



UNCONVENTIONAL FLYING OBJECTS

A Former NASA Scientist Explains How UFOs Really Work

$\lim_{x \rightarrow 0} \frac{(1+x)^n - 1}{x} = n$

$v^2 - v_0^2 = 2a(x - x_0)$

$I = \frac{2\pi}{\omega}$

$v = v_0 + at$

$P = mv$

$v = \omega r$

$\sin^2 + \cos^2 = 1$

$F = \frac{\Delta P}{\Delta t}$

$E = mc^2$

$P = IV$
 $= \frac{V^2}{R}$
 $= I^2 R$

$E_k = \frac{1}{2}mv^2$

$y = x^2 + a$

$v = f\lambda$

$PV = nRT$

$V = IR$

Chemical structure: Oc1ccc(O)cc1

Triangle diagram with sides a, b, c and angles α, β, γ

Circle diagram with radius r and angle 109°

Graph of a parabola $y = x^2 + a$

Wave diagram with wavelength λ

Circuit diagram with a battery, a variable resistor, a voltmeter (V), and an ammeter (A)

Paul R. Hill Foreword by Robert Wood with Don Donderi

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FOREWORD

NASA aeronautical engineer Paul R. Hill began to collect and analyze evidence about unidentified flying objects (UFOs) during the 1950s, but he could not publish anything about UFOs while employed by NASA. After Hill died in 1991, it was possible to publish the book that he wrote while working for NASA, *Unconventional Flying Objects*. Hill was a good engineer—he designed the fuselage for the World War II P-47 fighter-bomber—and his UFO analysis drew on his knowledge of the physics and engineering of flight. While at NASA, Hill designed and flew a machine that used the same basic principle of thrust that he used to explain UFO propulsion—except, as he had to admit, the anti-gravity drive. That drive would have allowed that principle to explain the observed near-earth performance of UFOs, and by extension, their interstellar performance. Hill knew that UFO technology so far exceeded the capability of terrestrial technology that UFOs could not have been made by humans: therefore, they have come here from somewhere else in the universe.

Hill's approach was 20 years ahead of its time. He never became trapped in the endless speculation about the reality of UFOs; he accepted the reports at face value and let his analysis of the observed phenomenon speak for itself. And his methodology was impeccable. He took the reported observations and then directly evaluated alternative hypotheses, exploring all relevant aspects of the observations. His comprehensive analyses dealt with size, color, halos, clouds, wakes, jitter, heat, maneuvers, performance, sound, solidity, landing, weight, nests and rings, propulsion, propulsive forces, force fields, radiation, merging systems, occupants, collecting, interference, weaponry and artifacts.

Although written in technically precise language, *Unconventional Flying Objects* is easy to understand because Hill sticks to the central principles of flight, dynamics and electricity, and he uses those clearly explained principles to clarify the remarkable set of reports he compiled. The plain narrative style and the clear observations bring the book within the reach of the non-technical reader. The case histories

are easy to follow, and the information unfolds like a mystery story unraveling its plot. Sketches are simple and focus on the point in question, as if Hill were drawing them on the blackboard in his office for the visiting reader. Interspersed within the observational narrative are quantitative explanations for much of what Hill observed. The calculations are simple, comprehensible and checkable through-out—one of the necessary conditions for good technical work. The appendices carry the quantitative analysis further than in the narrative chapters, and they will interest the engineer and scientist.

As Paul Hill knew, as our scientific predecessors of the seventeenth, eighteenth and nineteenth centuries knew, and as we know, science begins with systematic observation. Observation is the foundation on which experiment, and eventually theory, is built. Observational UFO evidence began to accumulate during World War II, was still accumulating when Hill wrote *Unconventional Flying Objects*, and continues to accumulate as we write. There are close-range, multiple-witness reports by trained observers, visual observations coincident with radar tracking, ground traces of visually observed UFOs, and “dogfights” between UFOs and the fighter jets of various nations, recorded on radar and reported by the pilots themselves. We have each independently reviewed more than sixty-five years of UFO evidence. On the basis of this evidence, we both know, as did Hill, that some UFOs must be extraterrestrial vehicles.

Given the continually accumulating, and by now very public, body of evidence for extraterrestrial UFOs, why do so many leaders in science, culture and government still deny their reality? Extraterrestrial contact is upsetting for all of us. To admit that technologically superior extraterrestrials are in contact with us is scientifically embarrassing because we do not understand nature as well as the extraterrestrials, it leaves us culturally uncertain what to do about it, and it makes governments anxious about what might happen as a result. The embarrassments, uncertainties and anxieties weigh heavily on the meritocracies of science, culture and government. People resist embarrassing, uncertainty-provoking and anxiety-producing facts by building psychological defenses that allow them to maintain a state of denial that is less upsetting than the facts.

