The Aguadilla UFO Incident – an analysis of the object's movement

Written by @flarkey

Document Last Saved : 27/04/2021 18:09

Abstract

In 2013 a video was recorded that is reported to show an unknown object manoeuvring over the island of Puerto Rico. A subsequent analysis of the video to suggested that the object showed extraordinary characteristics and could not be described with a simple explanation. This document re analyses the available data and concludes that the likely flight path of the object can be described simply and corresponds with what could be expected of an object drifting in the wind.

Executive Summary

The purpose of this document is to capture and demonstrate how an analysis of the Aguadilla, Puerto Rico 2013 UFO video was carried out in order to determine its likely flight path. The video is generally interpreted in one of two ways depending on the assumptions about the object made by the viewer, either that the object:

1) moves in an extraordinary way due to an exotic propulsion system, or

2) moves in a prosaic way, simply blown by the wind.

To determine which of these ideas is correct a hypothesis is proposed that accounts for the object's movement by natural means. The hypothesis is tested using analytical methods and interpretation of video metadata in order to plot a likely path for the object in three-dimensions. The accuracy of the calculated path is then validated through further analysis and calculations.

The results show that a straight-line path can account for the object's movement over the entire duration of the video. The report concludes that the object moved in a simple and naturally explicable way following the wind direction and speed at the time of the event.

The document goes on to show that the associated radar data also correlates with the updated video analysis, and that the object was most likely some sort of sky-lantern.

FORMING A QUESTION

Background to the Report

The Aguadilla, Puerto Rico UFO event occurred on the evening of 26th April 2013 and is regarded by UFO-logists as one of the best-recorded examples of the "UAP Phenomena." It is said that a video of the event shows a UAP with an exotic propulsion system performing extraordinary flight manoeuvres in both the air and sea. Conversely, some sceptics have said that the object does not behave extraordinarily and can be explained by a lighter than air craft such as a balloon drifting in the wind. If we could determine whether the object moved in an ordinary or extra-ordinary way it would provide additional evidence that could help investigators to determine what to object actually was.

Objective of the Report

The objective of this analysis is simply to answer the question:

Did the Aguadilla UAP move in an ordinary or an extraordinary way?

Methodology

The question will be answered using open source data and using the Google Earth software application.

The following methodology will be used:

- Form a question
- Collate Background Research
- Create a hypothesis about the most likely answer
- Devise an Experiment to verify the Hypothesis
- Extract Data from the available sources
- Analyse Data and show results
- Draw Conclusions regarding the question

Exclusions

This report will not attempt to conclusively determine what the object actually was, its size or its method of flight.

BACKGROUND RESEARCH

What is a UAP…?

To understand the term UAP we first need to look at a much older and familiar term – UFO. An unidentified flying object (UFO) has traditionally referred to any aerial phenomenon that cannot immediately be identified or explained. Most UFOs are identified on investigation as conventional objects or atmospheric phenomena. The term is more specifically used for claimed observations of extra-terrestrial spacecraft. The term "UAP" is an acronym for Unidentified Aerial Phenomenon and is a modern reworking of the term UFO. The terminology has recently changed because there are suggestions that some UAPs may not actually be 'spaceships' or 'craft', but are equally anomalous or extraordinary when compared to prosaic explanations.

UAP events are usually investigated by interested parties in order to explain what has been seen by an observer or group of observers. UAP investigations could conclude that observation was anything: fakes and hoaxes, unknown natural phenomena, secret human technology or inter-dimensional craft. About 5% of the reported UAPs can't be explained with simple answers and should be further investigated with the aim of confirming whether or not they are an extraordinary occurrence. So how do we identify something as 'ordinary' or 'extraordinary'…? One method of assessment is to use *"the 5 observables of UAPs"*. These are criteria that any observed event can be judged against to see if it should be considered as extraordinary and possibly a UFO.

The 5 observables are defined as follows:

1. **Anti-gravity lift** – objects move through the air with no evidence of conventional propulsion systems or lift generating devices such as wings or rotors.
2. **Sudden and instantaneous acceleration** - The objects may accelerate or change direction so quickly that no human pilot could survive the g-forces
3. **Hypersonic velocities without signatures** - If an aircraft travels faster than the speed of sound, it typically leaves "signatures," like vapour trails and sonic booms. Many UFO accounts note the lack of such evidence.
4. **Low observability** - Even when objects are observed, getting a clear and detailed view of them—either through pilot sightings, radar or other means—remains difficult.
5. **Trans-medium travel** - Some UAP have been seen moving easily in and between different environments, such as space, the earth's atmosphere and even water.

Definitions

In this document the following definitions will be used:

- ***UAP*** will be used to describe the observed phenomena without suggestion or assumption as to what it actually is.
- ***UFO*** will be used to suggest that the observed phenomena is a craft of undetermined origin, under intelligent control, propelled by unknown advanced technologies.

SCU Event Report

The Scientific Coalition for UAP Studies (SCU) is a think tank of scientists, researchers and professionals stretching across organizations, governments and industries to scientifically and publicly explore anomalous phenomena known around the world as UAPs, UFOs, USOs. The SCU performed an extensive analysis[1] of the Aguadilla event and concluded that the object moved in an extraordinary way, including entering and exiting the Atlantic ocean a number of times, and that a prosaic explanation of the object's movement was not possible given the available data in the video footage. Additional analysis of radar data and eyewitness testimony supported the conclusions of the Report.

Other Reports and SCU Responses

Other analyses of the event have been published by investigators. A notable one is by Rubén Lianza[2] and concludes that the object was two sky-lanterns released from a nearby wedding venue. SCU subsequently released second report[3], dismissing his analysis as it didn't explain the strange things seen in the video and the object's extraordinary flight path.

UAP Video

A video4 of the event is available on the SCU's YouTube page. This has been used as this report's source of data. The Video shows the footage of the event as recorded using the Infra-Red camera in an L-3 Wescam MX-15 surveillance turret mounted on a US Department of Homeland Security DHC-8 aircraft. Metadata associated with the recording such as positional information, altitude and time is overlaid as text onto the video. In the centre of the video are the Bore Sight Crosshairs, which indicate the line of sight projected from the aircraft along the centre of the field of view of the camera. This bore sightline is used to calculate the Bore Sight Position (sometime called "Target Position") data by intersecting the line with a digital model of the earth's surface (Digital Terrain Elevation Data, or DTED). This allows the height of the point on the ground within the crosshairs to be displayed, although this figure will contain a small error. A laser range finder (LRF) can be used to provide a more accurate target position, but it was OFF during this part of the mission, as displayed in the lower right hand segment of the overlay.

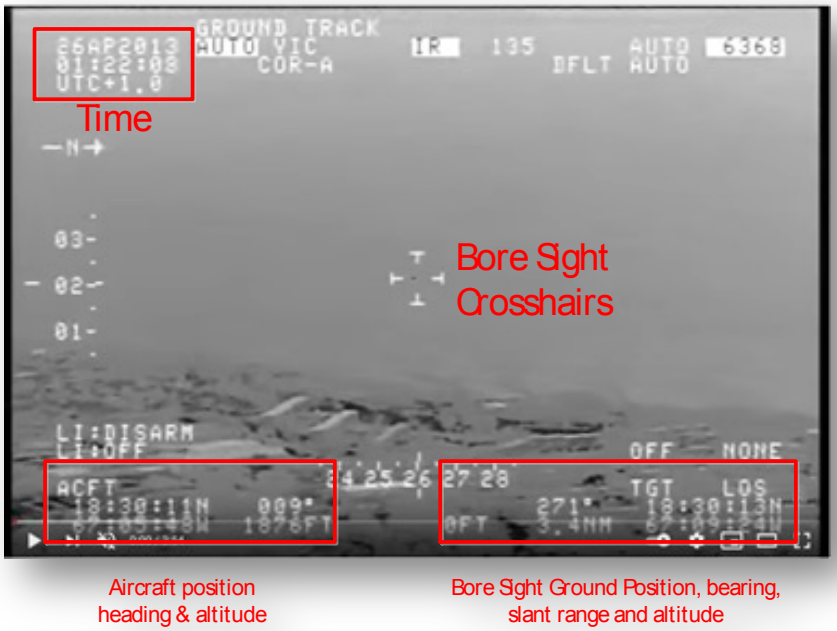
---

[1] Detailed Analysis Of The 2013 Aguadilla Puerto Rico UAP Captured By The Department Of Homeland Security
https://www.explorescu.org/post/2013-aguadilla-puerto-rico-uap-incident-report-a-detailed-analysis

[2] http://www.ipaco.fr/ReportAguadilla.pdf

[3] Balloon Alternative Hypothesis SCU Response
http://docs.wixstatic.com/ugd/299316_dbb13b934192433e8c80b50ec4ffd502.pdf

[4] 2013 Aguadilla Puerto Rico UAP/USO - Video on YouTube
https://www.youtube.com/watch?v=q6s5RwqnnLM&feature=emb_logo&edufilter=NULL



The video screen showing Infra Red image and overlaid metadata

Is it a UAP or UFO…?

The SCU's analysis concluded that the Aguadilla UAP and video event could not be accounted for with simple explanations. Although the SCU report did not specifically refer to the 5 observables of UAPs, their report did conclude that there is evidence of each of them in the video and radar data.

Observable characteristic	**Upon initial video viewing and SCU Analysis**	**Extra Ordinary?**
Anti-gravity lift	Object has no lift surfaces or propulsion method that explains flight path and turning manoeuvres	Yes
Sudden and instantaneous acceleration	Not seen in video, but high speed and erratic movement observed in Radar data	Yes
Hypersonic velocities without signatures	Not seen in video, but high speed transit was detected in Radar data	Yes
Low observability, or cloaking	Object not observed in visible spectrum, only visible in IR. Video shows some sort of 'field' around the object	Yes
Trans-medium travel	Object enters, transits and exits the ocean with ease.	Yes

Comments on the SCU Methods & Conclusions

The SCU report attempts to determine the flight path of the object by a number of methods which are all based on assumptions – some valid, and some not so. (see SCU Report Appendix G) The initial assumption that the report makes is regarding the fidelity of what is seen in the video. It is assumed that the objects apparent 'extraordinary' flight characteristics are an observed fact, without considering the nature of the analogue Infra red camera output and the digitally compressed video that is recorded. Converting an analogue video signal to digital video results in artefacts that effectively change what is seen in the recording when compared to what happened. This results in a lack of fidelity – or in other words - the video is not a truthful representation of the event.

It is therefore concluded that this investigation should not presuppose the position of the object at any point in the video, due to the reduced fidelity of the scene.

The second assumption made in the original SCU Report is the use of pixel width to determine the Objects size. The report uses the size of the object's IR signature in the frame to determine its size and then its position along a line of sight from the camera. This is done using simple optical and trigonometric principles. Even using this method the calculated size of the object is subject to significant errors. In the SCU report Appendix G it states the following:

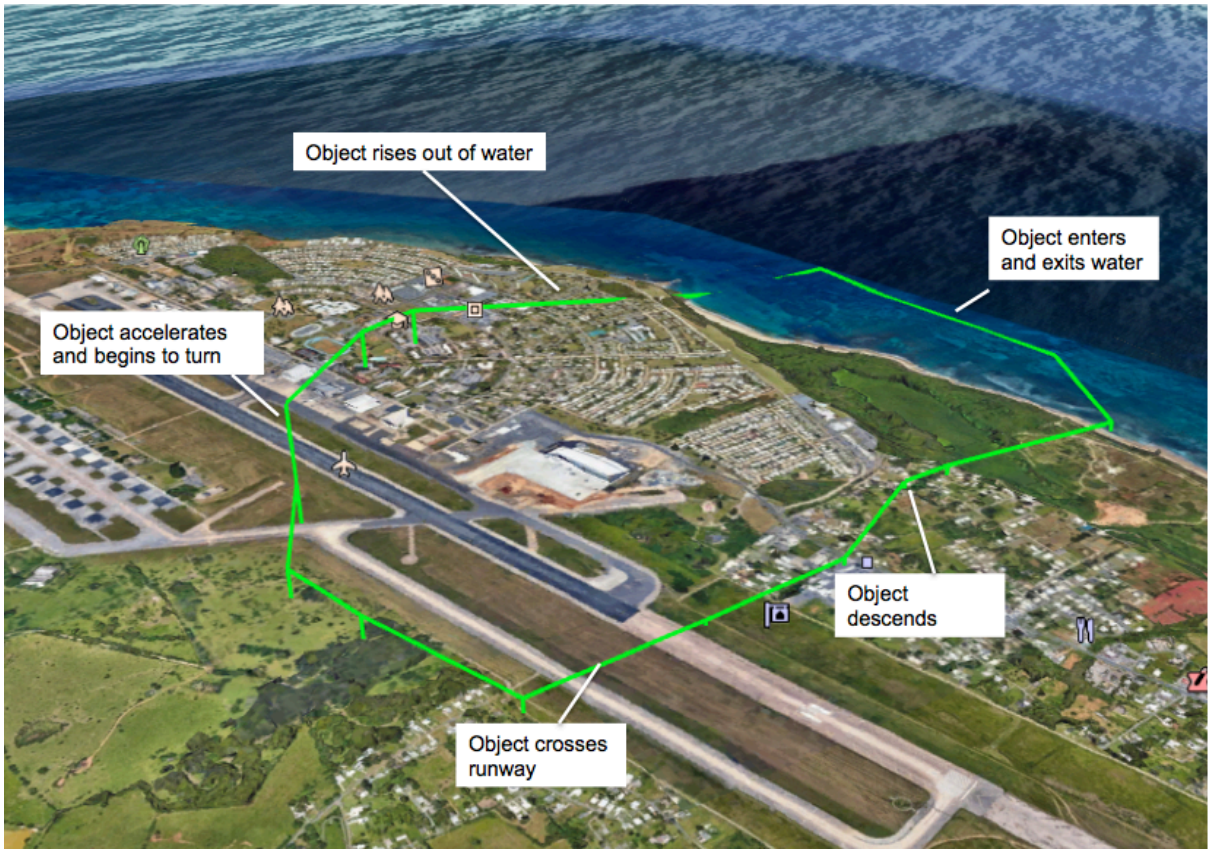
> such as water tanks, aircraft, cows, and moving automobiles eliminate issues with the accuracy of the IR camera as a significant source of the variations in size. We can conclusively say that this object is between 3.0 feet to 5.2 feet in length.

