Journal of Scientific Exploration, Vol. 14, No. 4, pp. 583–622, 2000 0892-3310/00
© 2000 Society for Scientific Exploration

Reanalysis of the 1965 Heflin UFO Photos

ANN DRUFFEL

257 Sycamore Glen, Pasadena, CA 91105

ROBERT M. WOOD

1727 Candlestick Lane, Newport Beach, CA 92660

ERIC KELSON

10201 Lindley Avenue, Apt. G-99, Northridge, CA 91325

Abstract—Photography is one of the few sources available that can demonstrate the scientific validity of UFO phenomena. The Heflin photos, taken in Santa Ana, California, in 1965 were regarded as most probably genuine until 1968. Then questions arose from scientists and other UFO researchers that remained unanswered until the 1990s, mainly because the four original photos had been taken by unidentified persons posing as government personnel. In 1993, Heflin's Polaroid originals surfaced unexpectedly under mysterious circumstances, and reanalysis was resumed by a three-member team, including two scientists and a veteran UFO investigator. State-of-the-art computer enhancement has revealed new data that answer all prior doubts and questions and discloses additional information that could not have been available at the time they were taken. In this article, we address the validity of the objections as originally put forth and the results of the computer-enhancement analysis. A second article, to follow, details more technical aspects of the computer-enhancement analysis performed.

Keywords: UFO photographs—vortex rings—Rex E. Heflin—photo computer enhancement—Fort Belvoir, VA—James E. McDonald, Ph.D.

Introduction

Historical Elements of UFO Photo Analysis

In the earliest era of UFO research, investigators realized that only those reports in which *documented proof* could be obtained would convince the scientific community that UFOs were actual objects. The main problem has been, from the beginning, to convince the scientific community at large that the UFO phenomenon constitutes a question worthy of serious study. Only by doing this can adequate attention and funding be brought to the problem. One class of sightings that offered hope of proof that a scientific mystery existed was photo cases that held up under careful scrutiny.

Very few earlier UFO photos survived scientific analysis. Some had been presented as genuine UFOs that proved Frisbees, hubcaps, disc-shaped lamps

reflected in windows, lens flares, balloons, lighted air vehicles, and more recently, computer-generated hoaxes.

The four Heflin photos taken in 1965 allegedly depicted a close passage of a UFO, and an all-out effort was launched to study them. The major UFO research organization of the time, the National Investigations Committee on Aerial Phenomena (NICAP), spared no effort to have them examined by the best photogrammetrists available, as did other smaller research groups. By the time the case was considered authenticated by the Los Angeles NICAP Subcommittee (LANS), the pictures had been studied by six photographic experts or teams and the integrity of the photographer, Rex E. Heflin, had been established beyond doubt. The event received media coverage all over the world, and the photos were reprinted in UFO journals in many countries. One of the photos even appeared in the 1968 *Encyclopedia Britannica* under a section titled "Spacecraft" (*Encyclopedia Britannica*, 1968). Many aspects of the investigation, including an intense reanalysis that has been on-going since 1993, are revealed here for the first time.

Essential Facts of the Heflin Sighting

On August 3, 1965, at about 12:30 p.m. PDT, Rex E. Heflin, age 38, stopped his work van near the intersection of Myford Road and Walnut Avenue, on the boundary of Orange County, near the city of Santa Ana in southern California. Heflin wore no watch and had to estimate the time. He was about one half a mile outside the perimeter of El Toro Marine Base, and his van was facing in a northerly direction. Some branches of a tree were obscuring a railroad-crossing sign, and Heflin had stopped to photograph it, for he was a highway maintenance engineer for the Orange County road department; part of his job involved keeping all traffic signs clearly visible. He attempted to report the obscured sign to his supervisor on his van radio but was unable to get through due to an unexplained failure of the radio.

Still inside his van, he was about to photograph the sign with his Model 101 Polaroid work camera, which was loaded with ASA 3000 film. He suddenly saw a flash of motion on the periphery of his left eye and then viewed a silvery craft flying slowly from left to right across Myford Road. The object's general appearance caused him to assume that it was an experimental aircraft from El Toro. It appeared to be about one eighth of a mile away and at about 150 feet altitude. Heflin judged its approximate size by comparing it to the traffic lanes over which it flew. These lanes, he knew, were 20 feet wide, and the craft was about the same apparent size (Heflin, 1965).

As the flying object crossed Myford Road, it seemed to hover and Heflin photographed it through his windshield as it crossed his line of vision (Figure 1). As the craft moved toward the east, it tipped and revealed a dark underside. "This is when I saw a rotating beam of light emitting from the center of the UFO on the bottom side," Heflin stated in his September 18, 1965, signed statement to the first UFO investigator, engineer Edward Evers, who inter-

Fig. 1. First photograph of Heflin sighting (Heflin Photo 1).

viewed him on behalf of NICAP and LANS (Heflin, 1965). Heflin described the beam as greenish white and rotating clockwise around the bottom from the center out to the rim; each rotation took about 2 seconds. He snapped a second photo through his passenger window (Figure 2).

Throughout its passage, the craft seemed to "wobble" slightly. In Heflin's words, its motion was "similar to a gyroscope when losing its stability." As the object moved further east, it began a turning motion, and Heflin snapped a third photo (Figure 3). "The UFO continued moving away, slowly gaining altitude… seemed to gain stability, then it increased its velocity and altitude more rapidly leaving a deposit of smokelike vapor" (Heflin, 1965). It then disappeared into the distance traveling north northeast over the Santa Ana Freeway that cut across the landscape about seven eighths of a mile away. A ring of bluish-black smoke hung in the sky at the same altitude and azimuth as the craft's position before it began its rapid departure.

