

important areas of atmospheric optics, including radio wave propagation, and of atmospheric electricity in which present knowledge is quite incomplete. These topics came to our attention in connection with the interpretation of some UFO reports, but they are also of fundamental scientific interest, and they are relevant to practical problems related to the improvement of safety of military and civilian flying. Research efforts are being carried out in these areas by the Department of Defense, the Environmental Science Services Administration, the National Aeronautics and Space Administration, and by universities and nonprofit research organizations such as the National Center for Atmospheric Research, whose work is sponsored by the National Science Foundation."

The Report also observes (7) that UFO reports and beliefs are also of interest to "the social scientist and the communications specialist." In these areas particularly—i.e., (6) and (7)—the study suggests (8) that "scientists with adequate training and credentials who do come up with a clearly defined, specific proposal" should be supported, implying that normal competitive procedures and assessments of proposals should be followed here as is customary.

We concur with these evaluations and recommendations.

IV. PANEL CONCLUSION

The range of topics in the Report is extensive and its various chapters, dealing with many

aspects of the subject, should prove of value to scholars in many fields. Its analyses and findings are pertinent and useful in any future assessment of activity in this field. We concur in the recommendation suggesting that no high priority in UFO investigations is warranted by data of the past two decades.

We are unanimous in the opinion that this has been a very creditable effort to apply objectively the relevant techniques of science to the solution of the UFO problem. The Report recognizes that there remain UFO sightings that are not easily explained. The Report does suggest, however, so many reasonable and possible directions in which an explanation may eventually be found, that there seems to be no reason to attribute them to an extraterrestrial source without evidence that is much more convincing. The Report also shows how difficult it is to apply scientific methods to the occasional transient sightings with any chance of success. While further study of particular aspects of the topic (e.g., atmospheric phenomena) may be useful, a study of UFOs in general is not a promising way to expand scientific understanding of the phenomena. On the basis of present knowledge the least likely explanation of UFOs is the hypothesis of extraterrestrial visitations by intelligent beings.

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The Condon Report, Scientific Study of Unidentified Flying Objects. E. P. Dutton & Co., New York, 1969. 967 pp. \$12.95; also Bantam Books, New York, 1969, \$1.95.

The "UFO problem" has, over the past 22 years, aroused strong public concern and stimu-

lated study by many investigators outside the mainstream of science. But, in the view of most scientists, it has been a nonsense problem not to be accorded serious scientific consideration.

The Condon Report and its subsequent strong endorsement by an 11-man *ad hoc* panel of the

National Academy of Sciences, essentially serve to reaffirm that latter reaction to the UFO problem. In my opinion, neither the Report nor the Academy offer adequate scientific argument to support their positions. After months of checking specific cases appearing in the Condon Report, following upon more than two years of personal interviewing of witnesses in about five hundred selected UFO cases, I find it extremely difficult to understand how so inadequate a report could have received such clear-cut Academy endorsement—except for the fact that none of the 11 panelists had any evident prior scientific contact with the subject and none, as far as is known, undertook any cross-check investigations of cases to be found in the Condon Report. Few scientific subjects receive Academy endorsement on such a superficial basis. It is my considered opinion that this strong endorsement will ultimately come home to roost on the steps of 2101 Constitution Avenue, and that the Academy will be hard put to account for having placed its stamp of approval on such a superficial report on a problem that has deeply puzzled the public for over two decades. The Report is bulky, but superficial nonetheless.

Certain salient weaknesses deserve particular emphasis:

(1) Out of the many thousands of UFO reports now on record from just within the United States alone, the Report analyzes a total of only about 90 cases—a sampling of under 1% of the available reports.

(2) And, even in that comparatively small sample, the Report fails to concentrate attention on the truly puzzling reports that have come from witnesses of highest credibility over the years. Instead it treats a mixture far too heavily weighted with trivial cases not representative of the type of reports that forced the Air Force to seek outside help in settling its commitment to resolve the UFO mystery. The Colorado project was supposed to explain the tough ones, not the easy ones.

