



Visual Invisibility

(Spoofing the Eye)

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Abstract

Visual Invisibility is an old effect in the military which effectively makes a plane invisible to the eye but not necessarily to a camera. Seeing a plane in a bright sky relies on the fact the plane is darker than the surrounding medium. It was found during World War II that simply putting lights on the wings of submarine hunters made them effectively invisible to the submarine's lookouts. Although this effect was mostly discarded when radar was invented, it was not forgotten. With the recent advent of radar stealth and advances in light panels MUFON should consider this effect when faced with craft never seen but found in pictures.



Visual Invisibility

In a recent paper, the author described a possible **Invisibility Cloak** that could be used by UFOs. The invisibility described in that paper (**Optical Invisibility**) was a true invisibility where a hole was created in the Electromagnetic field. It is, however, not the only way one can define invisibility. It is perfectly legitimate to define it in terms of what a specific sensor “sees”. Defining the sensor in question as the human eye results in **Visual Invisibility** and is the subject of this paper. This type of invisibility is not new. It has been an effect well known to the military since World War II. It is suggested in this paper that this effect may be the source of many MUFON reports that discuss a UFO found on a picture when nothing was seen in the sky. Basically visual invisibility employs Isoluminosity, Geometric Design, and Color to blend into the environment.

Most of this paper relates visual invisibility to modern military planes. That is not meant to imply that all military craft would be employing this effect. They could be, but it is more likely that once engineered, the effect would be applied to newer projects. The use of known planes is only provided to illustrate the need the military would have for the effect.

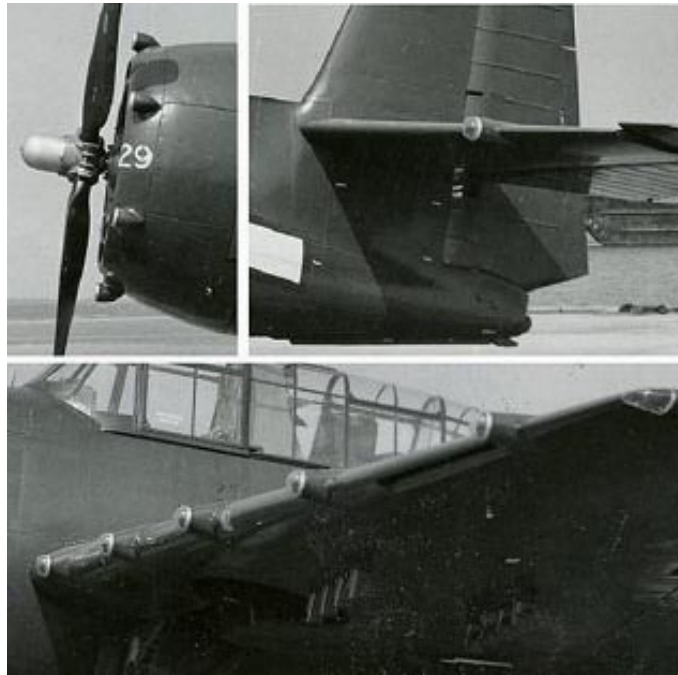
While many in the UFO community may suggest that these “advanced” vehicles are a result of extraterrestrial technology, the fact is that this effect does not require any alien help. It is a simple extension to modern equipment of known effects and is of very earthly origin. In fact, any extraterrestrial capable of traversing the void of space, seemingly ignoring inertia, and transforming at will between optical invisibility and visibility, would probably consider this too simplistic to even consider.

1.0 History

Near the beginning of World War II the US Director of Technical Services of the Army Air Corps, asked the Camouflage Section of the NDRC (National Defense Research Committee) for a method of camouflaging bombers to allow them to get close to German U-boats without being seen¹. It was specifically requested that a means be determined where the plane could get within 30 seconds of flying time² before discovery and a crash dive initiated. The codename of the request and project was “Yehudi”³

The initial results were a little discouraging. It was determined that even a white plane would appear as a dark silhouette against the sky⁴ and that even though a plane could be rendered invisible by coating it with floodlights, the power required would be prohibitive. They did however come up with a plan that worked. They knew from testing that at a distance of 2 miles, lights spaced less than 4 feet apart could not be distinguished as individual lights by the human eye. They therefore suggested that if the plane could be arranged to always approach the submarine in a head-on aspect, lights mounted along the front of the wings and in the propeller hubs would supply the requested camouflage. It was of course noted that even with the correct lamp brightness to match the sky the planes could still be visible by virtue to a color difference between the lamps and the sky. Data at that time showed a blue sky to have a color temperature⁵ of over 20,000 °K while a white cloud was approximately 5500 °K and an overcast sky approximately 6500 °K. Rotating glass filters were designed to compensate for the different colors required. This worked quite well until the submarines began using an early form of radar to locate the attack planes.

