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Technical Report

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UNIDENTIFIED AERIAL OBJECTS

PROJECT "SIGM"

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HEADQUARTERS

AIR MATERIEL COMMAND

WRIGHT-PATTERSON AIR FORCE BASE

DAYTON, OHIO

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SUMMARY

The results of the study reviewed in this report are based on data derived from reports of 243 domestic and thirty (30) foreign incidents. Data from these incidents is being summarized, reproduced and distributed to agencies and individuals cooperating in the analysis and evaluation. Distribution has so far been accomplished on the summaries of 150 incidents and more are in process of reproduction at this time.¹⁷²

A check list of items to be noted in reporting incidents has been prepared and distributed to government investigative agencies. The data obtained in reports received are studied in relation to many factors such as guided missile research activity, weather and other atmospheric sounding balloon launchings, commercial and military aircraft flights, flights of migratory birds, and other considerations, to determine possible explanations for sightings.

Based on the possibility that the objects are really unidentified and unconventional types of aircraft a technical analysis is made of some of the reports to determine the aerodynamic, propulsion, and control features that would be required for the object to perform as described in the reports. The objects sighted have been grouped into four classifications according to configuration:

1. Flying disks, i.e., very low aspect ratio aircraft.
2. Torpedo or cigar shaped bodies with no wings or fins visible in flight.
3. Spherical or balloon-shaped objects.
4. Balls of light

The first three groups are capable of flight by aerodynamic or aerostatic means and can be propelled and controlled by methods known to aeronautical designers. The fourth appears to have no physical form attached, but the means of support may not have been seen by the observer.

Approximately two percent of the incidents have been identified as conventional aerial objects to the satisfaction of personnel assigned to Project "Sign" in this Command. It is expected that a study of the incidents in relation to weather and other atmospheric sounding balloons will provide solutions for an equivalent number. Verbal statements by an astro-physicist at Ohio State University and by psychologists of the Aero-Medical Laboratory of this Command, indicate the possibility of solving an appreciable number of the sightings as a result of their investigations. Elimination of incidents with reasonably satisfactory explanations will clarify the problem presented by a project of this nature.

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The possibility that some of the incidents may represent technical developments far in advance of knowledge available to engineers and scientists of this country has been considered. No facts are available to personnel at this Command that will permit an objective assessment of this possibility. All information so far presented on the possible existence of space ships from another planet or of aircraft propelled by an advanced type of atomic power plant have been largely conjecture. Based on experience with nuclear power plant research in this country, the existence on Earth of such engines of small enough size and weight to have powered the objects described is highly improbable.

Reports of unidentified flying objects are not peculiar to the present time. In, "The Books of Charles Fort" by Tiffany Taylor, published in 1941 by Henry Holt & Co., New York, similar phenomena are described as having been sighted during past centuries. In the last war, numerous sightings of "balls of fire" in the air were reported by bomber crews.

means of producing lift for such a body, other than by aerostatic (simple buoyancy) means, would be by rotation of the sphere with translational motion relative to the air; or by discharging a stream of air vertically downward. Aerodynamic flight could be accomplished with a rotating sphere, provided the detailed design problems, including stability and control were worked out. The methods, using a blower system or jets, would require relatively greater amounts of energy and while they could be used for flights of very short range and duration, would not ordinarily be considered as practical by aeronautical designers.

The obvious explanation for most of the spherical shaped objects is that they are meteorological or similar type balloons. This, however, does not explain reports that they travel at high speed or maneuver rapidly. It is possible that the movement of the objects was some kind of an optical illusion, or that movement for a brief period due to a gas leak in the balloon was exaggerated by observers.

Balls of Light

No reasonable hypothesis of the true nature of balls of light, such as that reported by Lt. Gorman at Fargo, N. Dakota, has been developed that explains the behavior reported. The most reasonable explanation is that the lights were suspended from balloons, or other means of support, not visible at night, and the violent maneuvers reported are due to illusion.

Possibility of Scientific Developments in Advance of Knowledge in this Country.

