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## Introduction

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## Introduction

Flight safety within the National Aerospace System (NAS)<sup>1</sup> of the United States of America remains of critical importance to everyone who is associated in any way with aviation. Other nations share similar concerns as well. Safety impacts many aspects of the long-term viability of aviation that is a key transportation system of all modern nations so that anything that can be shown to potentially impact flight safety - of any kind of airplane (private, military, test, or commercial) - should be of genuine interest to aviation officials around the world. This report addresses one particular subject that, as far as can be determined from the open literature, has been overlooked by aviation officials at all levels, viz., generally small, energetic, propelled (i.e., not passive), spherical phenomena and/or objects that have been reported for decades within the NAS and elsewhere around the world.<sup>2</sup> Whether or not these strange and diverse objects pose a threat to flight safety remains to be seen. Nevertheless, the fact that so many have been reported by pilots and credible witnesses on the ground (flying very near airplanes) and numerous air force interceptors have been seen chasing them calls for a more critical analysis. Here we will simply call them unidentified aerial phenomena or UAP for short.

## Flight Safety

Aviation safety is of central concern to more and more people around the world. For as prosperity in general increases so do the number of people who can afford to fly. Indeed, the term “safety” embodies a large and very complex concept composed of hundreds of independent and interacting parameters; it is this complexity that makes safety so difficult a subject to study. A NASA-sponsored analysis of U.S. aviation accidents has subdivided government aviation statistics into scores of categories (Turnbull and Ford, 1999). This Langley Research Center activity is known as the “Aviation Safety Analysis and Functional Evaluation” (ASAFE). These researchers found that between 1990 and 1996 private pilots (a category called

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<sup>1</sup> Additional information available at [www.atcmuseum.org/nas.asp](http://www.atcmuseum.org/nas.asp)

<sup>2</sup> This report is limited to phenomena and objects that are known to travel below the stratosphere. Only a few subjects involving spherical objects that fly at much higher altitudes are discussed here such as the ECHO passive communication satellite balloons of the 1960s and more recent high altitude long endurance (HALE) unmanned aerial vehicles (UAV). See [www.psi.nmsu.edu/uav/conops/](http://www.psi.nmsu.edu/uav/conops/) and Section 3.2.

“general aviation”) accounted for 12,407 fatal aviation accidents (almost 85% of the total) and 4,374 fatalities (77% of all fatalities) in the U.S.A. Commercial aviation (a category called “Large Air Carriers”) accounted for 143 accidents which is under one percent of the total and 300 fatalities (0.3% of all known U.S. fatalities). U.S. military aviation operations were not considered in the ASAFE.

### UAP as Possible Causal Agents in Accidents

Since at the present time there are no specific categories included on the FAA, NTSB, or ASRS data recording forms by which any kind of UAP may be considered as a causal factor in aircraft accidents or incidents, no such events are found in Turnbull and Ford’s otherwise excellent and comprehensive work. Of course, reports involving UAP may perhaps be found there under a different heading. Four possible reasons for this lack of a reporting category for UAP within their study are suggested: (1) the incidence of such (UAP) events is so low that they don’t warrant inclusion or serious statistical consideration, (2) pilots cannot or will not use the term UAP or UFO officially when relating an aerial encounter that results in an incident or accident<sup>3</sup>, (3) pilots do not report such aerial encounters at all, and/or (4) this class of causal agents is deliberately deleted from official databases. Based on my experience possibilities 2 and 3 are most likely to account for this effect.

Let us take a further look at current U.S. aviation accident statistics presented in Turnbull and Ford’s report (Ibid.) to see if other insights may be gained concerning UAP sightings. We will concentrate on two types of aviation operations, general aviation (private) and large air carriers (commercial) since together they account for the largest number of accidents. Statistical analyses of aviation accidents show that skill-based errors by the flight crew “...are responsible for an overwhelming number of civil aviation accidents... (and is)... the top causal factor (in every category of air operation) ... accounting for 20-25% of the total number of causal factors.” In other words, breakdowns in pilot judgment and/or flying skills are thought to play a central role in contributing to aviation accidents. If a UAP is maneuvering erratically at high speed near an airliner and the pilot is trying to avoid it (see 3.1) great skill and judgment are called for. But unless that pilot actually reports seeing the UAP the encounter will not be logged at all and therefore will not be reflected in official aviation statistics.

