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THE MYSTERY

OF

THE GREEN FIREBALLS

*

A SHORT ADDENDUM

OR

How the Air Force Conveniently
Misinterpreted a Scientist's
Opinion in Order to
Pass the Buck

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THEODORE VON KARMAN
3100 THE MARENGO AVENUE
PASADENA, CALIFORNIA

Handwritten:
NNS 847503
WLL/1/10/49 Date 7-25-49

11 February 1949

Major General C. P. Cabell
Director of Intelligence
Office, Deputy Chief of Staff, Operations
Headquarters, United States Air Force
Washington 25, D. C.

Dear General Cabell:

Dr. Joseph Kaplan, a member of the Scientific Advisory Board to the Chief of Staff, USAF and Professor of Physics at the University of California, Los Angeles, called my attention to a report of the 17th District Office of Special Investigations (Inspector General, USAF) Kirtland Field, New Mexico, subject: (UNKNOWN) Aerial Phenomena, file number 24-8, dated 19 January 1949.

This report deals with extraordinary observations of certain aerial phenomena. These observations concern so-called "fireballs" of unusual color, size and speed. The report also contains the observations of Dr. Lincoln LaPaz, Director of the Institute of Meteoritics, University of New Mexico, Albuquerque. //

I always have been, and am yet, extremely skeptical about flying discs, saucers, fireballs and related effects. In this case, however, the personality and prestige of the observer and the number of apparently reliable people who saw the phenomena, makes me think it might be worthwhile to give more serious attention to the matter.

I wonder whether it would not be desirable to set up a kind of project in Albuquerque, which would give an opportunity for Dr. LaPaz to obtain adequate equipment and personnel for continuous, well planned observations. It seems to me that intelligent speculation on the nature of the phenomena can only begin when one has scientifically correct determination of size, altitude, speed, shape and color. Director LaPaz, who is an authority on meteoritics, definitely states that at least one of the observed "fireballs" could not be of heavenly origin. As far as my technical judgement goes, I believe it is highly improbable that the phenomena originates as a man made missile. Never-the-less, the fact is there, observed by competent and reliable people. Therefore, I believe the scientific approach is necessary, at least in order to secure exact and objective measurements.

I submit the question to you, as I am aware that such a project can be successful only if it is kept secret and is set up with the cooperation of trained experts in the Intelligence Division. I believe you can easily procure the subject report, providing it is not already in your hands. I would appreciate your reaction and advice.

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Gen Cabell

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X 095 Kaplan, Joseph
X 095 La Paz, Lincoln
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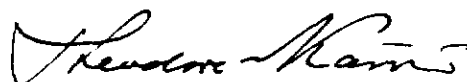
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Letter to Major General Cabell, dated 11 February 1949

I found in my files some documents concerning the members of the USSR Academy of Sciences and research programs of various institutions connected with the Academy. I received these publications as one of the members of the American delegation to the celebration of the Anniversary of the Academy, in Moscow in 1945. Since scientific research in the USSR is built up around the Academy of Sciences, I thought your collaborators might obtain some interesting information from these documents. I have, therefore, taken the liberty of forwarding them to Colonel Robert Taylor of the Collection Division.

I plan to be in Washington, at the offices of the Scientific Advisory Board, for a few days after 17 February 1949. If there are any matters you wish to discuss with me, or if there is any way I can be of assistance by furnishing information to you and your officers, I shall be glad to meet with you.

Respectfully yours,



DR. THEODORE von KARMAN

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MEMORANDUM FOR RECORD

PROBLEM:

1. To furnish information for General Cabell's reply to letter from Dr. von Karman regarding unknown aerial phenomena.

FACTS & DISCUSSION:

2. Letter from Dr. von Karman, dated 11 Feb 49, to General Cabell cites unknown aerial phenomena reported from New Mexico and refers to observations of Dr. LaPaz of the University of New Mexico. Dr. von Karman states that he has been and is still extremely skeptical about flying discs and other unidentified flying objects but that the personality and prestige of Dr. LaPaz, as well as a number of apparently reliable observers makes him think that it might be worthwhile to give more serious attention to the matter. Dr. von Karman suggests that a scientific approach is necessary to obtain exact and objective measurements.