Heflin drove north on Myford Road 100 or 200 yards toward the smoke ring, which was slowly rising in altitude and traveling northeast with the wind at an angle of about 50-degrees elevation. When he got close to the smoke ring, he got out of his van and photographed it (Figure 4). The only reference points in this fourth photo, besides clouds from an overcast sky, were a tele-

Fig. 2. Second photograph of Heflin sighting (Heflin Photo 2).

phone wire and a small portion of an orange tree in a nearby commercial grove. Heflin judged the ring to be three to four times larger than the diameter of the craft with which he assumed it was associated. The smoke ring was being bent out of shape by light winds. He was nevertheless surprised at the ring's "solid" appearance; it did not dissipate like ordinary smoke. Still thinking he had photographed an experimental plane, he turned his attention back to his work and found that his radio now worked normally (Heflin, 1965).

He was not particularly excited about the pictures he had taken and didn't mention the incident to anyone until he showed the photos that afternoon to a few coworkers in his Santa Ana office. They caused considerable interest, but some of his workmates seemed agitated by the fourth picture of the smoke ring; it wasn't anything one would expect to see associated with experimental aircraft. Heflin decided that "three pictures were enough for one day" and stopped showing the fourth (McDonald, 1968). In fact, he thought little more about any of them until some of his relatives and friends became intrigued with them.

Thinking that Heflin might have photographed a UFO, some of his coworkers asked to borrow the pictures, and he loaned them the originals to be copied. He also loaned the originals to his sister, Mrs. William Fincher. Final-

Fig. 3. Third photograph of Heflin sighting (Heflin Photo 3).

ly, Mr. and Mrs. Pat Hurley, friends of the Finchers, borrowed them and took them to a drugstore in Santa Ana, of which Mr. Hurly was part owner. Mrs. R. C. Hoiles, publisher and co-owner of the *Santa Ana Register* newspaper saw copies of the photos in Hurley's drugstore and asked to borrow them for possible publication.

Mr. Clay T. Miller, chief photographer of the *Register,* set about tracking Heflin down at his work. He persuaded him to bring the originals down to the newspaper office to be copied, but only after some hesitation on Heflin's part because he sought no publicity or remuneration. He still regarded them, at the time, as pictures of an experimental craft from El Toro. Six sets of negatives of the first three photos were made by Clay T. Miller, but they were cropped for easier publication, cutting off the foreground, which showed the shadow of a nearby telephone pole, in Photo 1. However, Mrs. Fincher had also loaned the originals to another friend, who took them to Wayne Thornhill, an amateur photographer. Thornhill also made copies, which were of lesser quality than the *Register's* but were not cropped. The foreground features later proved invaluable in ascertaining the exact time of sighting (later determined through Griffith Observatory to be about 12:37 PDT).

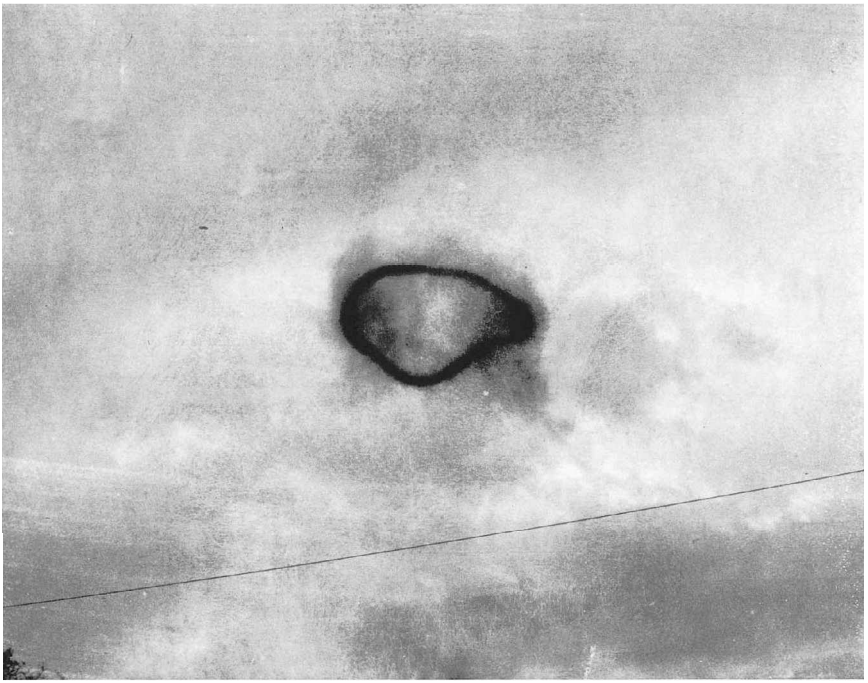

Fig. 4. Fourth photograph of Heflin sighting (Heflin Photo 4).

Aftermath of the Photos' Publicity

The *Register* checked at El Toro Marine Base, inquiring if any personnel there had seen the craft. El Toro officials stated that no other reports had been received and denied that the object was an experimental aircraft from their base. Heflin's first three photos of the unidentified craft were published for the first time in the *Register* on September 20, 1965, 6 weeks after the event had occurred. Heflin was never asked for permission to print the photos, and even though they were subsequently published widely in journals and magazines throughout the world, he never copyrighted them or asked for any remuneration for their use for 30 years.

As a result of the *Register's* story, years of investigation by UFO researchers began, as well as continual harassment of Heflin by curiosity seekers. Through it all, Heflin never sought publicity, but when he was sought out by objective researchers, he was always forthright and cooperative. Primary among these was the investigative team from LANS, which was headed at the time by Dr. Leslie K. Kaeburn, a noted biophysicist. Several qualified NICAP investigators participated in the LANS study, including John Gray and Edward Evers, two aviation engineers employed at North American Aviation. Idabel Epperson, an objective researcher who was cochairman of LANS (and

chairman after Dr. Kaeburn's death in 1968), was also an active investigator on the case. Other subcommittee members also participated, and various UFO researchers around the country launched independent investigations.

By the time LANS became involved in the case in September 1965, Marine Corps Intelligence officers had come by Heflin's house, interviewed him, and borrowed the first three pictures to make copies. Heflin did not ask the Marines for a receipt, yet they requested *him* to sign a receipt when they returned the photos unmarked. (The only marks on the four originals were the numbers 1, 2, 3, and 4, which Heflin had written in blue ink to demonstrate the sequence in which they had been taken.)

