
Uncloaking Mysterious Skies

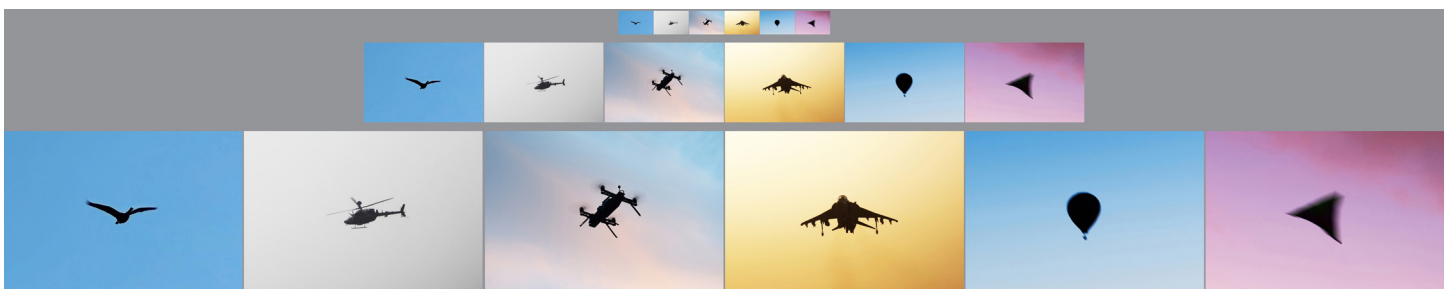
The Science Behind UFO Sightings

*This is the original, full-length version of the article that was submitted to and published by *Weatherwise* magazine in their January / February 2026 issue, inclusive of all images originally submitted with the article. *Weatherwise* published a slightly shorter version and used fewer of the supplied images.

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Mysterious phenomena in the sky—luminous orbs, figures that hover and then slip into the distance, and shapes that morph in size and appearance—grab attention, mystify, arouse imaginations, and can instill mass fear. Some have attributed these to fantastical-yet-extraordinarily improbable origins: alien explorers, time travelers, extra-dimensional beings, re-awakened ancient societies, and paranormal activity. Others have proffered somewhat realistic (yet often dramatically overstated) hypotheses, including military aerospace research, foreign governments conducting surveillance missions, and cutting-edge technological innovations run amok. These phenomena are most commonly classed as “unidentified flying objects” (“UFOs”), and more recently “unidentified aerial phenomena” or “unidentified anomalous phenomena” (both initialized as “UAP”). Despite frequent sensationalism and wild conjecture about these sightings, all have logical, scientifically based explanations, and virtually all these explanations involve atmospheric dynamics.


Strictly defined, a UFO is an observed airborne body or phenomenon that cannot be precisely named, described, or explained by the observer at the time of the sighting. A small dot-like object in the sky is one hypothetical example. It may be a bird, a helicopter, an unmanned aerial vehicle (“drone”), a military fighter jet, a hot air balloon, or a kite. Distance from observer determines how large the object appears in his field of view and his ability to resolve details of its physical characteristics and motion. If the observer cannot precisely name, provide a detailed description, or explain basic aspects of the object, then it is categorized a UFO. Add the elements of lighting (either natural or human-made), atmospheric optics (which could distort the view of the object), partial concealment by mist or fog, or gusty winds (which could cause the object to move erratically), then some may be inclined to suggest extraterrestrial visitors, secretive governmental projects, or other extraordinary and imaginative origins. And many do—and when various forms of media repeat these claims, sensationalism is often amplified, inciting others to look to the sky with eyes biased toward the chimerical.



Mosaic of images of airborne entities at three different hypothetical magnifications (simulating different relative distances). From left: Canada goose, midday, in clear conditions (Cheyenne, Wyoming); U.S. Army Bell OH-58D Kiowa Warrior, afternoon, in rainy conditions (Hindu Kush mountains of eastern Afghanistan); Darack Research UAV-2 experimental unmanned aerial vehicle, dawn, in lightly overcast conditions (Sierra Nevada mountains of eastern California); U.S. Marine Corps Boeing AV-8B Harrier II, mid-morning, hazy conditions (Al-Asad Airbase, Iraq); hot air balloon (slightly blurred due to combination of camera exposure time and balloon movement by wind), dawn, in clear conditions (Reno, Nevada); kite (slightly blurred due to combination of camera exposure time and kite movement by wind), dusk, in slightly cloudy conditions (Pine Nut Mountains, western Nevada). CREDIT: Ed Darack

Humans have noticed and documented unfamiliar skyward objects and events for millennia. Phenomena including comets, eclipses, and meteors appear in Chinese, Sumerian, and Babylonian records from centuries past. Prior to the 1800s, these events were attributed primarily to mysticism and religious premonitions. The first reports of what would come to be called UFOs appeared in the 19th century, a time of rapid innovation in the fields of mass communication and aviation. This period also witnessed a surge of science fiction publications and the associated widespread introduction of the theme of extraterrestrial explorers visiting Earth, notably those from Mars.

The debut of the telegraph in the mid-1800s enabled rapid dissemination of reportage and other information to newspapers throughout the world, propelling the media form's rapid growth. The development of airships, powered and steerable lighter-than-air vehicles, ranked among the most popular topics covered during this period. Although only experimental at that point, news stories promoted their potential for a wide range of applications, including military use. Their prospects captivated readers as the pioneering technology of the age of flight, and this intrigue was further piqued by drawings of speculative airships in newspapers and popular fictional written works such as *A Drama in the Air* and *Five Weeks in a Balloon*, both by French author Jules Verne.



The San Francisco Call

VOLUME LXXX.—NO. 178. SAN FRANCISCO, WEDNESDAY MORNING, NOVEMBER 25, 1896.

MISSION OF THE AERIAL SHIP

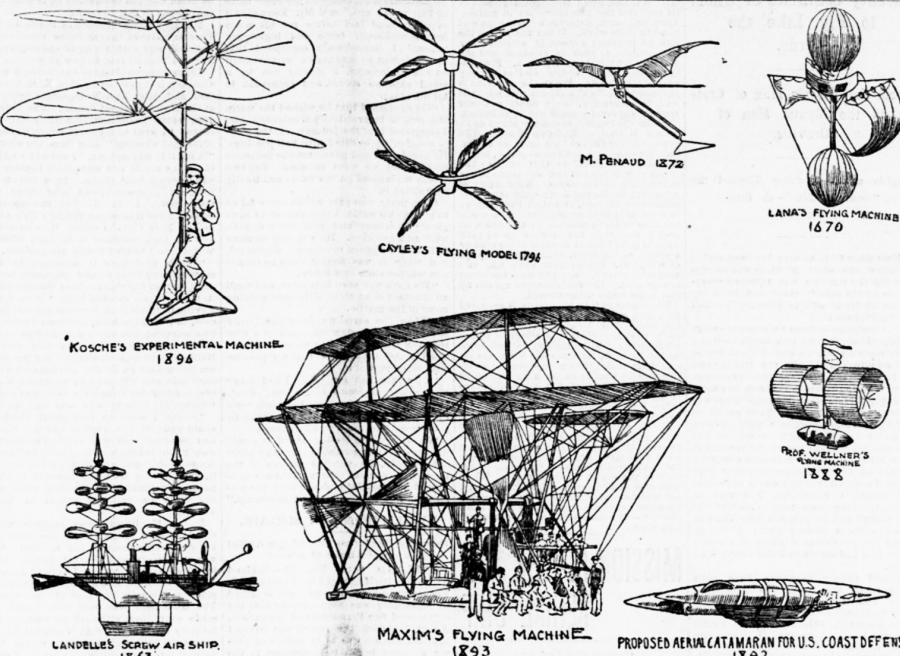
Will Probably Be Used to Destroy the City of Havana.