### Definition of Safety

In investigating aviation safety, its definition must be broad enough to encompass every possible causal event,<sup>4</sup> otherwise investigators are likely to overlook subtle and low probability of occurrence events that can have disastrous consequences. As mentioned above and as will become clear in this paper, one sub-set of possible causal events that has been largely left out of official reporting forms and protocols to date is the presence of UAP operating near aircraft. This is also the case, by the way, for most nations on Earth. When pilots, airport operators, and Air Traffic Control (ATC) personnel encounter UAP in the course of their routine operations, the

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<sup>3</sup> Evidence for this suggestion is given elsewhere (Haines, 2000; Roe, 2004)

<sup>4</sup> We are not advocating the inclusion of every possible causal event but rather those that careful research show to be linked to incidents and accidents. Such research must not preclude any possible causal event merely because it is not presently politically or correct or scientifically accepted.

consequences can be not only unexpectedly stressful but can lead to unanticipated and potentially dangerous situations.

The definition of increased aviation safety that results from the above discussion and which is used in this paper is qualitative rather than quantitative:

*Increased aviation safety results from the continual conduct of ground and air operations in a manner such that no personnel are killed or injured, no aircraft or ground support vehicles or equipment are damaged, and the potential and/or actual impact of all conceivable causal events upon the successful operation of all aircraft are taken into account.*

Of course, decreased aviation safety may be defined as the opposite of the above where people are injured or killed and aircraft (and ground equipment) are damaged and the impact of all conceivable causal events is not taken into account, including UAP. In the words taken from a Aviation Week & Space Technology magazine article (Pg. 54, August 14, 2000), “Insurers prefer to leave CAT (clear air turbulence) in the “act-of-God” category, which tends to keep liability to a minimum.” Perhaps the same thing might be said of UAP!

UAP have been appearing in the skies of nearly every nation on Earth for a long time and have been reported by highly qualified witnesses as this report will reveal. Interesting details of such incidents are presented in section 3.1, 3.2, 3.3 and elsewhere (Haines, 2000; Weinstein, 2009). Nevertheless, with only a few exceptions, these sightings have been ignored both by aviation officials as well as by the science community; they have been quietly and unofficially banned as being a phenomenon unworthy of scientific scrutiny<sup>5</sup>. But this simple ignorance, willful neglect or abject and even deliberate avoidance of the subject<sup>6</sup> has not made these ubiquitous phenomena disappear. Indeed, UAP continue to show up at (apparently) random times and places and at all altitudes above the surface of the Earth. It is because of this last characteristic that they become of particular interest to the staff of the National Aviation Reporting Center on Anomalous Phenomena (NARCAP). This fact forms part of the rationale for preparing this report concerning this particular class of (spherical) UAP.

## NARCAP

The *National Aviation Reporting Center on Anomalous Phenomena* was established in 2001 to provide a completely confidential and convenient place where U. S. pilots and air traffic controllers could report their sightings of highly unusual aerial phenomena of all kinds without fear of ridicule or damage to their careers.<sup>7</sup> Unfortunately, there is evidence that both kinds of responses continue to occur, not only in the U.S.A. but also in many other "modern" nations (Roe, 2004).

<sup>5</sup> See Sturrock (1999) for further support of this statement.

<sup>6</sup> These almost irrational behaviors have contributed to a lessening of respect for science by the general public who know that a real phenomenon exists and deserves to be studied and is not just a modern-day myth.

<sup>7</sup> Pilots and air traffic control specialists who desire to make a confidential report should go to the Reports section at: [www.narcap.org](http://www.narcap.org) where appropriate forms are made available.

NARCAP is a non-profit, public-benefit, scientific organization that is comprised of two major divisions: administrative and scientific. Further details may be found on its website: [www.narcap.org](http://www.narcap.org) Its all-volunteer staff works within four areas: Advisory, National Technical Specialists, International Technical Specialists, and Research Associates. Since its founding NARCAP has worked to assist others to set up affiliates in other nations such as Canada and France.

When UAP come in close proximity to airplanes<sup>8</sup> there is reasonable evidence to support the contention that there is a greater probability for an incident or accident to occur. (Haines, 2000; Weinstein, 2009) This is one reason why NARCAP documents such events and shares its findings through its website and by other means. The present research report continues this trend.

Government, commercial, private, labor union, insurance company and military aviation officials do not need to understand what UAP are before they take them seriously. One of NARCAP's main goals is to help these officials recognize their responsibility to be proactive and to work toward preventing accidents and incidents rather than waiting until it is too late. We stand ready to give our assistance.

### Spherical UAP

This report presents a critical review of various kinds of objects and phenomena that are still poorly understood along with others that are well known but still might be misidentified, viz., UAP having a spherical shape. This subject was deliberately selected because of the relatively large number of pilot and ground witness reports that describe them. In the case of ground witnesses cases are included in which one or more airplanes clearly pursue the UAP or vice versa. Deliberate Air Force jet scrambles are included as well (see 3.3.1).