In 1890 William James explained how facts that are unrelated to any of our mental frames of reference are just not recognized—or if recognized, are only fleetingly acknowledged—because we have no

mental category with which to associate them. We do not now have the science to explain UFO performance, so the technical frame of reference for UFO evidence is lacking, and this makes the evidence easy to ignore. In 1909, Sigmund Freud theorized that upsetting facts may be repressed out of conscious awareness, at the psychological cost of a subsequent neurosis. If your professional focus is national defense, repression may be the only way you can quiet your anxiety about our technological unpreparedness to deal with an extraterrestrial adversary. In 1975, Leon Festinger explained that unpleasant facts can be ignored by metaphorically “shooting the messenger”: when you denigrate and diminish the messenger’s importance or credibility, you discredit the facts. If your role is political, shooting the UFO messenger is easier than briefing your constituents on the reality of extraterrestrial UFOs. All of these psychological defense mechanisms have been used to ignore, dismiss or deny the accumulated evidence about the existence of extraterrestrial UFOs.

The philosopher Arthur Schopenhauer wrote: “All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident.” Hill’s book has helped to move the evidence for extraterrestrial UFOs far beyond ridicule and has helped to position it in the public mind somewhere between “violently opposed” and “accepted as self-evident.” Reading *Unconventional Flying Objects* should convince you that the existence of extraterrestrial UFOs is self-evident.

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Introduction

The sighting of what has been taken to be unconventional vehicle-like objects in our skies has created great interest, surprise, and, for some, a welcome diversion to the daily routine. Others react with incredulity, even open hostility. Opinions have been sharply divided, and, as is so often the case when facts are in short supply, emotions have ruled. All must realize the tremendous potential sociological, technological, and historical impact that contact with beings from another world would create if such were established. Through the decades of the 1950s and 1960s, the believers were in the minority but, as if to make up for their lack of numbers, were very outspoken and argumentative. There was no lack of opposition after the U.S. Air Force threw down the gauntlet.

Both the believers and the nonbelievers have insisted on proof without avail, until it is now widely accepted that the proof concept does not apply, since not one of the objects has been captured and therefore none can be subjected to laboratory tests in the scientific tradition. On the other hand, proof of nonexistence is even more remote. About the best that the challengers have come up with is that the phenomena as reported seem to defy the laws of physics as we understand them. They say that for this reason the reports cannot be believed. A major intent of this book is to show that UFOs obey, not defy, the laws of physics.

One reason for the tide of opinion now running in favor of the believers, if the Gallup Poll's 51-percent figure can be so interpreted, is probably the well-known Condon Study and its recommendations which resulted in the retirement of the U.S. Air Force from their limited investigations of unconventional objects. Project Blue Book was closed. What looked at the time like a case-closed

verdict of guilty against unconventional object sightings and all they might signify, in retrospect looks more like the demise of their main opposition by public institution.

Also, partly because of the outspoken opposition to the existence of unconventional objects in our skies by U.S. government institutions and sponsored studies, a scientific protest of sorts developed. Important and distinguished men of science such as Dr. James E. McDonald, atmospheric physicist; Dr. J. Allen Hynek, astronomer and for years Project Blue Book consultant; Prof. James A. Harder of the University of California, Director of Research for the Aerial Phenomena Research Organization; and others stepped forward to demand more impartial studies in order to determine what the sightings really meant. At last the UFO witness, long the butt of ridicule from all sides, had some of the heavy guns of science on his side for a change.

A common opinion among such scientists, as set forth by Dr. Hynek in *The UFO Experience*, is that a computerized study of UFO reports is required to sort fact from fiction and to establish a bona fide pattern of observations. They feel that such a study will establish to a higher degree of probability the objective existence, or nonexistence, of what the witnesses say they have observed. One of the outstanding UFO students to take the computer study approach is Dr. David Saunders, co-author of *UFOs? Yes! Where the Condon Committee Went Wrong*. He made a good start on such a study while an investigator on Condon's study project, but he was destined not to finish it owing to his separation from the project.

Fortunately, work on cataloging UFO phenomena into categories and patterns was started long ago by collectors and analysts of unconventional object reports. Notable among these are the numerous works by Coral and Jim Lorenzen, Jacques and Janine Vallee, Frank Edwards, and the National Investigating Committee for Aerial Phenomena (NICAP) under the direction of Maj. Donald Keyhoe.