ITS DESTINY IN GENERAL HART'S HANDS.

Interesting Details of the Powers of the Mysterious Conqueror of the Air.

VAST FORTUNES IN EXPECTANCY FOR ALL CONCERNED.

Oakland People Claim to Have Seen Intricate Evolutions in Midair—Venus and Jupiter as Fair Deceivers.



Two Centuries of the Flight of the Airship; From the Bird Wing to the Maxim Machine.

under perfect control. There is no doubt about this. It can be made to rise from a dead standstill. I cannot go into details about its construction, but will admit that it is of cylindrical shape, is built of aluminum and has wings but I cannot tell you even how many wings it has.

"I do not know yet whether or not an application for a patent has been made. But if one has gone on to Washington I shall try to withdraw it, as I do not think it will be good policy for us to let the information that would thus be furnished become public, owing to the purpose for which we first propose to use it. We would rather

business in the beginning of next April to make a trip across the continent. It will be 100 feet long from bow to stern and 125 feet cylinder. The main body will be 125 feet long. The front end will be a cone, as it is a scientific fact that a cone presents less resistance in passing through the air than any other solid body. The gas compartments will be in the upper portions of the cylinder and cone, and after being

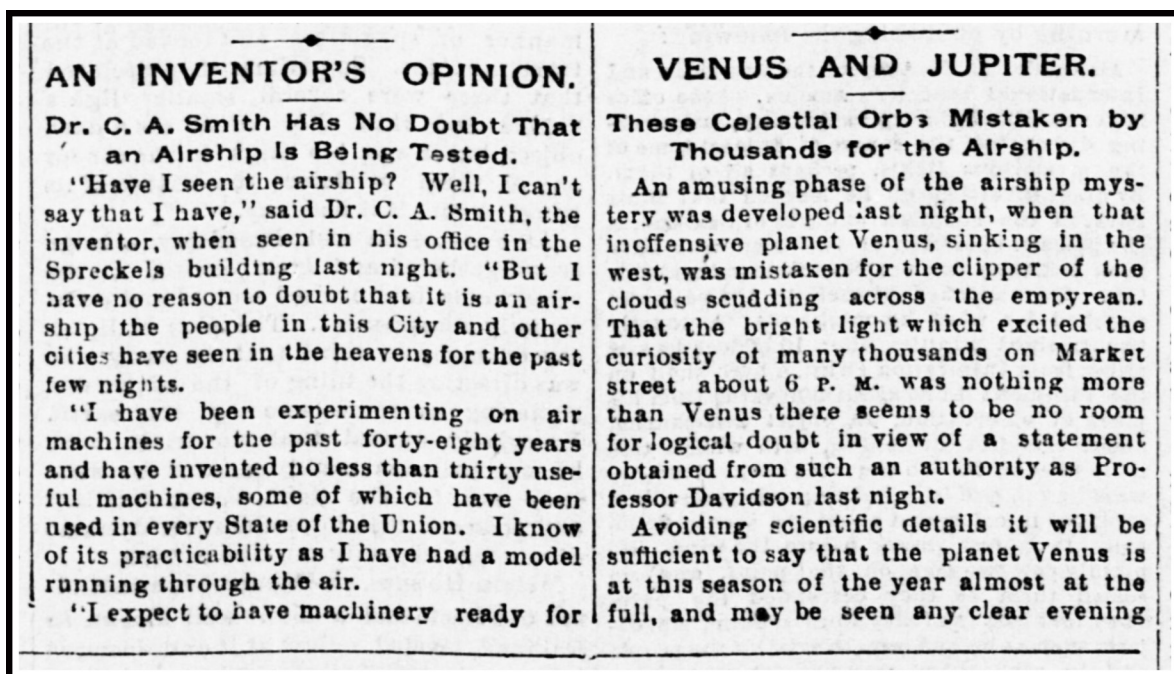
after dusk traveling rapidly from east to west until she disappears below the horizon. As soon as the professor heard the story, shortly after 7 p. m., he got out his telescope and had no difficulty in identifying the supposed airship as an ordinary, everyday star.

At 9 o'clock last night or thereabouts the cry was raised on Market street that

Front page of the November 15, 1896 morning edition of the *San Francisco Call*. CREDIT: Public Domain / Accessed through the California Digital Newspaper Collection, University of California, Riverside Center for Bibliographical Studies and Research.

In 1896, several articles appeared in newspapers in California and then throughout the United States trumpeting sightings of mysterious nighttime airships. The front page of the November 25, 1896 morning edition of *The San Francisco Call* carried a story with the headline “Mission of the Aerial Ship: Will Probably Be Used to Destroy the City of Havana.” Despite promising “Interesting Details of the Powers of the Mysterious Conqueror of the Air,” no such craft had flown or even existed. Written in the “yellow journalism” style popular at the time—a manner characterized by exaggerations and fabrications to increase newspaper readership—the story was based purely on purported sightings and wild conjecture.

Newspapers also published several articles that provided more rational coverage of the airship narrative, although editors gave these much less space. These unsensational reports attributed the sightings to wind-blown clouds, fog, twinkling stars and planets, and sometimes a combination of these factors. The front page of the November 25, 1896 morning edition of *The San Francisco Call*, for example, included two short, below-the-fold stories, one promoting the airship narrative and one voicing skepticism of it. In “An Inventor’s Opinion,” Dr. C. A. Smith stated that, while he had not seen the craft, he had “... no reason to doubt that it is an airship...” The article “Venus and Jupiter,” printed next to “An Inventor’s Opinion,” explained that the planets were “mistaken for the clipper of the clouds scudding across the empyrean.” It further noted that the airship narrative had been “...discredited by many as being a hoax and a phantom story, yet there are many people who firmly believe in the airship.”



Side-by-Side articles about the “Mysterious Airship” on the front page of the November 15, 1896 morning edition of the *San Francisco Call*. CREDIT: Public Domain / Accessed through the California Digital Newspaper Collection, University of California, Riverside Center for Bibliographical Studies and Research.

The “mystery airship” narrative resurfaced multiple times in subsequent years, with reports of sightings in several locations. The February 3, 1897 edition of the *Sioux City Journal* featured “Airship at Hastings,” about a supposed appearance above Hastings, Nebraska. The April 9, 1897 edition of the *Davenport Morning* included an article titled “Phantom of Night: Wandering Air-Ship Appears High in the Heavens” about a reported sighting at Rock Island, Illinois. On April 19, 1897, *The Dallas Morning News* published “A Windmill Demolishes It.” The article

explained that the craft, after having traversed much of the country, collided with a windmill near the town of Aurora, Texas, and “...went to pieces with a terrific explosion...” The article further stated that the pilot of the mystery craft “...was a native of the planet Mars.” Like all the other mystery airship articles, no evidence surfaced that any such craft—or Martian aeronauts—had ever existed.