This statement demonstrates that using their methods the object's calculated size as viewed in the video can vary between "3.0 feet to 5.2 feet" - is a percentage variance of 73%. It is hard to accept that such a variance can be viewed as *'conclusive'*. Using the object's calculated size as an input to any calculations will only result in errors in any conclusion. In a subsequent document by the SCU they contradict the validity of the methods used to determine the object's size. In a report which rejects the suggestion that the object is a Chinese Lantern ("Rubén Lianza Sky Lantern Hypotheses Rebuttal Dated 7-21-2017) the following point is made on page 9.

> So are we to believe that the Chinese Lantern increased in size from 3 feet to 4 feet? Absolutely not. The reason for this dichotomy is simply because the object's IR signature changes so often that its angular size cannot be used to accurately measure the size of the object. Therefore the drawing and conclusions made on page 13 of the Lianza report are based on incorrect assumptions.

It is therefore concluded that this investigation should not use the size of the object as an input due to its "indeterminate nature".

A number of graphics showing the SCU's likely path for the object are available in their report. This data has been reviewed and ha been transposed into Google Earth so that it can be viewed in 3-dimensions.



Object's likely path according to the SCU report

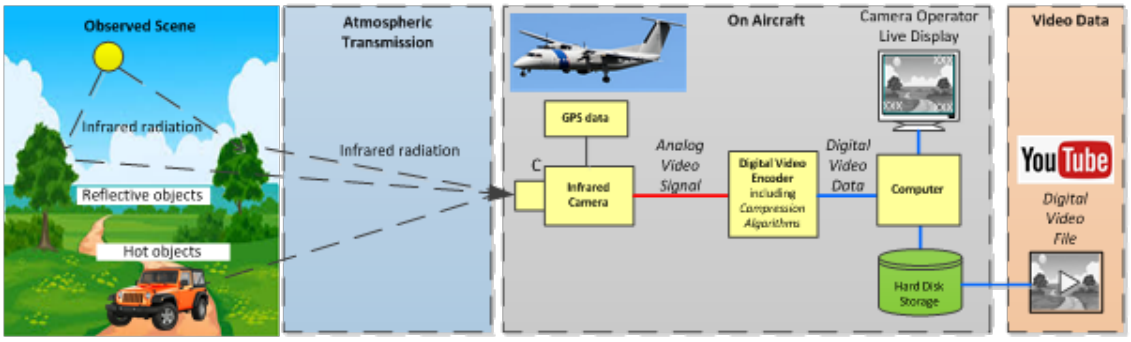
Another conclusion of the SCU report is regarding the speed of the object – they calculate the speed of the object to be hundreds of miles per hour and this is backed up by the appearance of the object moving at high speed at altitudes very close to the ground. However, this illusion of high speed when viewing objects through a zoom lens is well understood and is known as the ***parallax effect***. It results in the observer seeing the background move at a faster angular rate than foreground objects. The Aguadilla video is a great example of how the parallax effect can make objects appear to move faster than they really are moving.

It is therefore concluded that this investigation should not use the apparent speed of the object as an input due to the parallax effect.

Initial assessment of the Video

To the casual observer it is clear to see in the video what the object does and how it moves. Unfortunately the video is not an accurate representation of what happened at Aguadilla.

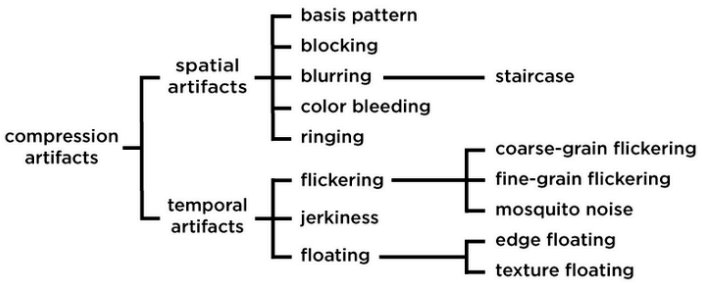
A significant issue with trying to understand the movement of the object is the fact that the video has been recorded digitally. The diagram below shows the process by which the video has been recorded. Infrared electromagnetic waves that emanate from the scene through the atmosphere are indecent upon an IR Camera. The analogue[5] video output from the camera is converted to digital video data either for displaying on the operators screen, or is saved to disk for later playback. It is this file that we have access to via social media websites.



Infra Red Video Recording Process

This creates a problem for UAP investigators because the analog-to-digital video conversion process includes compression algorithms that can create artefacts that were not seen in the original video source.

When the video is recorded it is 'compressed' in order to reduce its file size. The compression process can use a number of different methods and formats, but they all have the effect of making the video look slightly different. This results in what are called 'compression artifacts' appearing in the video scene. Compression Artifacts can be classified into numerous types[6].



Classification of Digital Video Artifacts

All digital videos have compression artifacts but the magnitude of these effects can vary from video to video and even between scenes in the same video. Throughout the length of the Aguadilla video we can see compression artifacts. Most noticeably, the numbers on the metadata overlay appear to be blurred and blocky. Whenever the object is moving in the

[5] On some platforms the analogue video can be HD digital video (eg HDMI or HD-SDI), but it still compressed before recording

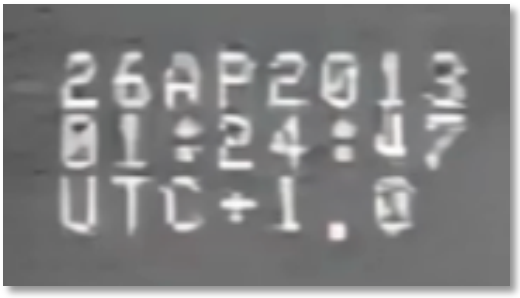
[6] https://blog.biamp.com/understanding-video-compression-artifacts/

scene a trail can be seen behind the object – this is evidence of blurring. In some of the scenes over the water the basis pattern can be observed. Additionally when the object is seen contrasting against the background the edge appears to be exaggerated – this is known as the 'halo' effect.

Furthermore, when the object appears small against a particularly bland background such as the sea the blocking nature of compression causes the object to disappear completely. This results in the object appearing to the casual viewer to enter and exit the water.

Examples of Blocking and Halo effect due to image compression

Halo effect



Blocking

Blurring

Basis Pattern

The image above shows significant blocking & artifacts towards the end of the video, making the object disappear and seem like it goes in the water (contrast has been adjusted for clarity).

Without the assumption that the object ‘enters the water’ any analysis performed can look at the line-of –sight from the camera objectively and without constraint. This ensures that any observations or conclusions can be made independently of whatever the digitally altered scene appears to show, thus ensuring an unbiased and more accurate conclusion to be drawn.

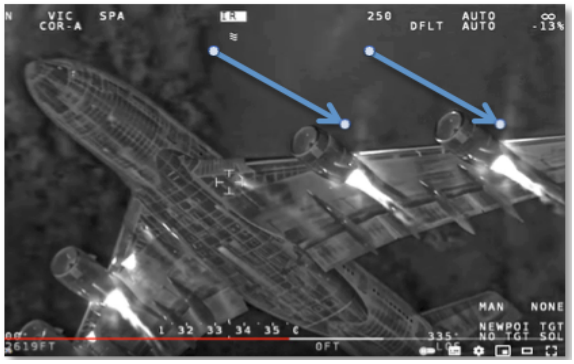
Camera Artifacts

In addition to digital compression artifacts there are optical artifacts generated by the IR camera’s lens system. Diffraction spikes that look like a + sign around the object can be seen around the object whenever it contrasts with a bland background. It appears as a cross around contrasting points in the video scene. This is illustrated in the following graphics.

Aguadilla UAP at Time code 01:23:01UTC

And with contrast enhanced, + is visible

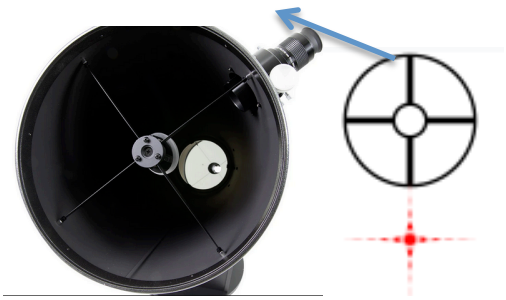
This is a common feature of digital IR cameras and can be seen in other IR videos from the MX-15 that are available on YouTube, such as the MX15 and MX20 promotional videos from L-3 Wescam.



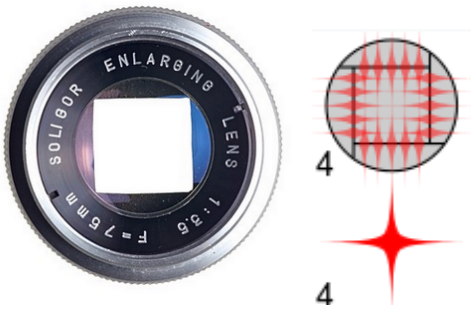
Diffraction spikes in L-3 Wescam promotional videos

The artifacts occur because of the design of the infrared camera. Unfortunately the actual design of the Wescam IR camera is not known, but they are commonly due to either:

1. supporting vanes of a reflecting mirror like in a Newtonian telescope
2. by having a non circular aperture which is common in cameras with a digital detector.



Newtonian optics



Square Aperture

https://en.wikipedia.org/wiki/Diffraction_spike

The SCU report did not consider the effect of video compression artifacts when analysing the Aguadilla video.

Other Event Data

Radar Data
This is addressed separately in a following section of this report.

Eye Witness Accounts
This report will not include the eyewitness accounts as inputs regarding the object's movement, as the descriptions of what was seen by them cannot be objectively assessed or further questions asked. The accounts that have been published are inconclusive and only suggest that an unknown 'light' or 'lights' were seen near the Aguadilla area before the time of the video. The lights were not seen to move erratically or at high speed and as they were reported before the video was recorded they cannot be confirmed as relating to the observed object.

Weather
The weather on the evening of 26th April 2013 is recorded in the SCU Report and is summarised as:

"The wind was out of the east 8-13 mph. Upper wind speeds were measured out of San Juan, which is 50 miles to the east of Aguadilla. At 8pm local time the upper winds from 400 feet to 3200 feet were similar and were out of the east northeast at 12 to 18 mph."

It is noted that location of the event is a coastal region where it can be very difficult to predict and forecast the actual wind for any given instant or even over a short period of time.

Solving Complex Problems

When looking for an answer in a complex problem we need a method or principle to ensure that we do not further complicate the conclusion. Occam's razor indicates that the simplest explanation — that is, the solution that requires the fewest assumptions — is preferable. Occam's razor is also known as the law of economy or the law of parsimony (frugality). The "razor" refers to the "shaving away" of extraneous material and assumptions. The idiom "*when you hear hoofsteps… think horses, not unicorns*" refers to this principle that the mostly likely solution is the simplest one, not because simpler explanations are usually correct, but because you make fewer assumptions when looking for horses instead of unicorns. In any answer to a question we should go to the simplest answer first, and test it for validity, before moving onto more complex or extra-ordinary solutions.

Creating a hypothesis

To answer the question "***Did the object move ordinarily or extraordinarily?***" we shall propose a hypothesis and then test it in order to verify its validity. Consider the two prominent theories regarding the movement of the object, i.e.

1. ordinary movement through the air driven by the wind
2. extraordinary trans-medium movement by an unknown craft with an unknown propulsion system.

Applying the principle of Occam's Razor, and the assumption that any wind-driven movement would be linear, the following hypothesis has been derived:

The movement of the object is linear with a direction and speed concordant with the local weather conditions at the time.

This hypothesis will now be tested in the following sections of the report.

Defining Variables

By defining the hypothesis in this way we can deduce that there are a number of variables that need to be collected (inputs) from the data, and variables that must be calculated by analysis (outputs) if we are to validate or falsify it. These are:

- Inputs
    - Aircraft Position
    - Target Position
    - Weather Data
- Outputs
    - Type of movement, e.g. linear or non-linear
    - The likely path of the object
    - The object's altitude
    - Direction of Movement
    - Speed of Movement

Predictions

If the analysis supports the hypothesis we can be predict that it will produce the following results:

- The movement of the object will be approximately linear
- Direction of Movement will be from between NE and E, as per the weather conditions at the time
- Speed of Movement will be between 15 to 20 mph, as per the weather conditions at the time

Falsification

Falsification is the act of disproving a proposition, hypothesis, or theory. If a theory cannot be falsified then any conclusions from the investigation are not judged to be valid.

The hypothesis discussed in this report could be falsified if it was shown that the movement of the object was outside any of the predictions at any time during the video.

DESIGNING AN EXPERIMENT

Method

Now that the hypothesis has been stated, we must define a series of tests in order to validate it. This will be achieved by creating a three-dimensional model using the input variables and the Google Earth software. The model will then be inspected and analysed in order to characterise the output variables.

Type of movement

We will determine type of movement of the object using triangulation in three dimensions. Triangulation is a method that uses three converging lines-of-sight to determine a common central point. Triangulation is commonly used in navigation to confirm the location of ships or aircraft.