Naturally, different data catalogs emphasize different features. Sporadically over a period of 25 years and during a final two-year period of concentrated effort and analysis, I have evolved my own brief catalog of UFO

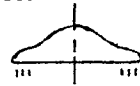
phenomena, summarized and substantiated in these pages. The items of this summary list of phenomena, comprising the highly repeating and therefore most believable aspects of the unconventional objects, will be called the UFO pattern. The UFO pattern, together with the more detailed information used in its compilation, forms the basis of this inquiry into possible scientific explanations. A review at this point of the bewildering array of data which constitutes the pattern should allow all readers to start on a more common footing. With regard to configurations, bear in mind that only highly repeating shapes are given.

The UFO Pattern: A Condensed Statement of Repeated Observations

CONFIGURATIONS, the highly repeating shapes.

Saucer

Domed saucer (most common)

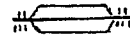
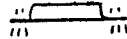


Lenticular saucer, or disk

Sometimes with low dome



Flat-topped straw hat



Double hat



Conical hat (giant)



Sphere



Saturn

Elipsoidal (egg or football)

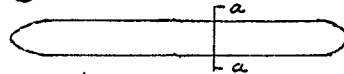
hovering —



underway —



Cylindrical (giant cigar)



Dirigible (large)

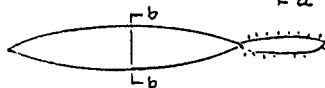


Figure i-1.

- Note: (1) Shine marks show typical nighttime air glow.
 (2) Dash-dot vertical centerline is saucer axis of symmetry.
 (3) Giant cigars have plumes also.

SIZE

The size range is tremendous, varying from something like 8 inches for a lenticular "foo-fighter" of World War II to well upwards of a thousand feet in length for the giant cylindrical shapes. Dirigible configurations range in the hundreds of feet, possibly larger. Saucers, spheres, and ellipsoidal configurations ordinarily range in the 1- to 30-meter size, and Saturn-like vehicles, so named because of their central rim, are frequently in the 5- to 15-meter range. Sufficient estimates of conical-hat saucers have not been made to suggest a range in size, but one was reliably estimated to be of the order of 200 meters in diameter. Obviously statistical studies are needed to further define the range of UFO sizes.

COLOR

In daylight, unconventional objects range from a brightly polished silver color to a dull aluminum appearance. Flat-bottomed saucers are often darker underneath in a central circular area or in an annular ring near the rim.

At night, there are two variations:

- (a) The unconventional objects carry running lights in many patterns. Sometimes they blink, making the object look like a Christmas tree or a theater marquee.
- (b) They are solidly lighted in red, orange, amber, yellow, blue or blue-violet, and brilliant white, singly or in combinations. The solid colors resemble neon lighting.

HALOS

The nighttime neon-like, solid-color luminescence emanates from an envelope of air around the objects like a halo, rather than from the vehicle directly. This halo tends to obscure the vehicle, making the edges indistinct, as we will explore further.

Around saucers and Saturns, the halo is most concen-

trated near the rim, more extensive below than above. (See shine marks on sketches.)

A unique cone of illuminating air is sometimes present below a saucer, giving it an ice-cream-cone appearance.

CLOUDS

The big cylindrical objects are sometimes surrounded with a white cloud, giving rise to the name "great cloud cigar." This phenomenon is less frequent with other configurations.

WAKES

Dirigible and cylindrical objects carry plume-like wakes when accelerating rapidly or moving at high speeds, grey to straw-colored in daylight, flame-colored at night. They can move slowly (100 mph) without generating the plume.

JITTER

Unconventional objects at times seem to vibrate heavily. If the object is also moving slowly, the movement seems jerky or jittery. It is difficult to know whether the jitter is an actual motion or an optical effect. For this reason, the phenomenon is listed with other appearance factors.

HEAT

No one complains that being near an unconventional object is like being near a hot stove. Heat radiations (infrared, etc.) from their surfaces or from the surrounding halos and wakes is missing except for mild sensations of warmth. This observation carries the strong implication that the surfaces, halos, and wakes are not very hot (i.e., nothing is at a red heat).

MANEUVERS

Hovering. Hovering at any altitude is common. UFOs also hover very close to the ground for substantial pe-

riods, sometimes giving the distinct impression that they are doing so instead of landing. (In other words, hovering seems to serve the same purpose as landing.)

Falling leaf or UFO-rock. This maneuver is similar to the motion of a coin falling in water. It most often occurs just before the UFO begins to hover.

Silver-dollar wobble. To duplicate this motion, give a coin a slow spin on a flat surface. This motion occurs at the end of a rapid descent as the UFO initiates hovering.