The flurry of late 1890s mystery airship reports marked the first of what might best be described as sky-oriented mysticism arising from and focused on evolving technology, conjecture about extraterrestrial life, and speculative pseudoscience (often inspired by actual scientific innovations and discoveries). Delivered throughout the world by newspapers, information about the capabilities (and conjecture about possible future capabilities) of emerging, little-understood aviation technology struck awe in many. The sensational chronicles of flying machines, combined with the proliferation of science fiction themes, synergized this captivation and stirred many in the public into a frenzy—and phantom sightings of airships ensued.

The airship narrative emerged several times in the early 20th century, notably in Britain. Unlike the late 1800s, however, functional airships did exist at that point. According to the paper “Constructing the Enemy Within: Rumours of Secret Gun Platforms and Zeppelin Basis in Britain, August-October 1914” by Brett Holman (2017 issue of *British Journal for Military History*), thousands of Britons reported that they saw German airships approaching from the sea for nighttime attack missions in 1909 and 1913. No marauders ever materialized; the sightings were attributed to wind-blown clouds and fog. The mass hysteria over these “scareships” culminated in a fear of clandestine airship bases that the Germans had supposedly constructed within Britain.

As aviation technology quickly advanced throughout the early to mid-20th century, an increasing number of people experienced the sky from aloft. Several initiatives used aircraft to study and explore the atmosphere, expanding meteorological knowledge. This included atmospheric scientists from the Massachusetts Institute of Technology who mounted meteorological instruments on a Cessna light airplane in 1931, American aviator Wiley Post who investigated the jet stream in 1934 by airplane, and U.S. Army Air Forces pilot Joseph B. Duckworth who conducted the first deliberate flight into the eye of a hurricane in 1943. The increase in numbers of “eyes in the sky” during this period also resulted in reports of phenomena that proved difficult to explain.

During World War II, particularly toward its end, pilots and crew of military aircraft of several nations reported strange luminous objects that purportedly would “chase” their aircraft, typically at night. Called “balls of fire” or “foo fighters” by American aviators, conjecture in both classified documents and newspaper reports focused on futuristic enemy technology, notably Nazi “wunderwaffen” (wonder weapons). Despite the alarm these phenomena caused, none downed or even damaged a single aircraft of any country. Reported in both the European and Pacific theaters of the war, detailed military and scientific analysis yielded that these objects were likely the effects of condensation trails (notably from rockets like the German V-2), St. Elmo’s fire (atmospheric electrostatic discharges), or moonlight reflecting off airborne ice crystals. Like the mystery “conquerors of the air” of the late 19th and early 20th centuries, not a shred of physical evidence that these phenomena were anything other than atmospheric effects ever emerged. The phenomenon conquered nothing more than imaginations (and continue to do so with some).

The years following the end of World War II witnessed rapid proliferation of all forms of flight, including personal aviation. On June 24, 1947, 32-year-old Kenneth Arnold, a private pilot, lifted off in a single-engine light airplane from the town of Chehalis, Washington, just south of Olympia. The solo aviator, who hailed from Boise, Idaho, set a course to the east, flying toward the crest of the Cascade range of volcanic peaks. An entrepreneur who worked in the field of emergency fire control equipment, Arnold was a seasoned pilot who used his airplane for business

travel. He was also a skilled aerial observer, his experience honed through his tenure as a member of the Idaho Search and Rescue Mercy Flyers and as a Flying Deputy for the Ada County Aerial Posse.

His day's journey included a detour to search for the location of a downed military aircraft near Mount Rainier, the discovery of which would yield a \$5,000.00 reward. While he didn't locate any wreckage, once he landed at the eastern Washington town of Yakima, he reported having witnessed an incredible sight. According to the pilot, nine airplane-sized craft, each shaped like a "saucer" or "disc" and sometimes flashing brilliantly, had flown in an echelon formation past Mount Rainier, southward to Mount Adams. Using the clock on his airplane and visual estimates of distance, Arnold gauged that the group of mystery aircraft had been flying at a rate of approximately 1,200 miles per hour, far above the speed of sound.

German 'Balls of Fire' Race Along Beside Allied Planes

A U. S. NIGHT FIGHTER BASE, France. (AP) — American fighter pilots engaged in flying night intruder missions over Germany report the Nazis have come up with a new "secret weapon"—mysterious "balls of fire" which race along beside their planes for miles like will o' the wisps.

Yank pilots have dubbed them "foo fighters," and at first thought they might explode, but so far there is no indication that any planes have been damaged by them.

Some pilots have expressed be-

lief that the "foo fighter" was designed strictly as a psychological weapon. Intelligence reports seem to indicate it is radio-controlled from the ground and can keep pace with planes flying 300 miles per hour.

Lt. Donald Meiers of Chicago, Ill., said there are three types of "foo fighters"—red balls of fire that fly along at wing-tip; a vertical row of three balls of fire which fly in front of the planes, and a group of about 15 lights which follow the plane at a distance, flickering on and off.

Associated Press article, "German 'Balls of Fire' Race Along Beside Allied Planes," published in the January 2, 1945 edition of the *San Pedro News Pilot*. CREDIT: Public Domain / Accessed through the California Digital Newspaper Collection, University of California, Riverside Center for Bibliographical Studies and Research.

Arnold shared details of his observations with newspaper reporters the following day, and the story erupted throughout the nation and then the world. Articles about the incident used "flying disc" and "flying saucer" to describe the alleged craft, introducing the terms to a global audience, with "flying saucer" destined to endure for decades in modern lexicons. Immediately after the release of the first news stories of the amazing account, aerospace experts voiced their skepticism, particularly regarding the claim of extreme speed (the speed of sound had not yet been broken by a manned aircraft). Despite this, others throughout Washington "corroborated" his story with their own eyewitness accounts of similar sightings, each set in a different part of the state.

JAPANESE ANTI-AIRCRAFT MATERIEL CINCPAC-CINCPOA BULLETIN 92-45.

11 APRIL 1945. ~~CONFIDENTIAL~~.

Reduced to ~~RESTRICTED~~ in Forward Areas.

MISCELLANEOUS JAPANESE AA WEAPONS AND DEFENSE MEASURES (Continued)

AA Rockets (Continued)

though no reports have been received as to its construction. Recent B-29 reports of "Balls of Fire" over Tokyo, which followed the planes for as long as six minutes, may possibly be manifestations of Jap rocket research. Similar manifestations (the so-called "Foo-Fighters") were encountered over Germany last summer. Preliminary reports of the Tokyo raids of 3 April 1945 show that the "Ball of Fire" appeared as a steady glow with a faint, following stream of fire. Evasive action caused these fire balls to fall behind, but they gained on straightaway courses.