(3) The Report omits completely many of the most outstanding UFO reports on record. Its omission even includes some cases which I know its investigators checked and which warranted serious discussion in the final draft, e.g., Levelland, Texas, Nov. 2, 1957, and Redlands, California, Feb. 4, 1968. Its omissions also include many historically important cases which it was urged specifically to examine by independent investigators such as myself, and for which it had the basic Air Force files, yet failed to confront (Eastern Airlines, July 24, 1948; Fukuoka, Japan

Oct. 15, 1948; White Sands, New Mexico, April 24, 1949; Longview, Washington, July 3, 1949; and *many others*).

(4) In many cases which the Report does discuss, the level of analysis and the thoroughness of the discussion are woefully inadequate (e.g., Lakenheath, England, Aug. 13, 1956; Beverly, Massachusetts, April 22, 1966; Vandenberg AFB, Oct. 6, 1967; Louisiana-Texas B-47 case, Sept. 19, 1957; Kirtland AFB, Nov. 4, 1957; just to cite a few examples).

(5) Even the description of the basic facts of the case is seriously deficient in many instances (e.g., Haneda AFB, Aug. 5, 1952; Joplin, Mo., Jan. 13, 1967; Pacheco Pass, Calif., Jul. 28, 1967; Seven Islands, Queb., June, 29 1954, as well as several of those cited in connection with the preceding point, particularly the B-47 case).

(6) Key witnesses were not even contacted in a number of the more significant cases for which quite unsatisfactory conventionalizing explanations were proposed (e.g., Beverly, Massachusetts; Kirtland AFB; Seven Islands, Queb., Washington, D.C., July 19 and 26, 1952).

(7) And, in other cases which the Report finally concedes to be unexplained, key witnesses whom I had little difficulty contacting and interviewing were not interviewed by the Colorado group (e.g., 1957 B-47 case; Utica, New York, airliner case, Jun. 23, 1955; Capital Airlines, Nov. 14, 1956).

(8) Exact dates, geographic locales, and witness names are omitted from all of the 59 cases comprising the core of the 90-odd cases discussed; in the remainder, date and locale but not witness names appear. This creates obvious difficulties for independent check by other investigators, as well as hampering just such discussions as this present one. The declared reason was to avoid embarrassment to witnesses, but the net effect is that only persons familiar with the UFO problem and with the specific case material examined by the Condon group are in a proper position to assess independently the strengths and weaknesses of the Report in the face of such omissions.

(9) Scientifically weak or specious argumentation abounds in the Report's case analyses. Unfortunately, within the scope of a mere review, that charge cannot be backed up with specific critique, since to do so would require lengthy discussion. But to cite just a few examples, see the cases for Flagstaff, Arizona, May 20, 1950; the B-47 case, 1957; Haneda AFB, Japan, Aug. 5, 1952; Odessa, Wash., Dec. 10, 1952; Continental Divide, New Mexico, Jan. 26, 1953; Seven Islands, Queb., June 29, 1954; or Vandenberg

AFB, Sept. 10, 1967. Many more examples could readily be cited.

(10) Despite treatment of a quite small total number of cases, despite inclusion of an objectionably large number of cases so trivial they should not have warranted even mention, despite concomitant omission of some of the scientifically most puzzling UFO cases of the 1947-67 period, and finally despite levels of case presentation and analysis that I can only criticize as generally inadequate, a quite astonishing feature of the Report (which seems to have escaped both Dr. Condon as he wrote his conclusions and also the Academy panel as it endorsed those conclusions) is the fact that, out of the roughly 90 cases considered, a tally reveals that just over 30 are finally left in the "Unexplained" category. (See tally on p. 173 and index entries under "Sightings, unexplained" on p. 961, as an aid in checking that count. I get 32; but some cases are so equivocally treated one cannot be sure of the final status.) When a supposedly definitive investigation of a long-puzzling problem such as this fails to give satisfactory accounting for about 30 of 90 cases considered, why does its director conclude (p. 1) "that further extensive study of UFOs probably cannot be justified in the expectation that science will be advanced thereby"?