Acute-angle turn. This is another dazzling but common maneuver. The UFO decelerates rapidly to a stop at the point of the turn and accelerates rapidly in the new direction. (It requires acute observation to note the stop.) The right-angle turn (90 degrees) is a special case of the acute-angle turn.

Sudden reversal of direction. This maneuver surprises the witness because it isn't in the repertoire of Earth vehicles. It is actually an extreme acute-angle turn (180 degrees).

Bank-and-turn. The motions are in every way comparable to the motions of conventional aircraft—a familiar one at last!

Straight-away speed run. This maneuver also can be similar to the corresponding maneuver of conventional craft, but can be different in that it is just as apt to be vertical as horizontal or any angle in between.

Tilt to maneuver. While not actually a maneuver, this observation, which I have confirmed, is important. UFOs tilt to perform all maneuvers. For example, they sit level to hover, tilt forward to move forward, tilt backward to stop, bank to turn, etc.

PERFORMANCE

Speed. Speeds to about 9,000 miles per hour have been measured by radar at 60,000 feet altitude at Goose Bay, Labrador; by radar near 18,000 feet altitude over the Gulf of Mexico; and eyeballed between landmarks at about this speed and 3,500 feet altitude over Hampton Roads, Virginia.

Acceleration. The literature on unconventional objects is filled with adjectives of superlative degree to describe accelerations, but there are no numbers. Here my sightings and calculations can help; they place minimum values of observed accelerations at the order of 100 times Earth-surface gravity on two occasions, once for spheres and once for a big dirigible. (This is an order of magnitude more than Earth vehicles of comparable size, but far less than some small tube-launched or gun-launched missiles.)

Some reported sudden disappearances are quite likely cases of extreme acceleration, which may be beyond the comprehension of the testifying witness and even the case investigator. The major report pattern is either that they disappear with "lightning speed" or "incredible swiftness" or that they move off slowly.

Altitude. A half-dozen sightings of unconventional objects by orbiting astronauts place operating altitudes at near 200 nautical miles. This figure would seem to qualify these objects as space-worthy, non-atmospheric phenomena, possibly spacecraft.

SOUND

Hum, buzz, or whine. These are the characteristic sounds of the UFO at close quarters. The sound rises in both pitch and intensity seconds before and during take-off from hovering or landed condition. Sometimes moving UFOs make a slight swish-of-air sound. At other times, the observer is greeted with absolute silence.

Unconventional objects seldom create a roar or boom, even when moving at supersonic speed.

SOLIDITY

Unconventional objects have solid surfaces. This characteristic is attested to by those who have touched them, rapped on them, and listened to the thud or the whine of ricocheting bullets from rifle and point-blank pistol fire.

LANDING

The main pattern is that UFOs let down retractable landing gear before landing. The gear leaves well-defined prints in the contacted surfaces.

WEIGHT

Landing gear imprints are defined well enough to make weight estimates possible. The weight estimates indicate that modest-sized unconventional objects weigh tons.

NESTS AND RINGS

Saucers landing without use of gear in reeds or soft terrain leave "saucer nests."

Low-hovering saucers sometimes swirl down "grass rings."

Hovering saucers at times form chemically and physically altered annular rings in the earth itself. These are called "saucer rings."

Hovering saucers at times leave evidence of charred roots or wilted plants.

PROPULSION

Unconventional objects have "no visible means of support." They have no externally visible engines, power plant, or other visible means of locomotion or propulsion. As one witness put it, "So whatever made it go, I don't know," Pattern-wise, jet propulsion is absent (see Section XII).

PROPULSIVE FORCES

Assuming unconventional objects don't neutralize their inertial mass, the accelerations displayed place the propulsive forces at high values, too high to be accounted for by any aerodynamic principle.

FORCE FIELDS

Analysis of direct physical evidence shows that unconventional objects employ force fields. Invisible forces bend down or even break tree branches; bump or slow automobiles, sometimes spinning them out of control or even tipping them over; and stop people by force and even knock them down, among other observations.

RADIATION

Unconventional objects are highly radioactive (see Section IV).

MERGING SYSTEMS

Spheres and saucers have on numerous occasions been seen to separate from the large cylinders and dirigibles and re-merge with them. The small objects move with the large object as a swarm, or dart away at high speed in different directions, some swiftly returning.

OCCUPANTS

Occupants have been seen to disembark from and to re-board unconventional objects. On occasion, one or two occupants are seen. On other occasions, several occupants seem to work as a team or crew.