The U.S. Air Force also contacted him and conducted an official inquiry. The investigating officer, Captain Charles F. Reichmuth, interviewed Heflin for more than 3 hours and also copied and returned the photos unmarked. He checked with Heflin's supervisors and learned that he was a valuable employee—mature, alert, and trustworthy. Reichmuth noted in his official report that he "could find no evidence to disagree with this estimate." He sent his report to Project Blue Book at Wright-Patterson AFB in Dayton, Ohio (Reichmuth, 1965; Young, 1967).

In spite of Reichmuth's generally positive report, a Project Blue Book "Photo Analysis Report" describes a comparison photo, made by other Air Force officials, of a 9-inch tray tossed into the air at 15–20 feet from the camera. The results of the Air Force experiment evidently satisfied Project Blue Book personnel that the photos were hoaxed. Blue Book was, at the time, the only publicly known official Air Force group responsible for studying UFOs, and it officially listed the Heflin photos as a hoax (Project Blue Book Files, 1965). This Blue Book assessment was made despite that Captain Reichmuth's report had stated, "From all appearances, he [Heflin] is not attempting to perpetrate a hoax" (Reichmuth, 1965).

A man representing himself as a NORAD colonel phoned Heflin on September 20 and arranged to meet him 2 days later, warning him not to discuss the event further with the press. On the evening of the 22nd, two men in civilian clothes, claiming to be from NORAD, came to his door. One of them flashed a salmon-and-green card, which, to Heflin, looked similar to those carried by El Toro Marines. Heflin did not remember the name on the ID but noted that it did not have a photo. The second man did not participate in the conversation. Heflin obligingly lent "the NORAD man" the three pictures of the craft, fully expecting that they would be returned, as they had been returned by the U.S. Marine Corps (USMC) and the U.S. Air Force.

The self-proclaimed NORAD men never returned the photos. Heflin tried to track them down with NICAP–LANS assisting in the search. NORAD disclaimed any knowledge of the photos. Heflin even contacted his Congressman, Representative Utt, who inquired on behalf of Heflin and was assured that NORAD offices had been searched from top to bottom with no results. The identity of the "NORAD men" remains a mystery to this day.

The First Photogrammetric Analyses

As a consequence, Heflin and UFO researchers were left with only *copies* of some of the best UFO photos that had come to light. The first groups of photogrammetrists who studied them could be assured of first-generation copies made directly from the originals; now the originals of Photos 1, 2, and 3 were no longer available. Heflin was criticized by some in the UFO field for lending out his original photos in what they considered a careless fashion. Heflin, however, was used to working with military officials in the course of his work and was by nature a trusting individual. He had been basically a skeptic regarding UFOs and for weeks after the event continued to think that the object was probably an experimental aircraft.

Not until scientists and engineers connected with NICAP–LANS and other organizations took interest in the photos, and particularly after they disappeared, did he begin to think he had photographed something highly unusual—i.e., a possible UFO. As the number of researchers who wanted to analyze them grew, it soon became impossible to ensure whether or not the copies they were working from were first-generation copies or not, since the originals were no longer available. The danger of "tampering" in second- and third-generation copies grew.

In the spring of 1966, a highly respected scientist, Dr. James E. McDonald, actively entered the field of UFO research. McDonald was senior physicist at the Institute of Atmospheric Physics at the University of Arizona at Tucson. To him, the government's apparent neglect and disinterest toward UFOs was untenable, and his own research had convinced him that UFO reports presented a serious scientific problem. He had studied the UFO phenomenon since 1958 and had worked closely with NICAP personnel and other smaller scientific UFO groups and individuals throughout the United States, Australia, New Zealand, Canada, France, and Russia (McDonald, 1968a).

Since 1966, he had been lecturing on the UFO problem to scientific organizations including the American Institute of Astronautics and Aeronautics, the American Academy for the Advancement of Science, the American Meteorological Society, and other scientific groups whose interests bordered on atmospheric physics. Besides his scientific talents, he was a prolific writer who had hundreds of highly technical and semitechnical articles published in referred journals. His interest in informing the public also prompted him to contribute to popular magazines such as *Scientific American* (McDonald, 1953).

The numerous objective UFO researchers with whom he became personally acquainted were intrigued by his scientific excellence, flawless reputation, and persistence, as well as his cordiality and humor. By March 1967, he had taken an active interest in the Heflin case, and long letters regarding every aspect of the investigation traveled between NICAP–LANS and Tucson, Arizona. McDonald also investigated the case by telephone, holding long conversations with any source that could give him information about Heflin's character and reliability.

Eventually he concluded that Heflin's photos were among the very few UFO pictures that could be considered "probably genuine." He included them in his list of "100 best cases," which he sent to the Condon Committee's staff with the suggestion that they be investigated by that government UFO study group, which at the time had been newly funded. Extremely dubious of the Air Force "hoax explanation," McDonald wrote in his "Heflin" file, "Wonder if anyone had taken Rex's camera, set it for 15 feet, shot a 9-inch pan, then checked for blurring of the freeway power lines visible in Heflin's photos?" (McDonald, 1968). Photo analysis had already shown that the telephone lines (and the UFO) were in sharp focus, indicating that Heflin had held his camera steady as he snapped his four photos.

He also investigated the interference on Heflin's van radio, because this was a reported physical effect that could be checked out. He confirmed that the radio malfunction *had* occurred and that other Highway Department radio systems in the area had also been affected. When Heflin had called in after the incident, he was told that others on the system had failed to get any signal at the time his own radio went dead. His superiors considered the incident very odd and encouraged Heflin to have the radio checked, even though the radio had worked perfectly after the UFO flew out of sight. The radio was checked, but the technician had found nothing wrong.