(11) Over and above the foregoing criticisms, I must remark that so much basically non-relevant padding has thickened the Report that it will give some readers the impression of great scope and others the impression that it's so detailed as to defy easy study. Although some of that excess bulk comprises discussion material done in a fairly businesslike way, it does not directly illuminate specific puzzling UFO cases, *per se*, and hence really does not support the mission laid before the Condon project, namely, showing whether careful scientific analyses can give satisfactory conventional explanations of the most puzzling UFO reports of the past twenty years.

(12) The Report does have some redeeming features, some good subsections (e.g., photocases, instrumentation suggestions), and there do appear some individual cases where the level of investigation is impressive (e.g., Falcon Lake, Manitoba, May 20, 1967); but these seem to me to be heavily outweighed by the many disturbingly weak features of the study.

To make some of the foregoing criticisms more explicit, we might consider the Haneda AFB case of August 5-6, 1956, 1952, an example of a long-puzzling case that has been described in many

past writings on the UFO problem (e.g., the books of Ruppelt, Keyhoe, and Hall, among others). I have before me the 25-page Air Force Project Bluebook file, made up of the original intelligence reports from the Far East Air Force units that did the direct investigation. Significant omissions of important detail occur in the version presented in the Condon Report. That the tower-control airmen who were observing a luminous unidentified aerial source described it as "an intense bright light" is omitted, as is the supporting comment that its intensity suggested "an aircraft with landing lights on," a significant remark since it came from an experienced air controller. It was an almost completely clear night of full moon and 60-mile visibility, yet the luminous source (which the Report attempts finally to equate to Capella) exhibited sudden disappearances on several occasions and changed altitude rapidly: "I watched it disappear twice through the glasses. It seemed to travel to the east and gain altitude at a very fast speed, much faster than any jet. Every time it disappeared it returned again, except for the last time when the jets were around." Capella lay at azimuth 40°, yet the Air Force report mentions that "the object faded twice to the east, then returned," as seen from Haneda. And even more obviously incompatible with the Report's Capella explanation is the omitted information that independent control tower observers from another air base, Tachikawa AFB, saw the object not to their north-northeast, but "over Tokyo Bay," implying a line of sight to the east or even east-southeast some 50 degrees south of Capella, a line of sight intersecting Haneda's over Tokyo Bay. Thus both Haneda and Tachikawa reported an intense luminosity over just the area where the radar and aircraft shortly thereafter located an unconventional target, yet the Condon Report cites the direction of the line of sight only for that location fitting its Capella hypothesis.

The very fact that "diffraction" is loosely alluded to in the Capella explanation indicates the superficiality of the analysis, as does the suggestion that corona effects demand droplets "spaced at regular intervals". And the suggestion that the Capella's apparent brightness may have been enhanced by "Raman brightening" reveals misunderstanding of the optics of the latter effect casually disregarding rather stringent angular requirements for any such mirage-type phenomenon. (Capella's elevation angle of about 8 degrees was far too great to permit sensible interaction with an inversion layer; but the latter was merely postulated to exist in any event.) Finally, the description of the luminosity actually given in the Air Force intelligence report involves too