3. Hq. AMC has been contacted and the project "Grudge", (unidentified flying objects), officer supplied the following details:

a. AMC has the report from Kirtland Field and Dr. LaPaz' observations to which Dr. von Karman refers in his letter.

b. Nine separate incidents have been reported from the general area of Los Alamos, New Mexico. There were more than nine witnesses however, as some of the incidents have as many as three or four observers. The incidents reported occurred between 12 Sep 48 and 2 Feb 49. Two other incidents of earlier date have been reported from the general area of Holloman AFB, New Mexico.

c. More than six months ago, Hq. AMC was in contact with Dr. LaPaz and was considering a contract whereby Dr. LaPaz would analyze unidentified flying object incidents from an astrophysical standpoint. It was decided, however, that Dr. LaPaz would be too remote in New Mexico for easy liaison with Hq. AMC on the project. A friend of Dr. LaPaz, Dr. Heineke, of Ohio State University, was subsequently awarded such a contract and has been in the process of analyzing unidentified flying object data particularly that which has occurred in New Mexico. Two days ago, Dr. Heineke visited AMC and stated that he did not as yet have any final overall conclusions on the phenomena. Dr. Heineke did not indicate any inadequacy of data for performing his analyses. Dr. Heineke indicated that he expects to

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Memorandum For Record (Cont'd)

visit Dr. LaPaz very soon and discuss the results of analyses of incidents in New Mexico. At the time Dr. Heineke was awarded the contract for this analysis he was highly recommended by Dr. LaPaz.

4. In addition to the coverage of these specific incidents in New Mexico, detailed investigations of all incidents reported to involve unusual flying objects during the period June 1946 to date have been conducted by the special project group of Hq. AMC. The continuing efforts of this project are directed toward establishing the identify of each unusual object reported. Single or seemingly related incidents which appear to involve objects that might represent some unusual man-made device or activity are fully explored by both the AMC project personnel and other specialists, such as those of the RAND Corporation (formerly Project RAND).

5. Of some 210 incidents, approximately twenty per cent have been explained. The majority of these involved misidentification of synoptic weather balloons. Others involved observations of airborne cosmic ray research equipment, bolides, meteors, and in one instance, the daylight observation of the planet Venus. Only two reported incidents were determined to have been hoax.

6. To date there has been no tangible evidence which would support a theory that any incidents are attributable to activity of a foreign nation. On the other hand, there is no evidence to categorically deny such a possibility, particularly since some incidents which occurred overseas could have involved foreign aircraft. The possibility of foreign devices becomes more remote in the case of domestic incidents, and would represent achievements which defy many well defined limits in aeronautical science. However, there are many incidents reported by reliable and competent observers which are still unexplained.

RECOMMENDATIONS:

7. It is recommended that Dr. von Karman be provided any of the foregoing information deemed appropriate and the following specific items:

a. The incidents which occurred in New Mexico are being analyzed in detail by Dr. Heineke, Ohio State University, who was recommended for the work by Dr. LaPaz, University of New Mexico.

b. Dr. Heineke's conclusions should furnish a firm basis for any future decision to gather additional data.

c. Considering those domestic incidents which have been identified, it seems unlikely that domestic incidents can be attributed to the activity of a foreign power or a science unknown to our specialists. It also seems unlikely that a foreign power would expose ~~their~~ superiority of power by a prolonged ineffectual penetration of the United States.

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Memorandum For Record (Cont'd)

4. The USAF has seriously pursued this problem since the first appearance of unidentified objects and is continuing investigations of each unexplained incident. In addition, the consulting services of a number of agencies and specialists are being utilized. Results are reviewed on a continuing basis and are used in formulating probable experimentations for sightings that still lack positive identification.

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON

THE INSPECTOR GENERAL USAF
17th DISTRICT OFFICE OF SPECIAL INVESTIGATIONS
KIRTLAND AIR FORCE BASE, NEW MEXICO

File No : 24-8

DR/MSN/web
12 May 1949

SUBJECT: UNKNOWN (Aerial Phenomena)

TO: Director of Special Investigations
Office of The Inspector General USAF
Washington 25, D. C.

1. Reference is made to TWX from this district, OSI 4-26-C, dated 27 April 1949, pertaining to file number 24-8 of this district.

2. On 27 and 28 April 1949, Dr Joseph Kaplan, University of California, Member of the Scientific Advisory Board, USAF, visited this district office and other Governmental and military installations in the area. The purpose of this visit was to review the reports of investigation and the circumstances surrounding the unidentified aerial phenomena that have been observed in this area during the last five months and to thereby make recommendations as to the advisability of making a scientific investigation of these occurrences. The investigation of Dr. Kaplan was conducted under orders transmitted to him by Dr Theodore Von Karman, Secretary of the Scientific Advisory Board, USAF.