The radio trouble, therefore, was not normal static or interference—the system was "just dead," as McDonald wrote in his "Heflin" file. Consulting with a University of Arizona colleague, Walt Evans, McDonald satisfied himself that it was

> quite conceivable that a strong [electromagnetic] field at the same frequency as Heflin was calling out on could "blank" the system because the type of amplifier usually used in first stage would simply block or saturate at very high receiver signal strength and transmit nothing at all" (the word "strong" was underlined by McDonald).

McDonald was puzzled, however, by the fact that the first three pictures of the craft in flight, taken from inside Heflin's van, showed "flat," apparently unclouded skies while the fourth, which Heflin stated was taken outside his van only about a minute or two after the first photo, showed what McDonald's meteorologist's eye judged to be "substantial clouds" in the vicinity of the ring. This did not trouble other researchers who worked on the photos, for they understood that Heflin's automatic light meter on his Polaroid work camera tended to "flatten" a bright sky in photos taken from inside his work van.

McDonald, however, continued to pursue the question. He checked with every available weather service within 50 miles of the Myford Road site. From their logs, and from scientific data concerning humidity and temperature in the locality for that date and time, he became convinced that the apparently thick clouds in *his* copy of Photo 4 could not possibly have formed in the

sky at that location on the date in question. In spite of the fact that copies of the same photo in the hands of NICAP investigators showed the sky as being overcast, he began to suspect that Heflin had taken the fourth picture at another time and place.

Idabel Epperson had also checked weather data. G. W. Kalstrom of the U.S. Weather Bureau at LAX International Airport had assured her that thick clouds could, and did, form in portions of the Los Angeles Basin when the rest of the sky was merely overcast. Epperson also noted that her own copy of Photo 1 showed an overcast sky while McDonald's copy showed a flat, apparently clear sky. The differences between Epperson's and McDonald's copies lie in the fact that they had been made separately by different film developers, who had used different degrees of exposure.

McDonald still was not convinced. He was confident that the apparent thick clouds in *his* copy of Photo 4 could not possibly have formed under the temperature–dew point difference that prevailed in the area at the time of Heflin's sighting. Pursuing the issue, Epperson learned from the National Weather Records Center and other weather stations close to El Toro that an overcast sky could look essentially "flat" in pictures taken at a low angle from inside an enclosed vehicle. LANS' photogrammetric consultants confirmed this. In addition to this possibility, there could have been fairly thick overcast in the easterly sky where the ring was photographed, according to weather conditions Epperson obtained from the U.S. Weather Bureau. At the 50-degree angle at which Photo 4 had been taken *outdoors*—where the camera's automatic light meter performed in normal fashion—this fairly thick overcast would have been plainly visible. McDonald remained doubtful, possibly because his expertise was cloud physics, not photography.

As the investigation continued, Heflin was bothered incessantly by curiosity seekers as well as members of the media; the Road Department also was swamped with calls. By now, he realized that he had photographed an "unknown" and began to wish heartily that he'd never told anyone that he had taken the pictures. He vowed to LANS that he "wouldn't tell a living soul" if he ever had an opportunity to photograph a UFO again. McDonald's growing doubts about Photo 4 also puzzled him. By now, LANS members had become well acquainted with McDonald's fierce persistence when bird-dogging a case. They assured Heflin that it was typical of McDonald to affirm and reaffirm every possible aspect of sightings that captured his interest. Besides this, McDonald had written personally to Heflin on December 27, 1967: "As you know, your 1965 photos remain the outstanding photographic evidence yet submitted concerning UFOs" (McDonald, 1967).

By the time McDonald was able to investigate the case on-site, LANS had done a 2-year check on Heflin's character and work record and had been assured by his superiors and coworkers that Rex Heflin was a straightforward individual with 15 years of responsible duty in the County Road Department and was not the type to pull a hoax that could jeopardize his job. The fact that

Heflin had an offbeat sense of humor and joked at times in a deadpan fashion, particularly when irritated, in no way detracted from his truthful and responsible nature.

Early in November 1967, McDonald arranged with Dr. William Hartmann, a University of Arizona faculty member who was in charge of photo cases for the Condon Committee, that they would investigate the Heflin case on-site together. Hartmann had copies of most of the documents concerning the Heflin sighting and had also confirmed the radio interference that had occurred at the time of the sighting, having interviewed Heflin's supervisor, Mr. Herm Kimmel, as McDonald and NICAP had done. Kimmel had told him he heard the radio cut off in the middle of the transmission and that the sudden cutoff was akin to "button release," except that there was no blip of noise, as occurred when the button was released. NICAP investigators, McDonald, and Hartmann were all satisfied that Heflin's description of the radio failure was accurate.

In January 1968, McDonald and Hartmann traveled to California and interviewed officials and radar technicians at El Toro Marine Base. Reviewing the Marines' official reports, they learned that the investigating officer had checked Heflin's character, work record, and reputation and had interviewed Heflin's relatives and friends. They had also shown the photos to the Commander of the 11th Navy District in southern California, although the Navy never expressed any open interest in the case.

The most cogent question on the scientists' mind was, had the unidentified craft been viewed on radar from El Toro or adjacent military facilities? If so, the Heflin photos would constitute a unique piece of empirical evidence, a UFO caught on *three* observing channels at the same time—i.e., visual, film, and radar. McDonald and Hartmann, however, were told that the radar log at the Marine Corps Air Station (MCAS) had noted nothing unusual at the time of the sighting.

They were also taken to the Electronics Communications Maintenance on the base where they met with First Lieutenant Leahy and Mr. Paul Schaen, who wore civilian clothes. Schaen had to "get clearance," apparently from unidentified superiors, to talk with McDonald and Hartmann. The three men went to the Radar Air Traffic Control Center, a joint FAA–USMC facility (McDonald, 1968). This facility had no record of Heflin's UFO on its logs, either. They told McDonald that according to their records, the winds were blowing at 4 knots from the north northwest at the time of Heflin's sighting, which directly contradicted wind information LANS and McDonald had searched out independently.