great an angular diameter and too much secondary detail to fit any "diffractive" or other optical distortion of a star. To the naked eye, its angular diameter was near the resolution limit, but, in 7× binoculars used by the controllers, its apparent subtense would have been near 20 minutes of arc. "The light was described as circular in shape," the USAF files show, "with brilliance appearing to be constant across the face. The light appeared to be a portion of a large round dark shape which was about four times the diameter of the light. When the object was close enough for details to be seen, a smaller, less-brilliant light could be seen at the lower left-hand edge, with two or three more dim lights running in a curved line along the rest of the lower edge of the dark shape." Even omitting these pertinent report details, the Capella diffraction suggestion is so far from adequate that one has to smile a bit at the Report's statement, "The precise nature of the optical propagation mechanism that would have produced such a strangely diffracted image as reported by the Haneda AFB observers must remain conjectural." By omitting the important print that the line of sight from Tachikawa AFB lay about 50 degrees away from Capella, by omitting reports of rapid altitude changes, by describing what the airmen referred to as several distinct secondary lights at the bottom of the dark periphery as merely "some bright beading," by ignoring lack of correspondence of the dark periphery to any known optical effect, by ignoring the point that Capella lay at too high an angular elevation to be significantly influenced by inversion refractive effects and related Raman interference possibilities, by misconstruing the geometric implications of the latter, and by ending up lamely asserting that "the phenomenon must be quite rare," the Condon Report casually writes off the visual portions of this famous sighting as "an optical effect on a bright light source." I could cite a disconcertingly large number of comparable instances in other cases in the Condon Report. But this is only part of the total mishandling of this one case; the mishandling and inadequate confrontation of the radar portions must also be described, even to give a summary impression of my objections to this single illustrative example.

The USAF radar station at Shiroy (an ADC GCI site with CPS-1 and CPS-4 radars) was alerted by Haneda, and eventually found an unknown target moving in a right orbit over the north end of Tokyo Bay. From Johnson AFB an F-94B jet with APG-33 airborne radar was scrambled. The Condon Report asserts that: "It is not clear whether the GCI radar ever tracked the fast-moving target described by the F-94

crew." Such a statement will have to be accepted by most readers of the Report; but my examination of the intelligence files clearly contradicts that. The radar officer in the rear of the F-94B, like the others in this case, submitted signed testimony which was in the case file, of which copies went to the Colorado project. The radarman states: "At 0015 (LST) Hi-Jinx (codename for Shiroy GCI) gave us a vector of 320 degrees. Hi-Jinx had a definite radar echo and gave us the vector to intercept the unidentified target. Hi-Jinx estimated the target to be at 11 o'clock to us at a range of 4 miles. At 0016 I picked up a radar contact at 10 degrees port, 10 degrees below, at 6000 yards. The target was rapidly moving from port to starboard and a lock on could not be accomplished..." Omission of the foregoing description of the almost exact correspondence between the location of the UFO relative to the F-94 as given by Shiroy's vectoring instructions and the locations where the F-94 got radar contact on it, plus omission of other related file information bearing on correspondence between airborne and ground radar observations, is difficult to understand; but it is by no means unrepresentative of the handling of much case material in the entire Report.

Before considering other omissions, it is important to note that the Condon Report concludes that "unusual radar propagation effects... produced the apparent UFO tracks on radar." Such an hypothesis is given a casually believable ring by failing to bring out the above-mentioned simultaneous tracking by ground and airborne radar. It is also given greater apparent plausibility when the Condon Report fails to cite the fact that, just prior to the vectoring the F-94 to the unknown, Shiroy GCI tracked the unknown through two full orbits over the north end of Tokyo Bay, during which it varied speed markedly and even hovered at times: "The object at this time," the FEAF intelligence report says, "had left the ground clutter and could be tracked at varying speeds in a right orbit. Although impossible to accurately estimate speed, Lt. — gave a rough estimate of from 100 to 150 knots, stopping and hovering occasionally, and a maximum speed during the second orbit (just before F-94 was vectored in) of possibly 250–300 knots. At approximately 0012, the object reportedly broke into three smaller contacts, maintaining an interval of about 1/4 mile, with one contact remaining somewhat brighter. The F-94 was vectored on this object, reporting weak contact at 0015 and loss of contact at 0018. Within a few seconds, both the F-94 and the object entered the ground clutter and were not seen again." Note the clear indication in that cited passage that