Passage from a classified military report, dated 11 April 1945, titled "Flak Intelligence Memorandum Number 4: Japanese Anti-Aircraft Materiel" noting "Balls of Fire" / "Foo-Fighters." National Archives ID: 406571488. CREDIT: United States National Archives.



United States Army Air Forces B-17 Flying Fortress bomber and a condensation trail from a German V-2 rocket (jagged white line above the bomber's vertical stabilizer). Condensation trails may have been the sources of some of the reports of "balls of fire" / "foo fighters." Photograph taken over France on November 6, 1944, during the U.S. 8th Air Force's flight to attack the cities of Hamburg, Harburg, and Neumünster, Germany. The photograph's note includes information about the nature of the V-2's condensation trail: "The jagged shape of the trail is believed to have been caused by changes in atmospheric conditions, rather than by irregularities in the course of the rocket." National Archives ID: 204889522. CREDIT: United States National Archives.

Although speculation about the nature of the purported craft focused on emerging secretive military technology, others proffered more colorful hypotheses. In a United Press wire article titled "Flying Disc' Tale Destroys Pilot's Peace," published on June 27, 1947, Arnold was quoted as stating "I haven't had a moment of peace since I first told the story." According to the article, a preacher contacted him claiming that his experience was proof of an impending doomsday, and a woman angrily identified him in public as the "...man who saw the men from Mars."

Flying saucer reports surged in early July of 1947 following the mass publication of the Arnold story, with new sightings reported daily throughout the country. Narratives of flying saucers spread similarly to those of mystery airships of the late 1800s, but much faster, as mass media had matured significantly, notably due to the proliferation of radio. No evidence, including physical artifacts or conclusive photographs, emerged of their existence, however. Then, on July 8, 1947, wire reports heralded that a rancher had discovered the wreckage of a flying saucer on his property, 75 miles northwest of the town of Roswell, New Mexico. The rancher, identified in news reports as W.W. Brazell, had found shiny foil, tape, and wooden supports. He took the remnants to Roswell Army Air Field, where base personnel subsequently distributed an erroneous press release stating that the debris originated from a “flying disc.” The military quickly changed its story, stating that the remains were from a crashed weather balloon. Convoluting the military’s narrative, the items had been part of a crashed high-altitude balloon used in a top-secret initiative, Project Mogul. The project used balloon-carried acoustic sensors to attempt to identify the time and location of Soviet nuclear weapons tests. Not wanting to divulge Cold War secrets, the military had fabricated the weather balloon story.

Several researchers, including those commissioned by the U.S. government, studied the Kenneth Arnold claim and produced a number of possible explanations, all related to atmospheric dynamics: mirages (specifically, a complex superior mirage called a Fata Morgana mirage), banner clouds, snow banners, and lenticular clouds. The lenticular cloud hypothesis stands as the most realistic of the candidates, not only for the Arnold claim, but for many other subsequent reports of UFOs. Mirages, banner clouds, and snow banners, while not realistically plausible for the Arnold incident based on his description, nevertheless can appear confusing and otherworldly, qualifying them as UFOs to those unaccustomed to witnessing these phenomena.

A mirage forms due to atmospheric refraction, the bending of light rays as they pass through air parcels of different densities (hence different refractive indices). The most common mirage is the inferior mirage, where air near a surface is much warmer than the air directly above it, bending light upward toward an observer. This creates the common “water on the highway” mirage among other visual effects. The less common superior mirage occurs during a temperature inversion, where warm air overlays cold air, bending light downward. The Fata Morgana mirage, named after the Arthurian legend “Morgan le Fay,”



3-image series of a Fata Morgana mirage’s effects. The images were photographed using an extreme telephoto lens mounted on a camera positioned on the southern extremity of the White Sands dune field in the Tularosa Basin in southern New Mexico, looking north. The prominent dark feature in the foreground is a small, unnamed hill, and the mountains in the background are part of the San Andres Range. The Fata Morgana mirage strongly distorted the small hill into shapes that some may see as “flying saucers.” CREDIT: Ed Darack

'Saucer' Found in N.M., Reports Army

ROSWELL, N. M. (AP)—The army air force here today announced a flying disc had been found on a ranch near Roswell and is in army possession.

Lt. Warren Haught, public information officer of the Roswell Army Air Field, announced the find had been made “sometime last week”, and had been turned over to the air field through cooperation of the sheriff’s office.

Associated Press wire article heralding the discovery of remains of a flying saucer, published in the July 8, 1947 edition of the *San Pedro News Pilot*. CREDIT: Public Domain / Accessed through the California Digital Newspaper Collection, University of California, Riverside Center for Bibliographical Studies and Research.

is a complex type of superior mirage where light rays bend repeatedly through a narrow atmospheric “duct.” This phenomenon produces extreme visual distortion, including causing mountain tops to appear as flat disks hovering in space. Fata Morgana mirages are very difficult to identify as they occupy a very small sliver of sky, much smaller than the objects described by Arnold. Furthermore, an observer can only experience the effects of a Fata Morgana mirage while positioned within or below the narrow confines of the atmospheric duct.

A banner cloud forms due to wind blowing across a steep-faced mountain when sufficient humidity and other conditions are present for the cloud’s formation. Given sufficient wind speed, a cloud will emerge off the lee side of the peak’s upper reaches. Banner clouds typically appear singularly, not in groups as was reported by Arnold, and they remain visually attached to the peak from which they emerge.



Banner cloud on Makalu, the fifth highest mountain in the world, Nepal. Photographed from a location approximately 500 feet above base camp at sunset. CREDIT: Ed Darack

Snow banners form when high winds blow streamers of snow and ice crystals off mountain peaks and ridgelines. These streamers typically lack the visual definition of clouds, often appearing translucent and are hence difficult to resolve from more than a few miles. Like banner clouds, snow banners typically form as singular features, not in groups, and they remain visually attached to peaks from which they emerge.



Extreme winds lift snow banners off the summit complex of Nanga Parbat, Pakistan. CREDIT: Ed Darack



Extreme winds lift snow banners off the summit of Cerro Paine Grande, southern Patagonia, Chile. CREDIT: Ed Darack

The description that Arnold provided most closely matches that of a group of lenticular clouds. A Lenticular cloud forms when laminar, wind-blown air is forced upward into higher, cooler air. When cooled below the dew point, moisture in the wind-blown air condenses into a smoothly textured, lens-shaped cloud, which is often symmetrical in form (the word “lenticular” is derived from the Latin word “lenticularis,” meaning “lentil shaped”). Lenticulars typically appear fixed in place, as the geometry of conditions spawning them remains stationary, even though the moisture that forms these clouds moves with the wind. Nicknamed “grindstone clouds” (a term used until roughly the 1960s due to their resemblance to sharpening wheels called grindstones), the shape of a lenticular cloud results from windblown air rising and descending in a symmetrical fashion. The “peak” of the uplift protrudes into the layer of air at and below the dew point, forming a lens profile.