That evening, a LANS meeting was held at the Epperson home for discussion of the Heflin photo case. McDonald's list of the 17 attendees read as follows: "Hartmann, Idabel Epperson and her daughter, Marilyn; Dr. Robert M. Wood; Maralyn Benton, Wood's secretary; Dr. Darryl Harmon; George Kocher and Mrs. Kocher; Dr. Robert Nathan; the Druffels, Charles and Ann;

the Eugene Coltons; John Gray." Also present were Dr. Stephen Black and Philip Daly, two BBC personnel who were in the U.S. shooting segments for a British UFO documentary.

This particular meeting was packed with newcomers, mostly scientists who had been invited to meet McDonald and Hartmann. Some of them were not schooled in interviewing UFO witnesses with proper objectivity and courtesy. When they began interrogating Heflin, the questions flew hot and heavy. Heflin typically kept his cool. Hartmann expressed doubt that anyone could take three Polaroid photos in, roughly, 20 seconds, the conditions under which Heflin said he had taken his first three pictures of the flying object. LANS investigators had asked Heflin the same question 2 years prior, and he had demonstrated his ability to do it, using his own work camera. Another of the visiting scientists asked whether Heflin knew if the object was *really* coming from directly *behind* him? Heflin, who wondered privately about the logic of the question, replied, "No, I don't. I didn't *see* it until it was on the periphery of my left eye." And on and on.

John Gray, the principal LANS investigator on the Heflin case, was also questioned closely. Gray was an engineer who checked ground equipment for the Apollo Project at North American Aircraft. His technical qualifications and methodical investigative skills were exceptional. Nevertheless, because the smoke ring in Photo 4 had been photographed over an orange orchard with only a telephone wire and a small branch of one tree as reference points, McDonald asked why Gray wasn't *sure* which branch of which tree Heflin had photographed, discussing this "problem" for 40 minutes. Gray had identified the tree and the branch 2 years ago when the investigation was in its first stages, but because twigs on fruit trees change over the seasons, Gray was no longer sure exactly which branch was represented in the photo.

This answer did not satisfy McDonald, for he wished to make his own check on-site to confirm the elevation and azimuth at which Photo 4 had been taken. This would depend largely on the direction and speed of the wind at the time, and NICAP's and McDonald's own investigations had revealed that the wind had been from the southwest at 4 knots. Yet Hartmann and McDonald had been given conflicting information from the joint FAA–USMC radar facility the prior day. We might wonder who the "Mr. Paul Schaen" mentioned in McDonald's Heflin notes really was, and if he could possibly have been deliberately attempting to throw McDonald and Hartmann off the track. Soon after his return to Tucson, Arizona, McDonald rechecked wind data using his own sources and reconfirmed that the winds were blowing from the southwest at the time and date of the sighting.

Robert Nathan, an independent scientist working at a southern California aerospace facility, had computer enhanced the photos for LANS. His interest was purely unofficial and had nothing to do with his work association. At the time, he had considerable private interest in the UFO phenomenon. He often

attended LANS meetings and analyzed several photos for the subcommittee. He had told LANS investigators that his computer enhancement had revealed that the black band around Heflin's UFO was particulate matter—possibly atmospheric pollutants picked up by the craft as it flew through smoggy Orange County. Other scientists present at this January 15, 1968, meeting speculated that the black band was held around the craft by some type of electrostatic effect, possibly associated with the craft's propulsion system. Dr. Nathan had determined that the smoke ring in Photo 4, which he referred to as a "vortex ring," was also composed of particulate matter. He stated that he saw no reason why the "smoke ring" could not logically be the original black band that surrounded the object in the first three photos that had been left behind by the craft upon its rapid departure. He also saw no reason to doubt that Heflin's Photo 4 was part of a set depicting a UFO event, all photographed within 2 minutes.

McDonald brought up his growing doubts about what was to him conflicting cloud data. He voiced objection to Photo 4 on the basis that he had received positive information from the most reliable weather sources available that there could not possibly have been any substantial clouds at the time of sighting. He emphasized that he'd cross-checked all possible cloud observation sources concerning Los Angeles area mesometeorology and the role of mean inversion depth and dry suprainversion air.

The scientific terms didn't impress Heflin. "The meteorologists are going to *have* to find some clouds to go in these photos!" he stated firmly. He was not claiming there *were* clouds in the atmosphere above the dark smoke ring because he simply hadn't noticed. But he *had* photographed the smoke ring only about a minute after taking his three photos of the UFO, and if the photo contained clouds, then there had to be clouds.

LANS investigators backed Heflin. They tried to interpret to McDonald that in their own copies of the fourth photo the clouds were not as dark as in McDonald's copy, again explaining that the various copies had been made from different generations of the originals and had been processed at different degrees of exposure. McDonald was still unconvinced.

The question of whether the manufacturer had put numbers on the back of the Polaroid film on which Heflin's photos were taken was also discussed at length. Most of the scientists present at the meeting insisted that *all* film packs bore numbers, but Heflin stated there were no sequence numbers on the originals. He explained that the Polaroid Special 3000 film packs used by the County Roads Department at the time had no numbers and that this was a serious issue in the department because the work cameras were often exchanged among the employees. Later research by Heflin, LANS members, and McDonald verified that Polaroid ASA 3000 film was manufactured with no sequence numbers around the time of Heflin's sighting.

The strange account of a recent visit of a "U.S. Air Force captain" to Helfin's home was also discussed. Heflin had confided the event to LANS. On

the evening of October 11, 1967, a man in a U.S. Air Force uniform, identifying himself as "Captain C. H. Edmonds," came to his door. His ID had no photo and was salmon and green, like the ID the "NORAD" men had used 2 years earlier. As Heflin talked with him on the porch, he noted that about 30 feet away, directly in his line of sight, was a 1965 or 1966 Chevy parked at the curb. The auto was dark blue with dark lettering on the door, which blended into the surface. Heflin was unable to read it.