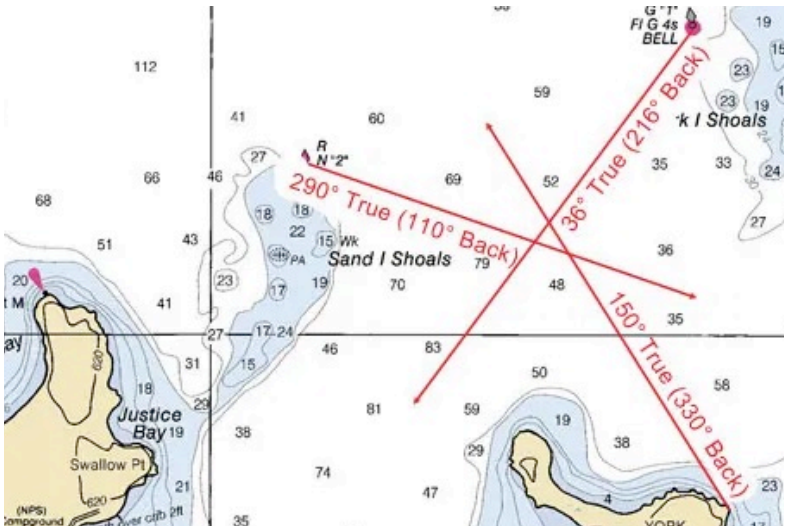


Figure 1 Triangulation at sea

Simple triangulation methods use a 2 dimensional static technique but the method can be equally applied to a 3-dimensional moving scenario by rotating and aligning the lines-of-sight until a converging solution is found. In this event, triangulation can be achieved by drawing three lines of sight, each with a start point as the aircraft's position, and an end point as the sensor bore sight position on the ground. This will result in three lines in three-dimensional space that may not necessarily intersect or converge.

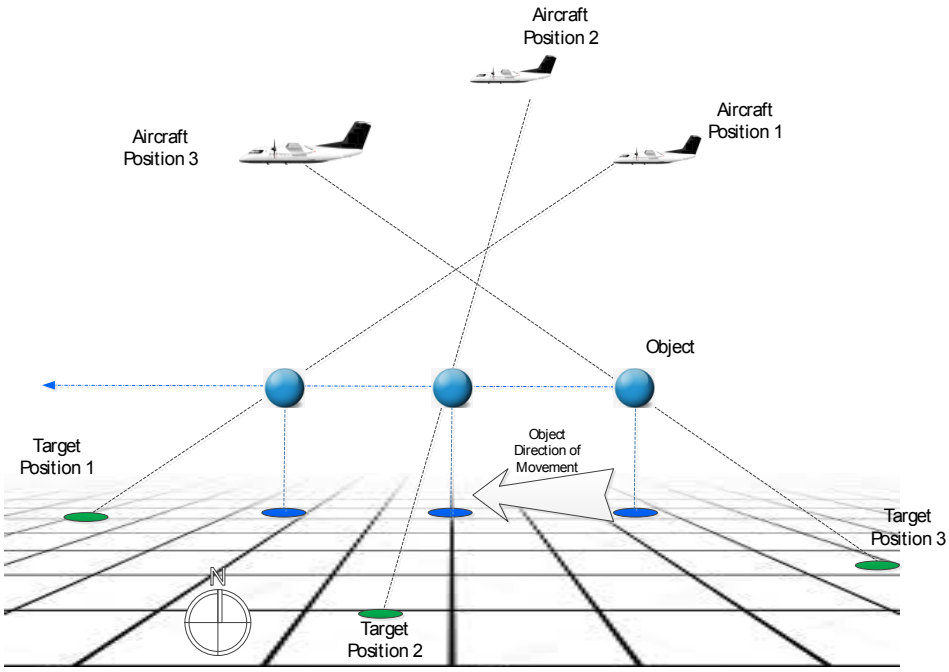


Figure 2 Plotting multiple lines of sight

However, by movement of the model we can determine a fourth line of sight in which the lines all intersect at a common point. This line of sight is considered to be the direction of motion of the object. The start and stop points of the object's path (Latitude, Longitude and Altitude) can be determined at this time, along with the time at which the object was at these points by cross referencing with the time displayed in the video.

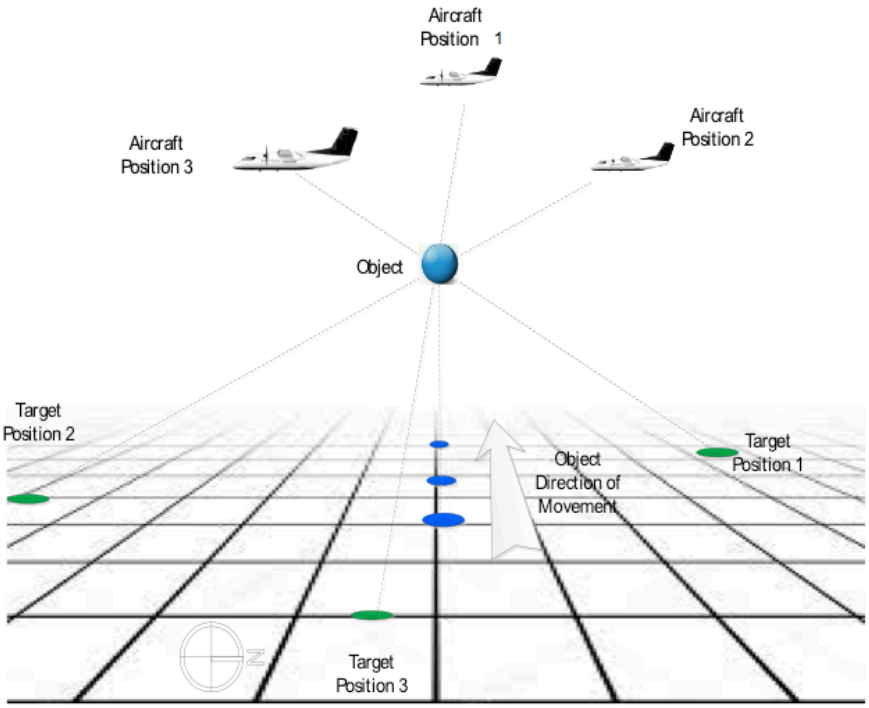
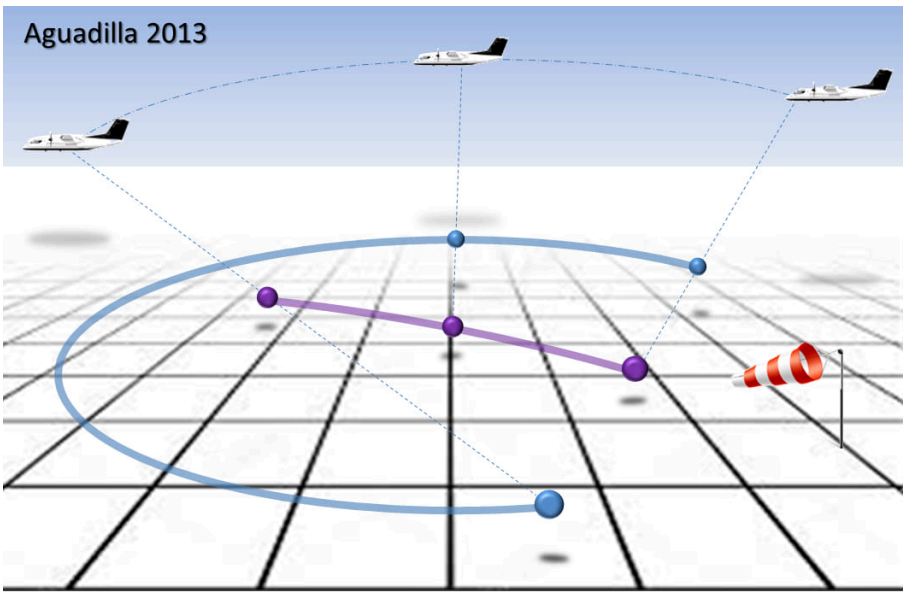


Figure 3 Moving the model to determine the object path

Degrees of Freedom

It is acknowledged that the multiple lines of sight could be produced from different flight paths and in fact there are infinite possibilities for the actual object flight path. However, in order to verify the proposed hypothesis only the linear path will be considered. This is chosen because it does not rely upon anything extraordinary to facilitate it. It could be said that a linear flight path was facilitated and contrived by a biased and careful selection of the data in order to disregard the "degree of freedom" that is available to any investigator. However, it is judged to be highly unlikely that any contrived flight path would also be concordant with both the recorded wind direction and wind velocity at the time.

It is the correlation with the weather data that will provide the justification for any conclusion regarding the validity of a linear path.



Same sight lines, different flight paths. Only one matches the wind.

Verification of the Path

At this stage it would be possible to conclude that the calculated path supports a non-linear motion of the object, and that it just so happens to cross a flat plane at three points. This would be contrary to the hypothesis. Therefore, in order to remove this possibility, the line of motion will be verified by drawing another three lines-of-sight from different aircraft positions to the object and determining if they intersect, or pass very close to, the calculated line. If they do, this would result in a line of motion supported by six lines of sight.

Verified by calculating speed

The validity of the vector can further be confirmed by calculating the object's velocity between the points using the distance between the start and end points divided by the time it took to travel between them. This speed should be concordant with the forecast wind speed at the event.

Verification by calculating direction

Additionally the direction of the object's movement can be calculated using the bearing between start and end positions, as shown on the Google Earth model. This bearing should also be concordant with the wind direction at the event.

COLLECTING DATA

Ensuring accurate Data

To ensure a good overview of the event, three initial data points have been taken so that they encompass the full duration of the objects visibility in the video.

- The object is visible from 1.22:08hrs UTC+1.25.05hrs UTC+1
- The frames selected are from 1.22:08 UTC+1hrs to 1.25.01hrs UTC+1

Four seconds are missing at the end because the object is not clearly identifiable within the Bore Site crosshairs. This equates to a total 173 seconds of data available regarding the object.

Selection of screenshots

As stated previously, specific frames have been selected where the object is close to or within the bore sight crosshairs.

Screenshot at 01:22:08 hrs

Screenshot at 01:23:02 hrs

Screenshot at 01:25:01 hrs

Data Extraction

The relevant positional data from the screenshots has been extracted to give the following table.

Point	**Video**	**ACFT**			**TGT**		
Description	Time code	Lat N D:M:S	Long W D:M:S	Alt ft	Lat N D:M:S	Long W D:M:S	Alt ft
Point #1	01:22:08	18:30:11	67:05:48	1876	18:30:13	67:09:24	0
Point #2	01:23:02	18:31:05	67:08:15	1807	18:29:21	67:07:21	217
Point #3	01:24:57	18:25:43	67:07:45	3598	18:30:51	67:08:08	0

Table 1 Data extracted from the video

For use in Google Earth, the position data has been converted from Degrees: Minutes: Seconds to Decimal Degrees, and altitude from feet to metres. Furthermore, Northerly latitude values remain positive and Westerly longitude values have become negative.

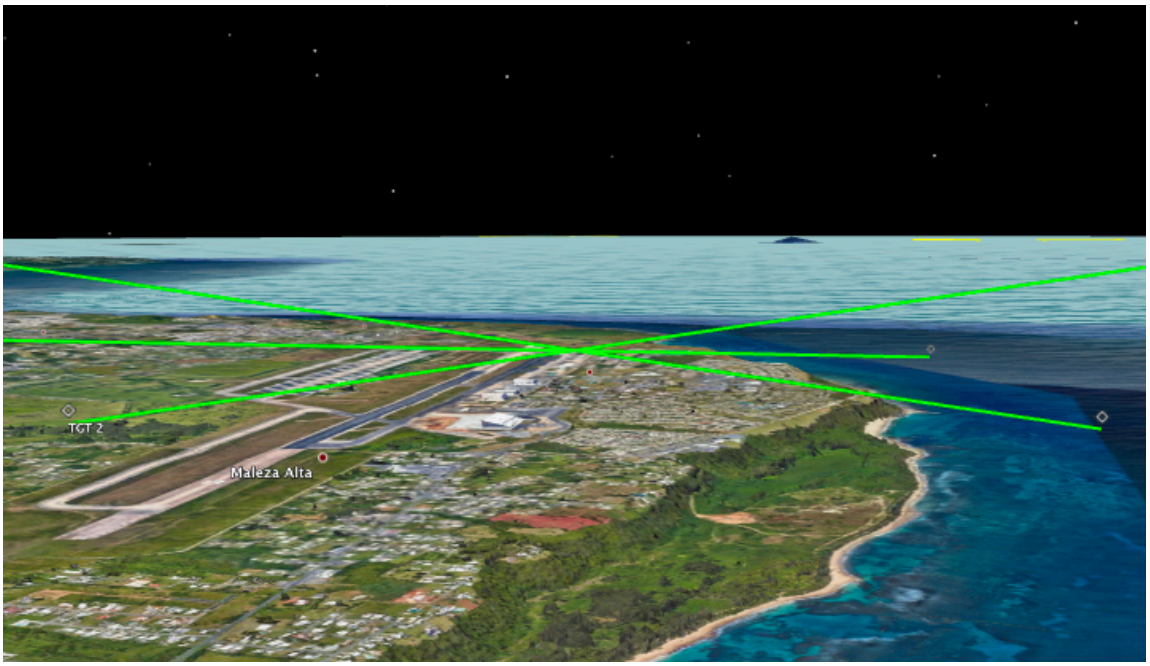
Point	**Video**	**ACFT**			**TGT**		
Description	Time code	Lat N D.d	Long W D.d	Alt m	Lat D.d	Long D.d	Alt m
Point #1	01:22:08	18.503056	67.096667	572	18.503611	-67.156667	0
Point #2	01:23:02	18.518056	67.137500	551	18.489167	-67.122500	66
Point #3	01:24:57	18.428611	67.129167	1097	18.514167	-67.135556	0