Consideration has been given to the possibility that these unidentified aircraft represent scientific developments beyond the level of knowledge attained in this country. Since this is probably the most advanced of the industrial nations on the earth, and our interest in scientific developments throughout the world is very active, it would be necessary for any other country to conduct research and development work in extreme secrecy for any such project to have reached such an advanced state of development without a hint of its existence becoming known here. The only nation on earth with extensive technical resources which has such rigid security, is the U.S.S.R. An objective evaluation of the ability of the Soviets to produce technical developments so far in advance of the rest of the world results in the conclusion that the possibility is extremely remote. Most of the successful Soviet aeronautical developments have been produced by utilizing experience of other nations, some of them being very close copies, so it is very unlikely that they have developed the propulsion and control devices necessary to make these objects perform as described.

Another possibility is that these aerial objects are visitors from another planet. Little is known of the probabilities of life on other planets, so there is no basis on which to judge the possibility that civilizations far in advance of ours exist outside the earth. The commentary on this possibility by Dr. James Lipp of the Rand Project in Appendix D, indicates that this solution of the mystery connected with the sighting of unidentified flying

in neither case has it been used as a primary lift-producing surface. However, an extension of the Prandtl theory of lift indicates that a fuselage of the dimensions reported by the Eastern Airlines pilots Whited and Chiles in the Montgomery, Alabama, incident could support a load comparable to the weight of an aircraft of this size at flying speeds in the subsonic range. The Prandtl theory probably gives very conservative values of maximum lift for bodies of this shape. German experience indicates that the maximum lift may be twice as high as that given by the theory.

Although the craft sighted by Whited and Chiles was reported to be without wings and fins, it is possible that it could have been equipped with extensible wings for take-off and landing, contained within the fuselage in cruising flight.

This type of aircraft could also be partially supported in the take-off and landing condition by the vertical component of the jet thrust, if the landing and take-off took place with the fuselage axis, or the jet stream direction in a vertical or nearly vertical altitude. The further possibility that an extensible rotor, concealed within the fuselage, could have been used, would provide another method for landing and take-off that would allow wingless flight at very high speed. Such a design could result in a relatively large duration of flight and corresponding range.

While no stabilizing fins were apparent on the "flying fuselage" reported by Whited and Chiles, it is possible that vanes within the jet, operated by a gyro-servo system could have provided static stability, longitudinally, directionally and laterally. The same vanes could also have been used for accomplishing static balance or trim, as well as control for maneuvering.

The above discussion regarding weight, controllability, stability, etc. is not intended to represent deductions regarding the exact nature of the torpedo or cigar-shaped aircraft which were sighted by the airline pilots, Whited and Chiles, and others. They are merely statements of possibilities, which are intended to show that such an aircraft could support and control itself by aerodynamic means.

The propulsive system of this type of vehicle would appear to be a jet or rocket engine. The specific fuel consumption of engines to this type would be rather high. This, coupled with the fact that aerodynamic lift on such a body would be accompanied by high drag, places a serious limitation on the range of this aircraft for any particular gross weight. If this type of unidentified aerial object has extremely long range, it is probable that the method of propulsion is one which is far in advance of presently known engines.

Round Objects (Spherical-and Balloon-Shaped Objects)

Spherical-or balloon-shaped objects, are not usually considered as efficient aircraft. Not only would the drag of such bodies be high, but the energy expenditure that would be required to develop lift by aerodynamic means would be excessive. The only conceivable

objects is extremely improbable. Pending elimination of all other solutions or definite proof of the nature of these objects, this possibility will not be further explored.

A large-scale experiment was made at the time of Orson Welles' "Martian" broadcast. Some records of this must persist in newspaper files.

Classification II -- Man-made terrestrial phenomena

1. The objects may be Russian Aircraft. If this were so, then the considerations of Sections A and B indicate that we would have plenty to worry about. It is the author's opinion that only an accidental discovery of a degree of novelty never before achieved could suffice to explain such devices. It is doubtful whether a potential enemy would arouse our curiosity in so idle a fashion.

Classification III -- Extra terrestrial objects

1. Meteors: It is noteworthy that the British physicist Lovell writing in "Physics Today" mentions the radar discovery of a new daytime meteorite stream which reached its maximum during June 1947. The reported objects lose little of their interest, however, if they are of meteoritic origin.

2. Animals: Although the objects as described act more like animals than anything else, there are few reliable reports on extra-terrestrial animals.