He saw movement in the back seat of the vehicle, which he assumed was a second man, and a strange purplish glow emanated from that area. Edmonds chatted with Heflin, stating that he'd been involved in numerous important UFO cases, including one in the Bermuda Triangle! He also asked various personal questions, such as what UFO groups Heflin was affiliated with; Heflin told him he'd joined NICAP only. While this was going on, Heflin heard crackles and pops coming from his hi-fi, which he'd been listening to when Edmonds knocked on his door. He'd never before heard interference like this and inwardly wondered whether it was somehow linked to the strange purplish glow in the back seat of Edmonds' vehicle. Later, he speculated that he might have been secretly photographed or recorded.

When Edmonds left a few minutes later, Heflin called John Gray and told him what had happened. By this time, he was atypically angry, not only at Edmonds' unwarranted intrusion but also because he'd been having a lot of trouble with his phone. His friends had been complaining they were never able to reach him at home. Heflin *had* been home at the time they'd called, but the phone hadn't rung. He told Gray he'd had his number changed more than once, obtaining unlisted numbers each time. Somehow, strangers managed to get his new telephone numbers, and the crank calls continued. A neighbor woman had told him that she'd seen Marine Corps and Air Force officers "nosing" around his home while he was at work (McDonald, 1968).

After the LANS meeting, McDonald tried to mend his strained relationship with Heflin, pointing out the numerous aspects of the case that were positive. He explained that as a scientist, he needed to maintain strict objectivity in the investigation so that the facts would emerge. He also pointed out that another Orange County multiple-witness case tended to corroborate Heflin's sighting.

This incident had occurred during the first week of August 1965, the same week as Heflin's sighting. About 9:00 p.m., Mr. and Mrs. Ralph Joseph were driving on the Santa Ana Freeway in Anaheim, a city about 10 miles from the location of Heflin's sighting. They saw a large glowing object sitting atop high-voltage lines that ran high above the freeway. The object had a rounded dome and was disc shaped with a rounded bottom. It glowed bright white with self-contained light, which did not illuminate its surroundings.

Many cars were stopped on the shoulder of the freeway, and motorists had gotten out and were staring at it. The Josephs slowed down but did not stop. At

their closest point, they were about 40 feet from the object yet could hear no sound from it. They judged its size as "much bigger than a car." It was about 3 times the width of the power-pole yardarms and its width was four times its own height. No features, such as seams or "windows," were visible.

The Josephs expected that the occurrence would be reported by the media, and they listened to the car radio as they drove, but nothing was broadcast about it. Neither was there any mention in the newspaper or TV news programs during the next few days. Yet the object had been totally visible from a heavily traveled freeway. This phenomenon of underreporting from busy locations is a reflection of lack of clarity of uniform reporting procedure. It is still true in 2000. LANS and McDonald had conducted interviews with the Josephs, which left them satisfied that the witnesses were solid and reliable. Other witnesses to the sighting were sought but without success (Epperson, 1966).

By 11:30 the morning after the LANS meeting, a group of varied investigators gathered at the Myford Road site, including the two BBC newsmen. Dr. William Hartmann and one of the BBC documentarians tried to replicate the photos with a similar camera, using both a small model hung on a string and a Leica camera lens cap suspended by a fine thread. Both photos came out surprisingly sharp even though the lens cap was only 2 feet from the camera. The strings used in the first test shot showed plainly, although the thread was less visible. Heflin watched silently.

Dr. Robert Nathan, however, had demonstrated 2 years before that there were absolutely no strings or other supporting mechanisms visible in Heflin's photos. Hartmann was fully aware of this. He also was aware that Heflin's camera focused the frame of the truck window remarkably well, considering the fact that other features of the landscape miles away (and everything in between) were also in focus. These facts didn't matter to Hartmann, however. Later, writing up the case in the Condon Report, he judged Heflin's photos "of little probative value," claiming that his replication shot with the lens cap was a good match with Heflin's Photo 2 (Condon, 1969). This is an early example of the naive assumption that just because a photograph *could* be ostensibly faked, that it *was* faked.

The two BBC documentarians also neglected to show Heflin common courtesy. McDonald wrote a complete account of their interaction in his "Heflin File," which is included in coauthor Druffel's biography of McDonald's UFO research, *Scientist vs. the System: Dr. James E. McDonald's Fight for UFO Science*, publication of which is forthcoming. Other aspects of the complex interactions in this complex investigation are included in this book, manuscript and appendix, which reaffirm Heflin's total reliability and honesty.

When the two BBC representatives pressured Heflin for a full, filmed interview at the site, Heflin refused, saying that an American producer, John MacDonald, had already done a creditable job for ITV. He suggested they borrow *his* film. He did allow them to film a very brief segment, in which he stated that he understood why various investigators were interested in his photos and that

people had the right to reach their own conclusions. He also explained how the automatic light meter on his camera had allowed the sky to appear flat and featureless in Photo 1, Photo 2, and Photo 3, which had been taken inside his work van, but showed the overcast sky in Photo 4, which was taken outside the van.

Ending his interview with the BBC, Heflin pointed out to McDonald the area of the sky where the object had emitted the bluish-black smoke ring and drove with him to the location where he had taken Photo 4. McDonald estimated mathematically that the smoke ring had been photographed at about 400 feet altitude. The position of the smoke ring convinced McDonald that the wind data gathered by both himself and LANS were accurate, that the wind *had* been blowing from the southwest, and that the Marine Corps Air Station had given him inaccurate data.

When he arrived home in Tucson, Arizona, McDonald tried every way available to him to check out the ID presented by "Captain Edmonds," who had visited Heflin. Because no official investigating agency had identification cards without photos and none were salmon colored, this satisfied him that Edmonds was an imposter. The eerie purplish glow that had apparently affected Heflin's hi-fi remained a mystery.

McDonald had been surprised when Hartmann demonstrated that Heflin's 101 Polaroid camera was capable of sharply focused photos at close range and had begun to think that Heflin *could* have photographed a small model. However, he learned from LANS that two and a half years before the very start of case investigation, LANS photo expert Zan Overall had discovered that Heflin's work camera sharply focused nearby objects; when set at infinity, the photos turned out sharp at 3 feet (McDonald, 1968).