Table 2 Extracted data converted for Google Earth Formats

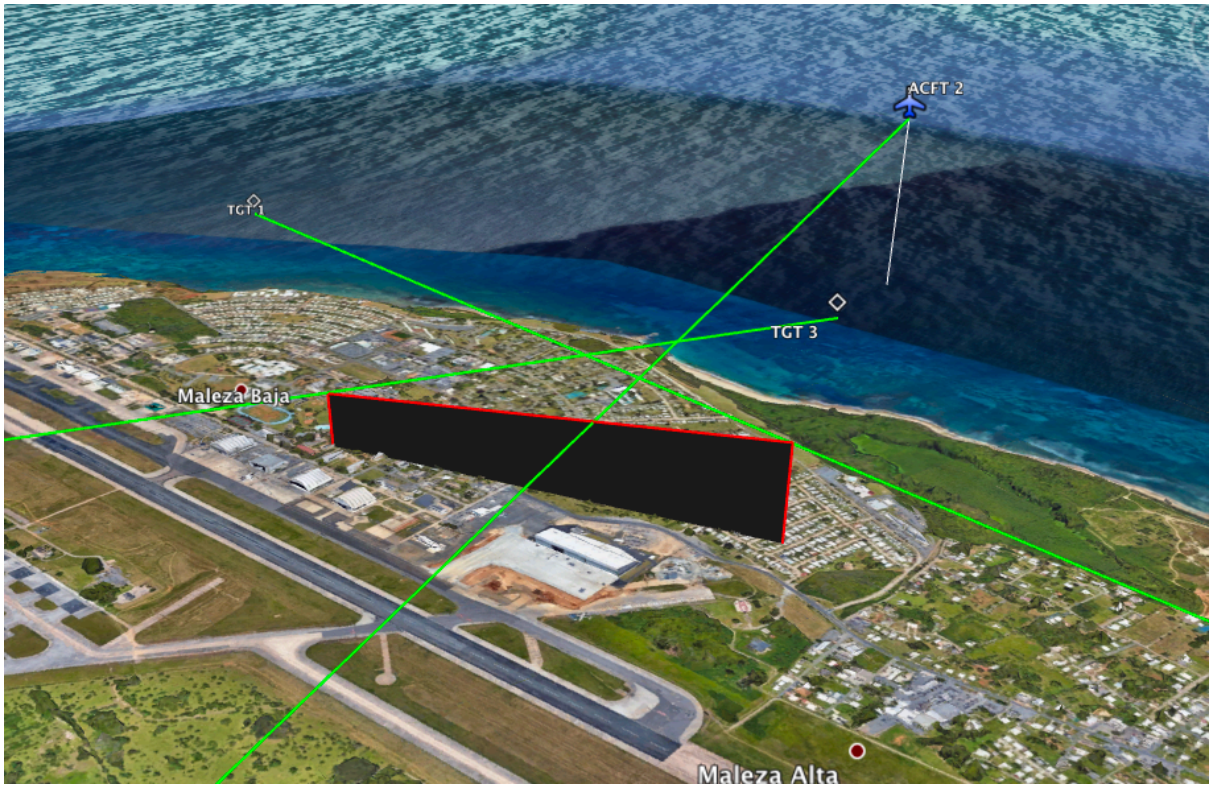
ANALYSING THE RESULTS

The data in Table 2 was plot in three dimensions using Google Earth. The plot shows the bore sight lines from the Aircraft positions 1, 2 and 3 to Target positions 1, 2 and 3, as indicated by the green lines.

The view was rotated manually until a single point appeared where the bore sight lines converged.



A line was then drawn between where this convergence intersects with line 1 and line 3. The line in red is the hypothesised path of the object and has been ‘extended to ground’ for clarity.



The initial calculated flightpath of the object

Validation of the Path

As per the method described earlier we will now test this path by taking three more screen shots and plotting them in the same way. If they pass very close to or intersect this line then we can consider the line to be accurate.

Next Frames

The specific frames that have been selected to test the path are shown below. Again, they have been selected with the object visible within the bore sight crosshairs in order to reduce errors.

Screenshot at 01:22:44 hrs

Screenshot at 01:23:35 hrs

Screenshot at 01:23:52 hrs

Validation Data

The data from these points is as follows:

Point	**Video**	**ACFT with # Suffix**			**TGT with # Suffix**		
Description	Time code	Lat N D:M:S	Long W D:M:S	Alt ft	Lat N D:M:S	Long W D:M:S	Alt ft
Point #4	01:22:44	18:31:23	67:07:10	1693	18:28:59	67:08:05	236
Point #5	01:23:35	18:29:38	67:09:33	2314	18:30:07	67:07:11	200
Point #6	01:23:52	18:28:41	67:09:40	2506	18:30:23	67:07:18	174

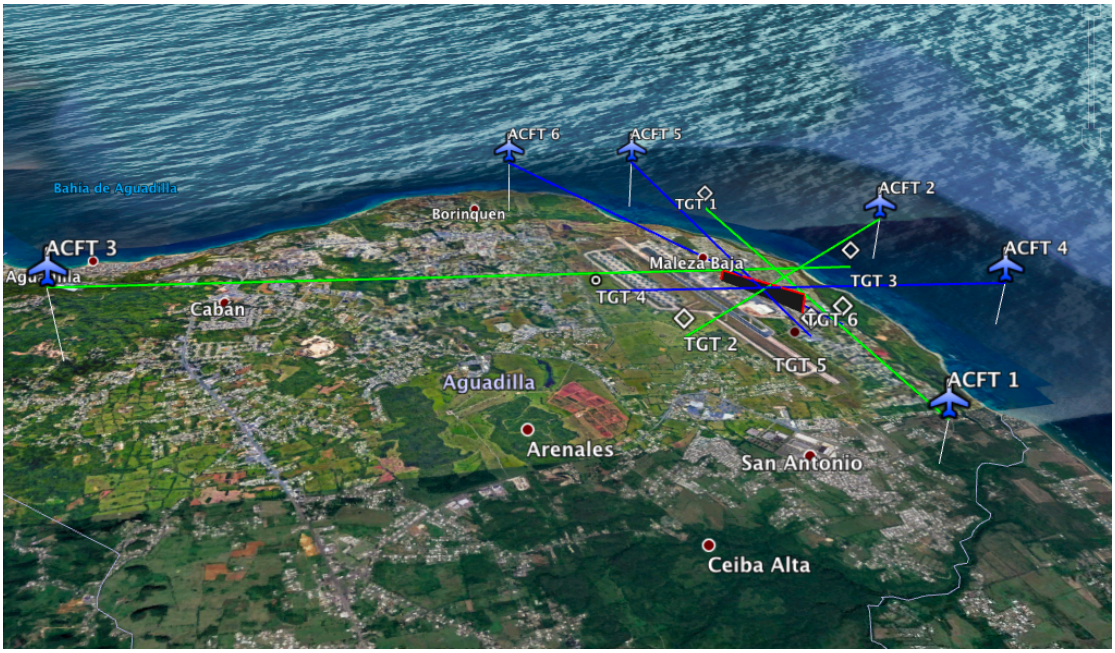
Table 3 Three additional points extracted from the video

The data was again converted for use in Google Earth and is as follows:

Point	**Video**	**ACFT with # Suffix**			**TGT with # Suffix**		
Description	Time code	Lat N D.d	Long W D.d	Alt m	Lat D.d	Long D.d	Alt m
Point #4	01:22:08	18.523056	-67.119444	516	18.483056	-67.134722	72
Point #5	01:23:02	18.493889	-67.159167	705	18.501944	-67.119722	61
Point #6	01:24:57	18.478056	-67.161111	764	18.506389	-67.121667	53

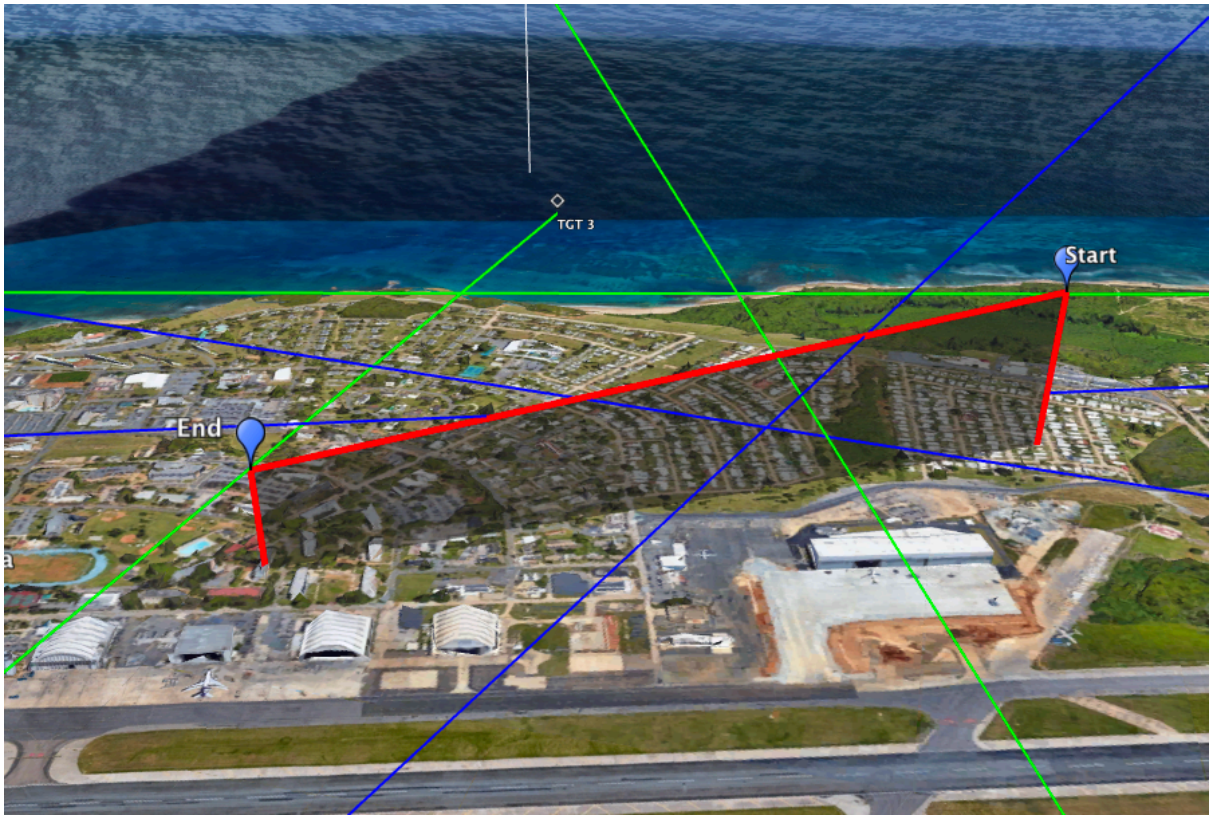
Table 4 Additional point data converted for Google Earth Formats

It can be seen from an overview of the Google Earth model that these three lines, shown in blue, also pass close to the red line.



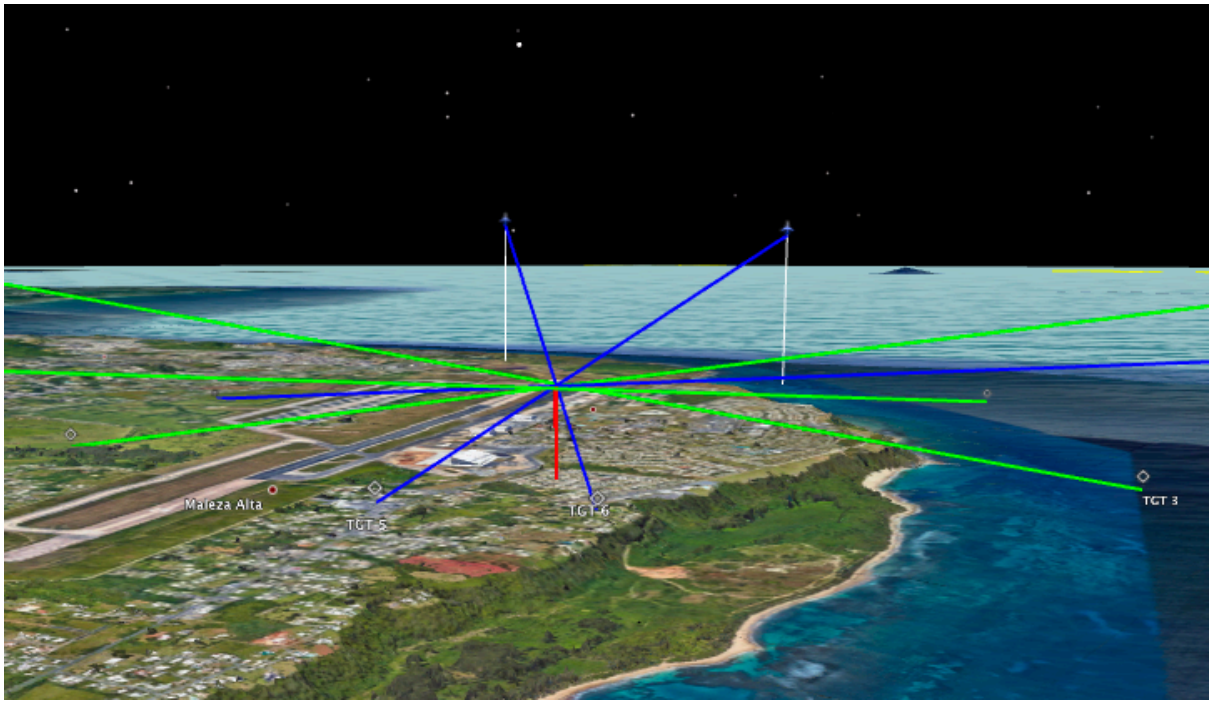
Adding supplementary lines of sight

Upon closer inspection we can see that six bore sight lines, in blue, do pass very close to the red line.



All lines of sight pass near the initially calculated flight path

Looking along the calculated path of the object we can see that the six lines appear to intersect at one point. This further validated the red line as a common path for the object.