3. Space Ships: The following considerations pertain:

a. If there is an extra terrestrial civilization which can make such objects as are reported then it is most probable that its development is far in advance of ours. This argument can be supported on probability arguments alone without recourse to astronomical hypotheses.

b. Such a civilization might observe that on Earth we now have atomic bombs and are fast developing rockets. In view of the past history of mankind, they should be alarmed. We should, therefore, expect at this time above all to behold such visitations.

Since the acts of mankind most easily observed from a distance are A-bomb explosions we should expect some relation to obtain between the time of A-bomb explosions, the time at which the space ships are seen, and the time required for such ships to arrive from and return to home-base.

PART III -- RECOMMENDATIONS

1. The file should be continued.

2. A meteorologist should compute the approximate energy

APPENDIX "D"

13 December 1948

AI-1009

Brigadier General Putt
United States Air Force
Director of Research and Development
Office, Deputy Chief of Staff, Materiel
Washington 25, D. C.

Dear General Putt:

Please refer to your letter of 18 November 1948 relative to the "flying object" problem and to Mr. Collbohm's reply dated 24 November 1948. In paragraph (b) of the reply, Mr. Collbohm promised (among other things) to send a discussion of the "special design and performance characteristics that are believed to distinguish space ships."

This present letter gives, in very general terms, a description of the likelihood of a visit from other worlds as an engineering problem and some points regarding the use of space vehicles as compared with descriptions of the flying objects. Mr. Collbohm will deliver copies to Colonel McCoy at Wright-Patterson Air Base during the RAND briefing there within the next few days.

A good beginning is to discuss some possible places of origin of visiting space ships. Astronomers are largely in agreement that only one member of the Solar system (besides Earth) can support higher forms of life. It is the planet Mars. Even Mars appears quite desolate and inhospitable so that a race would be more occupied with survival than we are on Earth. Reference 1 gives adequate descriptions of conditions on the various planets and satellites. A quotation from Ref. 1 (p. 229) can well be included here.

"Whether intelligent beings exist to appreciate these splendors of the Martian landscape is pure speculation. If we have correctly reconstructed the history of Mars, there is little reason to believe that the life processes may not have followed a course similar to terrestrial evolution. With this assumption, three general possibilities emerge. Intelligent beings may have protected themselves against the excessively slow loss of atmosphere, oxygen and water, by constructing homes and cities* with the physical conditions scientifically con-

* "Not too large or they might be visible. Perhaps underground, where the atmospheric pressure would be greater and where the temperature extremes would be reduced.

trolled. As a second possibility, evolution may have developed a being who can withstand the rigors of the Martian climate. Or the race may have perished.

"These possibilities have been sufficiently expanded in the pseudo-scientific literature to make further amplification superfluous. However, there may exist some interesting restrictions to the anatomy and physiology of a Martian. Rarity of the atmosphere, for example, may require a completely altered respiratory system for warm-blooded creatures. If the atmospheric pressure is much below the vapor pressure of water at the body temperature of the individual, the process of breathing with our type of lungs becomes impossible. On Mars the critical pressure for a body temperature of 98.6F. occurs when a column of the atmosphere contains one sixth the mass of a similar column on the Earth. For a body temperature of 77°F. the critical mass ratio is reduced to about one twelfth, and at 60°F. to about one twenty-fourth. These critical values are of the same order as the values estimated for the Martian atmosphere. Accordingly the anatomy and physiology of a Martian may be radically different from ours - but this is all conjecture.

"We do not know the origin of life, even on the Earth. We are unable to observe any signs of intelligent life on Mars. The reader may form his own opinion. If he believes that the life force is universal and that intelligent beings may have once developed on Mars, he has only to imagine that they persisted for countless generations in a rare atmosphere which is nearly devoid of oxygen and water, and on a planet where the nights are much colder than our arctic winters. The existence of intelligent life on Mars is not impossible but it is completely unproven."

It is not too unreasonable to go a step further and consider Venus as a possible home for intelligent life. The atmosphere, to be sure, apparently consists mostly of carbon dioxide with deep clouds of formaldehyde droplets, and there seems to be little or no water. Yet living organisms might develop in chemical environments that are strange to us: the vegetable kingdom, for example, operates on a fundamentally different energy cycle from Man. Bodies might be constructed and operated with different chemicals and other physical principles than any of the creatures we know. One thing is evident: fishes, insects, and mammals all manufacture within their own bodies complex chemical compounds that do not exist as minerals. To this extent, life is self-sufficient and might well adapt itself to any environment within certain limits of temperature (and size of creature).