There were other interesting aspects of the Heflin photos. Dr. Nathan had noticed an unexplained "blurring" around the UFO, which was not caused by motion of the craft *or* the camera. As pure speculation, he wondered if the blurring might be due to ionized air around the craft. UFO researchers had long hypothesized that the propulsion systems of UFOs might ionize the air surrounding them while they were in flight. Also, while enhancing the underside of the craft in Photo 2, Nathan had brought out a wedge-shaped portion of light. It was consistent with Heflin's description of a revolving light ray sweeping around the bottom of the UFO.[1]

NICAP photogrammetrists and most UFO researchers remained convinced that Heflin's Photos 1, 2, and 3 were most probably genuine, and that Photo 4 was part of a set taken within about 2 minutes of each other. It is impossible, of course, to declare a UFO photo absolutely authentic unless one had the actual UFO nearby with which to compare it.

---

[1] Significantly, Dr. William Hartmann's alleged "replication" of Photo 2 showed no such wedge-shaped feature.

The Fort Belvoir Photos

McDonald's doubt about Photo 4 served to diminish his acceptance of the case, however. He redoubled his efforts to solve the "smoke ring" problems. UFO literature held references to a few other cases of dark smoke rings associated with UFOs, such as a blue-black smoke ring in Ohio, which had a ball of fire swinging around the outside, described in the *Apro Bulletin* (Lorenzen and Lorenzen, 1966). But another smoke-ring photo case, occurring at Fort Belvoir Army Base in Virginia, was far more interesting. This case proved to be an important part of the Heflin debate.

At 9:00 a.m. on a cold, cloudy day in September 1957, U.S. Army Private George L. Stofko, Junior, witnessed a solid-looking black ring hovering low over a building of the base. Intrigued, he grabbed a camera from his car and took six photos. The first showed the ellipsoidal black ring hovering against a clouded sky. This photo turned out dark on one side, but the second showed the ring clearly. In the third photo, taken just a short time later, the ring was being surrounded by whitish vapor. In the fourth, this apparent "clouding" had almost obliterated the ring, but a curious "ribbed" effect was noticeable as if "projections" on the black ring are poking out through the vapor. In the sixth photo, the black ring was completely hidden in the small oval cloud, which was apparently at much lower altitude than other clouds in the sky (Dell, undated).

The Fort Belvoir photos had come to NICAP's attention through NICAP members Z. J. Halaut and Don Berliner, and NICAP Photographic Adviser Ralph Rankow had followed up on the case. He learned from Stofko that the black ring had been viewed by other soldiers, that it seemed "solid," and that it was approximately 60 feet in diameter. This group of soldiers were on a brief break from their work in the Post Engineer Section and viewed the phenomenon for 1–2 minutes. They had to return to work and could not stay to see what eventually happened to the small, oval cloud. Stofko had no idea what the "object" was. He told Rankow that some of the other soldiers had also taken pictures, but he wasn't well acquainted with the coworkers and hadn't kept track of them.

The witnesses agreed among themselves that they had inadvertently witnessed a secret military experiment and did not tell any officials on the base that they'd taken pictures (McDonald, 1968b). Several years passed before NICAP learned about the Fort Belvoir photos. When contacted, Stofko couldn't find the negatives. They had been misplaced, because he had been transferred several times since the occurrence. He'd shown the photos to various friends over the years but had met with ridicule and disbelief until he showed them to NICAP.

Stofko's first two photos were strikingly similar to the black ring in Heflin's Photo 4. Stofko's ring had appeared "solid," and it maintained its ovoid shape during the 1–2 minutes it was in sight. Heflin, too, had noticed the "solid" appearance of the smoke ring associated with the UFO he'd photographed, even

though it had been blown out of shape by 4-knot winds. However, Stofko had taken his pictures in meteorological conditions that were cold, damp, and windless. McDonald reasoned that these conditions could have helped produce the clouding effect. He was puzzled, however, by what he termed the "rosette shape" in the sixth photo. His meteorological expertise told him that clouds that formed under such conditions should have flattened bottoms, yet this small cloud was oval. McDonald pursued the puzzle relentlessly, thinking that if he could solve the Fort Belvoir incident, it might shed light on Heflin's fourth photo.

Charles A. Maney, a professor at Defiance College in Ohio and a top NICAP official, was a careful researcher who also took great interest in the Fort Belvoir photos. He suggested to Ralph Rankow that ionization of the air near the aerial object had produced the vapor that formed around and inside the ring. He also referred to a 1952 newspaper clipping, which described experiments by Noel W. Scott, an army physicist at Fort Belvoir. Scott had produced a partial vacuum in a bell jar then allowed a tiny stream of ionized air to enter from the bottom of the jar, producing a cloud of vapor that later filled the jar.

According to this newspaper article, Scott produced orange-red fireballs, discs, and other shapes of various colors, according to what gas he introduced into his bell jar. This article stated that Scott "was trying to simulate a flying saucer" and claimed that these "miniature masses of illuminated air" had sufficient body or substance to be picked up on radar. Scott's experiments were cited by the Air Force as "possibly" explaining some of 1952 sightings, when groups of UFOs overflew the Capitol and White House, with the result that military jets had been sent up to investigate them (*Toledo Blade,* 1952).

McDonald was not convinced that the Fort Belvoir photos depicted a true UFO, but he considered them an interesting problem of cloud physics. Seeking more data on ring-shaped UFOs, he learned from Dr. Jacques Vallee that donut-shaped UFOs had been reported in France. However, in these cases, the hole was about one third the diameter; they did not have the "hula-hoop" appearance of the Fort Belvoir object.