The above paragraph was provided for the express purpose of showing the concept of using light to hide an airplane in daylight was used 80 years ago.



Figure⁶ 2: Grumman TMB-3D Avenger (Torpedo Bomber) with Yehudi Lights

2.0 Craft Invisibility

The section describes how isoluminosity, geometric design and color are employed to allow the aircraft to blend into the environment.

2.1 Isoluminosity

The prefix “iso” means equal or the same. Isoluminosity therefore means the same luminosity or brightness. In the discussion above they were creating a situation where the plane had basically the same brightness as the background sky. In terms of perception, human eyes have a great deal of difficulty in distinguishing between two overlapping objects of the same brightness. The obvious cause is the loss of an outline, thus melding the two objects together.

As stated previously, the further use of visual invisibility in World War II was eliminated due to the introduction of radar. It didn't matter if a lookout could see the plane, the radar operator could. Today, that's no longer true. The new catch-word in military aviation is stealth. In terms of US planes it began with the SR-71 (Blackbird) and has steadily advanced. We were introduced to the F-117 in the Iraqi war. The problem seen with it then was that it was a night fighter (painted black). They were not used much during the day since they could be seen and were vulnerable to laser sighted anti-aircraft fire. The obvious next step for these and other stealth aircraft is to make the plane invisible in the daylight.

While the author cannot prove that the Skunk Works, among others, may have been working on invisibility, he would suggest it would indicate incompetence to ignore the possibilities of visual invisibility. Unlike the 1940s when floodlights were attached to the planes, today we have light panels which can be operated in various modes to mimic the sky the plane is flying in. Although the plane is still vulnerable to a laser sighting mechanism, it first must be found to have a laser beam bounce off of it.



2.2 Geometric Design

Geometric Design is a form of camouflage similar to the patterns seen on army uniforms. It does not make the wearer “invisible”. It tricks the observer’s eye and brain into failing to see a clear separation of the edges of the craft’s profile from the colors and shapes around it. As a result, while the eye still sees the craft, the brain – which processes the images by filling in for those areas the eye does not see – is tricked into accepting the pattern as part of the background and not as a craft. It is an artificial application of what nature has provided to a wide range of animals and insects, most notably the color-changing capability of chameleon lizards and the ability of some ocean species to change shape as well as color.

In essence geometric design breaks up straight lines into smaller sections of color similar to the background. It should be noted it is not the planes shape which would be causing this; it would be the result of small differences in the light panel colors.

2.3 Color

The easiest color to make invisible with lights is white. The reason for that is any other color is darker and more difficult to render invisible. As above, color variation is provided by the light panels. However, at this point, it has probably been noticed by astute readers that due to that choice of color we have solved the problem by creating two set of planes; one (black) which flies at night and one (white) which flies in the day. That is not exactly what is desired by the military.

Although not the best choice for daylight, the base color chosen for any flying vehicle will probably be black. It is still possible to make the craft visually invisible with a black base color but it will require brighter lights and possibly more lights. Since the picture will probably be focused using the standard sky brightness, the increased brightness of the craft could saturate the pixels in a picture of the craft, thus increasing the difference between the craft and the sky making the craft easier to see in the picture. Having a black airframe and controllable lights would also allow the airplane to blend with the sky in a continuous manner during night and twilight periods.

3.0 Viewing⁷

To this point, the emphasis has been on the craft and what must be done to make it visually invisible. This section will consider the object from the point of view of the witness and the camera.

3.1 Human Eye

Although the human eye is better than a camera, it does have drawbacks. One of these is in handling very bright objects. If intense enough, the light actually scatters off the portions of the eye and can be overwhelming. This situation is termed “glare” and as everyone knows it limits what is seen. We automatically squint and turn our heads to reduce it. Some additional reduction is obtained in the brain by its averaging the scene around the glare. This is true for all bright objects, even without glare. Each cone (color) cell is connected to 5 to 100 ganglia (nerve cells). Therefore there isn’t a one-to-one correspondence between sensor and result⁸. Additionally, due to a limitation of computing power in the brain for sight and in recovery time for the cells in the eye, there is a constant scanning going on and not all cells are sampled during each scan. The brain automatically expects the sky to continue and therefore averages the results.

