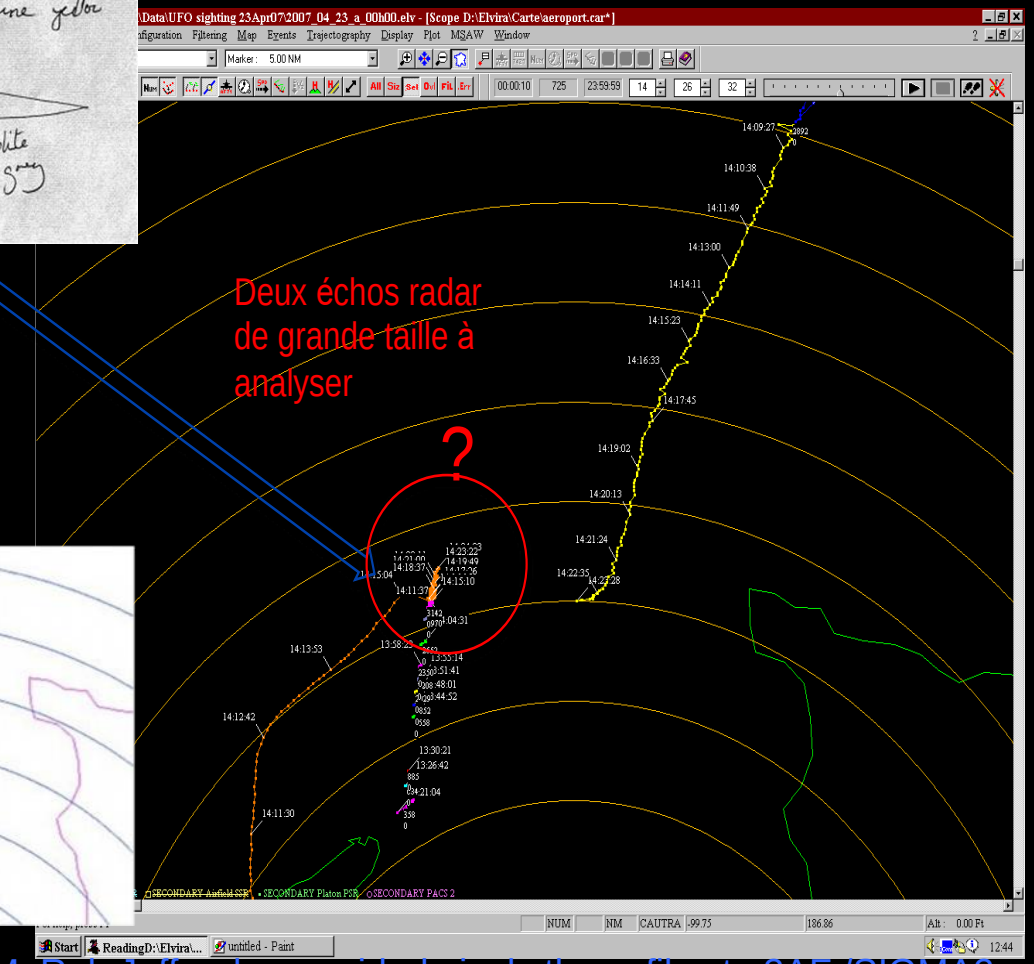
14:17:14 : AL455 is descending, passing through 2900' : "Low to me now, er, I'd say 2000 feet, 1

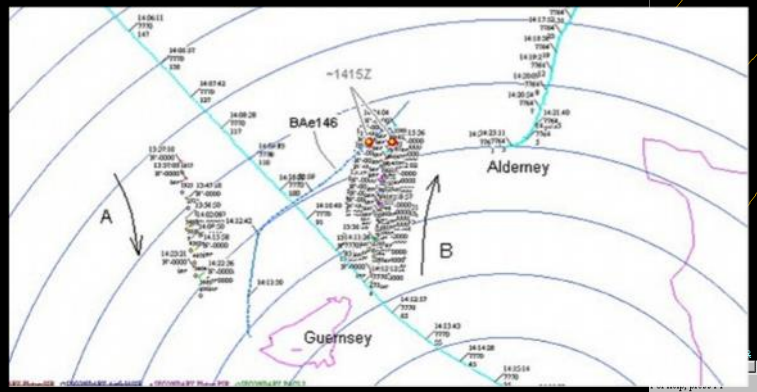
Sighting case analysis
CHANNEL ISLAND CASE (GUERNSEY-JERSEY) 23/04
SIGMA2 attempt to analyse Elvira radar files (on goi