The author has collected a large number of pilot narratives that describe one or more spherically shaped objects (or lights at night) that approach their airplane from a distance, take up station nearby (often decelerating rapidly to match exactly their own airspeed), sometimes fly across to the opposite side of the airplane or spiral around the airplane several times, and eventually fly away into the distance or they may suddenly disappear. Now, if such narratives are to be taken seriously - which they must be if only for the sake of acknowledging the credibility and general reliability of the pilot witnesses, if not also for the sake of aviation safety - we must take a careful look at what we know about spheres in general. But first a rather typical sighting report is presented for the sake of background.

### A Sample Pilot Narrative

The author listened to the following account from an Air Force pilot many years ago; it is fairly typical because it includes several spherical and apparently metallic objects that maintained strict formation flying with his huge Air Force aircraft over an extended period of time. In addition, there were multiple eye witnesses of the encounter on board as well as subsequent official pressure placed upon the witnesses to "forget" the entire incident.

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<sup>8</sup> Or conversely, when a pilot approaches a UAP, the same is true.

The author was a passenger on a NASA airplane enroute from Moffett Field, California to Houston, Texas in the mid 1980s to take part in a Space Station technical research briefing at the Lyndon Johnson Space Center. The small "corporate" passenger jet held about twenty people. In addition to the two NASA pilots in the cockpit was a third who acted as navigator. I began talking with him. He said that he was a retired Air Force B-52 Commander; with some initial reluctance he told me about his own unusual experience that took place in approximately 1962. He shared the following story with me with the understanding that I would not disclose his name. While his story is presented here in quotes I was not able to record it at the time. His words impressed me so much, however, that they have remained clearly etched in my memory ever since.

"I was piloting a brand new B-52 right off the assembly line in Wichita, Kansas and had a full crew on board, but we had no operational radar or guns. They were going to be installed later. We were headed for an airbase in the southwestern part of the country. The sky was completely clear and the sun was high overhead when this event happened. We were at our assigned cruise altitude that I don't remember now. I had engaged the autopilot that maintained our airspeed, altitude, and heading. Suddenly I noticed a bright flash of sunlight far over on my left side and I turned to see what it was. I was surprised to see a spherical object that looked metallic, like polished chrome. It took up a position some distance near my left wing tip and kept pace with us. It was perhaps from four to eight feet in diameter and had no seams, rivets, insignias or other markings that I could see. As I was just about to yell for my First Officer to come over and look at the thing he said from his (right) seat something like, 'Commander, there's a round, metallic ball flying with us off our right wing.' He went on to describe to me an identically shaped and sized object that seemed fixed in position with us. We must have been flying at about 300 to 350 kts or so at the time.

"Well, to make a long story shorter, the crewman in the tail who would normally operate our tail guns called on the intercom and announced that there was a round shiny metal ball following very close right behind our airplane. The top gunner and the bottom gunner also both called in to say that they too saw two more objects of the same shape keeping exact pace with the airplane, one directly above and the other below us. These three objects had the same appearance as the two we had off our wingtips.

"Well what did I do? I didn't know what they were so I went into a standard evasive flight maneuver. First I disconnected the autopilot and then put the plane into a dive and changed our heading to see if I could lose the objects. After about ten or fifteen minutes of doing this it was clear that we couldn't shake them. They maintained their positions (relative to the huge jet) exactly no matter what I did, so they certainly weren't reflections of sunlight or weather balloons or birds.

"I finally decided to climb back up to our assigned cruise altitude and heading and turned the autopilot back on again. Then, after a few more minutes the five spheres left us, apparently in the exact opposite order in which they had arrived. This was confirmed by the other crewmen on board. The object under our belly (apparently) was the first to leave. It dropped down some distance and then accelerated upward in a steep climb. It was on our own flight heading. We both saw it pass by our nose. The object that was flying above us took off next. It simply took off in the same direction as the first in a high acceleration and we also saw it disappear into the sky in

seconds. The tail gunner said that the third object slowed or backed away from the airplane a little and then, it too, accelerated upward on our heading into the sky. Then the co-pilot and I were amazed to see both wing-tip spheres accelerate at the same moment and climb out of sight parallel to each other until they were also gone. It was like they were under the same simultaneous control.”