3.2 Camera

Camera settings can aid in the viewing of a human engineered visually invisible craft in a picture. Cameras are not as adept as the human eye in adjusting to different light sources. In addition most photos obtained by MUFON are from normal people, not expert photographers. An increased light intensity will cause colors to become more vivid (toward color saturation) and if bright enough may cause pixel saturation in photographs. It can therefore be said that camera setting errors tend to amplify any mismatch between objects and ambient light. They also do not have a brain to interpret what they see, and therefore will not average out the object. (See Appendix A for a further discussion of Camera Settings.)



3.3 Ground Perspective

Even if the craft was capable of exactly matching the sky above it, there is another source of color errors; perspective. Due to perspective, observers watching the same area of sky from different points on the ground will see any specific location on the bottom of the craft as covering a different area of sky. Therefore, unless the sky had a perfectly uniform color temperature some observers will see a color error for that panel.

4.0 (Possible) Mechanization

Obviously, if the craft were able to exactly mimic the sky, the camera problems above would have no effect. There are, however, inherent problems with attempting this. The main one being the ability to transit from clear sky to cloud and vicer verser without presenting a target on the ground. The simplest way to set light panels on one of these aircraft would be to have a sensor on the opposite side of the ship to obtain and transmit the color temperature it sees to the panel. This is not as difficult as transmitting an entire picture, all that would be required is transmitting a number representing the temperature. The power to the controlled panel is then set to the value required to generate the same or slightly higher value in its light. Although it would be possible to have an analog signal and get exactly the average color seen it is more likely that a digital system for both the sensor and the panels would be developed since it would be less prone to errors. It, however, would also have a built in approximation at each step and therefore possible built in color errors. This obviously would not correct the perspective problem discussed in Section 3.3.

5.0 Example

Figure 2 is one possible example of this effect in action. As per the “witness”, the object was only seen when looking through the pictures. Although the sun is to the right in the complete picture, the multiple light sources in the picture eliminate the possibility this picture being the result of a simple lens flare. That however does not rule out balloons or other earthly possibilities.



Figure 2: MUFON case # 45050; Humble Texas, 10 November 2012

Interestingly there was a second photograph (Figure 3) taken in Magnolia Texas of a similar object over a month later. Magnolia and Humble Texas are both suburbs of Huston and are approximately 34 miles apart. This case was reported to “UFOs Northwest”⁹. In this case the photographer was taking a picture of a jet contrail and got the object indicated. It was also reported in this case that the “witness” did not see the UFO until looking at the pictures.

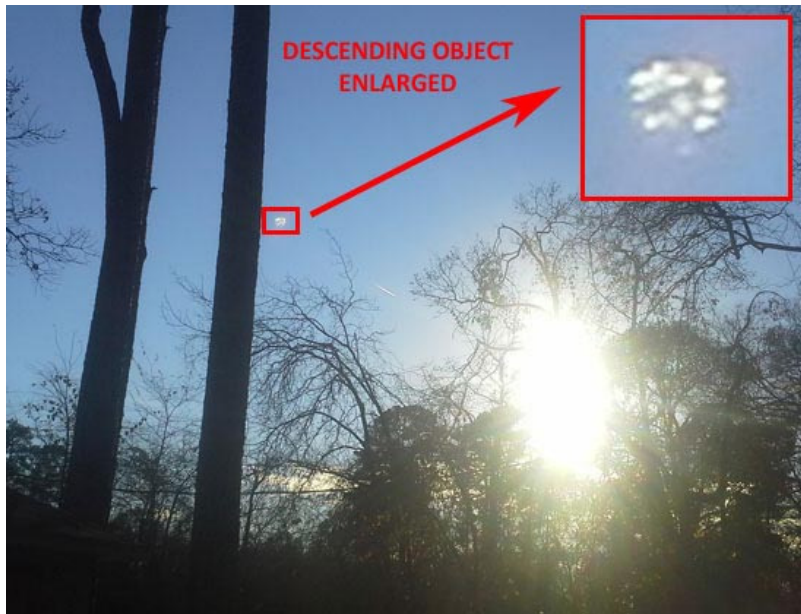


Figure 3: UFOs Northwest: Magnolia Texas, 21 December 2012

To fit the topic of this paper, one would expect the craft in the photographs to resemble normal military craft and these do not. However, there was a recent picture in the “Special Reports” section of Filer’s Files of a “new” type of aircraft. It was stated in that article that the photo was given to Major Filer (US Air Force retired) by Commander Graham Bethune (US Navy retired). Figure 4 is a copy of that picture.