Cumuliform in nature, lenticulars form throughout three basic cloud types, stratocumulus (low level), altocumulus (middle level), and cirrocumulus (upper level). Middle level lenticulars (altocumulus lenticularis) are the most commonly observed and reported. In addition to lenses, lenticulars can resemble pancakes, wheels, plates, and saucers. They form above mountains or mountain ranges due to wind-blown air ramping higher when moving over these barriers, a process called orographic lift. Due to air’s buoyancy, standing atmospheric waves often form in the lee of mountains and mountain ranges during wind events, which can produce a line of several lenticular clouds.

Lenticular clouds frequently emerge above and in the lee of Cascade volcanoes like Mount Rainier and Mount Adams. Sometimes several lenticulars form one atop the other above Cascade peaks in a “stacked” configuration, and sometimes several emerge in a line above a ridge or to the lee of a peak; all remain relatively stationary. The 1,200-mile-per-hour speed that Arnold reported may be attributed to his perspective from a moving aircraft combined with his misjudgment of surrounding physical features, a phenomenon called motion parallax. The flashing light may have been due to sunlight reflecting off their white forms or from glints off the canopy of his aircraft. Furthermore, despite his experience as an aerial observer, his acuity may have been degraded by a physiological condition called hypoxia, a reduction in oxygen level in his body. He had been flying at an altitude of 9,200 feet above sea level when he made his sighting, and his aircraft, a CallAir Model A-2, did not have a pressurized cabin and he was not using supplemental oxygen.



Line of lenticular clouds over the south ridge Lullillaco, Chile. Lullillaco, an Andean stratovolcano, is shaped similarly to Mount Rainier, also a stratovolcano. This image coincidentally shows a group of nine lenticular clouds (depending on how each is counted) in an echelon formation, like the scene described by Kenneth Arnold while flying past Mount Rainier on June 24, 1947. CREDIT: Ed Darack

The initial spree of flying saucer reports incited by the Kenneth Arnold claim waned after July of 1947, in great part due to a complete lack of evidence of any aircraft, alien technology, futuristic systems, or other fantastical contrivances. According to the U.S. military, U.S. Air Force Captain Edward Ruppelt conceived the term “unidentified flying object” and its initialism “UFO” in 1947 and the U.S. government began officially using it in 1952. Ruppelt developed the term to most accurately connote the full scope of such sightings without superfluous descriptives. Several governments throughout the world commissioned studies on UFOs in the 1950s and 1960s, including the United States. One of the most exhaustive, the U.S. Air Force’s Project Blue Book, investigated more than 12,000 UFO reports made between 1952 and 1969. Like other formal studies on the topic, it concluded that atmospheric phenomena, notably lenticular clouds, accounted for the vast majority of UFO sightings, with the remainder being misidentified aircraft.

In the years following the Arnold claim, a few magazines published articles about the genesis of lenticular clouds and other weather phenomena that generated UFO reports. In “Areas of Occurrence of “Grindstone” Clouds” in the December, 1958 issue of *Weatherwise*, author Ronald L. Ives provided a detailed analysis of locations where the clouds commonly occur and seasons most favorable for their formation. He noted “During the past decade, observers in many parts of the United States have reported and photographed circular and ball-shaped clouds, and have described them as almost everything from interesting cloud formations to space vehicles from the lost Kingdom of Mu.”



Stacked lenticular clouds over Mount Foraker in the Alaska Range of Alaska, photographed from the 14,200 foot level of Mount McKinley (Denali). CREDIT: Ed Darack

Despite scientifically based explanations, a host of unfounded narratives for unidentified flying objects persisted and propelled UFO mysticism as a global cultural phenomenon. The term “UFO” even assumed an unofficial meaning of “extraterrestrial” or “alien” craft in popular media in the 1950s. The public’s interest in skyward phenomena surged due to a convergence of several factors during this period, keeping imaginations oriented toward the sky. An increasing number of Space Age technological advances, including the first satellites, fueled interest in space travel and exploration of other worlds. Jet aircraft, including jet-powered passenger airliners and flashy supersonic military combat jets, made their widespread debut. Science fiction novels, radio programs, movies, and television specials used flying saucers and extraterrestrial life as recurring themes. The tones of these media products ranged from serious to lighthearted, capturing a wide range of audiences.



A group of stacked lenticular clouds over the Carson Valley of Nevada at sunset. CREDIT: Ed Darack

Some scientists helped fuel the speculative fire. The April 7, 1952 issue of *Life* magazine included a long feature article titled “Have we visitors from space?” The article discussed flying saucers, fireballs, and mysterious skyward lights, all within the sensationalist context of extraterrestrial origins. One of the sources cited in the article, Ger-

man scientist Dr. Walther Riedel, told *Life* that while he had never seen a flying saucer, he had kept detailed records of global sightings. “I am completely convinced that they have an out-of-world basis,” stated Riedel, who helped develop several pioneering rockets for both Germany and then the United States.

Researchers have undertaken several studies in the disciplines of mass communications, media, psychology, and sociology on the phenomenon of UFO sightings. In the paper “The effects of news stories about UFOs on readers’ UFO beliefs: The role of confirming or disconfirming testimony from a scientist” (*Communication Reports*, Volume 10, 1997 – Issue 2), authors Glenn G. Sparks & Marianne Pellechia discussed how the inclusion of a scientific authority in a news story about UFOs affected reader perception of them. They concluded: “Results revealed that participants were more likely to express belief in UFOs when the story included a scientific authority who spoke in favor of UFOs’ existence. A scientific authority who discredited the existence of UFOs did not produce lower levels of UFO beliefs.” [In the context of their study, “UFO” suggested an extraterrestrial origin.]

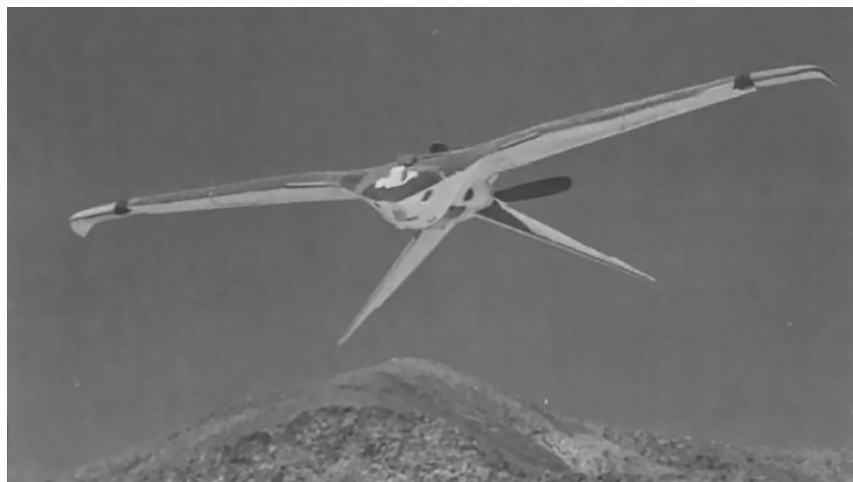
The paper “Journalism Versus the Flying Saucers: Assessing the First Generation of UFO Reportage, 1947–1967” (*American Journalism*, June 11, 2019) directs attention at media reportage for the proliferation of irresponsible narratives of UFO sightings. Authors Phillip J. Hutchison and Herbert J. Strentz stated “Journalists not only created and perpetuated the label “flying saucers,” but news organizations also thrived on a synergistic relationship with the entertainment industry.... When judged against the professional standards of the era, UFO coverage often was superficial, redundant, silly, and poorly coordinated.”