3. Dr Joseph Kaplan, accompanied by Lt Col Doyle Rees and Captain Melvin E. Neef, of this office, and Dr Lincoln LaPaz, Institute of Meteoritics, University of New Mexico, visited Sandia Base, New Mexico, and Los Alamos, New Mexico.

4. Present at the conference at Sandia Base on the morning of 27 April 1949 were:

Lt Col Herbert L. Crisler, Armed Forces Special Weapons Project
Lt Col Fredrick J. Clark, Armed Forces Special Weapons Project
Mr. Matthew J. Doyle, Armed Forces Special Weapons Project
Comdr E. E. Mandelkern, Armed Forces Special Weapons Project
Dr Joseph Kaplan
Dr Lincoln LaPaz
Lt Col Doyle Rees
Captain Melvin E. Neef

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BASIC: Letter, Hq 17th District OSI (IG) USAF, dated 12 May 1949
file number 24-8, subject, "UNKNOWN (Aerial Phenomena)"

a. At this conference Dr Kaplan reviewed developments of interest in the aerial phenomena on the part of the Scientific Advisory Board, following his report to Dr Von Karman concerning information given him early in February by Dr LaPas, Lt Col Doyle Rees, Major William H. Godsoe, Fourth Army Intelligence Liaison, Sandia Base, and Captain Melvin E. Neef. Additional evidence, concerning not only specific incidents, but relating to the very intense interest felt in the aerial phenomena in the area covered by the represented agencies, was then given by Lt Col Crisler, Lt Col Rees, Commander Mandelkorn and Captain Neef. At the conclusion of the testimony given by the individuals listed above, Dr Kaplan stated that it was his intention, on the basis of the information so far made available to him, to recommend that a full scale scientific investigation of the aerial phenomena be undertaken as a project set up at the Institute of Meteoritics of the University of New Mexico; The Institute to receive full cooperation from other interested agencies in the area. Dr Kaplan stressed that this project was to be separated completely from Project "Grudge" (old Project "Siga").

b. Dr LaPas outlined the program to be undertaken in the event the project suggested by Dr Kaplan was approved by the Scientific Advisory Board. Dr LaPas separated the problem into two parts; first, the collection of observation data; and second, the evaluation of such data.

- (1) Collection of Data; Under this heading Dr LaPas recommended that attempts be made to secure systematic visual, photographic, spectrographic and radar observations of the aerial phenomena occurring in the vicinity of at least the following three centers; first, the Atomic Energy Commission installation at Los Alamos, New Mexico; second, the Atomic Energy Commission installation at Sandia Base; and third, the USAF Guided Missile installation at Holloman Air Force Base, Alamogordo, New Mexico. Lt Col Rees emphasized that provision should be made to secure systematic coverage at the Fourth Army installation at Camp Hood, Texas, where a number of incidents have occurred recently. Dr LaPas also recommended that field searches be made after appropriate air reconnaissance, such searches to employ drag-nets for the collection of any ferro-magnetic materials that may have been thrown down by the fireballs; meteor detectors in areas where larger, buried fragments were thought to be located and, if possible, systematic search of the earth's surface in well-determined stream-fields by use of man power from

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BASIC: Letter, Hq 17th District OSI (10) USAF, dated 12 May 1949, file number 24-8, subject, "UNKNOWN (Aerial Phenomena)"

military installations. Dr LaPaz also recommended that, in connection with air search, an attempt be made to collect fine dust and tiny spheres resulting from the volatilization of the fireballs, which conceivable require several days to fall down through the atmosphere to the earth after the appearance of a fireball. It was his recommendation that the collection of such dust be attempted by use of the collection techniques recently devised by Dr William Crozier of the New Mexico Proving Ground.