COLLECTING

Unconventional objects and their occupants engage in collecting things such as plants, minerals, and water, both manually and by automated processes such as suction hoses.

INTERFERENCE

Unconventional objects interrupt all electric circuitry, burn out batteries, and stop gasoline engines, but they don't affect diesel engines.

WEAPONRY

Unconventional objects employ heat beams, paralyzing beams, and force beams as tools and weapons, generally applied in moderation.

ARTIFACTS

Artifacts are hard to obtain, and even more difficult to prove bona fide. The most outstanding artifact is a fine white filament, left in the wake of unconventional vehicles, known as angel hair. It may be gathered by witnesses but disappears by sublimation, a direct change from the solid to the gaseous state of matter.

OVER AND UNDER WATER

Unconventional objects have been observed submerging into and emerging from bodies of water, as well as floating on the surface, often enough to form a pattern.

HABITS

UFOs at times appear in much greater numbers than usual. The resulting increase in the rate of UFO sightings and reports is called a *flap*. A flap may be confined to a single continent or may be worldwide. Flaps occur on a cyclic basis with two years being one of the periods.

UFOs appear to have preferred observational habits. Among preferred snooping sites are defense installations, hydroelectric installations, dams, and lakes. They also give preference to lone individuals or small groups and to isolated cars. They are sometimes attracted by blinking light signals.

UFOs are most often observed at dusk or early evening. They are frequently seen traveling or maneuvering over water, just off shore. They sometimes return to a given area within minutes or hours or return the following day, as though they had not concluded their observations.

Individuals may be taken aboard for examination. In

some cases, the person remembers the experience; in others, recall appears possible under hypnosis.

This UFO pattern—represented by this brief outline—contains the essentials of existing UFO data. This pattern in its entirety is all we have on which to base an understanding of the unconventional objects.

Having briefly reviewed the pattern, one can see what all the fuss has been about. If all this is true, the old dead universe many astronomers believed in is gone; the new live universe they now accept is verified, with exobiology assuming major importance; new viewpoints are given to old mythologies; religions are affected; ideas about space-travel difficulties are shattered; interest in exploration beyond the solar system is heightened; all natural sciences are given tremendous impetus; emotional involvements will be heightened; dogma of all types will be shattered. With the entire twentieth century being a period of scientific revolution, the establishment of unconventional objects as fact would add much to the revolutions, perhaps a quantum jump as some have suggested.

Be all that as it may, the process of acceptance takes time. Anyone who has read Dr. Thomas S. Kuhn's fascinating book, *The Structure of Scientific Revolutions*, must know that the acceptance of the UFO has to be the gradual process that it is turning out to be because it is man's nature, and scientific history, that old ideas are discarded only after new ideas are firmly established. It often takes new generations to squarely face new facts. Dr. Kuhn says:

No part of the aim of normal science is to call forth new sorts of phenomena; indeed those that will not fit the box are often not seen at all. Nor do scientists normally aim to invent new theories, and they are often intolerant of those invented by others. Instead, normal-scientific research is directed to the articulation of those phenomena and theories that the paradigm already supplies (p. 24).

Let us assume that crises are a necessary precondition for the emergence of new theories and ask how scientists respond to their existence. Part of the answer, as obvious as it is important,

can first be discovered by noting what scientists never do when confronted by severe and even prolonged anomalies. Though they may begin to lose faith and then to consider alternatives, they never renounce the paradigm that led them to the crisis. They do not, that is, treat anomalies as counter instances, though in the vocabulary of philosophy of science that is what they are (p. 77).

New facts and theories have to form a neat, logical package before they can be accepted, and justifiably so; otherwise technological chaos would reign. Therein lies the problem. Some degree of technological sense has to be made of the unconventional object, even to make "seeing believing." Otherwise, we are still apt to be in mythology, or dealing with the occult. If there be any doubt about this, look how members of occult groups have grabbed the ball and are sprinting with it. They have now been joined by a few parapsychologists who do little better. A prominent parapsychologist, in attempting to link the mind with UFOs, has suggested they are projected here by vast mental powers.

Objective

I seek the answers to unconventional objects in the physical sciences. Indeed, the main questions posed by the UFOs can best be formulated and asked in terms of the engineering sciences. As an example, I support the questioning viewpoint of Dr. Bruce Rogers, expressed in his article in the December 1973 *UFO Investigator*, entitled "UFOs: Their Performance Characteristics." After giving various speed and acceleration performance examples, including the case of the 9000-mph UFO in Goose Bay, Labrador, he duly asks why they don't burn up when moving at such speeds in the earth's atmosphere, and how the occupants can stand the high accelerations. Continuing the engineering science view, he questions how the vast power needed to drive them can be packaged in the limited space available, pointing out that an atomic power plant would never fit. Dr. Rogers concludes, "There is much that is mystifying about UFOs,

and woefully little information about them. But, there is one thing about which there can be no doubt. Whoever builds and operates these vehicles possess a technology incredibly advanced beyond anything known on our planet."