Association Aéronautique et Astronautique de France

Commission Technique 3AF- SIGMA2



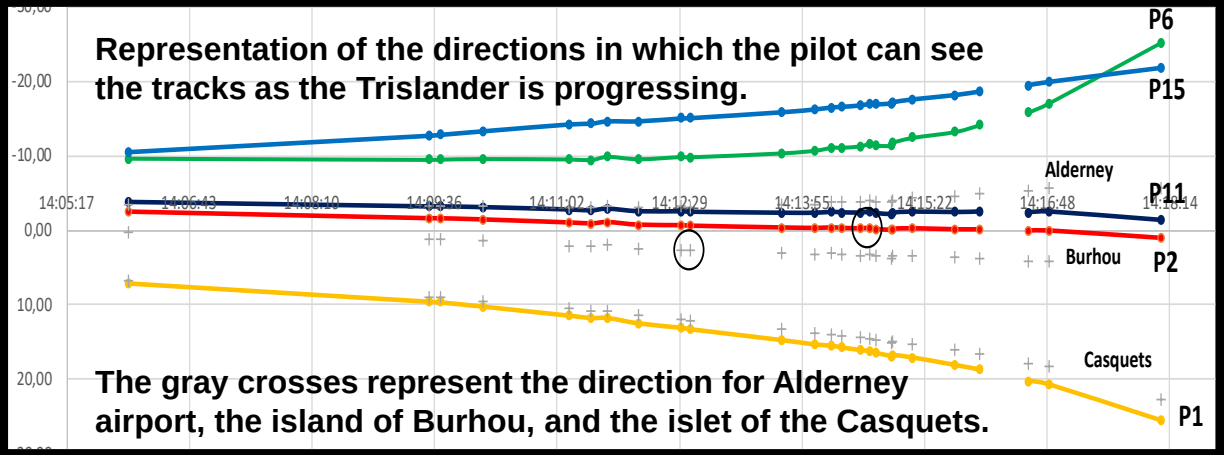




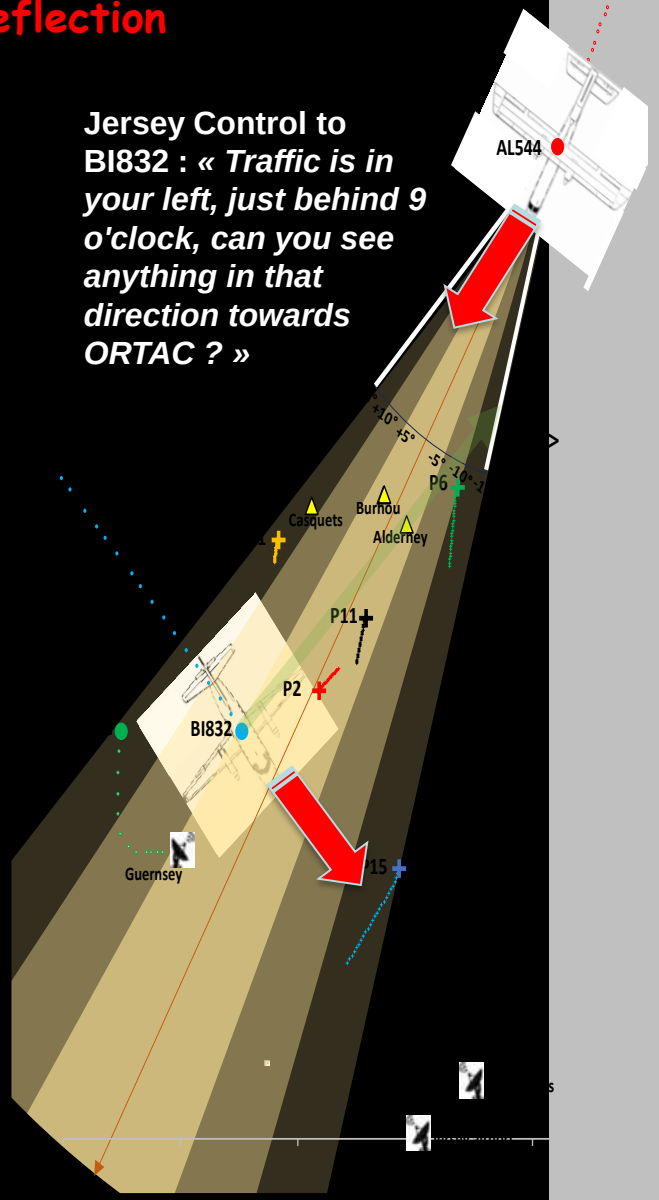
Elvira radar files are courtesy from M. Rob Jeffs who provided nicely these files to 3AF /SIGMA2
(Jersey+ Guernsey primary and secondary radar files+ audio records)