- (2) Evaluation of Data: In connection with the evaluation of the observational data secured and any material specimens that may be recovered, Dr LaPaz recommended that arrangements be made permitting Dr Edward Teller of the University of California Group at Los Alamos, Dr William Crozier of the New Mexico Proving Ground, Dr Kent and his ballistics staff at Aberdeen Proving Ground, and Professor Clyde Tombaugh and his associates at White Sands Proving Ground, to act as consultants for the project. At the conclusion of Dr LaPaz's remark, Commander Mandelkorn recommended that the staff of the Harvard College Observatory Meteor Program installation, near White Sands Proving Ground, also be made available for consultation purposes. Dr LaPaz agreed that this was desirable, but pointed out that it has been impossible to secure cooperation from Mr Carroll of the Harvard College Observatory Group in the past. This point was confirmed by Captain Neef, and Commander Mandelkorn then volunteered to insure that in the future there would be no difficulty in securing cooperation from the HCO Meteor Staff.

5. On the afternoon of 27 April 1949, Dr Kaplan studied the files of the 17th District Office of Special Investigations as pertained to the occurrence of aerial phenomena, and was further briefed by Lt Col Rees, District Commander, Captain John J. Stahl, Jr, Deputy District Commander, Captain Neef, Supervisor of the Security Division, Special Agent Jack L. Boling and Dr LaPaz. No new recommendations arose as a result of this conference, but it was felt that the incidents studied rendered imperative initiation of such a systematic program of investigation as Dr Kaplan had proposed at the Sandia Base conference during the morning.

6. On 28 April 1949 Dr Kaplan, Dr LaPaz, Lt Col Rees and Captain Neef met at the Atomic Energy Commission installation, Los Alamos, New Mexico, with the following:

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BASIC: Letter, Hq 17th District OSI (IG) USAF, dated 12 May 1949,
file number 24-8, subject, "UNKNOWN (Aerial Phenomena)"

Mr B. C. Wells, Director of Security
Mr Sidney Newberger, of the Security Office
Mr John A. Carroll, AEC Security Service
Mr Earle D. Hightower, of the Security Office
Mr Henry R. Hoyt, University of California
Mr Abner Schreiber, AEC Security Service

This conference was held at the request of Dr Kaplan in order that he might ascertain the nature of the observations made by members of the Atomic Energy Commission and the AEC Security Service Inspectors at Los Alamos, and that he might personally determine the degree of concern felt by the Security and scientific personnel at the installation. Dr Kaplan personally interviewed a number of University of California personnel and AEC Security Service Inspectors, who had personally observed anomalous luminous aerial phenomena. No further recommendations were made at this conference. Dr Kaplan stated that he would immediately submit his report to Dr Von Karman, setting out his findings and make the recommendations set forth above.

7. Dr Kaplan expressed a great concern, as these occurrences relate to the National Defense of the United States. He advised that he felt that this was of extreme importance and should be investigated scientifically.

DOYLE REES
Lt Col, USAF
District Commander

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UNIVERSITY OF CALIFORNIA

INSTITUTE OF GEOPHYSICS
LOS ANGELES 24, CALIFORNIA

July 13, 1949

~~CONFIDENTIAL~~

Major General C. P. Cabell
Director of Intelligence
Department of the Air Force
Hqs. United States Air Force
Washington 25, D.C.

Dear General Cabell:

Your letter of 1 July 1949 regarding the "green fireball" observations of Dr. Lincoln La Paz was a timely one. It arrived at the time when I finally decided that some well considered opinions might be presented. I have deliberately waited for nearly ten weeks since my visit to New Mexico for three reasons. First of all, I was so favorably impressed by the quality of the observations made by security guards and other personnel at Los Alamos, that I wanted to have a "cooling off" period before arriving at any conclusions. Secondly, I wanted to wait long enough to allow for some more reports of fireball incidents. Finally, and possibly the most important reason, I wanted to find out whether one could theoretically predict a new atmospheric phenomenon of the type described. I would like to comment on each of these points in turn, and finally to make some recommendations.

At the recent meeting of the American Physical Society in Seattle, Dr. N.E. Bradbury Director of the Los Alamos Scientific Laboratory suggested that a conference be arranged at Los Alamos early in September, in order to discuss these incidents. He proposed that in addition to Dr. La Paz and myself, Drs. E. Teller and G. Gamow be invited to attend. I believe that these two distinguished theoretical physicists plan to be at Los Alamos during the time proposed and it should be possible to arrive at valuable conclusions. I am to be at the Geophysical Research Laboratory of the Air Materiel Command from about 22 August until 2 September and thus I can stop at Los Alamos on my way back to the Coast. In any case, it is relatively easy to go to Los Alamos from Los Angeles and it is my feeling that such a conference should be held. The fact that Dr. Bradbury volunteered the suggestion indicates that he has not come to any definite conclusions. I might say at this point that I have come to one and will present this conclusion in this letter.