UFOs are indeed a technological challenge, and serious work to explain them in terms of the physical sciences is long overdue. Professor James Harder is one of the prominent scientists who have repeatedly expressed this view for a number of years. In the *APRO Bulletin* for March/April 1973, he said:

Who among UFO investigators has not wished for a clear, closeup, detailed photograph of a UFO? And what would it prove? Surely it would help settle the question, still on some agendas, of whether UFOs actually exist . . . however, is it not time to go beyond that issue to a host of scientific problems and questions that are raised once one has accepted the fact of UFO existence? It seems to me that we should be well into a second phase of UFO investigations in which the object is not so much to prove the existence of UFOs as to try and understand more about them.

The main objective of the analyses in this book is to present what can be explained of the UFO pattern in terms of today's scientific principles. If much of the pattern can be so explained, those crying "defying the laws of physics" will be discredited, making the UFO more understandable and therefore more acceptable. For the reasons stated by Dr. Kuhn, a lot of scientific sense has to be made of the UFO enigma to make UFOs acceptable. In simple terms, pieces of the jigsaw puzzle have to be fitted into place to the point where the casual observer can see the picture forming. Then the clever bystander, always present, can suggest a piece here and there to aid the progress as well as to correct misfits, for teamwork is essential in the end. But a start must be made.

Early Beginnings

I made my beginning analysis of unconventional object maneuvers in the 1950s. This work was no doubt stim-

ulated by my sighting of unconventional objects on July 16, 1952. My sighting was made at the peak of the flap for that year, tightly sandwiched between the July 14 Pan American Airways sighting in my own neighborhood and the great Washington D.C. flap on July 19, 1952. My sighting was investigated by Project Blue Book, classified as unknown, and given first public mention by Major Edward Ruppelt on pages 157-58 in his *Report on Unidentified Flying Objects*.

My background of flight experiments with rocket-supported platforms was pertinent to the understanding of the control of unconventional objects, that is, to the understanding of how they maneuver. It enabled me to correlate their tilt-to-control maneuvers fifteen years before that idea came to a member of the Condon Project. In his book, Dr. David Saunders says, “. . . information might be gleaned from a careful analysis of the relation (if any) between attitude changes (tilting) of a single UFO and changes in its direction, or speed of flight. Questions along these lines were a part of my UFO reporting questionnaire that the project never got around to using” (p. 232).

While I did not invent the idea of flying platforms, I built the first ones capable of flight testing and capable of testing flight maneuvers. They were of the type which tilt-to-control, the thrust remaining coincident with the axis of symmetry. I did not realize until after I had experienced the superb controllability of my device that unconventional objects might be controlled on the same principles. If this thought was correct, I had a nearly perfect piece of equipment for simulating their maneuvers. Another encouraging aspect was that saucer UFOs even looked like a flying platform.

I was soon doing the pendulum-rock and falling leaf, the sudden reversals, banking-to-turn, and the silver-dollar wobble, surely the first UFO maneuver flight simulations. I did them as much because they came naturally and I enjoyed doing them, as for any other reason. Although some data about some of them, such as the falling leaf and sudden reversals, was common even then, data about others, such as the bank-to-turn, was in

short supply and the experiments were almost ahead of the data. But as the data rolled in through the 1950s, the correctness of the UFO maneuver simulations became more and more evident. By the time I saw the Tremonton, Utah, movies of maneuvering disks (see Section XI) in slow and stop motion, in which I could make out the circular planforms and the edge-on fadeouts as well as the elliptic in-between on banking turns, I was totally convinced that the analysis of UFO maneuvers as presented in Section XI is the correct one.

I was prevented from making any pronouncements about this application of my work by official National Advisory Committee for Aeronautics (NACA) policy. That policy was that flying saucers are nonexistent. The NACA Director, Dr. Hugh L. Dryden, made a public pronouncement to that effect at about that time, and I had been instructed by my superior in official channels that my name could not be used in connection with my sighting or in any way that would implicate the NACA with these objects. NACA research officials were all scientists with management training in which the necessity for unambiguous policy had been emphasized. Clearly, I was destined to remain as unidentified as the flying objects. When the name of the organization was changed from NACA to NASA, the National Aeronautics and Space Administration, the same officials remained in charge, and one could notice no change in policy. The only difference was that individuals were going into space; when astronauts sighted unknowns in space, a grounded official couldn't rationally contradict them. But they could shut them off the air (*APRO Bulletin*, February 1976).