GCI was tracking the F-94 and the unknown simultaneously and that, concurrently, the F-94 was in radar contact with the unknown. To suggest that this could be "anomalous propagation" is simply absurd, and I believe I need not take space to cite detailed reasons for that view. The very fact that the F-94 first picked up the unknown on a radar line of sight 10 degrees below the horizontal would strain an anomalous-propagation hypothesis to the breaking point, but the fact that the unknown was steadily ground-tracked through two orbits and then tracked with an F-94 in radar pursuit, seems to me to rule out decisively the explanation offered to the reader of the Condon Report.

Both the Shiroi GCI controller and the F-94 radarman are quoted in the intelligence file as describing the unknown as "a bona fide moving target," of cross section slightly under that of a jet. Attitudinal cross section changes may be implied in other testimony not given the reader in the Condon Report: "The blips on the CPS-1 were described as small and relatively weak, but sharply defined. The brightness varied somewhat, and at one time appeared very bright as the object appeared to be in a fairly sharp turn at higher speed than previously noted. Both recorded orbits were in approximately the same position, with the object moving and occasionally hovering in one position for several sweeps (4 rpm)...." And note that the latter remark implies hovering for something like 40-50 seconds, in between movements estimated at several hundred mph, and evidently reaching values in excess of F-94 speed (about 400 mph) in the final phases. Anomalous propagation!

So much for one illustrative case. I assert that many more could *very readily* be cited, based on my own recent extensive review of case material in the Condon Report. The study is seriously deficient in precisely those areas most essential to the basic mission of the Colorado Project. Only an Academy panel that was rubber-stamping, not independently and vigorously cross-checking, could have endorsed such a report. Unfortunately, the total number of scientists who are even slightly informed about UFO case material is still minute; so present general acceptance of the negative conclusions of the Condon Report is probably an almost inevitable short-term response. But, in the longer run, it is my belief that this Report and its high-level acceptance will come to seem almost incredible. For the real nature of the UFO phenomena seems so scientifically challenging and cries out for such top-caliber attention that a major study which led only to downgrading it to even lower levels than it had enjoyed in all preceding years

seems hard to understand. I cannot understand it.

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The Condon Report, Scientific Study of Unidentified Flying Objects. E. P. Dutton & Co., New York, 1969. 967 pp. Price \$12.95; also Bantam Books, New York, \$1.95.

The issue of unidentified flying objects, conceived in the crucible of sensationalistic journalism, eventually grew to become a national issue. In 1966, enthusiasts of UFOs finally managed to force the Federal government to take serious steps in the matter. A sum of 2 million dollars was granted to a group of respectable scientists under the leadership of Dr. Edward U. Condon, a noted atomic scientist, to form a team at the University of Colorado to study in a scientific manner, whether the UFOs reported by many sighters were indeed spaceships from beyond the solar system.

The study period lasted two years, a time span which is long enough for some meaningful conclusions to be reached and yet short enough to prevent most members of the team from feeling that the search for UFOs has or will become their life career. In addition, Dr. Condon's group has "been able to place aside all prejudices" and to proceed with the study of the UFO reports with a scientific attitude. If harsh questions were asked, it is because that was the only way that unbiased answers could be obtained.

The study resulted in a voluminous report, containing nearly 1000 pages of fine printed material and presented in seven sections. The introduction is written by Walter Sullivan, New York Times science editor and author of the book, "We Are Not Alone," describing recent scientific efforts to find extraterrestrial civilizations in our universe.

Section I presents the main conclusion and recommendations for a future approach to the UFO problem. The conclusion is plain enough: "...Nothing has come from the study of UFOs in the past 21 years that has added to scientific knowledge. Careful consideration of the record as it is available to us leads us to conclude that further extensive study of UFOs probably cannot be justified in the expectation that science will be advanced thereby." The statement that "...further extensive study...cannot be justified..." probably will enrage those who have