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"There is no hope of advance in science without a paradox." —Niels Bohr

THE NEW ZEALAND FILM ANALYSIS— Part II

RECENT GOVERNMENT OVERTURES TOWARD UFO INVESTIGATION

HYNEK IN JAPAN AND THE HONDURAS

FIVE UFOS SELECTED FROM 93 U.S. CASES: June 15-July 14

COMPLETE DETAILS ON THAT MICHIGAN COAST GUARD CASE

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EDITORIAL



by Dr. J. Allen
Hynek

From time to time there is place for whimsy in an editorial, and this is an example.

Suppose you were given the job of selling an idea—not a product, but an idea, an idea quite foreign to popular thinking, and one which runs against common sense, against scientific and military opinion, and against the learned opinions of the intelligentsia. You must sell this idea not to just a selected group but to the majority of the population of the United States.

Quite a job, you'll agree. You might start by engaging a highly expensive Madison Avenue advertising firm, and obtain prime time TV and radio time in stations all over the country. This would be accompanied by a barrage of newspaper advertising... perhaps full page ads in major newspapers, and you might hire fluent speakers to tour the country, much as in a political campaign.

To attain the actual acceptance of this idea by more than 100 million people, the majority of our population, would be, you'll agree, a major accomplishment, and a very expensive one!

Yet this has been accomplished without the spending of one cent... and against a barrage of ridicule, of active opposition from science, the military, and the press! Of course, it took some thirty years to do it.

The Gallup Poll earlier this year indicated that 57% of the American population feels that UFOs are "for real". Yet thirty years ago, when the "campaign" started, the whole idea was foreign to our thinking, and would have been regarded as preposterous. Quite a successful advertising campaign!

But who put it on! Extraterrestrial intelligences? Our own "collective unconscious" as the psy-

(cont. on back page)

J. Allen Hynek



THE NEW ZEALAND FILM ANALYSIS Part II

WHAT CAN WE LEARN FROM THOSE FILMS?

At first glance, the footage resulting from a hand-held camera in a moving plane of lights both focused and defocused seems to yield little useful information. Certainly the average news viewer watching the TV broadcast of these films last January must have felt unimpressed with their lack of drama or detail. Yet in the hands of an optical physicist like Dr. Maccabee, a surprising amount of data can be obtained which further supports the anomalous nature of the sources.

BRIGHTNESS

Maccabee desired to determine the brightness of the light sources captured on film; yet his microdensitometer scans of the small, focused images showed them to be highly overexposed, with the film having a transmission that approaches that of the clear film leader. Such overexposed images render the task of estimating the illuminance on the film plane difficult. Quite ironically, the solution to this problem laid in the use of the otherwise-annoying streaked images caused by the cameraman's hand-held motions. By spreading the image's light over a larger area of the film frame (in the same exposure time), the image is less overexposed, allowing a more accurate measurement.

The single film frame seen below was shot during the sighting of the radar-confirmed light seen at the beginning of the Argosy's trip north-bound. The image density of the light source was measured at different points in the loop-shaped streak relative to the film density of the dark background. Using classical formulae for image illuminance, film density vs. exposure curves published by Fuji and (conservatively) the smallest distance noted by the plane's radar to the light source, Maccabee calculates a lower limit of 260,000 candelas. This is ten times the light intensity radiated by a 10,000-watt incandescent bulb, the largest commercially-available. If this type of bulb had its output focussed into a 70° beam, however, it would achieve the 300,000 candelas calculated. The full moon, low on the horizon, would also be comparable.