Rationale and Disciplines in the Analyses

The rationale used in the analyses is primarily simple logic, and the usual fitting of evidence to theory in what has come to be accepted as the "scientific method." Perhaps the previous paragraphs regarding the fitting of flight maneuver data to a control theory is a fair example, although we are not usually so fortunate as to have laboratory simulations.

In some cases, a process of elimination is used, a process suggested by that fictional detective, Sherlock Holmes, whose admonition was to first eliminate the impossible, for it is in the remaining possibilities, however improbable, that the answers are to be found. Since "impossible" is a dangerous word to associate with unconventional objects, the concepts eliminated are those which do not fit the data, or the UFO pattern. Section V presents an example. All the known particles of modern physics, together with their antiparticles (with the possible exception of the four neutrinos) are eliminated as propulsion possibilities in the following sense. A beam of high speed particles shot out from the UFO cannot be a realistic basis for their propulsion because such beams would have gross effects, such as gross heating or lasting radioactivity, not evident in the UFO pattern.

On the other hand, it is well known that any process of elimination, however well based, is circumstantial evidence of the weakest character with respect to the positive identification of a single result. Fortunately, while I was eliminating all known forms of propulsion possibilities except acceleration fields, I uncovered a substantial body of direct evidence that UFOs use and direct acceleration fields in the proper direction for propulsion. This is nearly the same as saying they direct force fields; this trait is so listed in the UFO pattern outline and supported by the data of Section VI. The next consideration is whether the field is electric, magnetic, gravitational in nature, or something else.

But the unconventional object can be explained by no one phenomenon such as magnetic-field propulsion or gravitational propulsion; nor can it be explained by any one technology. A multi-disciplinary approach is a minimum requirement. In considering the correctness of a group of theories resulting from a broad approach, one needs a yardstick which will enable the viewer to stand back and take the measure of the picture forming as the pieces of the jigsaw puzzle are fitted together. A good yardstick was found in *UFOs and Diamagnetism*. According to the author, Eugene Burt, a leading physicist wrote the following statement in criticism of Burt's theory:

I see little point in a debate on a particular, essentially ad hoc hypothesis. What counts in the structure of scientific concepts and theories is not the workability of an hypothesis concerning a particular phenomenon but the entire network or matrix of ideas including this particular phenomenon and everything else with which it is connected. The test of correctness is not a single line of logic but the internal consistency of the whole network—one must be able to traverse the network in any direction and have things hang together without contradictions (p. 117).

This masterful statement applies to UFO theory as well as to all branches of organized knowledge. I am trying to conform to it.

What's a Good Name?

While an appropriate name for unconventional objects is beyond the scope of this book, I thought I should point out that *UFO* is not a reasonable name or acronym, and explain what I mean when I use it.

One to two hundred years ago, science was called natural philosophy, and scientists were known as natural philosophers, or naturalists. When a field naturalist made a discovery, he first identified the find as something new or a variant of organized knowledge. He then classified it, and gave it a descriptive name. Now when we discover an unconventional object, we identify it as "unidentified" and name it the same! On the first page of *The Report on Unidentified Flying Objects*, we find whom to thank for this contradiction. Major Edward Ruppelt says, "UFO is the official term that I created to replace the words flying saucers."

One suspects that a field naturalist would have done considerably better, as naming was their specialty. Ruppelt scored a complete miss on two out of three words: *unidentified* and *flying*. It is assumed that anyone with a good dictionary can see why unidentified is a misnomer. As to flying, the atmosphere has no more than nuisance value to the unconventional craft, which, unlike aircraft, use the atmosphere neither for support

nor for locomotion. Unconventional objects, or craft, don't fly. They are vectored along trajectories.

Even the word *object* is almost totally un-descriptive, except that it correctly indicates something solid, and not a mere plasma, light, mirage, or other form of natural phenomena.

Borrowing the adjective *unconventional* from Coral Lorenzen's usage, I use *unconventional object* until a more descriptive name appears or is accepted. Since *UFO* is shorter and so well known, this acronym is used with the understanding that the U stands for unconventional. *UO* would be more accurate, but I do not propose it, preferring to leave naming to people with the proper talent.