- One single object
- PAN is always observed in the same position during aircraft progress
- PAN observation duration : about 10 minutes
- No eyewitness observation from the ground
- Real-time investigation : sharing of information and cooperation between pilot, controller and other crews of aircraft in flight
- Radio communications have been recorded and time referenced
- Secondary radar (Guernsey) and primary radars (Guernsey, jersey)

Search for compatible secondary or primary plots tracks (2D no altitude) : Identification of 5 possible tracks (low speed) Some slow radar tracks with strange reflection



Jersey Control to BI832 : *« Traffic is in your left, just behind 9 o'clock, can you see anything in that direction towards ORTAC ? »*



P1 Track 009° - Speed 11 Kt

P2 Track 231° - Speed 17 Kt

Good detection from both radars - Frog leaps track (periodic detection losses) – Boat type speed (50 km/h)

Guernsey detection OK, rare for Platons - Consistent with AL544 and BI832 observation

P6 Track 007° - Speed 39 Kt

Track constructed from a very few Guernsey radar plots detected out of UAP time slot – Speed : fast boat or ULM ?

P11 Track 015° - Speed 23 Kt

Track constructed from a clear track of Guernsey and Platons plots – Best position from UAP observation point of view - Boat type speed

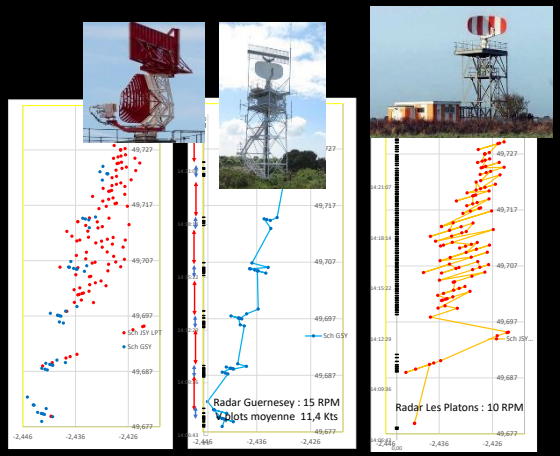
P15 Track 020° - Speed 57 Kt

Good detection from Guernsey and Les Platons – Low aircraft type speed

The case of track P1 : the frog leaps track

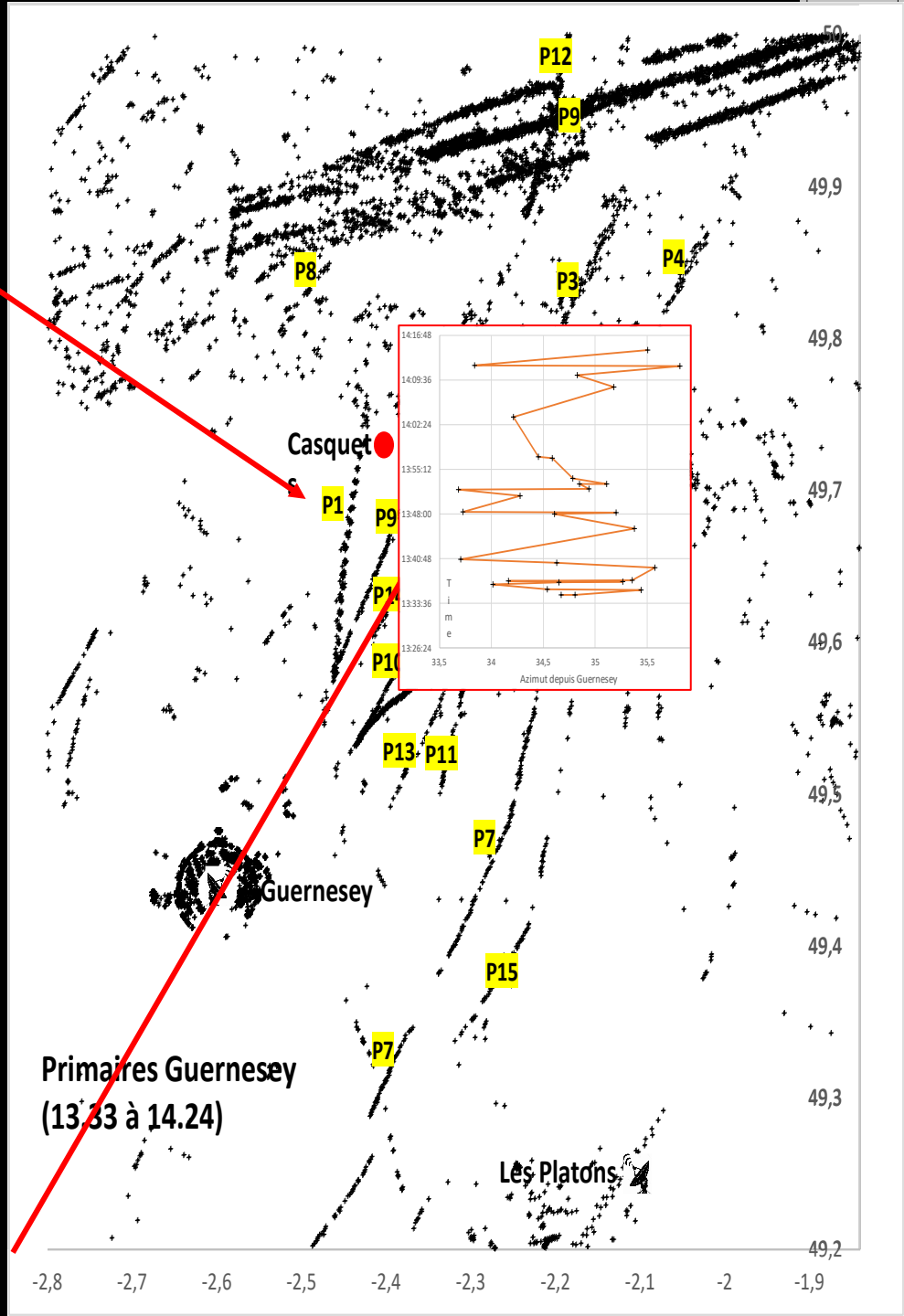
Periodic losses of detection from primary Guernsey as from Les Platons radars :

- Not synchronous on both primary radars
- Les Platons : after 14:14, 1 hit per rotation
- Investigation on course to explain :
  possible target rotating movement ?
  Length (estimate > 600 m?)
- Slow velocity



Track 1 plots fluctuation analysis
Blue (Guernsey radar) conitnuous group of leapfrog plots (lentgh
