

# Radar UFOs: Where Have They Gone?

*The answer lies in improved radar and computer technology*

Philip J. Klass

**U**FOLOGY IS in the doldrums, as even its most ardent promoters admit. The reasons are many. One contributing factor is that reports of UFOs being spotted on radar, which occurred frequently during the 1950s and early 1960s, have almost completely disappeared. Such reports offer impressive evidence to the layman of alien craft in our skies, even if not to those who design radars and know of their vulnerability to spurious echoes.

If the UFO proponents were motivated by scientific curiosity, they would be searching for an answer to the disappearance of radar-UFOs. But even if they were so motivated, their conviction that the U.S. government is engaged in a massive "UFO coverup" could prompt them to conclude that UFOs are still showing up on our radars but that this is being kept secret.

Possibly a few UFOlogists might leap to the conclusion that the UFO builders in some distant, advanced civilization finally have discovered the "stealth techniques" that the United States plans to use in our next-generation military aircraft, to reduce their detectability to enemy radars. In reality, the reason for the sharp dropoff in radar-UFO reports is advanced technology—not "theirs" but ours!

Ever since its invention during World War II, radar has been plagued by spurious echoes, often caused by a temperature-inversion in the lower atmosphere that causes some of the energy from a ground-based air-surveillance radar to be "bent" downward so that it reflects off objects on the surface. As atmospheric conditions change, an anomalous "blip" can disappear from one area on the radar display and another unrelated blip may soon appear in another. An inexperienced operator can easily conclude that the object causing the blip has moved, say, 100 miles in 30 seconds, corresponding to a speed of 12,000 mph—clearly beyond the ability of any known terrestrial craft, i.e., a UFO.

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Flocks of birds in flight reflect enough radar energy to show up as a well-defined target and, as radars became more powerful in the 1960s, even a single sea gull could generate a spurious target on air-defense radars.

In response to the Soviet acquisition of nuclear weapons and a large fleet of long-range bombers, in the 1950s the United States sought to erect an effective air defense. During World War II, information on enemy aircraft detected on radar was telephoned to a central air-defense facility where the location and track of each target was plotted by human operators on large plastic boards using grease-pencil. But this method was much too slow to cope with jet-powered bombers armed with devastating nuclear weapons. The newly invented digital computer seemed ideal to take over the task of tracking enemy aircraft, predicting their future positions, and directing our own interceptors. The radar data giving each target's bearing, range, and altitude could be transmitted rapidly and directly to the computer for processing.

The computers selected for this vital air-defense mission, built by IBM, were monstrous in size, for they used vacuum tubes instead of today's microcircuits. But despite their size, the computer memory/storage technology of the 1950s was so primitive that each computer could only keep tabs on a few hundred targets simultaneously. This was adequate for the projected size of the Soviet bomber fleet if each radar target fed into the computer was a legitimate one. But if there were many spurious targets, generated by atmospheric conditions or birds, the computer memory would become saturated, leaving no capacity to handle legitimate threats.

Another problem was how to transmit data from the far-flung radar sites to one of the air-defense computers that typically was hundreds of miles away. To avoid having to use costly microwave relay stations, it was decided that each radar would only transmit information on legitimate targets (their bearing, range, and altitude), which could be done using relatively low-cost telephone lines. Other data, such as echoes from thunderstorms and birds and spurious echoes caused by anomalous propagation conditions, would be filtered out at the radar site.

This decision, born of economic and operational necessity, together with the technology developed to implement it, would ultimately spell the demise of the radar-UFO.

UFO proponents claim that an experienced radar operator would never be fooled by a spurious target, sometimes called an "angel." Certainly an experienced operator is less susceptible than an inexperienced one. But radar and computer designers discovered that the problem of discriminating between real and spurious targets sometimes can be very difficult. This is evidenced by the fact that it has taken more than a decade to develop computers and software smart enough to make such decisions.

Ironically, one of the several criteria used to discriminate between real

and spurious targets would filter out potential radar-UFOs even if they were legitimate extraterrestrial craft flying at hypersonic speeds, as will be explained.

Both military and civil air-surveillance radars have rotating antennas that get a brief look at a target only once during each revolution. This varies from once every 4 seconds for short-range airport radars to once every 12 to 15 seconds for long-range radars. The computer that tracks these radar targets is programmed to calculate the speed of each by measuring the difference in position of the target on successive scans. For example, consider a radar whose antenna rotates through 360 degrees once every 15 seconds. If the target's position changes by 2 miles between successive scans, the computer calculates that the craft is moving at 480 mph.

Because the fastest U.S. military aircraft have a top speed of around 2,000 mph, a computer program intended to filter out spurious targets may be set so that any object that appears to be moving erratically and at more than 3,000 mph (allowing a 1,000 mph cushion), based on successive scans of the antenna, is presumed to be the result of anomalous propagation conditions. (If the time should come when U.S. military aircraft, and possibly Soviet aircraft, fly at 3,000 mph, obviously the computer program would need to be updated.)

Similarly, at the opposite end of the speed scale, the computer may be programmed to discard any airborne target that seems to be flying at less than, say, 40 mph to prevent echoes of birds from saturating the system.

With the advent of low-cost microcomputers, radar designers have been able to introduce a number of additional, more sophisticated filtering techniques to further reduce the prospect of obtaining spurious echoes. These improvements are coming into use on new-generation civil and military radars.

Still another blow to the radar-UFO came in the early 1970s, when the Federal Aviation Administration introduced two innovations. One was the use of computers to monitor and track aircraft for air-traffic-control purposes. The other was the use of a radar transponder, required for all airliners, all military aircraft, and many privately owned aircraft.

When a transponder-equipped aircraft is illuminated by a ground radar, the transponder sends back a brief coded message that gives the aircraft's barometric altitude and an identity code that the computer can translate into, for instance, TWA #800. Such signals make it far easier for a computer to track each aircraft than is possible using a weak reflected signal, which can be seriously attenuated if the aircraft is flying through clouds.

These innovations, introduced in the early 1970s, made it possible to provide traffic controllers with displays that not only show the bearing and distance to each transponder-equipped aircraft, but also its altitude,

its identity, and even its speed.

For those smaller general-aviation aircraft not equipped with transponders, the radar echo is used, but it is analyzed. Spurious echoes are filtered out at long-range radars so that spurious targets are never displayed for controllers at the FAA's enroute-traffic-control centers.

The shorter-range radars at airports until recently have displayed both the "raw radar" data and the decoded transponder information, but the equipment at more than 60 major airports is being upgraded so that controllers will have displayed only those radar echoes that the computer is quite confident are aircraft.

As new-generation radars, with improved capabilities for filtering out spurious targets, are installed at the nation's major and middle-size airports, some of the older-generation radars replaced are installed at small airports with low traffic density.

These older radars, without modern spurious-target filtering capability, did produce a few radar-UFO reports, especially before controllers at the smaller airports learned of their idiosyncrasies. But today even these old hand-me-down radars are providing few radar-UFO reports, thanks to their more experienced operators.

As a result of much improved radar and computer technology the nation's air-traffic-control system operates more efficiently and with greater safety. But it would not be surprising, after publication of this article, if some UFO-promoters should charge that the U.S. government has installed this new equipment, at great taxpayer expense, simply to filter out "legitimate UFOs" as part of a massive coverup. ●