All lines of sight converge the initially calculated flight path

Define the Likely Path

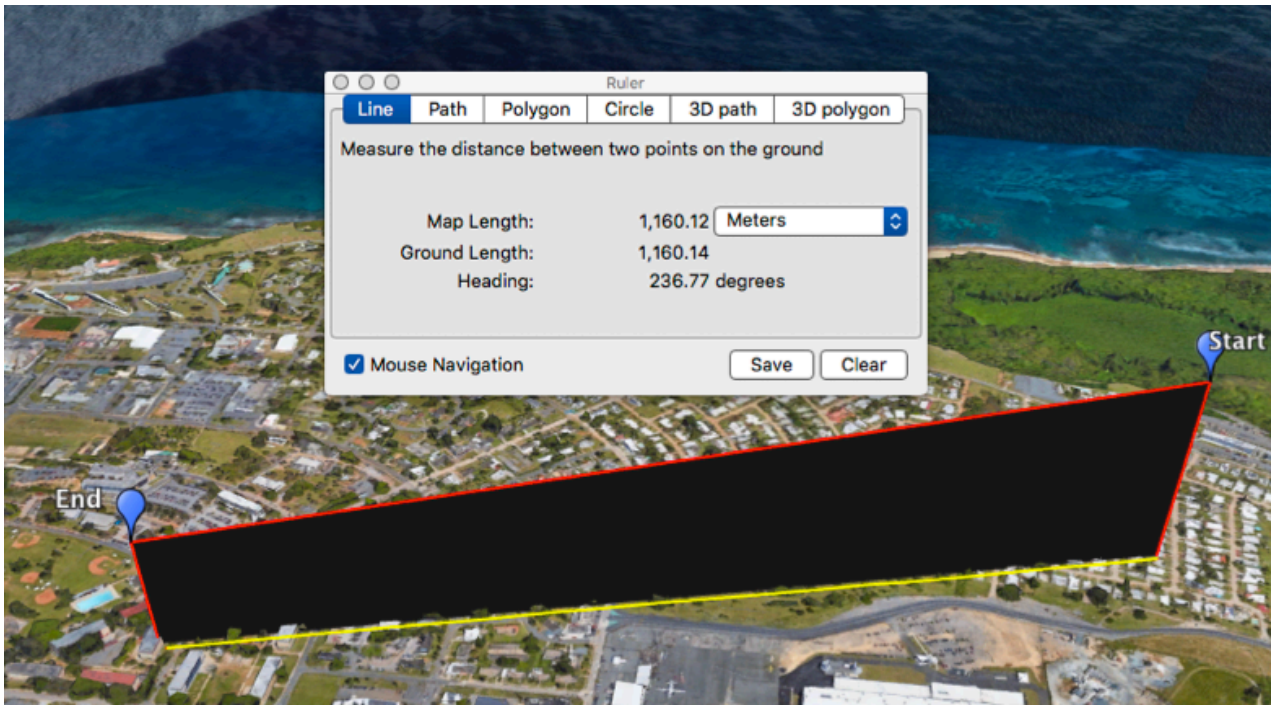
The object's likely path is from the Start Position at point just north east of the airfield and at the end of the video it is at the End Position just north of the airfield's hangars. The object starts at an altitude of 305m (1001 ft) and descends to an altitude of 210m (689ft). The positions are defined as:

Position	Latitude D.d	Longitude D.d	Altitude m	Altitude ft
Start	18.503287	-67.125027	305 m	1001
End	18.497528	-67.134305	210 m	689

Table 5 Start and End points of the objects path

Calculate Speed of the Object

We can measure the straight-line distance of the calculated path using the Ruler tool in Google Earth. This gives a distance of 1160 m.



We can calculate using the formula ***Speed = Distance / Time***. As stated earlier in the report, the time between the first and last screenshots was 173 seconds. Therefore:

Speed = 1160 m / 173 seconds

= 6.705 m/s

= 14.999 mph

Calculate Direction of Path

Again using Google Earth Ruler tool we can see that the object moves on a bearing of 237°, which equates to a back bearing of (237-180) of 57°. This can be considered to be a cardinal point direction of North-North-East (NNE).

Self Falsification

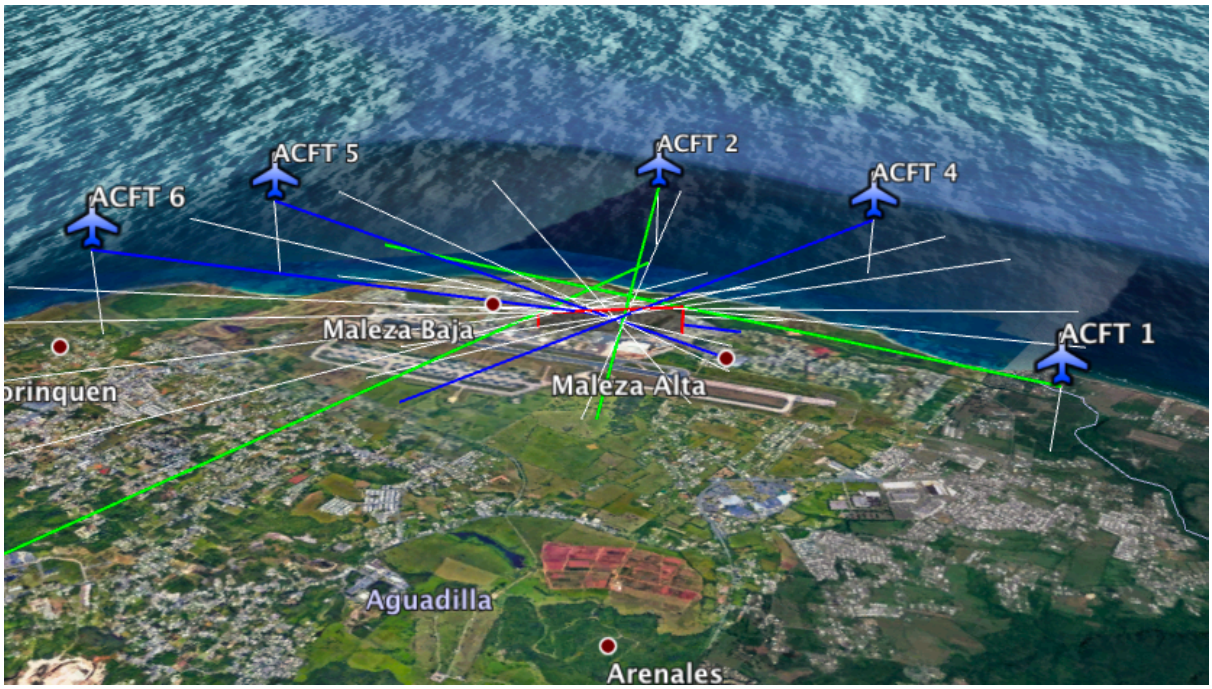
To improve the robustness of any hypothesis, attempts should be made by the investigator to falsify their own work. It was stated earlier that the hypothesis could be falsified if it was shown that the observed movement of the object in the video was outside the predicted results. This is particularly true for the calculated path of the object. In order to test the deduction of the linear path to the highest degree we shall take as many more points of view and lines of sight that we can. Upon reviewing the video again, twelve more data points were taken where the object passes close to the crosshairs, giving a total of 18 lines of sight.

The data points are listed in the table below:

No	Video Time code	ACFT			TGT		
		Lat D:M:S	Long D:M:S	Alt ft	Lat D:M:S	Long D:M:S	Alt ft
1	01:22:15	18:30:33	67:05:50	1896	18:29:47	67:09:18	3
2	01:22:21	18:30:51	67:05:58	1909	18:29:39	67:08:45	207
3	01:22:32	18:31:15	67:06:25	1834	18:29:21	67:08:26	236
4	01:22:45	18:31:22	67:06:47	1745	18:29:03	67:08:21	226
5	01:23:00	18:31:07	67:08:08	1798	18:29:19	67:07:24	217
6	01:23:16	18:30:37	67:08:59	1945	18:29:42	67:07:07	210
7	01:23:29	18:29:57	67:09:26	2189	18:30:01	67:07:08	203
8	01:23:45	18:29:12	67:10:39	2447	18:30:14	67:07:15	194
9	01:23:24	18:28:14	67:11:35	2529	18:30:39	67:07:14	16
10	01:24:07	18:27:53	67:12:27	2561	18:30:46	67:07:19	16
11	01:24:18	18:27:21	67:13:05	2698	18:30:55	67:07:32	0
12	01:24:32	18:26:44	67:08:34	2844	18:30:55	67:07:49	0

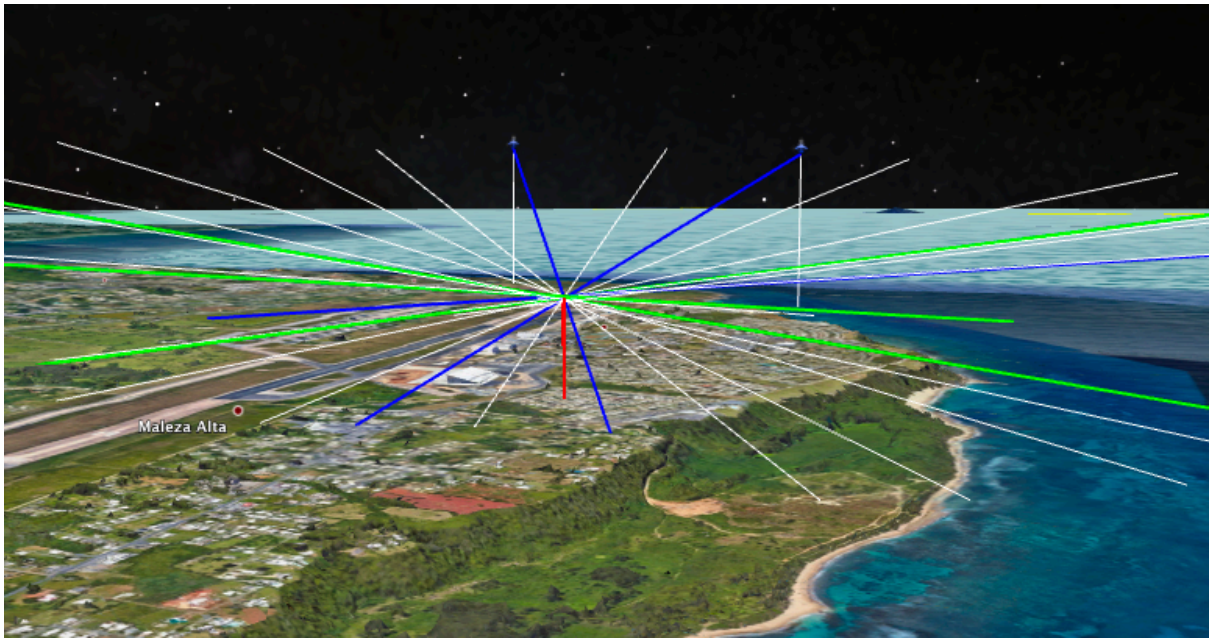
Table 6 Additional Data Points

The points were converted for use in Google Earth, however have not been included here for brevity. Upon viewing the data points in the Google Earth model they can be see to again converge around and along the probable object path.



Further verification of the flight path

On rotating the model in the same way as before all 18 lines can be seen to cross along the line of the objects path.



Multiple converging lines of sight

Conclusions

Using this method the calculated line is judged to have not been falsified.

The other predicted results (the direction and speed of the object) are purely mathematical calculations and are considered to be proven.

DRAWING CONCLUSIONS

Using the results shown in the preceding sections we can draw the following conclusions form the result:

- The object's movement can be explained by linear motion
- The object's speed over the likely linear path was 14.999 mph
- The object's direction over the likely linear path was 237°, which equates to a back bearing of 57° or NNE.
- The object's altitude varies from 1001 ft at the start of the event to 689 ft at the end.

The last conclusion we can make regards the object's movement compared to the weather at the time. As stated previously the weather at the time of the event had "winds are out of the E to ENE, forcing the balloon W or WSW, at a maximum speed of 18 mph up to 3200 feet elevation". The conclusions above calculate that the object moved at 15 mph, which is within the limit of the forecast winds.

The calculated path back bearing of the object was 57° (NNE) compared to the weather forecast of between E (90°) and ENE (75°). This is only one minor cardinal point different from the forecast wind direction. Note that the location of the event is at a coastal region where it can be very difficult to predict and forecast the actual wind for any given instant or even over a short period of time. Additionally, the upper winds actually measured at San Juan are given in the SCU report suggest a wind direction of between 60° & 65°, giving a difference of only 8°. Furthermore, San Juan is 50 miles to the east of Aguadilla, so small differences between forecast and actual weather are to be expected.

78526 TJSJ San Juan Observations at 00Z 26 Apr 2013

PRES hPa	HGHT m	TEMP C	DWPT C	RELH %	MIXR g/kg	DRCT deg	SKNT knot	THTA K	THTE K	THTV K
1015.0	3	25.8	20.8	74	15.49	55	4	297.7	342.8	300.4
1000.0	137	25.0	20.5	76	15.43	60	12	298.1	343.2	300.9
980.9	305	23.4	20.2	82	15.41	60	12	298.1	343.1	300.9
947.3	610	20.4	19.6	95	15.38	65	16	298.1	342.9	300.9
943.0	649	20.0	19.5	97	15.38	64	15	298.1	342.9	300.9
925.0	816	19.2	17.5	90	13.79	60	13	298.9	339.3	301.4
914.5	914	18.6	16.5	88	13.11	60	13	299.3	337.8	301.6
898.0	1071	17.6	15.0	85	12.08	60	11	299.8	335.4	302.0
882.6	1219	16.5	13.7	84	11.31	60	9	300.2	333.6	302.2
881.0	1234	16.4	13.6	84	11.23	59	9	300.2	333.4	302.2

Recorded weather data

For this reason the difference of 8° is judged to be an acceptable and explicable error. We can therefore conclude that:

- **The object's movement was concordant with the weather conditions**

Hypothesis Validation

Lets revisit the hypothesis. It was stated earlier as:

The object movement of the object is linear with a direction and speed, concordant with the local weather conditions at the time.

Referring to the conclusions made in the previous section and noting that they were all were as per the predicted results we can therefore conclude that **the hypothesis has been demonstrated to be valid**.

Answering the Question

This now allows us to answer the question posed at the start of this analysis:

Question: “Did the Aguadilla UFO move in an ordinary or an extraordinary way?”

Answer: The object most likely moved in an ordinary way.