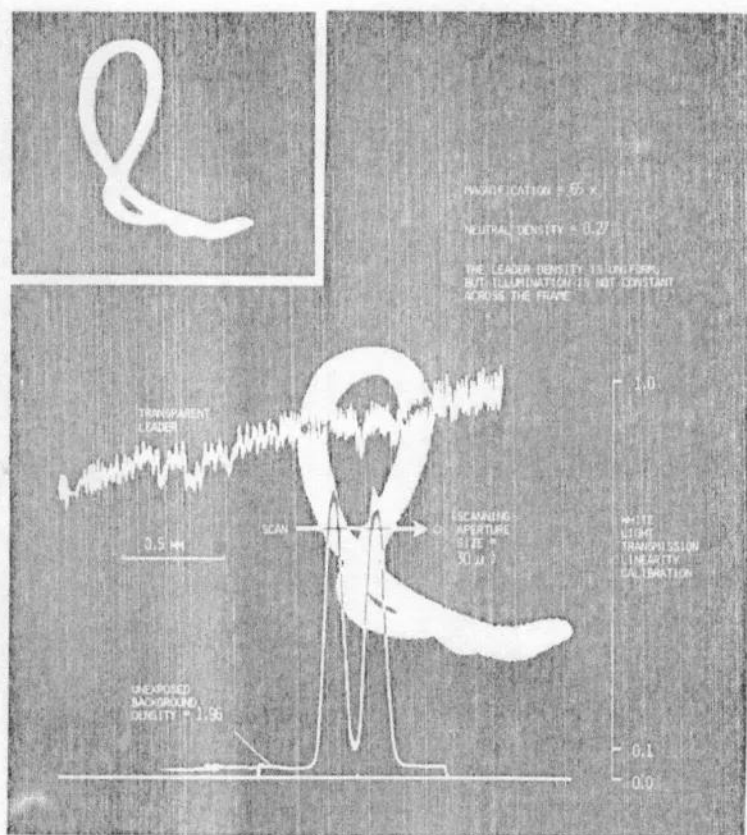
SIZE

Using the focal length of the lens, the width of the streaked image and the shortest radar-determined distance to the source, Maccabee determined the lower limit for the size of the source. Assuming a stationary object with streaks due only to camera motion, the angular width of the horizontal streaks is about .00065 radians, and .001 for the vertical streaks. This would be consistent with a non-circular object which, at 18 km, would be 12 meters by 18 meters in actual size.

Finally, recall this particular source was seen for over 12 minutes, and the prospect of "freak weather phenomena" (e.g., reflections, ball lightning) becomes rather improbable.

WHAT ELSE DOES THE FILM FOOTAGE REVEAL?

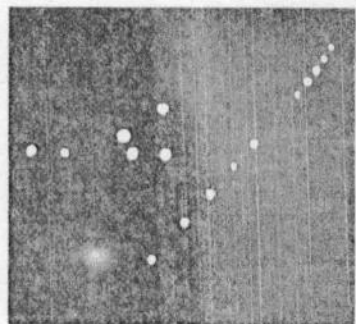
THE TRIP SOUTH: Amongst the 263 feet of film shot on the trip to Christchurch are shots of the plane on the ground at Blenheim, the takeoff, cockpit interior shots, anomalous lights of the Kaikoura coast, the town lights of Kaikoura itself, and the landing at Christchurch. There are about 230 frames showing a bluish-white light that is basically elliptical, but which may have a triangular protrusion. Even the known light sources (e.g., the city and runway lights) are useful here, because they help to calibrate the film, the camera and the plane's windows for light sensitivity, color and distortion. For example, a flashing red light on top of the Argosy, filmed



Microdensitometer scans of one frame from the New Zealand film

by Crockett before the plane left Blenheim, so saturated the red-sensitive layer of the film when he zoomed in on it that it took on a bright yellow center on the film. This was important for the analysis of a flashing red light at the end of the film.

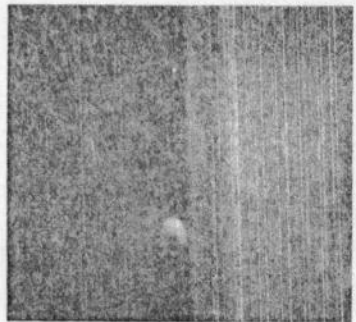
Another example: the runway lights retain their round shape while shot through the plane window.