I am attaching a memorandum which will describe the conferences that I attended during my visit to New Mexico installations. I will now come to the three points referred to in the first paragraph of this letter.

At the conference held on 28 April in the office of Director Wells of the A.E.C. at Los Alamos, I had the opportunity to hear the stories of several security

Major General Cabell
July 13, 1949
page 2

guards and other A.E.C. personnel who had seen these unusual fireballs. I was particularly impressed by the consistency of their opinions as to the wave length of the radiations emitted by the fireballs. When we showed them a spectrum chart, every observer picked out a wave length which agreed well with that of the so-called auroral green line of atomic oxygen. This line lies in the yellow-green at a wave length of 5577 Angstrom units. A strong pure source of such radiations has been produced by me in my laboratory and it gives one the impression of looking at a bright emerald. I'll return to this point later. While one may question the observations on which speeds and directions are based, it is not likely that several observers will agree on color and not be correct. Of all of the observations that have been reported color is probably the one on which most reliance may be placed.

My second point had to do with possible future incidents. In a letter just received from Dr. La Paz, he reports the occurrence of three more remarkable fireball incidents, each one occurring very nearly at 8:10 p.m.; the dates are 5 June, 20 June in New Mexico, and 29 June in Arizona. He also called my attention to a report by Dr. D. H. Menzel of the Harvard College Observatory of some remarkable objects seen on the night of 12 May 1949. A report on this has been written by Dr. Menzel for the A.M.C. at Wright Field. I have not seen the report.

Finally, can these be natural atmospheric phenomenon of the type described? It is not too difficult to conclude that some new atmospheric phenomena will be observed during these years when the atmosphere will have been under more study than ever in man's history. The increased awareness of the public relative to atmospheric phenomena is a natural result of the increased scientific interest in the earth's atmosphere.

As I pointed out earlier, the one certain characteristic of this phenomenon is the color. The descriptions indicate that the color might well be restricted to a very narrow range of wave lengths, possibly even monochromatic. Now, as we pointed out earlier, the oxygen atom emits a radiation in both the aurora and the light of the night sky at a wave length of 5577. This is the well-known green auroral line.

The best laboratory source of this line so far reported is one discovered by me. This source is the auroral afterglow of nitrogen at a pressure of 100 mm Hg containing small amounts of oxygen. Under proper excitation conditions and N_2/O_2 ratio, it is possible to observe an intense green glow lasting for about thirty seconds. The spectrum of this glow changes with time and within two seconds of the interruption of the discharge, the spectrum is effectively monochromatic, consisting only of the green line. There is therefore a mechanism in nitrogen-oxygen mixtures which makes it possible after the introduction of energy by means of an electrical discharge, to have an afterglow in which the only radiating mechanism in the visible is that of the oxygen atom emitting the green auroral line. I have been studying this phenomenon recently and am now

Major General Cabell
 July 13, 1949
 page 3

~~convinced that if nature produced an aurora at the levels at which the green fireballs were reported, such auroras would radiate only the green line in the visible.~~

It is interesting to note that the pressures at which this laboratory phenomenon has so far been observed with the greatest intensity is 100 mm. This is the pressure in the atmosphere at about 9 miles. It is highly probable that the phenomenon would be observed with similar characteristics over a fairly large range of pressures, say from 100 mm on up. It is safe to conclude that at the levels at which the green fireballs have been reported, auroras would have spectra in which the green line would be much more intense than in high level auroras.

My conclusion therefore is, that based on (1) the most reliable aspect of the observations, i.e., the color, and (2) on the existence of a laboratory phenomenon which predicts a "green aurora" at these levels, the soundest conclusion at present is that we are dealing with a new type of auroral display. The absence of sound would agree with this hypotheses. Although not absolutely ruled out, it is generally agreed that the aurora is a silent phenomenon. The rapid horizontal motion reported for the fireballs is difficult to explain. The occurrence of these phenomena at low magnetic latitudes is also difficult to explain on the hypothesis that they are caused by natural auroral activity of some kind. It is however interesting to emphasize that in the two characteristics which are the most reliable ones reported, the phenomenon resembles the aurora. It is for these reasons that at the present time, I must conclude that we are dealing with a natural phenomenon.