-Red (Jersey radar)- strong fluctuations
Suggesting strong RCS in one direction (1600 m)- glint effect (size estimate from visual sighting about 635 m - from radar continuous scan (1300 m)

Some plot alignments are due to the radar's distance resolution principle (discrete values)



Conclusion on UAP optical observables and plasmas

(see SIGMA2 progress report 2021)

Some analysis on UAP (UK MoD report, Russian academy of science) concluded on:

- Anomalous observables
  - Kinematics & accelerations suggesting low inertia objects
  - EM behaviour (interference, low observables,…)- differences between optical and EM
  - Low interaction with the medium (air, water,…), “transmedium” evolution.
  - Ground tracks with MW effects on vegetation
- The existence of the so called atmospheric “buoyant plasma” (UK MoD report on UAP/ Project Condign)

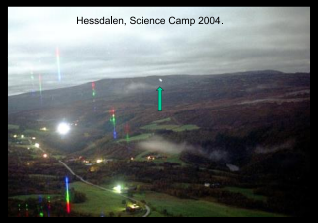
- Our analysis as of today
  - Atmospheric transient light effect in case of thunderstorm may happen (plot)
  - They are unusual phenomena and could appear like fast light balls (up to Mach 1), travel at high altitude (8000 m) and last few minutes
  - However they don't match the high acceleration and change of velocity depicted in some UAP cases, they are also not transmedium and do not induce jamming, or land.

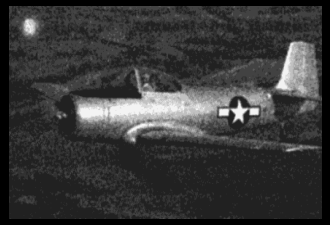
- We recommend the collection of optical, EM and trajectography data on these phenomena completed with spectrum and image analysis
- This can be performed by optical camera networks (similar to camera networks tracking meteoroids with RF receivers and spectral analysers WFOV) with NFOV sensors for analysis. The use of wide-band EM recording instruments would also facilitate the identification.

Data collection on UAP

We need to collect data to evaluate the impact of UAP on our environment before trying to guess if it comes from another place?