Experiments with the camera also show that a round light remains round even when the focus is changed. Yet in the southbound trip, a large, defocused light has a triangular corner to it. Maccabee feels, then, that the "corner" is characteristic of the light's shape, and not the lens or window behaviors.

THE TRIP NORTH: Crockett shot 148 feet of film on the return leg of the flight, but at a much slower speed—10 frames/sec. This resulted in a longer exposure time per frame, as evidenced by the interior cockpit shots. Seen in this footage is the takeoff from Christchurch, anomalous lights near Christchurch and Cape Campbell, and the landing at Blenheim.

The first light filmed here was the one that resulted in the loop-shaped image analyzed earlier. One useful look at this light occurred when Crockett filmed the object at full zoom (100 mm) and pulled back to wide-angle (16 mm) showing both the light and a dimly-glowing meter on the console below the window sill at



the same time. In one shot of the "Christchurch" light, the camera is apparently held steady while the light moves off to the plane's right, as described.

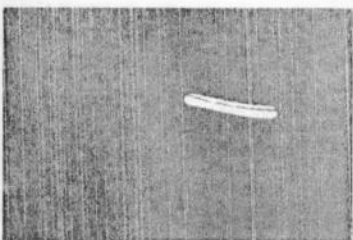
On film, the image started out as a thin ellipse surrounded by a reddish fuzz with the left end of the shape tilted up at a 45° angle. Forty seconds of film later, the images have changed into fat ellipses devoid of the red fuzz, even into triangular shapes. Maccabee's transmissometer measurements of these small images show that the images are so bright that the film's color dyes have been saturated and the exact colors can't be determined.

Then Crockett switched lenses to the faulty 240-mm lens and shot the sequence of this light usually broadcast on American TV, wherein the large (2 mm on the film) dim extra-focal image "shrinks" down to a small (0.2-0.3 mm) and bright light, followed by enlargement to about 1 mm again. This last image is a symmetry inversion of the first large image, apparently, further supporting the conclusion that Crockett simply passed through the real focus point of the lens for infinity at "15 feet" and kept on going out of focus again without knowing that his Sun zoom lens was faulty.

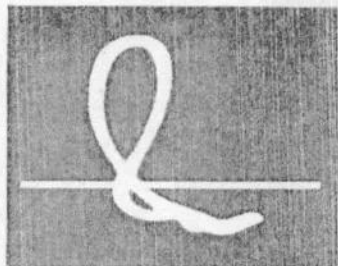
On some of the focused images of this light, however, the light assumes a bell-shaped form which is visibly brighter on the bottom than on the top; this matches an earlier description Crockett provided when



using the 100 mm lens. Even when the image is streaked by hand-held motion, the bottom part of the streak is brighter.



TECHNICAL DETAILS ON THE FRAME ANALYSIS



The intensity (I) of the source can be determined with this equation:

$$I = \frac{E_1 A_1 R^2}{T A_L} (3.9 R/V)$$

where I is in lumens/steradian (i.e., candelas-cd.), E_1 is the film plane illuminance in lm/m^2 , A_1 is the image area, R is the distance to the source, T is the lens transmission (assumed to be 80%), and $A_L = \pi D^2/4$ is the area of the lens aperture. For $f/1.9$, $D = 10 \text{ cm}/1.9 = 5.26 \text{ cm}$. The visibility, V , estimated from the ground level data, was about 70 km.

Neutral densities of the film (density = $-\log_{10}$ of the film transmission) as measured by Maccabee range from 0.4 to 0.2, while the clear leader is about 0.12. The densities for the three colors (red, green, blue) in the portions of the film which have not been exposed (e.g., the black background) lie in the range of 2.1 - 2.3. Fuji's published characteristics for this high-speed color film indicate that the normal density range is from about 0.10 to 2.3-2.7 for the three colors, and that the "speed point density" for the film (the value for a "good" exposure) is 0.90. Actually, the value may be more like 0.80, since the upper density range of the film stock used was a bit lower than normal.