The possible importance of any new atmospheric phenomenon, particularly one which apparently occurs low in the atmosphere, is so great that I would like to recommend the setting up under Dr. La Paz's direction, of a carefully planned photographic and spectrographic patrol of the area in which most of these incidents have been reported. The by-products of such a program are sufficiently promising as to justify its setting up. This problem was discussed with Dr. La Paz and others during my visit and he is prepared to embark on the program. With sufficient consultative help he should be able to organize and operate a valuable program.

Sincerely yours



J. Kaplan

P.S. My use of the term "aurora" means that the radiative processes are auroral in character and not necessarily that the cause is auroral.

Conference on Aerial Phenomena held between 0900 and 1200, 27 April, 1949

In conference room at Hqs. Sandia Base, Albuquerque, New Mexico

Present:

Sandia Base:	Colonel Crisler Colonel Clark Mr. Doyle
O.S.I., U.S.A.F.:	Colonel Rees
4th Army:	Captain Neef
A.F.S.W.P.:	Commander Mandelkorn
Institute of Geophysics Univ. of California Los Angeles 24	Dr. Kaplan
Institute of Meteoritics Univ. of New Mexico	Dr. La Paz

Purpose: General discussion of the problem and possible future programs.

Conference on Aerial Phenomena held between 12 00 and 1600, 27 April,
1949 at Colonel Rees' Office, Kirtland Field, Albuquerque.

Present:

O.S.I.:

Colonel Rees
Captain Stahl
Captain Neef
S/A Jack Boling

Institute of Geophysics
Univ. of California
Los Angeles 24 :

Dr. Kaplan

Institute of Meteoritics
Univ. of New Mexico :

Dr. La Paz

Purpose: Review of available data

Conference on Aerial Phenomena held between 0900 and 1200, 28 April,
1949 in Director B. O. Wells' office, Los Alamos, New Mexico

<u>Present:</u>	U.S.A.E.C.:	Director Wells Colonel Neuberger Captain Martin Inspector Earl Hightower
	Univ. of California:	Mr. Hoyt
	A.E.S.S.:	Colonel Carroll Major Schreiber Inspector Patterson Inspector McGuigan
	O.S.I., U.S.A.F.:	Colonel Rees Captain Neef
	Institute of Geophysics Univ. of California Los Angeles 24 :	Dr. Kaplan
	Institute of Meteoritics Univ. of New Mexico :	Dr. La Paz

Purpose: Interviews with actual observers of these incidents.

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Wrtn 28 July 1949

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MEMORANDUM FOR RECCRD

PROBLEM:

1. To prepare a reply to letter from Dr. Joseph Kaplan, Institute of Geophysics, University of California, concerning conclusion on "green fireball" phenomena in New Mexico.

FACTS AND DISCUSSION:

2. Letter from Director of Intelligence to Dr. Kaplan on 28 June 1949 requested information on Dr. Kaplan's investigation and conclusions concerning "green fireball" observations in New Mexico.

3. Dr. Kaplan's reply of 13 July 1949 stated that his interviews with observers of the phenomena had shown the most reliable aspect of the observations was the color. Dr. Kaplan personally determined that the phenomenon can be reproduced in the laboratory. He finds that in color, the "green fireballs" resemble an auroral afterglow obtained from a mixture of nitrogen and oxygen (under 100 mm Hg pressure) which has been excited by an electrical discharge. The same conditions could obtain in the atmosphere at a height of about 9 miles. Dr. Kaplan concludes that the "green fireballs" are natural phenomena. He recommends a project for investigation of this natural phenomenon under Dr. La Paz, University of New Mexico.

4. Matter was discussed with Colonel Holzman, Office of Research and Development, DCS/M, who advised that Research and Development is willing to receive data on "green fireball" phenomena for consideration but does not believe it is advisable to encourage further investigation. If Research and Development considers it necessary, facilities are available for scientific investigation of upper atmosphere phenomena.

5. Letter has been prepared from Director of Intelligence to Dr. Kaplan expressing value of conclusion. Indication is given that Director of Intelligence will not have responsibility of establishing investigative projects for natural phenomena but will transmit Dr. Kaplan's conclusion and recommendation to Geophysics Section, Directorate of Research and Development, DCS/M, which has responsibilities for upper atmosphere research.