The term *saucer* is used to refer to a craft that moves through the atmosphere without an obvious means of support or propulsion, a form of unconventional object as we have described it. A saucer is characteristically shaped like two saucers placed lip-to-lip and may have a rounded dome or cupola on top. Alternatively, it may be shaped like a straw hat or a single inverted saucer or bowl. Saucers are characteristically surrounded by an ionized atmosphere, or plasma, that gives them nighttime illumination in red, orange, yellow, green, blue, or white, and often gives them a mist-shrouded appearance. They are silent except for a hum or buzz noticeable to near observers.

The acronym *UFO* is a wider generic term than *saucer*. It refers also to unconventional objects of other shapes as well: spherical, Saturn-shaped, egg-shaped (ellipsoidal), dirigible-shaped, and cigar-shaped. Specifically, *UFOs* are vehicles capable of operation both in space and in the earth's atmosphere.

At no time does the term *UFO* refer to a *UFO* report or to a misidentified object or natural phenomenon.

Data Sources

There is now a lot of good *UFO* data, thanks to the private organizations whose people have encouraged *UFO* reporting and have investigated, filed, and cataloged the data, published it in bulletin and book form, and are continuing to do so. In writing this analysis, I

have placed major reliance on these sources; I could have done nothing without them. The bulletins to which I refer are the *APRO Bulletin*, published by the Aerial Phenomena Research Organization of Tucson, Arizona, and the *UFO Investigator*, published by the National Investigations Committee on Aerial Phenomena of Kensington, Maryland.

Many complaints have been noted about the lack of hard UFO data. It has been the nature of UFO data to be primarily in anecdotal form. Still, some measurements and many good estimates have been made of the UFO phenomena which have been parametrically classified. While there is admittedly a shortage of hard data, I do not subscribe to the complaints. It is my experience that exploratory research is usually done with a modicum of good data, and UFO research simply fits the rule. I believe that the problem is less with the data than the data readers. As Professor of Philosophy Emerson Shideler said, we need "to be readier to accept phenomena as reported" (*APRO Bulletin*, November/December 1971). That is the data. On occasion I knowingly use data that some have rejected as false, but those who have rejected it are usually those who reject all data not explainable as natural phenomena. The first step in this analysis is to accept the data that fits a consistent pattern.

There are hard data shortages in the measurement of gravitational and magnetic fields near UFOs and in the measurement of electromagnetic wave characteristics from the lower gamma wave frequency through x-ray, ultraviolet, visible, and even radio frequencies. Insofar as the understanding of UFOs is concerned, more high acceleration data would definitely help. However, there is already enough speed data to show that in our atmosphere UFOs have speeds that cannot be matched by aircraft or rockets.

Organization of the Analysis

The analysis is broken into sections, each covering a general topic. To some degree the order of the topics is determined by which questions can be most firmly an-

swered. UFO theories or explanations can be considered either as possible or plausible explanations, or as real explanations. I have ordered the topics as I have so that the first dozen or so sections should entertain theory with a high probability of being the real explanation. (I never was one who lacked the courage of my convictions.) The remaining sections, beginning with supersonic aerodynamics, present what should be at least good possibilities. This unusual ordering presumably has the psychological advantage of seeking areas of agreement between author and reader early in the book. Section XVIII, on interstellar travel time, however, is straight, bona fide science, and can hardly be wrong unless the entire twentieth-century physics is wrong. It therefore does not necessarily follow that explanations offered in the second half are less real. Groundwork and technical considerations come into the ordering also.

Section I is a simple presentation with the aim of making the reader realize that the UFO is a solid, down-to-earth object or machine, not some nebulous natural phenomenon.

Section II treats UFO speed and acceleration performance because performance has been such a point of public concern. I have never seen UFO acceleration data. Accelerations are invariably described by adjectives, mainly superlatives bordering on or including the infinite. While these descriptions are sensational, they are bad science. I therefore take the liberty of boring the reader with two formulas useful in the calculation of acceleration, and illustrate the procedure to obtain what may be the first acceleration data. At least the data is new, for it is taken from my own sightings, which happen to suit.

With some preliminaries out of the way, Section III begins to hammer out an explanation of the most commonly observed UFO phenomenon, their glowing halo. A hundred years ago this illuminating ion sheath around a UFO would have been the same total mystery to science that it is today to the casual observer. But with today's quantum-mechanical principles, the explanation is a piece of cake. The A and B of quantum mechanics is

explained, if not the C to Z, as it pertains to molecular ionization.

Section IV substantiates Section III by showing radioactivity in the x-ray range to be the obvious cause of the ion sheath.

Section V eliminates high speed ejected particles as a possible means of UFO propulsion.

From there, the analysis progresses toward the field explanation of UFO propulsion in an order that is self-explanatory.