According to the ANSI standards, ASA 400 film reaches its speed point density when exposed by a flux of about 0.025 lm sec/m^2 . For the camera's 0.044 second exposure (at 10 frames/second), this becomes 0.57 lm/m^2 . The measured loop image densities differ from the speed point density by 0.4-0.6 units, indicating the image illuminance was $10^{0.4} = 2.5$ to $10^{0.6} = 4$ times the speed point illuminance. Using a conservative three times the speed point illuminance, $E_1 = 1.7 \text{ lm/m}^2$. The total image area for which the density is 0.4 or less (3X the speed point or greater) = 0.003 cm^2 . Assuming the smallest measured radar distance to the light source, the equation yields a value of 260,000 cd. If the distance was 35 km, the value would greatly increase to $2.5 \times 10^6 \text{ cd}$.

One alternative explanation for the 4.1 mm length of the streak and its brightness is that the camera shutter momentarily stopped rotating. This effect does occur at the end of some scenes throughout the film footage. In this frame, however, there was no increase in the exposure of the dark background, which would have resulted in a visible or measurable reddening of the frame overall (as in the others). Moreover, the neighboring frames reveal that this was not the end of a scene, and the looped shape was consonant with the hand-held motion in the previous and succeeding frames.

WHAT ARE THE ALTERNATIVE EXPLANATIONS?

While the general features of the case (including brightness and motion) already suggest reasons that rule out natural or man-made sources for the lights, here are some specific reasons that help rule out some proposed prosaic explanations.

The Visual Sightings:

1) JUPITER (and Saturn)—Jupiter was proposed to the press by Mt. Stromlo scientists and Sydney amateur astronomer, Robert Lanigan-O'Keeffe, among others, especially after an early examination of a video tape of the bright "Christchurch" light seemed to show it was surrounded by four moons. Both planets were located high in the northeast, however, which is totally inappropriate. The "moons" do not show up on the original film stock examined by Maccabee.

2) VENUS—the "preliminary conclusion" of UFO skeptic Philip Klass on the basis of the films alone, and many others including British UFO journalist Norman Oliver and the head of New Zealand's Mt. John Observatory. It's a "better" choice, since the direction and elevation favor the "northbound" UFOs better (though not the "southbound" . . . they were in the west), but there's still one damning fact: Venus didn't rise until 3 AM, local daylight savings time, even at the plane's altitude. Remember, the co-pilot pointed it out to the rest of the crew at the very end of the flight.

3) AIRCRAFT—ranging from the "unscheduled aircraft" of British amateur astronomer Patrick Moore, to the "top secret U.S. military remote control drone vehicle" proposed by a former R.A.F. research specialist to "helicopters operating illegally at night". Both the Wellington and Christchurch facilities and the RNZAF affirmed that there were no civilian or military aircraft around the Argosy.

4) METEORS—proposed, incredibly, by British radio astronomer Sir Bernard Lovell (in the *Brisbane COURIER-MAIL*, January 3). When did meteors begin holding still for cameras for 12 minutes? Yet even Professor Ronald Brown of Melbourne's Monash University supported this in the Australian press. Adrian Berry, science correspondent of the *DAILY TELEGRAPH* speculated that the Argosy crew simply failed to appreciate the speed of the "meteorites" . . . so did the radar and the Bolex.

5) CITY LIGHTS AND BEACONS—Certainly not to the east over the sea, the scene of the most anomalous action.

6) JAPANESE FLEET LIGHTS—used for squid fishing that night. The brightness could work here, as would the angle below the plane's horizon (for the northbound flight only). The fleet was located, however, at an estimated 260 km southeast of Christchurch; a scanning satellite picked it up at 1:00 AM. In fact, the pilot and co-pilot pointed out the distant squid fleet to the passengers! Similarly scuttled, then, is New Zealand ornithologist J. Harrow's suggestion that mutton birds reflected the light from these ships.