ACTION RECOMMENDED:

6. Approval, signature and dispatch of letter to Dr. Kaplan.

COORDINATION:

Colonel Benjamin G. Holzman, AFMRD, Extension 74153 *GH*

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E.O. 12958, Sec. 1.3
841508

BY WJK NAME, Date 7/20/85

12 April 1950

MEMORANDUM FOR: Dr. Theodore von Karman, Chairman,
Scientific Advisory Board

SUBJECT: Anomalous Luminous Phenomena

1. Introduction:

This report will include the following:

a. Letter from Dr. Lincoln LaPas to Dr. J. Kaplan summarizing the results of observations on anomalous luminous phenomena which have been observed in New Mexico and neighboring States and giving Dr. LaPas's comments on the meaning of these observations.

b. Comments by Dr. J. Kaplan on the letter of Dr. LaPas.

c. The interpretation of these phenomena and other comments.

d. Recommendations regarding the release of this information.

2. Dr. LaPas's letter on Anomalous Luminous Phenomena:

December 26, 1949

To: Dr. J. Kaplan, Scientific Advisory Board

From: Dr. Lincoln LaPas, Director, Institute of Meteoritics,
University of New Mexico.

Subject: Anomalous Luminous Phenomena.

Anomalous luminous phenomena, generally of an unusual, vivid green color, have been widely observed in New Mexico and neighboring states since 1948, December 5. By laboratory tests, the peculiar green color seems to be identical with that given off by copper salts in the blowpipe flame. If this identification is correct, the wave length of the radiation from the green fireballs is near 5218 Angstrom Units.

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✓ 095. LA PAS, THEODORE
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Most of the phenomena have occurred during the twilight or early evening hours, but incidents have been recorded at various times throughout the night and, infrequently, even in broad daylight.

The following significant differences have been noted between nocturnally occurring green fireballs and typical meteoric fireballs:

(1) Most of the anomalous fireballs appear to move in horizontal paths. Where sufficient observations have been available to permit the calculation of the real path, as distinct from the apparent path, of the fireballs, this real path has actually proved to be nearly parallel to the plane of the horizon throughout its entire extent. Such persistent horizontality stands in the sharpest contrast to the downwardly concave paths traversed by genuine meteorites when these penetrate deeply into the atmosphere of the earth.

(2) The nearly horizontal real paths of the anomalous fireballs are situated only ten miles or so above the surface of the earth, although these paths may have lengths ranging from 25 to 140 miles. I know of no genuine meteorites that have traversed real paths of these lengths at such extremely low altitudes.

(3) The anomalous fireballs move over these real paths at velocities of 3 to 10 miles per second, velocities considerably less than those determined from observations of the luminous paths of genuine meteorite falls, but considerably greater than the speeds of any rockets or jet planes of which I have knowledge.

(4) In the case of genuine meteorite falls with luminous paths terminating even at heights considerably greater than those at which the real paths of the anomalous green fireballs are situated, the observed luminous phenomena are always accompanied by extraordinarily violent noises. No noises whatever have been observed in connection with any one of the horizontally moving anomalous green fireballs. In fact, among the several scores of anomalous incidents of all kinds investigated by the writer during the last year, there is only one, that of 1949, December 4, for which apparently dependable observations of noise were made.

(5) Genuine meteors almost without exception show variations in brightness clearly discernible even to the unaided eye, beginning as fine, thin hair-lines of light, and gradually brightening up, possibly passing through several light maxima before they burn out. In the case of the horizontally moving green fireballs, almost all of the observers have reported that these balls appeared almost instantly at their full brightness and exhibited no variations in magnitude during their period of visibility, disappearing with equal suddenness.

(6) The anomalous greenish luminous phenomena show a curious association with well-known meteor showers, although none of these annual meteor showers normally produce extremely bright green fireballs. The relationship cited might indicate an attempt to render the green fireballs less conspicuous by causing them to appear only when there is a background of considerable natural meteoric activity.

(7) For the green fireballs, duration estimates usually lie between 2 and 3 seconds. Such estimates are considerably longer than those (0.3 to 0.5 seconds) for the ordinary visual meteors, but are shorter than the duration estimates invariably reported in the case of a genuine meteorite fall (5 to 30 seconds, or even longer). For none of the horizontally moving green fireballs has a train of sparks or long-enduring meteoric cloud been reported. This contrasts sharply with the behavior noted in the case of genuine meteoric fireballs--particularly those that penetrate to very low levels in the atmosphere.