Other details of how the flight crew dealt with this alleged event and how they were treated by Air Force officials upon landing will not be discussed here except to say that after they landed the entire flight crew was warned not to talk to anyone about the event and even to treat it as if it hadn't happened at all. Concerns were expressed that the B-52 might have been contaminated by radioactivity during the event. For instance, the pilot was commanded not to taxi the airplane near any buildings but leave it near the runway. Interestingly, there is no record of this event found in Project Blue Book files of the Air Force. If an official report was made, it must have been routed to another destination.

Even though there were no objective measurements made at the time, this incident involved at least five highly trained Air Force witnesses and probably more. The details of this incident become important (and increasingly familiar) pieces of a larger puzzle, a puzzle whose clear image probably lies at the core of all UAP. What was the source of the energy the objects employed in order to pace the jet for so long a time? What kind of flight guidance and control mechanisms were used in order to perform these precise maneuvers relative to the jet? More particularly, how did five separate spherical objects navigate in order to assume a fixed position relative to the B-52 during its normal flight and its subsequent evasive maneuvers? What kinds of natural atmospheric phenomena might explain this sighting? Could these objects have been unmanned aerial vehicles (UAV)? Did these UAP constitute any actual threat to flight safety of this B-52?

### Contents of This Report

We will begin with what is not discussed in this report. We will not look back into the voluminous historical literature that documents pilot sightings of UAP of the first fifty to sixty years of aviation worldwide. The interested reader will find the following sources of particular interest in this regard (Clark, 2003, Good, 1988, Hall, 1964, Ruppelt, 1956, Smith, 1997). Suffice it to say that spherically shaped UAP have been reported by pilots and others since the early days of the twentieth century. In order to make a stronger case for the need for genuine concern to be shown about aviation safety specifically related to these unexplained aerial phenomena we have chosen to emphasize more recent sighting reports. Two other subjects that are not discussed in any depth here include the present negative political attitude that continues to be shown toward this subject as well as the closed mindedness of the science community toward the reality that UAP represent. It is simply counterproductive to do so here. In spite of these omissions the reader will find much to contemplate in the following pages.

Various physical characteristics of spheres are considered in section 2 such as their aerodynamics (2.1), radar cross section (2.3), and geometry (2.5). Also presented are two papers presenting hypothesized electrical and plasma properties of various atmospheric phenomena (2.2), including a proposed research methodology that could further our understanding of them (2.4). Section 3 presents selected evidence for the existence of spherical UAP. Section 3.1 presents an

interesting array sighting reports of spherical objects and luminous phenomena reported by pilots in Brazil, Canada, France, Japan, Mexico, and the USA. Indeed, we know that reports could have been elicited from scores of other nations given the time and effort to do so. Because there are many reports made by eyewitnesses on the ground of spherically shaped objects seen in close proximity to airplanes, a number of them are summarized in section 3.3.1 along with selected airborne photographic evidence in 3.2.

But what could these objects and/or phenomena be? This fundamental question is addressed in section 4 where we discuss weather and other kinds of balloons (4.1), Unmanned aerial vehicles<sup>9</sup> and other generally spherically shaped lighter-than-air objects (4.2), Ball lightning and earthlights (4.3). The complexity of this general subject is so great that a number of additional miscellaneous subjects are also addressed, e.g., examples of other lighter-than air spheres (3.3.2), unexplained spheres discovered on Google-Earth imagery (5.1), and a preliminary taxonomy of UAP shape names (5.2). The report concludes with several conclusions and recommendations that should be taken seriously by aviation officials at the highest levels of government and industry in the name of improved flight safety.

#### Another Dimension

Perhaps hidden from sight here, but surely not on purpose, is the fact that spheres have a beauty and simplicity all their own. These two features in particular can be easily overlooked when we steer a course guided only by principles of scientific and technological navigation. If we concentrate only on the question of how such objects fly but overlook the simplicity of their shape, we have missed a part of the truth. If we study only details of their radar cross section without at the same time contemplating their intrinsic elegant beauty we may have missed another potentially important aspect of their nature.<sup>10</sup> So the reader is urged to keep an open mind to every possible aspect of this subject from scientific to aesthetic, pragmatic to theoretical, simple to complex.

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<sup>9</sup> According to an FAA Aerospace Forecast for the period 2009 to 2025 unmanned commercial aircraft systems will evolve significantly in terms of their autonomy (i.e., on-board control capabilities) and independence from Earth-based control. More than one hundred companies, academic institutions, and government organizations are developing more than three hundred UAS designs at the present time!

<sup>10</sup> While "simplicity" and "beauty" may lie outside the traditional boundaries of the "hard" sciences they are, nonetheless, aspects of reality. They are as important to consider as anything else because no one yet knows the actual core identity of UAP.

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