7) BALL LIGHTNING (also "Plasma," "Natural Phenomena", "Meteorological Phenomena")—so said Duncan Lunan (British astronomical writer) and Norwegian aerospace expert Erik Tandberg. It's usually associated with thunderstorms, though; 3 hours of individual events, lasting as long as 12 minutes each, coupled with the intense brightness of the lights, renders this hypothesis unseemly.

8) BALLOONS WITH LIGHTS—light intensity too strong, speeds too fast; none officially acknowledged by the weather offices.

9) HOAX—Britain's Astronomer Royal, Sir Martin Ryle, deemed it all a hoax . . . by an Australian TV news department, with five people who didn't know each other, plus the cooperation of radar controllers at two air towers?

The Radar Sightings:

Explanations for the radar targets were accompanied, of necessity, by a disclaimer for the concurrent visual sightings (similar to the above):

1) EQUIPMENT MALFUNCTION—The Wellington MTI-processed radar display should reveal only moving targets; some of the anomalous targets were indeed seen to move on radar, as fast as 60 knots or more. Yet other targets did not leave trails on the scope, implying that they were stationary. According to Maccabee, a stationary target could defeat the MTI filtering if its surface was vibrating, or if it moved back and forth. A change in the phase or frequency of the returned signal could also be accomplished by a plasma.

Bryan Chalmers determined that the anomalous targets were appearing only on the MTI display; turn it off and the targets disappeared. Since MTI processing makes the radar receiver more sensitive, this

would be normal if the anomalous targets were actual weak reflectors of the 50 cm radar. Even planes can be weak targets like these if their orientations pose a small cross-section to the radar antenna.

2) "DIELECTRIC DISCONTINUITIES" CAUSED BY CLEAR AIR TURBULENCE—According to the flight crew, the air was quite calm, and the plane could be operated on automatic height control. This device corresponds decreasing air pressure with increasing altitude. When the air is turbulent, the pressure fluctuates and the device is ineffective. Besides, regions of clear air turbulence pose cross-sections that are very small for long radar wavelengths like 50 cm (one millionth the Argosy's "size" or less).

3) ATMOSPHERIC BENDING OF THE RADAR BEAM SO THAT IT REALLY "SAW" SURFACE FEATURES LIKE SHIPS—It's true that the Wellington controller had no height-finding capability. When the atmosphere is sufficiently refractive to bend the radar beam downwards, however, an unusual amount of land and sea clutter (even waves) appears on the non-MTI display. Chalmers checked this and found there were no conditions indicative of "anomalous propagation" on this display. This was consistent with balloon readings of the atmosphere taken at 11 PM, December 30. Only for a small region around 3400 meters was there a region with sufficient curvature to bend rays down toward the earth at a rate equal to the earth's curvature. The effect of this was small, however; a ray that travels 10 km through a medium that bends it downward from a starting angle of 5° upward would be only 30 meters lower in altitude with a bending rate of 2 minutes/km.

Consider the incident where the plane was apparently paced by a blip on radar for as long as 36 seconds. For a radar "angel" to accomplish this, it would have to have had the same azimuth as the plane (though not the same altitude), the same radar path length and the same change in path length for three radar sweeps. A plane could do this, but there were none. Neither a boat nor a wave could move at the plane's speed, and certainly no "natural" radar reflector could pace the plane for so long. But what if the rays first travelled upward from the antenna and were reflected downward to a stationary target (like a ship) while the reflecting region moved upward? That would increase the range of the target artificially. To increase the length of the curved path by the two

miles traveled by the plane in those 36 seconds, the bending region would have to rise eight nautical miles at the same time . . . that is, the volume of air in question would have had to travel four times faster than the plane, which is faster than Mach 1!

4) THE RADAR HIT THE ARGOSY, BOUNCED OFF A STATIONARY TARGET, (LIKE A SHIP) AND POSED A SECOND (MULTIPATH) IMAGE TO THE RADAR ANTENNA.—The plane was flying at an altitude of over 2 nautical miles, so the extra distance travelled by the twice-reflected ray would show up on the scope.