(8) In spite of persistent search, no material specimens of any kind have been recovered from any of the horizontally moving green fireballs. In view of the extraordinary size and brightness of many of these objects, of the low altitude of their real paths in the atmosphere, and of the accuracy with which their earth traces were located, it is difficult to understand why no recovery of fallen material has as yet been made.

The following significant differences have been noted between the two well-observed anomalous daytime incidents and typical daylight meteors:

(1) Although the real paths were over most of their extent still lower in the atmosphere than those traversed by the nocturnal green fireballs, the incidents were entirely noiseless.

(2) The anomalous daytime incident of February 17, 1949 lasted 7 minutes; that of March 27, 1949 lasted more than half an hour. These durations are much longer than that of any recorded genuine meteoric incident; and also much longer than the duration of any nocturnal green fireball incident, excepting only the very remarkable "twin" greenish-white fireballs observed from Holloman AFB on 12 May, 1949 by Dr. Donald H. Mensel, the distinguished Harvard astro-physicist, and carefully described by him in a memorandum dated 16 May, 1949.

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(3) The luminous objects seen on February 17 and March 27 not only were able to traverse long horizontal paths low in the atmosphere, but were also able to maneuver, i.e., to turn and climb in a manner impossible to a genuine meteorite.

An excerpt from Investigative Report #24-8 of the 17th District O.S.I., giving a detailed account of the nocturnal green fireball incident of December 12, 1949 is appended. The December 12 fireball was quite typical of the smaller green fireballs and was the first such incident for which it was possible to make an approximate determination of the real path of the fireball through the atmosphere. This real path turned out to be a nearly horizontal straight line, situated about 9 miles above the surface of the earth, beginning over a point with the coordinates (35° 50' N; 106° 40' W) and ending over a point with the coordinates (35° 45' N; 107° 5' W). The path, which had a length of about 25 miles, was traversed at a speed of about 10 miles per second; and the backward extension of the path passed almost centrally over the Los Alamos A.E.C. installations.

/s/ Lincoln LaPas
Lincoln LaPas, Director
Institute of Meteoritics
University of New Mexico
Albuquerque, New Mexico

3. Comments by Dr. J. Kaplan:

In an excellent study of "The Fireball of April 3, 1949" by John F. Heard, published in the Journal of the Astronomical Society of Canada, July-August 1949, it is pointed out that some of the observers are sure that they saw it from the beginning; and describe it as "suddenly appearing", rather than as appearing first as an ordinary shooting star. The time of flight was also distinctly slow and is estimated as between three and four seconds. This sudden appearance is described by LaPas in paragraph (5) of his letter and the duration estimates of between 2 and 3 seconds are mentioned in paragraph (7). In these respects at least the anomalous luminous phenomena do not disagree with an actually observed fireball. Also, the speeds reported in LaPas's paragraph (3) agree with the speed of the April 3 fireball. Furthermore, the colours of the April 3 fireball varied from greenish-blue at the beginning of the path to orange at the end of the path. This also agrees with the reports on the anomalous luminous phenomena. It is seen therefore that the phenomena are not as "anomalous" as Dr. LaPas's conclusions would indicate.

* Not included in this report

* Not included in this report

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These characteristics of the nocturnal fireballs which are anomalous, e.g., height and lack of sound, are ones which are difficult to observe without very careful instrumentation (height) or ones which do not necessarily mean that the object is not a meteor. The absence of persistent trains could be explained if these turn out to be low ~~line~~ ^{low level} meteors.

The anomalous daytime incidents are completely baffling. No meteor would persist for time as long as thirty minutes .

4. The interpretation of these phenomena and other comments:

At the present writing, with the information available up to 1 January 1950, this writer concludes that the nocturnal phenomenon is a natural one and that the green fireballs are meteors. The Geophysical Research Laboratory of the Air Force is coordinating and participating in a well thought out observational program in New Mexico (White Sands) which will attempt to observe heights, speeds, spectra, ionization and other properties of the phenomena.

5. Recommendations regarding the release of this information:

It was pointed out earlier that the Air Force Geophysical Research Laboratory and other agencies are carrying out a coordinated observing program on these luminous phenomena. Since this work is located in the neighborhood of extremely important military and atomic energy installations, it seems to be desirable not to release information at this time. I believe that as soon as the identification of the nocturnal fireballs has been completed and, as I believe these turn out to be meteors, the Air Force should release the story.

DR. J. KAPLAN
Member
Scientific Advisory Board

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