Figure 4: US Navy UFO; Photograph from Filer’s Files #45, 8 November 2012

Assuming the flat sections around the outside are light panels and the inner ring contains the engines, the similarity of the craft in Figure 4 with those seen in Figures 2 and 3 is amazing. It is admitted that a similarity is not proof of anything, however multiple instances of the similarity do start to point toward a connection.



6.0 Conclusions

Although there are probably errors in the above specifics of how Visual Invisibility is being achieved, the fact that it absolutely can be done with yesterday's (not today's) technology is absolute. To assume that the major aerospace companies and the military do not know that is fallacy in the extreme. Additionally, if one knows, it is likely the others know as well.

Consider sightings of the large triangular craft that are often received by MUFON. For a long period they were mainly a night-time experience. If they were alien and crossed huge areas of space, why should they seem so timid? Since it was the most reasonable answer, many in MUFON began to assume the triangles were actually Earth built. We are now receiving more and more day-time triangle reports and that raises the question of what has changed? It is the authors belief that the triangles have now been fitted with the required lighting system that allows them to slide between visibility and invisibility at will, thus allowing them to hide both visually and in the minds of observers.

We should never be so involved with alien technology that we ignore our own. As was stated at the start it is the author's opinion that this effect is probably the source of many of those cases with invisible craft showing up on photographs. The challenge at this time is attempting to prove it.

Although not proof, it should be possible to show the pixels in the picture covering the craft are brighter than the sky surrounding them. However it probably isn't a good idea to advertise this method since once commonly known, it would be possible to create fakes.

The better possibility is to carefully scan the old and new technical journals. When a scientist discovers something, they write about it. They will never say it's for a secret project or that it's meant to hide airplanes or anything like that, but they will describe the effect they worked on and what they did to overcome it. It is suggested we search for "light panel" with secondary requirements such as "low power", "high intensity", "electrically adjustable". (The low power portion is only in relation to power that may be available on any specific craft.) It is suggested we watch for abstracts in societies such as the AIAA (American Institute of Aeronautics and Astronautics), the NAA (National Aeronautic Association), and possibly the IEEE.

A third, albeit possibly ethereal, possibility results from the fact that if there are visually invisible airships, they are probably relatively large and will definitely be roaming around in controlled airspace. Even if these ships cannot be seen visually or on radar, they still have to avoid collisions with other traffic that also probably can't see them. Collision avoidance means they will have onboard radar and to be under the control of Air Traffic Controllers. Once we know of a sighting, it is suggested that we attempt to obtain a transcript of the ATC chatter for the area. Someplace in it there has to be a reference to the craft. It could be vectoring or altitude changes; or anything else. It is not important what is requested or granted. What would be important is how the ATC refers to the craft. If the ATC accepts a nomenclature of "Unidentified" or "Test" Aircraft in place of a tail number it is probably the craft we are looking for. We also may see contrail of airplanes making relatively rapid turns to avoid collisions.

That last statement brings us to a third Houston sighting of a craft similar to that discussed in Section 5. This occurred on 28 November 2012. A discussion of it was initially published in "World UFO Photos"¹⁰. Figure 5 is a copy of the picture of the sighting. According to the witness, while he was stopped " ... at a red light I spotted an airplane high above the immense dawn sky, leaving a contrails behind it." He then " ... started seeing a bright, round circle right where the airplane was going, the airplane started making a turn, like it was avoiding whatever that circle was." He then grabbed his camera and took three pictures. After that "the bright circle shined and it disappeared."