In “Cultivating paranormal beliefs: how television viewing, social media use, and podcast listening predict belief in UFOs” (*Atlantic Journal of Communication*, March 8, 2023), authors Robert Stise, et al. discussed “cultivation theory” regarding the proliferation of beliefs of extraterrestrial craft and paranormal entities. Cultivation theory describes how a media consumer’s repeated exposure to specific—often slanted—views on a topic cultivate outlooks biased toward those specific views. The paper, based on survey data, stated that specific types of media consumption “...were positively associated with belief in UFOs.” [“UFOs” suggesting extraterrestrial or paranormal origins]. These beliefs may lead many to gauge skyward sights with “confirmation bias,” a psychological predisposition to interpret a scene in a way desirable, comfortable, or satisfying to the viewer—”seeing what one wants to see.” A windblown nighttime cloud is interpreted as a mystery airship; ice crystals reflecting moonlight are interpreted as “foo fighters;” and a stationary lenticular cloud is interpreted as a supersonic flying saucer.

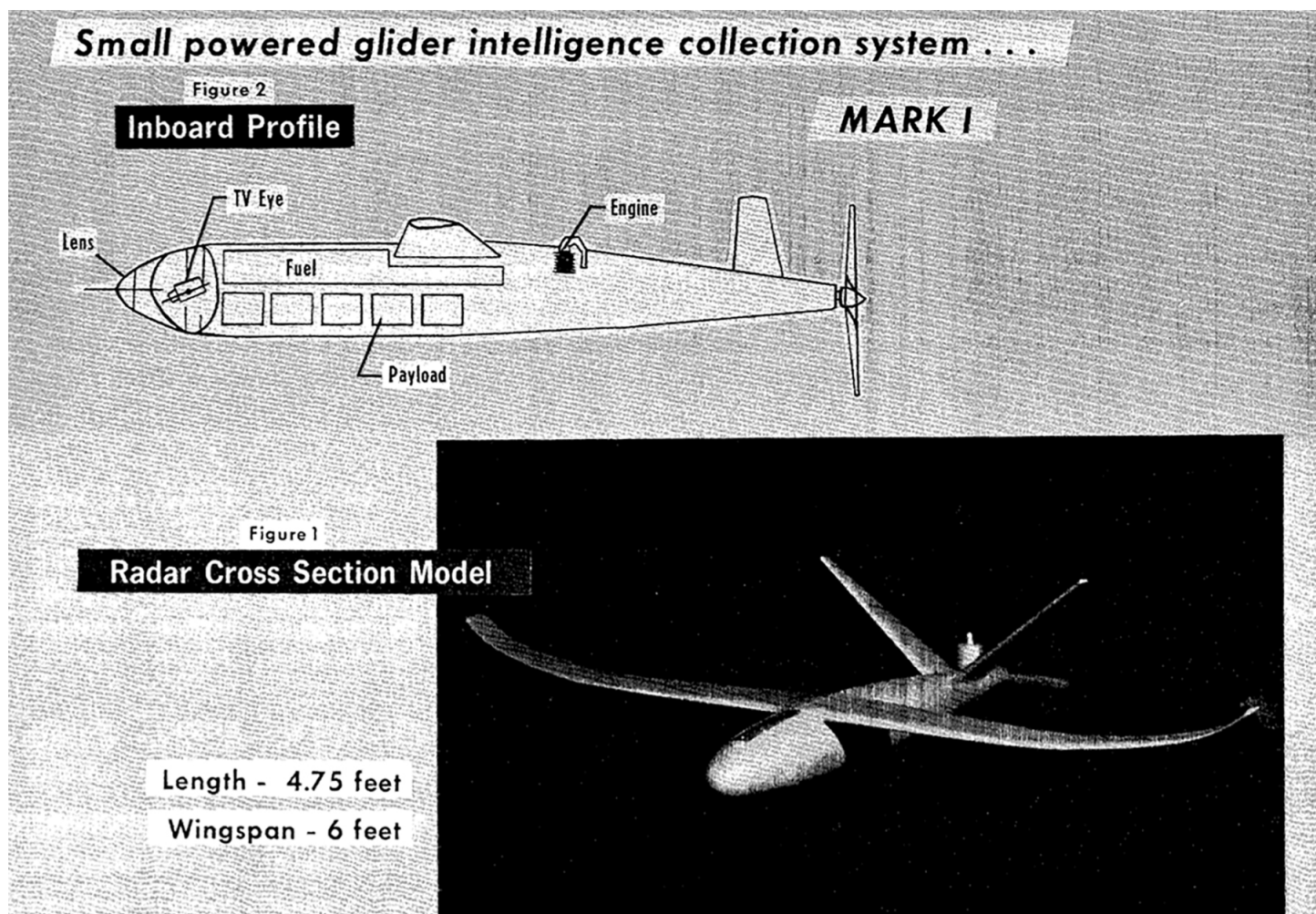
Military aerospace technology advanced at a blistering pace in the decades following World War II. Cold War imperative prompted the U.S. government to develop secretive bases throughout the country for development and testing work, notably in sparsely populated locations in the western United States. In the mid-1950s, the United States Central Intelligence Agency established a facility near Nevada’s Groom Lake that would be designated “Area 51.” Far from prying eyes, the military and its contractors developed and tested several well-known projects at Area 51, including the U-2 Dragon Lady, the SR-71 Blackbird, and the F-117 Nighthawk. They also conduct work on several systems that never advanced past the testing stage. This included Project Aquiline, a small unmanned aerial vehicle resembling an eagle that was intended to conduct clandestine ISR (intelligence, surveillance, and reconnaissance) missions.

Secret and top-secret work conducted at Area 51 and at other similar government facilities involves iterative development, advancement, and refinement of established technologies for very specialized purposes. Very little focuses on “quantum leap” initiatives (work on which is typically conducted at universities, and for which practical applications may not exist for decades). Like all other research and development centers, much of the work at Area 51 ultimately doesn’t fulfill its intent and is abandoned, like Project Aquiline (much of which was developed using

rudimentary, commercially available componentry, including a chainsaw engine). Despite this, colorful rumors emerged about Area 51 based in great measure on its level of secrecy. Narratives have included that the government develops futuristic systems based on alien technology, that the facility houses captured extraterrestrial beings (on which the CIA conducts experiments), and others. The Area 51 narratives have effectively merged conjecture about extraterrestrial visitors with fascination about cutting edge technology. They are excellent examples of how imagination fills informational voids (in the case of Area 51, these voids were imposed for national defense necessity). As mass communications



Photograph of the Project Aquiline UAV in flight at Area 51. Project Aquiline was a small unmanned aerial vehicle shaped like a large eagle for ISR (intelligence, surveillance, and reconnaissance) missions. It was developed by the CIA at Area 51 in the late 1960s to the early 1970s. CREDIT: Central Intelligence Agency



Declassified information about Project Aquiline. Project Aquiline was a small unmanned aerial vehicle shaped like a large eagle for ISR (intelligence, surveillance, and reconnaissance) missions. It was developed by the CIA at Area 51 in the late 1960s to the early 1970s. CREDIT: Central Intelligence Agency

(b) TOP SECRET documents must be transmitted via approved courier system.