Venus has two handicaps relative to Mars. Her mass, and gravity, are nearly as large as for the Earth (Mars is smaller) and her

cloudy atmosphere would discourage astronomy, hence space travel. The remaining Solar planets are such poor prospects that they can be ignored.

In the next few paragraphs, we shall speak of Mars. It should be understood that most of the remarks apply equally well to Venus.

Various people have suggested that an advanced race may have been visiting Earth from Mars or Venus at intervals from decades to eons. Reports of objects in the sky seem to have been handed down through the generations. If this were true, a race of such knowledge and power would have established some form of direct contact. They could see that Earth's inhabitants would be helpless to do interplanetary harm. If afraid of carrying diseases home, they would at least try to communicate. It is hard to believe that any technically accomplished race would come here, flaunt its ability in mysterious ways and then simply go away. To this writer, long-time practice of space travel implies advanced engineering and science, weapons and ways of thinking. It is not plausible (as many fiction writers do) to mix space ships with broadswords. Furthermore, a race which had enough initiative to explore among the planets would hardly be too timid to follow through when the job was accomplished.

One other hypothesis needs to be discussed. It is that the Martians have kept a long-term routine watch on Earth and have been alarmed by the sight of our A-bomb shots as evidence that we are warlike and on the threshold of space travel. (Venus is eliminated here because her cloudy atmosphere would make such a survey impractical). The first flying objects were sighted in the Spring of 1947, after a total 5 atomic bomb explosions, i. e., Alamogordo, Hiroshima, Nagasaki, Crossroads A and Crossroads B. Of these, the first two were in positions to be seen from Mars, the third was very doubtful (at the edge of Earth's disc in daylight) and the last two were on the wrong side of Earth. It is likely that Martian astronomers, with their thin atmosphere, could build telescopes big enough to see A-bomb explosions on Earth, even though we were 165 and 153 million miles away, respectively, on the Alamogordo and Hiroshima dates. The weakest point in the hypothesis is that a continual, defensive watch of Earth for long periods of time (perhaps thousands of years) would be dull sport, and no race that even remotely resembled Man would undertake it. We haven't even considered the idea for Venus or Mars, for example.

The sum and substance of this discussion is that if Martians are now visiting us without contact, it can be assumed that they have just recently succeeded in space travel and that their civilization would be practically abreast of ours.

The chance that Martians, under such widely divergent conditions, would have a civilization resembling our own is extremely remote. It is particularly unlikely that their civilization would be within a half century of our own state of advancement. Yet in the last 50 years we have just started to use aircraft and in the next 50 years we will almost certainly start exploring space.

Thus it appears that space travel from another point within the Solar system is possible but very unlikely. Odds are at least a thousand-to-one against it.

This leaves the totality of planets of other stars in the Galaxy as possible sources. Many modern astronomers believe that planets are fairly normal and logical affairs in the life history of a star (rather than cataclysmic oddities) so that many planets can be expected to exist in space.

To narrow the field a little, some loose specifications can be written for the star about which the home base planet would revolve. Let us say that the star should bear a family resemblance to the Sun, which is a member of the so-called "main-sequence" of stars, i.e., we eliminate white dwarfs, red giants and supergiants. For a description of these types, see reference 2, chapter 5. There is no specific reason for making this assumption except to simplify discussion: we are still considering the majority of stars.

Next, true variable stars can be eliminated, since conditions on a planet attached to a variable star would fluctuate too wildly to permit life. The number of stars deleted here is negligibly small. Reference 3, pages 76 and 85 indicate that the most common types are too bright to be in nearby space unnoticed. Lastly, we shall omit binary or multiple stars, since the conditions for stable planet orbits are obscure in such cases. About a third of the stars are eliminated by this restriction.

As our best known sample of space we can take a volume with the Sun at the center and a radius of 16 light years. A compilation of the 47 known stars, including the Sun, within this volume is given in reference 4, pages 52 to 57. Eliminating according to the above discussion: Three are white dwarfs, eight binaries account for 16 stars and two trinerities account for 6 more. The remainder, 22 stars, can be considered as eligible for habitable planets.