5) A BENDING LAYER MAKES A FEW RAYS HIT THE OCEAN SURFACE AT A PATH DISTANCE EQUAL TO 84 NM. THEN THE CURVATURE LESSENS, AND THE RAYS STRAIGHTEN OUT TO FORM AN 86 NM PATH.—Granted, it wouldn't take much of a change in the curvature now to accomplish this, but the average curvature would have to exceed the curvature of the earth, since the radar horizon (without bending) is at 47 NM.

The big problem with all of these "bending" exercises is that they usually result in several false targets, not just one, and all over the scope. Moreover, these random targets would appear on the non-MTI scope as well . . . these didn't and no sign of anomalous propagation appeared. Besides, if the other stationary targets were anomalous propagation only, the MTI would have filtered them out.

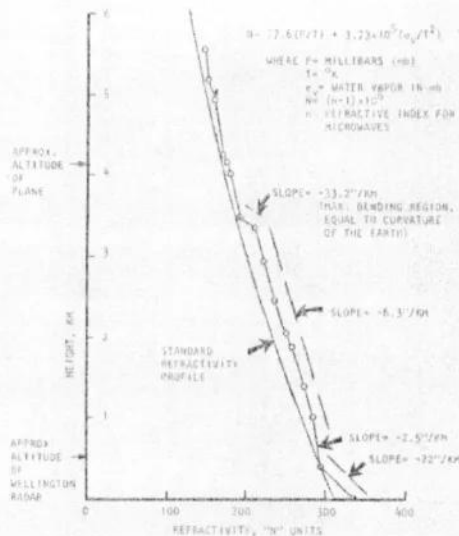
EPILOGUE: THE JANUARY 3RD GROUND FILM

"If Channel O can go out and film a UFO on the first try," Australia's TV One must have reasoned, "why can't we?" Thus, cameraman Frank Kazukaitis, sound recorder Lloyd McFadden and reporter Terry Olsen found themselves sitting by a riverbed with a 16-mm movie camera, a normal lens and a 600-mm telephoto lens



Terry Olsen on "Good Morning, America" show

TECHNICAL DATA



Refractivity profile for Christchurch, New Zealand from the 11 PM, Dec. 30 balloon launch.

(equivalent to a 24X telescope in this format)—and waiting—and watching. At 3:15 AM, the sound operator, who was "on watch" while the cameraman snoozed, watched a "red glow" emerge from the sea. As it rose and became a chalky yellow color, casting its light over the sea's horizon, the crew captured it on film. ABC-TV's David Hartman hosted a satellite video linkup with witness Terry Olsen and physicist Michael Collins in New Zealand and Dr. J. Allen Hynek in Chicago to explore the details of the sighting. Some anomalous-sounding effects were described, but the information provided (both on- and off-screen) was sufficient to reveal that this second film was quite definitely of Venus:

- The light, though huge-looking on the TV screen, was described as appearing three times the apparent size of a star to the naked eye.
- It rose up from the eastern horizon (a fact learned off-camera by Hynek) at 3:15 AM . . . just right for Venus.
- It was seen for three-and-a-half hours until it faded out in the brightening dawn sky.
- Its rising motion was not apparent to the naked eye, but was seen through the telephoto lens. Hynek asked which direction it moved through the fixed lens; the answer was up and to the left. This is the way Venus would rise in the Southern Hemisphere, just opposite of the

Northern (up and to the right).

• Terry Olsen, when asked if he could see Venus in the clear, starry sky at the same time as the "UFO", replied "I wouldn't know Venus if I saw it."

• The huge image on film? Besides the "cropping" employed by television stations and newspapers when portraying the film image, it should



also be noted that the cameraman had never used the extreme telephoto lens before (according to Olsen) and it's difficult to tell whether or not the image is really focused.

The that "second UFO" film received as much airplay as it did was regrettable, as it gave UFO skeptics an easy chance to demean the New Zealand films on the strength of this latter identification. That the skeptics have avoided the first film, however, is an indication of its worthiness as a photographic record of a truly mysterious event.