(4) Access to Area 51 will be controlled from Project Headquarters, OSA. Individuals from CIA,

A passage from the declassified top-secret document “Aquiline Briefing Statement” regarding the development of Project Aquiline, a small unmanned aerial vehicle shaped like a large eagle for ISR (intelligence, surveillance, and reconnaissance) missions. Project Aquiline was developed by the CIA at Area 51 in the late 1960s to the early 1970s. CREDIT: Central Intelligence Agency

expanded in size and reach with the widespread embrace of emerging media forms including the internet and talk radio, enthusiast channels promoted these claims to a global audience. Today, many of these themes have permeated all types of media, reaching a tremendous number of people throughout the world.

Some people even began traveling to Nevada in a quest to catch glimpses of alien craft in the sky. The state of Nevada named State Route 375, which skirts the boundary of Area 51, “Extraterrestrial Highway” in 1996, capitalizing on the movement. A motel, bar, and restaurant named “The Little A’Le’Inn,” located near the boundary of Area 51 in the small town of Rachel, caters to “UFO tourists.” A visitor to the region may sight a lenticular cloud at dusk, Venus twinkling due to particularly strong atmospheric refraction, or a condensation trail of a jet aircraft passing in front of the moon, interpreting each based on personal bias. The visitor can then eat an “Alien Burger” and meet others at the establishment’s bar to discuss the sightings (and more importantly, their interpretations of them) as the occasional fighter jet roars overhead.



Nevada State Route 375, officially designated “The Extraterrestrial Highway.” CREDIT: Ed Darack



“The Little A’Le’Inn” in Rachel, Nevada, with a lenticular cloud-shaped “flying saucer” replica. Many visitors, if not most, might not be familiar with lenticular clouds, but certainly flying saucers. CREDIT: Ed Darack

Much like newspapers featured airship innovations in their reporting in the late 1800s, media outlets have focused on unmanned aircraft technology in recent decades. And like mystery airship sightings of the late 19th century, mystery “drone” (unmanned aerial vehicles, or UAVs) reports have emerged in recent years. In late 2019 and early 2020, people in northeastern Colorado and southwestern Nebraska made several reports of nighttime UAVs and UAV “formations” or “swarms.” Between November and December of 2024, reports of unmanned aerial vehicles surged in New Jersey, then New York and Pennsylvania, and then in several states throughout the country. Conjecture focused on military use and possible enemy incursions, and even extraterrestrial links. Like all previous episodes of UFO sightings in history, no hard evidence, including clear video or photographs, of any “mystery drone” emerged. Investigations concluded that the sightings could be attributed to manned aircraft, stars and planets, lightning, nighttime flights of consumer and hobbyist UAVs, and hoax reports.

The U.S. government began to officially transition from its use of “unidentified flying object” to “unidentified aerial phenomena” and “unidentified anomalous phenomena” (both “UAP”) in the early 2020s (the “anomalous” version being used for instances of observations of phenomena in water and on land). While outlets of all forms of media, from internet sites to major motion picture studios, continue to lionize UFO mysticism (with many embracing it), very few provide substantive explanations of sightings based on atmospheric science; many stories often conclude with open-ended conjecture.

Armed with some basic knowledge of the atmosphere and its various phenomena, those who experience mysterious skyward scenes can more accurately identify them or at least realistically categorize them. Some of the most common include: meteorological conditions partially concealing natural features, architecture, birds, celestial bodies, and aircraft; aircraft condensation trails in unusual shapes or configurations; clouds formed in unusual shapes, patterns, or symmetry; atmospheric refractive phenomena, including mirages; and atmospheric optical phenomena such as fog bows and sun pillars.



Graffiti of a lenticular cloud-shaped “flying saucer” hovering above a stenciled head of cattle on an open range sign on the side of Nevada State Route 375, officially designated “The Extraterrestrial Highway.” Town of Rachel in background. CREDIT: Ed Darack



An artillery illumination round, which is fired to produce light over a battlefield, during training in the Chocolate Mountain Aerial Gunnery Range, California. Illumination from aircraft, military training, and ground-based structures can be the source of UFO reports. Atmospheric effects, including mirages and partial concealment by clouds, rain, or fog can cause lights to wax and wane in brightness, flicker, and confuse viewers trying to determine their origin. CREDIT: Ed Darack

Meteorological concealment and obscuration:

Fog, clouds, rain, and snow can partially or completely conceal natural and human-made objects, creating disorientating and confusing scenes, even with large, well-known landmarks and objects.



Full moon, heavily obscured by rain from a passing evening thunderstorm, Pawnee National Grassland. CREDIT: Ed Darack



Light rain obscures the view of a C-130 Hercules military transport aircraft flying over Cheyenne, Wyoming at dusk. CREDIT: Ed Darack



Clouds of a clearing winter storm obscure the view of the upper reaches of Shiprock, New Mexico. CREDIT: Ed Darack



Low clouds obscure the view of the upper portion of Chicago's Willis Tower (formerly Sears Tower). CREDIT: Ed Darack

Aircraft condensation trails:

Condensation trails, commonly called contrails, form due to water vapor in aircraft engine exhaust condensing in cold air, forming long, string-like clouds. Temperature, humidity, vapor pressure, and wind conditions in the air through which an aircraft flies determines whether condensation trails will form, how robust they will be, and how long they will remain before dissipating. Uncommonly shaped contrails or multiple contrails serendipitously oriented in shapes or patterns can cause confusion for some unfamiliar with them.



Spiral-shaped condensation trail in sky above group of U.S. Marines training at the Marine Corps Air-Ground Combat Center outside of Twentynine Palms, California. CREDIT: Ed Darack



Two contrails in an "X" configuration above Cheyenne, Wyoming. CREDIT: Ed Darack

Clouds formed in unusual shapes, patterns, or symmetry:

While most clouds don't draw attention due to their ubiquity, those formed in unusual shapes, patterns, or symmetry may appear unnatural to some, and even incite thoughts of otherworldly origins—if the viewer is so inclined. Careful observation of any cloud will reveal its origin as it continuously changes shape due to the dynamism of the atmosphere.