SCU Radar Analysis

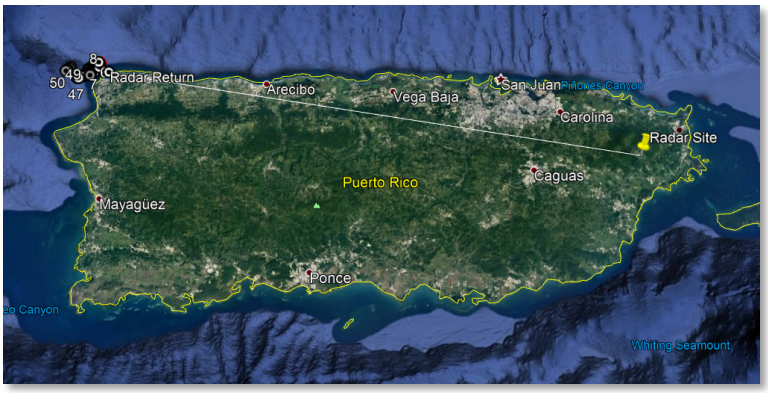
Introduction

This document provides an independent review of the radar data associated with the Aguadilla 'UAP' event of 13 April 2003. The event is considered to be one of the best 'UAP' encounters as there is a large amount of video and radar data available for analysis. The Scientific Coalition for UAP Studies (SCU) has published a report that analyses all the data gathered during the event. The SCU Report Appendix F examines the Radar information that was collected approximately 10 minutes before the 'UAP' video was recorded and concludes that the object seen in the video and on radar is a trans-medium craft capable of extraordinary flight manoeuvres.

This document reviews the SCU methods of analysis and their conclusions and continues by proposing a different interpretation the data.

About the Radar

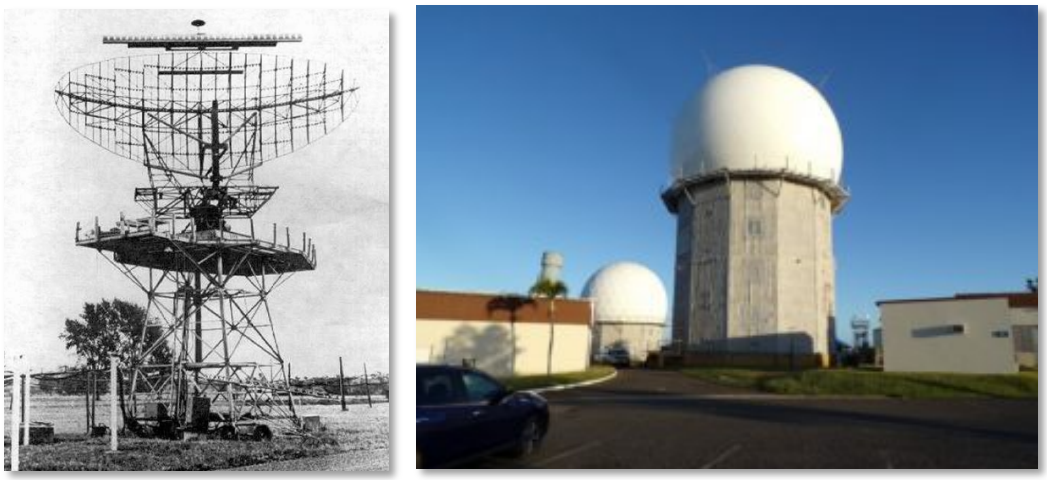
The Radar used to detect the object is AN/FPS-20 type that is located at Pico del Este - approximately 90 miles South-East of the Aguadilla area. The radar was designed and manufactured by Bendix in 1956 and the type has seen wide use throughout the world. The radar has been upgraded to AN/FPS-67 standard, but this did not significantly improve the tracking performance of the radar.



There are many general descriptions of the radar available on the web, however these descriptions are very generalised and do not provide detailed information. :

https://en.wikipedia.org/wiki/Bendix_AN/FPS-20,

https://www.radomes.org/museum/equip/fps-20.html



AN-FPS-20A Radar, and the QJQ Radar Site

Detailed Specification

The SCU report quotes the following technical details regarding the QJQ radar site.

> **Radar Analysis—Verification of Thermal Imaging Video Information** As noted earlier in this report, data used in this analysis was from the primary radar site known as QJQ and is a long range radar located 90 miles ESE of the area of interest and is at 3,417 feet elevation. The radar is a FPS-20E and has a range of 200 nautical miles.[12] The radar was manufactured by Bendix and is an L-Band radar that operates at 1280-1350 MHz and has a transmission power of 2.0-2.5 megawatts.[13] Based on the lowest altitudes detected of identified aircraft in the area of interest, this radar is capable of detecting objects, if near the airport, at 400 feet altitude. A graph and discussion of how this information was derived is in Appendix F.

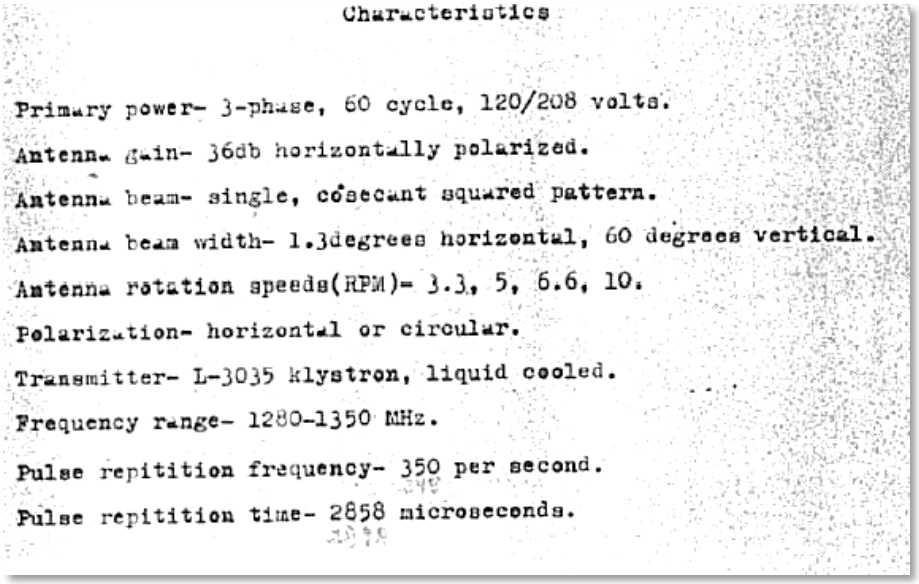
The SCU report takes this detailed information from a very old report written by a Bendix radar engineer Harvey Clute Jr. The report details a similar AN/FPS-20 radar installation at Naval Air Station Oceana in Virginia. The report gives a detailed description of the radar and how it operates, the various upgrades and the performance specifications of the radar.

> [13] OCEANA NAS, Harvey Clute, Jr., Bendix Engineer.

This document is Reference 13 in the SCU Report and can be accessed here:

https://radomes.org/museum/documents/NASOceanaAN-FPS20Description.pdf

The Characteristics in the Bendix document are as detailed in the SCU report.



Characteristics

Primary power- 3-phase, 60 cycle, 120/208 volts.

Antenna gain- 36db horizontally polarized.

Antenna beam- single, cosecant squared pattern.

Antenna beam width- 1.3degrees horizontal, 60 degrees vertical.

Antenna rotation speeds(RPM)- 3.3, 5, 6.6, 10.

Polarization- horizontal or circular.

Transmitter- L-3035 klystron, liquid cooled.

Frequency range- 1280-1350 MHz.

Pulse repitition frequency- 350 per second.

Pulse repitition time- 2858 microseconds.

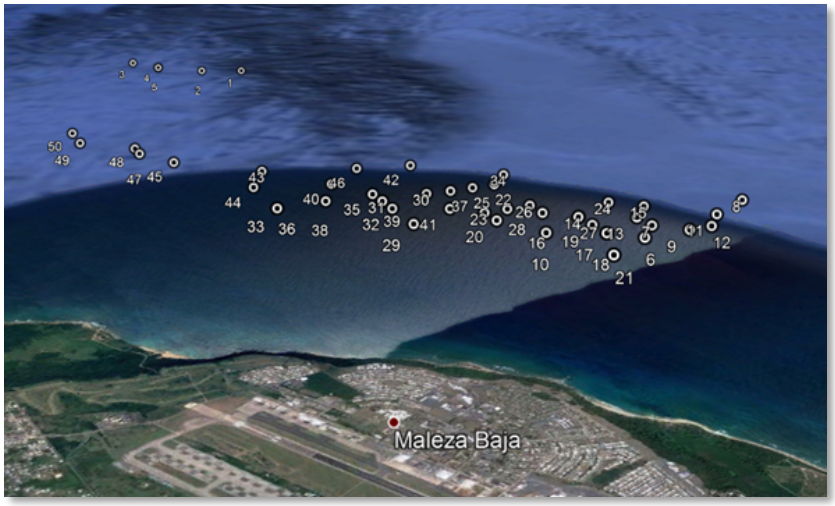
Event Radar Data

The SCU acquired a significant amount of radar data via a FOIA request. A subset of the radar data relating to this event is published in Appendix F of their report. The radar data covers 50 points that are between 2 and 4 miles off the coastline of Puerto Rico. Overall the positions of the radar returns generally progress over time in a direction parallel with the coastline. The SCU Report suggest that it is highly likely that the two observed events (radar and video) are connected and that the radar data further demonstrates the movement of an unknown object in an extra-ordinary manner.

Radar Site: QJQ 26 Apr 2013

Time	MsgType	Rng(nmi)	Az(deg)	Lat	Lon
00:58:16.909	Sch	85.25	280.811	18.31.48.965 N	067.13.32.938 W
00:58:28.874	Sch	85.375	280.635	18.31.34.812 N	067.13.43.643 W
00:58:40.902	Sch	85.875	280.371	18.31.16.718 N	067.14.19.057 W
00:58:52.899	Sch	85.625	280.459	18.31.21.911 N	067.14.02.078 W
00:59:52.882	Sch	85.625	280.459	18.31.21.911 N	067.14.02.078 W
01:00:04.941	Sch	81	281.25	18.31.39.674 N	067.09.01.791 W
01:00:16.922	Sch	81.125	281.338	18.31.48.439 N	067.09.08.066 W
01:00:40.900	Sch	81.25	281.777	18.32.26.646 N	067.09.08.238 W
01:00:52.866	Sch	81	281.426	18.31.54.354 N	067.08.58.828 W
01:01:04.909	Sch	81.25	280.986	18.31.20.395 N	067.09.21.664 W
01:01:16.875	Sch	81.125	281.602	18.32.10.482 N	067.09.03.561 W

The data for the radar returns just off the coastline near Aguadilla has been extracted and plotted in Google Earth in order to assist with our further analysis. In the image below the Radar Returns have been labelled 1 to 50 in the order that they were detected. It can be seen that the lower numbers tend to be at the right of the image and that the numbers generally increase as they move left. This shows the general drift of the radar plot position over time.



Radar returns plotted in Google Earth

The SCU analysis determines that the radar data shows the object moved at speeds up to 1723.51 mph, but typically between 70 and 200 mph in an erratic path, and therefore is judged to be further evidence of an extraordinary UAP. However, this document will show that these calculations are based upon an incorrect interpretation of the radar data due to an over estimation of the Radar's accuracy in both range and direction.

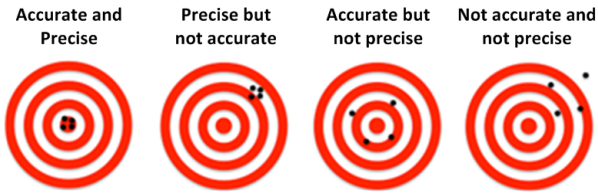
SCU Radar Analysis Methodology

The SCU report uses publically available AN/FPS-20 radar performance data to interpret the pattern and distribution of the radar returns. Each radar return is taken as accurate and the speed of travel between each point is calculated. This assumes that the radar returns are both **accurate** and **precise**.

Analysis of Radar Information — Appendix F

	Elapsed Time	GPS Points: Start Point		GPS Points: End Point		Points: Distance (ft)	Heading (Degrees)	Speed	Radar Skips
1	11.965 sec	From 18.530268	-67.225816	To 18.526337	-67.228790	1798.27	215.6	102.47	
2	12.028 sec	From 18.526337	-67.228790	To 18.521311	-67.238627	4029.98	241.7	228.44	
3	11.997 sec	From 18.521311	-67.238627	To 18.522753	-67.233911	1799.25	72.1	102.26	
4	59.983 sec	From 18.522753	-67.233911	To 18.522753	-67.233911	0.00	---	0.00	+++++
5	12.059 sec	From 18.522753	-67.233911	To 18.527687	-67.150498	30482.85	86.4	1723.51	
6	11.981 sec	From 18.527687	-67.150498	To 18.530122	-67.152241	1092.37	325.8	62.16	

The Radar returns are in the format *Degrees Minutes and Decimal Seconds* to 3 decimal places. In the table above they have been converted to *Decimal Degrees* accurate to 6 decimal places. This gives a very ***precise*** value (to within 3 inches) for the position of the return but is it an ***accurate*** position? The following diagram shows the difference between Accuracy and Precision.



It is noted in their report that the SCU struggled with determining the radar accuracy in both range and direction. The SCU report correctly recognised that the accuracy of the radar is primarily dependent upon the radar beam divergence. They understand that it complicates the analysis and go on to say that it cannot be determined *"without the complete design plans of the system"*:

> Further complicating this effect is beam divergence. This means the beam spreads as it moves away from its antenna and widens the envelope in which the beam is able to resolve targets. Since this spreading is a function of the design of the beam's antenna, this effect cannot be calculated without knowledge of the complete design plans of the system.

However, at two points within the document the SCU state that the Radar Accuracy is 1/8 mile. It appears that the SCU have determined the radar accuracy independently using the publicly available radar performance figures.

> was stationary because the accuracy of the radar is only within 1/8 mile. If those first four

> **The radar sweeps every twelve seconds. Each "+" after a radar hit indicates that the target was not detected in the previous radar sweep. A designation such as "1ac,1af" indicates that two different radar sweeps occupied approximately the same physical location to within 1/8 of a mile of each other.**

Although they do not provide a source for this accuracy figure, it seems that SCU have determined that '***accuracy'*** is equal to the distance between radar pulses at the operational range of the radar – 81 nautical miles. This calculated value is correct for the radar pulse

separation distance at this range, but it is not a measure of the radar's accuracy. The radar sends 4200 pulses per 360° rotation, and therefore there is 0.086° between each radar beam.