Figure 5: Houston Texas; 28 November 2012, Plane avoiding collision with UFO

It would be interesting to listen to a transcript of the pilots and controller for this incident. One has to wonder when the jet pilot became aware of the “UFO”

References and Comments

1. “Visibility Studies and Some Applications in the Field of Camouflage”; Summary Technical Report of Division 14, Office of Scientific Research and Development, NDRC; Vannevar Bush Dir.; chapter 6; 1947
2. *ibid*; chapter 6, page 225
3. In WW II, Yaudi was a popular slang for someone who wasn’t there. As such, it was the opposite of Kilroy. It is stated in “World Wide Words” to have been first used for mean something that isn’t there in the “Science News Letter” of September 1940. The spelling used in this paper was directly copied from the document in reference 1.
4. *ibid* ref 1; Figs 8 & 9; ppg 24-25
5. The measurement of the color of the light as a “temperature” was started in the late 1800s, when the British physicist William Kelvin heated a block of carbon. It glowed in the heat, producing a range of different colors at different temperatures. The numbers shown at this section were taken directly from Reference 1, page 234. It represents the best data known in the early 1940s.
6. Copied from Wikipedia: “http://en.wikipedia.org/wiki/File:Yehudi_Lights_on_Grumman_TBM-3D_Avenger.jpg”
7. The author is not an expert in physiology and hopes he hasn’t stated anything incorrectly in this section.
8. In comparison to a physical picture, one can consider the term “result” to indicate something which corresponds to a pixel in the picture.
9. <http://www.ufosnw.com/newsite/december-21-2012-magnolia-texas-416-pm-cst/>
10. Pictures 200 and 201 of 384 in Gallery 8: <http://WorldUFOPhotos.org>



Appendix A

Color Temperature

As per Wikipedia, “the color temperature of a light source is the temperature of an ideal black body radiator that radiates light of comparable hue to that of the light source.” This means it is a characteristic of visible light that allows its description in terms of a “temperature”. It is measured in degrees Kelvin and shown in the following table. It should be noted that although most tables of Color temperature agree in general, there is always a great deal of discrepancy between them.

<u>Light Source</u>	<u>Temperature (°K)</u>	<u>Color</u>
Clear Blue Sky	10k - 20k	Blue
Sky Partly Cloudy	6.0k – 10.0k	
Overcast Sky	6.5k -8k	
Sun at noon	5.0k – 5.4k	Green
Electronic Flash	5k – 5.5k	
Fluorescent Light	4k – 5k	
Domestic Lighting	2.5k = 2.9k	
Twilight Sun	2.0k – 3.0k	Red – Orange
Candle	1.8k – 2k	

Table A1: Color Temperature

The colors to the right are only given as an indication of the overall hue of the light source. An image taken under tungsten bulb (a normal household incandescent bulb) without adjusting the digital camera for white balance produces a dull orange shade as it spreads the biased light. Similarly, an image taken under the fluorescent lighting produces a brighter bluish cast. A digital camera can measure the colors in the red, green, and blue light of the spectrum, as reflected to its sensors. In a photo taken under the midday sun there is the whole spectrum of light (which makes up “white” sunlight). Under these conditions, the colors in an image appear nearest to the “true” colors.

White Balance

Probably a natural prejudice is our belief that what our eyes see is the correct or “true” color of any light. White balance is the process of removing unrealistic (to our eye) color casts, such that objects which appear white to us are rendered as white in the photo. Although some cameras allow the photographer to dial in the color temperature the lighting is assumed to be it is unlikely that person would be the one sending MUFON a picture of a UFO. Most cameras provide a couple preset White Balance settings and/or an “auto” setting.

Since the author has an iPhone 4 that will be used as an example. Although there is not a formal setting for white balance on most cell phone cameras, including the iPhone, there is a way to indirectly set the white balance on the iPhone 4. The white balance is changed every time the camera is refocused. In addition to zooming, the focus of the camera can be changed by simply tapping upon a spot on the screen. Each tap will automatically adjust a number of settings including the white balance. Apple has tried to come up with an average group of settings when it auto-focuses on a scene, and sometimes does that quite well. At other times, however, it misses by miles. It should also be noted the iPhone has a flash on/off setting that has as one of its effects, changing the white balance of the camera.

What this means is that using an auto setting for white balance will sometimes provide exactly the same thing the photographer’s eye sees and at other times it will not. It is during those “not” times that it becomes possible to get a picture of a visually invisible human created flying ship. One only needs enough of a color difference to see the outline of the ship. The difference in white balance does not have to be very large for the eye to see it in a photograph. Therefore even those instances where the camera does a relatively good job of estimating the background it may still be possible to see the ship.