A circle-shaped cumulus cloud above Cheyenne, Wyoming. CREDIT: Ed Darack



A triangle-shaped stratus cloud above Cheyenne, Wyoming. CREDIT: Ed Darack



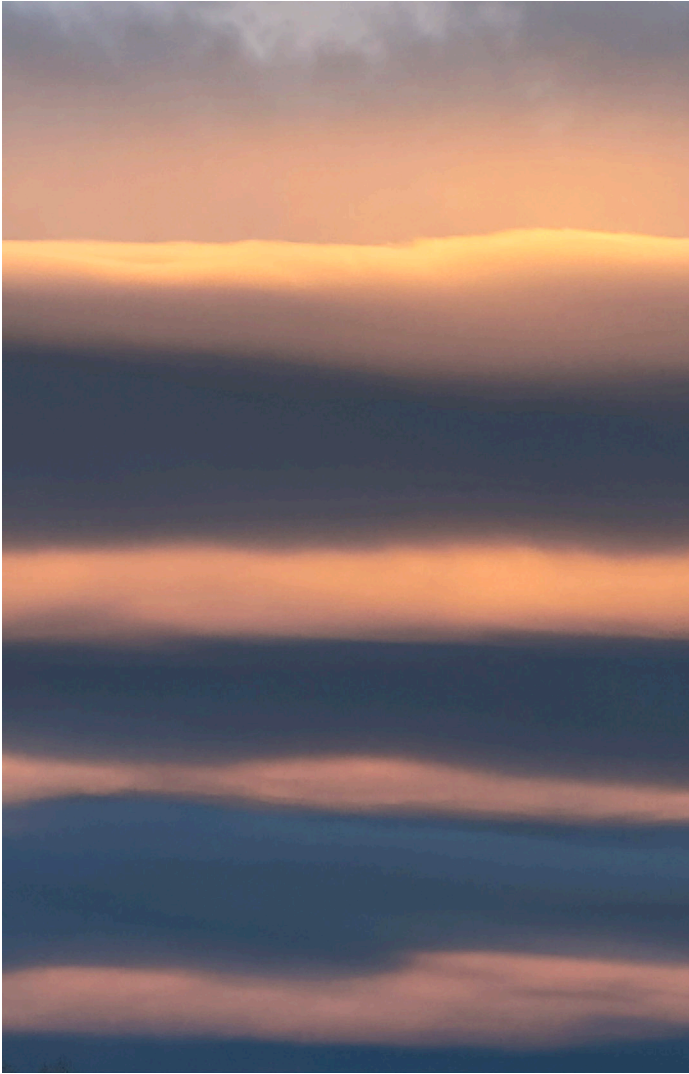
A wave cloud (left and right) over the eastern Sierra Nevada mountains of California. A wave cloud forms similarly to how a lenticular cloud forms, where moisture carried by wind-blown air is forced into higher, cooler levels of the atmosphere, and condenses. Wave clouds over the eastern Sierra Nevada mountains are called “Sierra Waves” and are renowned orographic cloud phenomena. CREDIT: Ed Darack



A stratus cloud, shaped like an elongated triangle, at sunset over Cheyenne, Wyoming. CREDIT: Ed Darack



Scud clouds in a wave formation after the passage of a thunderstorm in eastern Colorado. CREDIT: Ed Darack



Layers of stratus clouds at sunset over Cheyenne, Wyoming.
CREDIT: Ed Darack



Mammatus clouds over a windmill, near New Raymer, Colorado. Mammatus clouds form due to descending cold air condensing into pouch-shaped forms, often after the passage of a thunderstorm.
CREDIT: Ed Darack

Atmospheric refractive phenomena:

Atmospheric refractive phenomena include scintillation (apparent twinkling and shifting of position of a point of light in the sky), mirages, and color shifts of luminous bodies (like the green flash during sunrise or sunset).



An inferior mirage near Marfa, Texas dramatically distorts the view of car headlights at dawn. CREDIT: Ed Darack



A complex superior mirage, with elements of a Fata Morgana mirage, affecting the view of artificial lights in the Tularosa Basin of New Mexico. This image shows the refractive phenomenon called “looming,” where the apparent elevation of a distant object increases. CREDIT: Ed Darack

Atmospheric optical phenomena:

Atmospheric optical phenomena include fog bows, rainbows, sun pillars, halos, arcs, and others where water droplets and ice crystals in the atmosphere reflect, diffract, and refract light.



Fog bow and Brocken spectre with solar glory, photographed in the morning after a snowstorm on Colorado's Great Sand Dunes. CREDIT: Ed Darack



Sun pillar at dawn, Cheyenne, Wyoming. CREDIT: Ed Darack

Other atmospheric-related effects that may cause confusion leading to UFO reports include auroras, the effects of fires, and crepuscular rays.



Dense smoke from the Slide Fire, a wind-driven wildfire in San Bernadino County, California, at sunset. The dense smoke acts as a strong filter, dramatically altering the appearance of the sun. CREDIT: Ed Darack



Crepuscular rays behind Mount Olomana on the island of Oahu, Hawaii, photographed from the air. Crepuscular rays, often called “god beams,” are sunbeams that are typically seen when the sun is low on the horizon. They form due to scattering of light by atmospheric particulates. CREDIT: Ed Darack

Backed by knowledge of basic mechanisms of the atmosphere, and how these mechanisms manifest visually, observers can enjoy sights of the sky without confusion or fear. Believers and those biased toward the fantastical remain, however, filling voids of knowledge with chimerical musings. In 1952, during the height of flying saucer mania, country western singer Eddie Cletro released the song “Flying Saucer Boogie” (on the album of the same name). It glibly summarizes the effects of biased mindsets first demonstrated in the late 1800s with mystery airship reports. The lyrics discuss sighting “big bright lights” and “flying plates,” suggesting that these may be of otherworldly origins, but then Cletro makes a candid admission as the song’s refrain, “It’s just imagination, but I saw them just the same.”

SIDEBAR: Photography and UFO Images

Not a single conclusive image of an extraterrestrial craft, “physics defying” futuristic technology, or other “supernatural” entity or phenomena has ever emerged. Troves of film and digital images featuring out-of-focus or otherwise unresolvable dots, lines, and basic shapes do exist, however, and these are frequently used to suggest otherworldly origins. Many of these markings can be attributed to artifacts during the digital imaging process, imperfections of digital sensors, firmware problems with digital sensors, dust on digital sensors or film, and electrostatic discharges or scratches on film. Some are simply images of objects unresolvable due to distance or a combination of distance and the effects of the atmosphere, including haze, fog, or refraction.



Silhouette of a person photographing an experimental unmanned aerial vehicle (UAV) in eastern Colorado. No detailed, high-resolution photographs have ever emerged showing a truly unidentifiable flying object. Only those of known origins, including atmospheric phenomena, celestial bodies, known manned and unmanned aircraft, and other identifiable systems exist. CREDIT: Ed Darack

Images can be created to intentionally suggest a desired effect, for instance, photographing an approaching car through an inferior mirage to create the look of an unidentifiable flying craft (without using digital photography editing software). The series of images below shows an approaching car, photographed through a strong inferior mirage on a spring morning along a highway in Texas. By using an extreme telephoto view, the car is isolated against a clear backdrop, and the mirage both masks detail of the vehicle and creates the illusion of it floating through the sky. As the car approaches the camera, however, an increasing amount of detail emerges, revealing that it is a black passenger car in front of two large white trucks.



3-image series of a black car followed by two white trucks as seen through an inferior mirage. To make the images, an extreme telephoto lens was used, and the camera was placed on the surface of the roadway to maximize the effect of the mirage. CREDIT: Ed Darack