SCU Calculated "Accuracy" = Distance between beam pulses

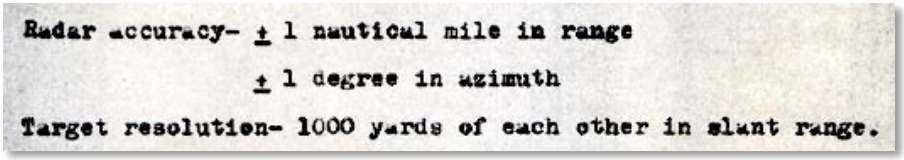
= 81 nm x Tan (angle between consecutive radar pulses)

= 81 x Tan (0.086)

= 0.121 nautical mile

= ~ 1/8 nautical mile

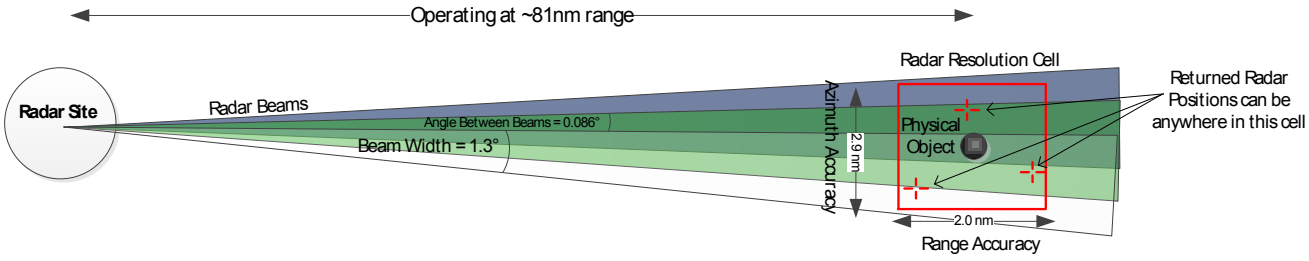
It is erroneous to assume that radar is accurate to this distance because of numerous factors such as the beam width, the pulse duration and the effect of multiple beam paths. As mentioned previously, the SCU report states that the exact beam envelope cannot be determined *"without the complete design plans of the system"*. . This is an unusual statement because the radar accuracy performance is explicitly published in the Bendix report that they reference (ref 13):


Radar accuracy- ± 1 nautical mile in range
± 1 degree in azimuth
Target resolution- 1000 yards of each other in slant range.

This shows that the radar accuracy can be subject to large variances . It can be said that the Radar Returns are "***Precise but not accurate***". They cannot be taken as the actual position of a detected object at any particular time.

Visualising the Actual Radar Accuracy

Using the accuracy data within the Bendix document we can model and calculate the correct beam envelope and the radar accuracy and accurately understand the performance characteristics of the radar.



- Radar pulse rate = 350 per second
- Radar Rotation Rate = 5 per minute
- Radar 360° Sweep Time = 12 seconds
- Radar Pulses per rotation = 4200
- Angle Between Beams = 0.086°
- Radar Beam Width 1.3°
- Radar Range Accuracy = ±1 nautical mile
- Radar Azimuth Accuracy = ±1°

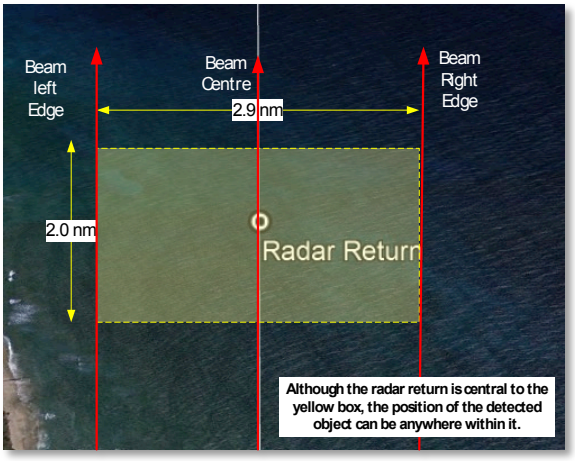
Distance between beam centres at 81nm = 81 x Tan(0.086)
=0.12 nm
= 1/8 mile
****THIS IS NOT THE SAME AS ACCURACY*****

Cell Dimensions = ± (Azimuth Accuracy x Range Accuracy)
= ± (1 nm x (81nm x Tan (1°)))
= ±(1 nm x 1.45 nm)
= 2 nm x 2.9nm

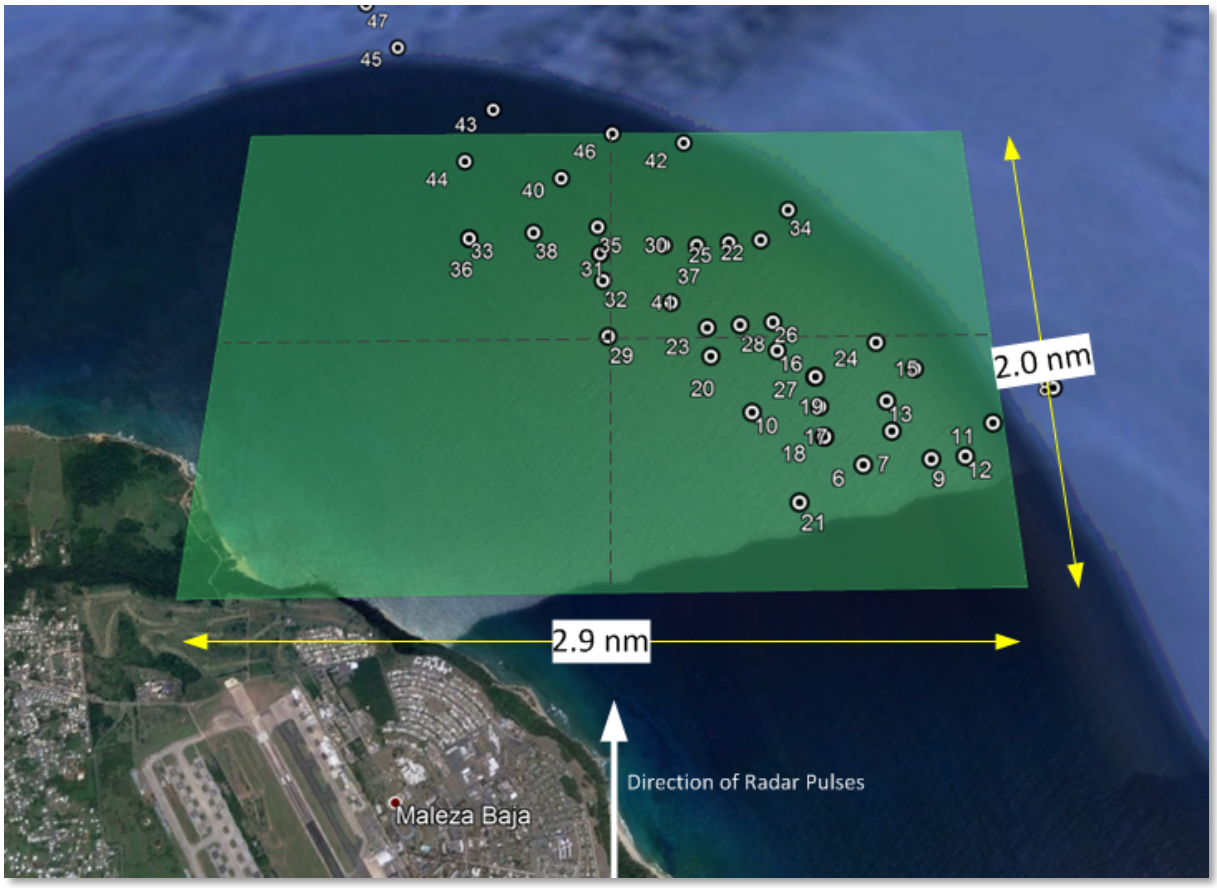
When compared with the 1/8 mile statement from SCU, this understanding shows that they overestimated the accuracy of the radar by a factor of 16 in range and by a factor of 23 across track. It is unknown why the SCU did not use the stated performance figures during their analysis.

This new understanding of the radar accuracy should now change the way we view the radar data. Rather than deducing that each of the 50 points is an exact position where the object

is, we should assume that the point returned by the radar is the centre of a rectangle with dimensions 2 nautical miles x 2.9 nautical miles.



This is known as the radar resolution cell and shows that the radar is much less accurate than originally assumed. To illustrate the size of the radar inaccuracy accuracy, this has been super-imposed onto radar Point 29. This shows that although the returned coordinates are precise (18°30'54.89"N 67° 9'50.62"W) they could be inaccurate.



Revised Analysis

With this revised understanding of the radar data we can revisit the analysis that was performed and provide a much more likely account of how the tracked object moved.

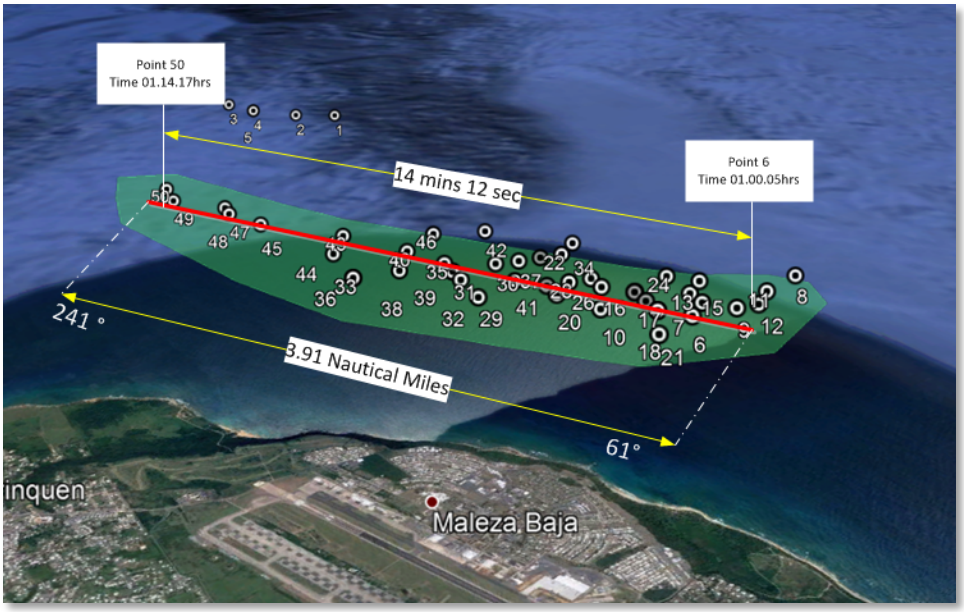
It is now apparent that taking each radar point as a precisely plotted point is a poor method because of the potential for error in the returned distance and azimuth values.

Points 1 To 5

It is noted that points 1 to 5 are a significant distance away from the main collection of points 6 to 50. It is unknown if they are related to the other 45 radar return plots and could be a spurious detection of another unrelated object. For that reason they have been removed from further analysis.

Modelling the Path

A simple method that we can use to visualise the likely path of the tracked object is by drawing a 'best fit line through all the radar points. This will average out the errors out over time and will give the reader a fair estimate over the duration of the event. To assist in visualising this the extent of the total radar "footprint" has been drawn in Google Earth. The red line shows the best fit line and has been annotated with specific dimensions, time-codes and bearings.



The Radar returns drift over time

Straight Line Analysis

Now that we have a measured the parameters of the best fit line we can calculate the likely object velocity.

Point 6 at 01:00:05 hrs and Point 50 at 1:14.17 hrs

Time difference of 14m12s.	= 0.2367 hours
Distance	= 3.91 Nautical Miles \
	= 4.50 statute Miles
Speed	= Distance / Time
	= 4.5/ 0.2367
	= 19 mph
Object heading	= 241°
Back Bearing	= 61° (ENE)

Conclusions based on the Radar Data

It can be concluded from this analysis that the object tracked by the radar likely moved at an average speed of 19 mph with a heading of 241°.

It is further noted that the object's likely velocity and direction of travel is consistent with the observed wind-speed and direction at the time of the observation (From ENE between 15 – 20 mph).

These conclusions regarding the flight characteristics are significantly different to those made by the SCU.

Object Splits in Two

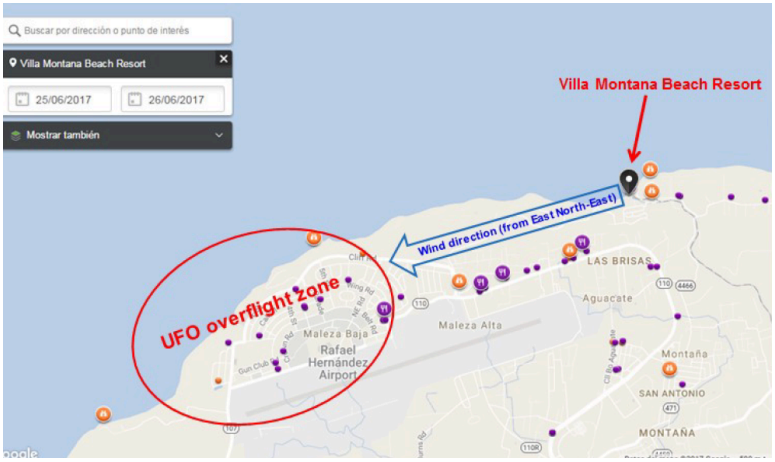
Another unusual part of the Aguadilla video is where the object appears to split into two separate objects. This happens at the time code 01:24:42hrs and subsequently two distinct objects are visible for around 10 seconds until the second object 'disappears' leaving only one object visible for another 13 seconds until it also eventually disappears. This strange end to the video has been suggested by some to be further evidence of the extraordinary nature of the Aguadilla object. However, there are some who say this can be accounted for by a simple explanation.

This report shall not further analyse the video to add yet another possible explanation, but it will review and assess the theory that the object was a type of candle-powered sky-lantern.