- **We need to evaluate the impact in the air and space environment by collecing data (physical observables measurements EM, radra, optical , magnetic, acoustical,..)**
- **Evaluate the interaction between UAP and ou media (air, space, aquatic, land, vegetation), on human being, on technology.**
- **This may have impact on understanding what it is, what is the physics linked to thse phenomena. Migh have**
  - **Impact on sciences, technologies?**
  - **Impact on the knowledge of our near universe?**
- **We need research, universities involved and to do that daya collection.**

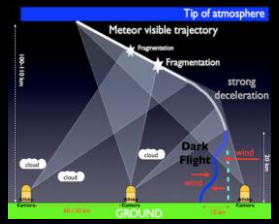




Axis of progress: measurements and analysis

Association Aéronautique et Astronautique de France

FRIPON network
(coverage of France+ connections with Italy, Chili,..)



Wide FOF Visible camera + RF receivers:
Detection- trajectography,
position,velocity,

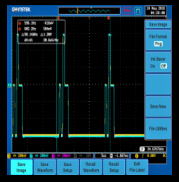
Collection of kinematics data unsensitive to trajectory, disruptive acceleration (meteorids)
Filtering to capture UAP tracks
Complete with doppler data and RF reflecitivty

Work to do on flitering ,use of AI

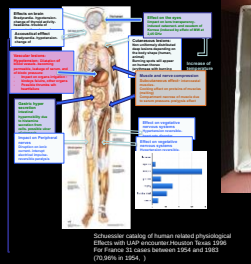
FARFADET network
Detection+ optical image analysis + analyse
(shape, spectrum?)

Detection – ultrafast cameras (images of LTE, Sprites))
Complete the coverage

Analysis of EM spectrum? In case of close encounter



Analysis of traces of UAP interaction with he medium
Analysis of samples (vegetation, earth, water?, materials, electronics…) and human



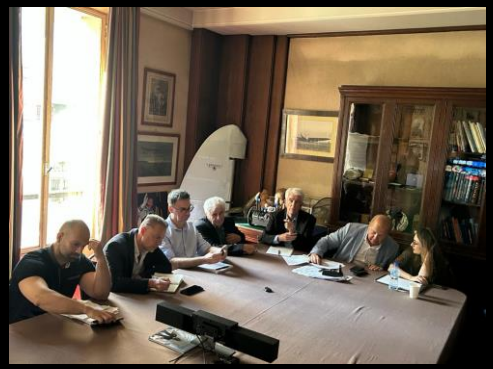
Other references

Participation to TV Show on ANEWS Web TV: "Dossiers OVNIS since 2021

- https://www.anews-securite.fr/emission/emissions/dossier-ovni/

- 20 09 Dossier Ovnis 2.jpg

- **SIGMA2 Webinar1 on UAP Optical observables (14 June 2023)**
  - https://www.3af.fr/global/gene/link.php?doc_link=/media/event/2023164317_announcement-3af-sigma2-webinar-1-on-uap-june-2023.pdf
  - https://www.3af.fr/agenda/3af-sigma2-webinar-1-on-uap-optical-observables-2270



- **SIGMA2 participation to SCU Webinar on UAP studies (30 July 2023)**
  - https://www.youtube.com/watch?v=_G81h4KEz2M

Some SIGMA2 links and reference

3AF
Association Aéronautique
et Astronautique de France

3AF SIGMA2 website events

- https://www.3af.fr/groupe/sigma2-phenomenes-aerospatiaux-non-identifies-43/page/actualites

- **SIGMA2 analysis of ODNI preliminary assessment on UAP (2021)**
  - **ODNI report 2021:** https://www.3af.fr/global/gene/link.php?doc_id=4558&fg=1
  - **ODNI report 2022:**
    - https://www.explorescu.org/post/sigma2-analysis-of-odni-2022-annual-reporton-unidentified-aerial-phenomena
- **SIGMA2 2021 summary progress report:**
  - https://www.3af.fr/news/sigma2-work-progress-summary-2021-2178
  - https://www.3af.fr/global/gene/link.php?doc_id=4375&fg=1

- **SIGMA2 Progress report 2021 complete:**
  - https://www.3af.fr/agenda/download-the-sigma2-progress-report-2149

- **SIGMA2 articles**

- **SIGMA2 webinar 1, 2 and 3 on UAP observables**
  - Webinar 2 https://www.3af.fr/fr/agenda/3af-sigma2-webinar-2-approach-to-uap-physical-observables-2324
  - Webianr 3 on 2 July 2025 https://www.youtube.com/watch?v=lv8sccO7FSg

Next publication