The IPACO Report

Ruben Lianza's report suggested that the object was in fact two objects all along – two red Chinese Sky-Lanterns that were initially tied together but after some time separated. This would explain the eyewitness testimony of seeing 'reddish pink' objects above the airfield. Whenever they 'disappeared' it could be explained by the flame extinguishing in the lantern thus removing the light source. Sky-Lanterns are often launched in pairs at weddings to simulate the bond between the bride and groom. Sky-lanterns are made of very flammable paper material and could equally have set alight and disintegrated.

Lianza also determined that a Hotel and Wedding Venue, Villa Montana, which a few miles north east of the airfield could be the source of lantern. An email to the hotel confirmed that they often released the type of lantern described. Their website shows examples of a wedding party at the nearby beach launching sky-lanterns



The SCU Report

The SCU report refrains from claiming to know what the objects are or why they split into two. In a later report the SCU rejected Lianza's suggestion of a lantern, not because it was an unlikely answer, but because his analysis does not account for the 'proven' erratic flight path of the object, and as stated previously they judged his method of using the infra-red size of the object unreliable due to its "indeterminate nature". Strangely, this method was the same as the SCU used to determine the extra-ordinary flight path of the object.

Deductions

This report has used a very different method to the IPACO Lianza report, but as deduced a similar flight path for the object over the airfield. This report has also concluded that the object was 'wind-driven'. It is therefore concluded that Lianza's proposition that the object was a sky-lantern launched from a nearby wedding ceremony is the most probable answer as to what the object actually was.

Effect on the "five observables"

It is noted that the property of 'splitting in two' is not one of the five observables of UAPs and therefore has no bearing on whether the Aguadilla object was a UAP/UFO or not.

Summary & Conclusions

The Aguadilla, Puerto Rico UFO is regarded by UFO-logists as one of the best-recorded examples of the "UAP Phenomena." It is said that a video of the event shows a UAP performing extraordinary flight manoeuvres in both the air and sea. However, this report shows that the object's likely path was a straight-line path that could be explained by an object being propelled by the winds at the time.

Was it a UAP or UFO…?

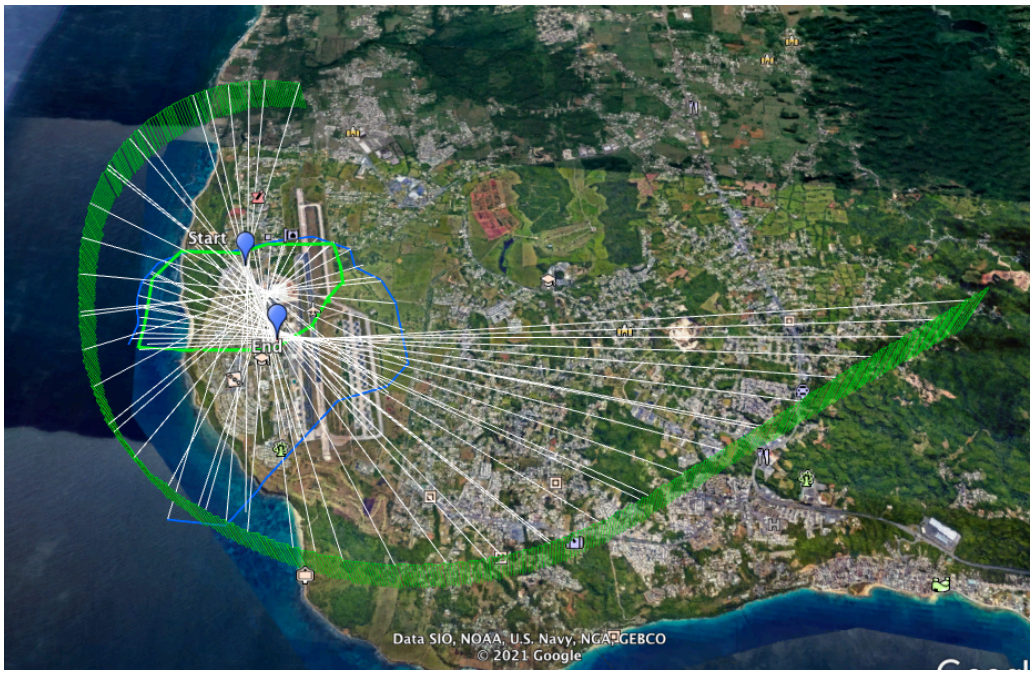
Lets now look again at the 5 observables of UAPs. It was initially stated that the object, according to the SCU's analysis of the video and radar data, that the object demonstrated each of the five observable features. Now we can see that the object does not display any of the five observables and therefore it is not judged to be a UFO.

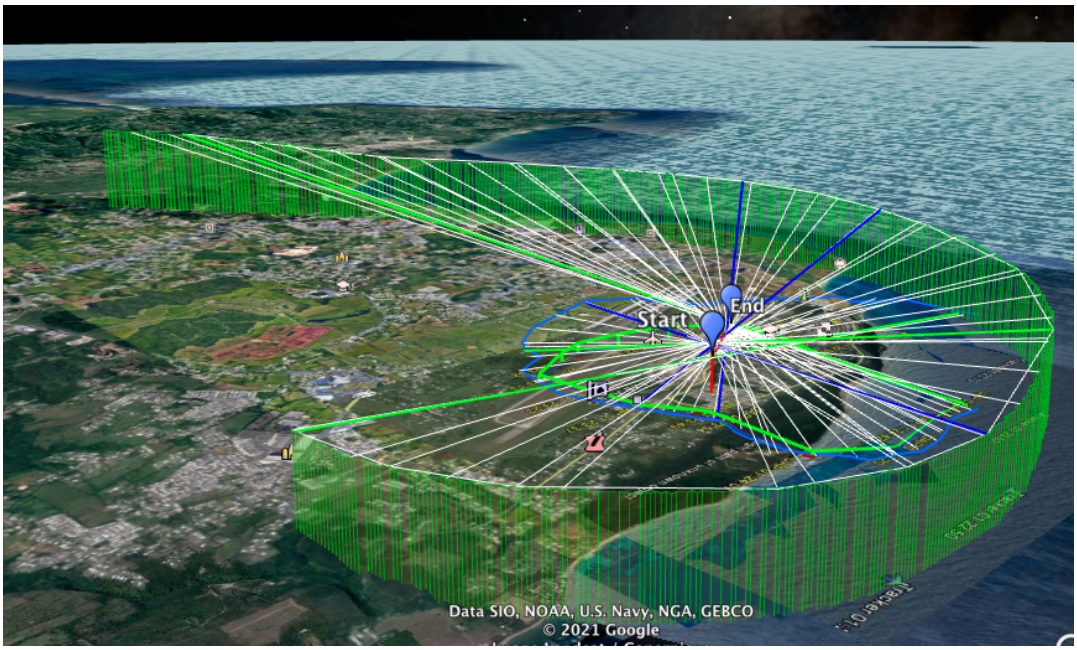
Observable characteristic	**Upon initial video viewing and SCU Analysis**	**After Further Independent Analysis**	**Extra Ordinary?**
Anti-gravity lift	Object has no lift surfaces or propulsion method that explains flight path and turning manoeuvres	Object is floating on the wind and is likely a balloon or lantern	No
Sudden and instantaneous acceleration	Not seen in video, but high speed and erratic movement observed in Radar data	Object remains at a steady slow speed in both Video and Radar	No
Hypersonic velocities without signatures	Not seen in video, but high speed transit was detected in Radar data	Object remains at a steady slow speed in both Video and Radar	No
Low observability, or cloaking	Object not observed in visible spectrum, only visible in IR. Video shows some sort of 'field' around the object	Object easily visible in IR. Some distortion of the craft visible in the video due to digital compression artifacts	No
Trans-medium travel	Object enters, transits and exits the ocean with ease.	Object remains north of the airfield, does not descend to 0 ft altitude and does not go near the sea	No

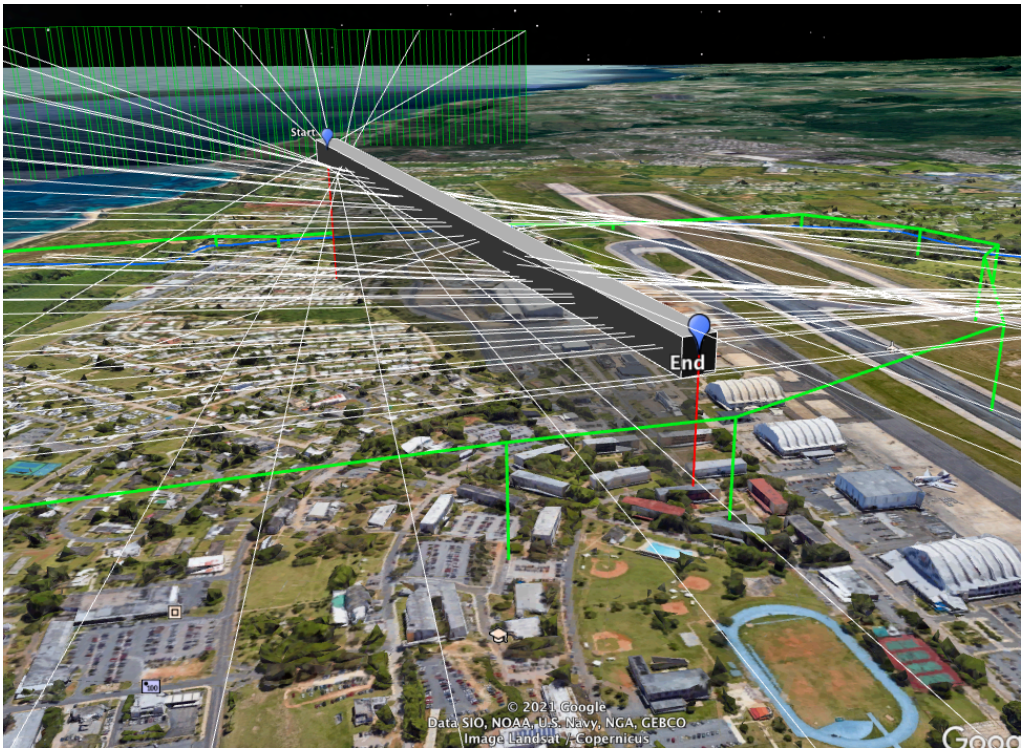
It could be said that that the object is still a UAP as it has not been fully identified. This is true, however it is highly likely, bearing in mind that this analysis has shown it was likely to be propelled by the wind, that the Aguadilla object was a 'lighter than air' item such as a helium filled balloon, or a hot-air filled lantern.

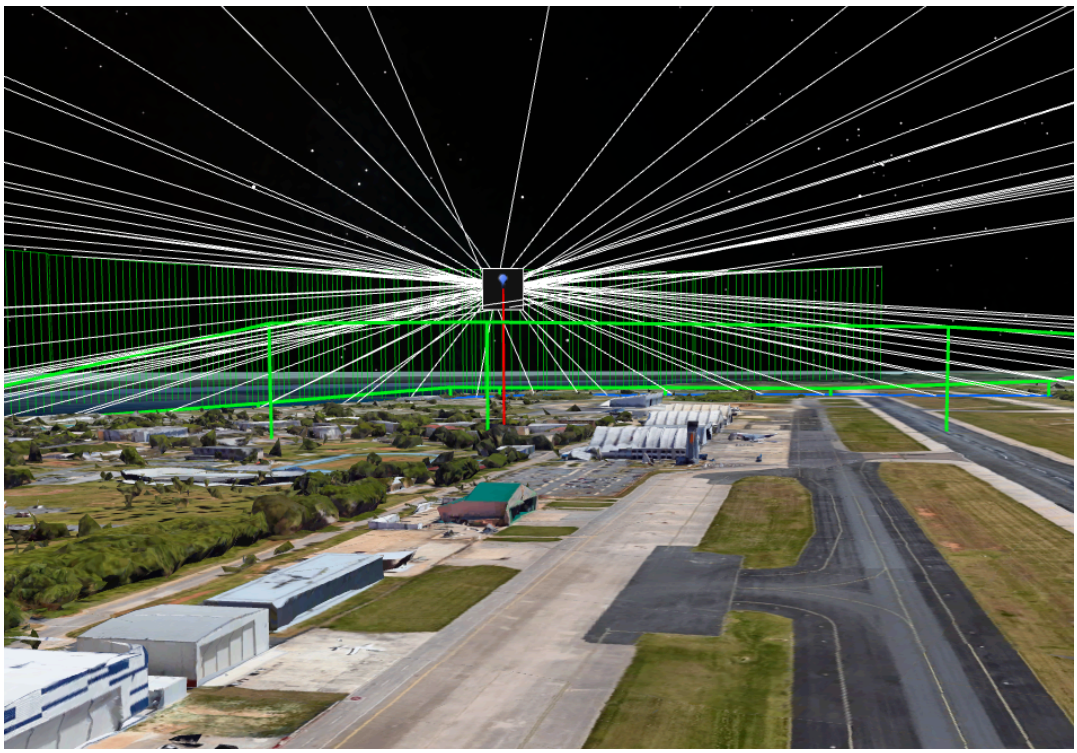
Further Work

Since the initial publication of this work in January 2021 further crowd sourced positional and line-of-sight data has been obtained from the AboveTopSecret.com website. This has allowed further confirmation that the linear path is supported by multiple lines-of-sight. In total 51 lines of sight have been shown to pass through an section of airspace that is 50m x 50m x 1100m. This section of airspace again comports with the wind direction and distance and an object blown by the wind would occupy.









Supporting Analysis Data:

The Google Earth kml file can be downloaded at this link: https://tinyurl.com/UAPkml .

The latest version of this report can be downloaded at https://tinyurl.com/UAPreport .

About the Author

Flarkey lives in the UK and has been interested in UFOs since he read about Bob Lazar in 1990. He has an Engineering Degree in Electronic Systems and has been employed by one of Europe's largest defence contractors for the last 21 years. For the last 11 years he has worked primarily with Airborne Reconnaissance and Surveillance Systems, which has involved operating many of these systems during test flights, including the MX-15 Turret and radars.

Twitter: @flarkey - **Reddit**: /u/flarkey - **email**: flarkey@gmail.com

“Pluralitas non est ponenda sine necessitate”