In the meantime, the Fort Belvoir photos were published in a newsstand publication, *Dell UFO Magazine #4,* which seemed to knock information loose from other quarters. A man calling himself Jack Strong wrote to Ralph Rankow, stating that he was an ex-Army man and had seen the smoke ring while stationed at Fort Belvoir around the same time Stofko took his photos. In technical terms, Strong stated that the black ring had been caused by an "atomic bomb simulator," which Strong claimed was a device consisting of a charge of high explosives that produced a small black mushroom cloud. Strong contended that on the morning Stofko photographed the black ring, the atmosphere was "dead calm" and the air "cold and moist." He stated that at a height of about 40 feet, the "cap" of the mushroom developed into a perfect

smoke ring vortex, detached itself from the main column, and continued to rise into the cold, saturated air.

Strong's letter also alleged that the vortex ring swept moisture out of the air and that the smoke particles on the periphery of the vortex provided condensation nuclei for the formation of a visible cloud, forming "the lens-shaped body" with the vortex still visible within it. He speculated that the "ribbing effect" in the Fort Belvoir photos may have been due to slight variations in velocity at different points around the periphery of the ring. Even though Strong's letter to Rankow was expressed in technical terms, he claimed not to know enough about atmospheric physics to explain why the center of the ring clouded in so rapidly. He stated, however, that "the presence of a stable ascending vortex continuing particles suitable for condensation nuclei must, in connection with such conditions, be very rare."

Rankow wondered if the government might be behind Jack Strong's explanation. He asked McDonald to study Strong's letter and determine if it stood up from a technical point of view (Rankow, 1967). McDonald wrote back, saying

> I find it ludicrous that the Army would be using anything like what he [Jack Strong] describes as "the atomic bomb simulator." Disney might, the Army scarcely, in my opinion. Secondly, the suggestion that anyone could find a means of generating a "perfect smoke ring vortex," with the sharp outlines and a perfectly circular form that appears in [Stofko's] Photos 1 and 2, is not reasonable. Vortex rings are intrinsically quite unstable and maintain circularity for only a very brief time… . [A]ny vortex ring of such small dimensions and low altitude would be most unlikely to produce condensation of atmospheric moisture, and even if it did, would generate a much more fragmentary mass of cloud than is exhibited by the Stofko photos… . [A]ll ordinary clouds of any substantial size (restricting attention to cumuliform types) develop essentially flat bases, whereas the base of the cloud rosette in the Belvoir photos is distinctly rounded.
>
> [Strong's letter]… strikes me as having been formulated by somebody with rather more than casual knowledge of vortex ring dynamics. [He] ought to know enough to realize that parts of his argument are just not very sensible. That inference may be quite incorrect, and for that reason, I repeat my request that you keep all of this confidential for the time being. I think that the suspicions that you hint in your letter are by no means unreasonable. The letter has a peculiar ring (McDonald, 1968c).

This represents, to our knowledge, the first time McDonald expressed in writing the possibility that the government might be seriously involved in a UFO cover-up. Always before, McDonald preferred to argue that the government's apparent neglect of the UFO question was due to a "grand foul-up" rather than a widespread official cover-up, reflecting the widespread attitude of the academic community. It is common even today that academics have little knowledge or respect for the astonishing achievements of the intelligence community.

McDonald set about trying to track down Jack Strong. He also expressed doubt about the Fort Belvoir photos to Dr. William Hartmann. Contacting Fort Belvoir officials, Hartmann was told that the black smoke ring photographed by Stofko had resulted from a "demonstration device" for visiting firemen and

that the main function of this device was not to simulate a mushroom cloud but rather, under favorable atmospheric conditions, to blow smoke rings. Hartmann visited Fort Belvoir officials on-site. They told him that the device had been in use for many years, including September 1957, but was not presently in operation. He was told by an unnamed sergeant at Fort Belvoir that "there were some days when it [the device] didn't work at all."

In a long memo to Hartmann, McDonald wondered how it *ever* worked, considering the physics involved. He also expressed his opinion that neither explanation, i.e., "atomic bomb simulator" or "demonstration device," was convincing (McDonald, 1968d).

An Andrew H. Taylor of Pittsburgh, Pennsylvania, also wrote to *Dell UFO Magazine,* claiming he was one of a group of soldiers who set off an explosive device at Andrews Air Force Base in May 1959, during an Armed Forces Day show. He described how he and his crew had filled ten 55-gallon drums with No. 2 diesel fuel, arranged them in a 60–70–foot circle, and set them off by a small charge, to simulate an atom bomb explosion. Taylor claimed that a black ring formed, exactly like Stofko's photos and that a cloud had developed around the ring.

Bill Hartmann was ready to accept the Army's explanation for the puzzling Fort Belvoir photos, but McDonald was not convinced. Army officials offered no written reports describing the history of the device, no photos or other documentation proving it had ever existed.[2] Yet Fort Belvoir officials claimed that their device could, under the right atmospheric conditions, produce a stable smoke ring that remained perfectly circular and tight while rising hundreds of feet into the air. These claims disturbed McDonald. His own calculations on the Stofko photos indicated that the Fort Belvoir smoke ring retained its *exact* shape while rising to an altitude of a few thousand feet. If there had been enough moisture in the surface layers of the air to produce condensation of the vortex ring, as stated by Jack Strong, there should have been clouds at roughly the same altitude as the ring itself. Instead, the ring cloud was distinctly lower than the background cloud deck.

McDonald wrote to a colleague, Dr. Clayton H. Reitan of the Department of Meteorology at the University of Wisconsin, asking him to try to locate Strong at his given address in Wisconsin and stating his concern that Strong's explanation did not seem meteorologically reasonable. He added a confidential postscript to Reitan, pointing out that

> some of the other information that has been recently obtained from military sources on the background of these photos has a slightly phony ring. There is, in the back of my mind, a certain suspicion that "Jack Strong" might somehow be involved in these maneuverings (McDonald, 1968e).

---

[2] The authors request any reader who might have personal knowledge that these devices existed at Fort Belvoir, or at Andrews Air Force Base in California, to please contact them at 257 Sycamore Glen, Pasadena, CA 91105.

With Reitan's help, both "Jack Strong" and "Andrew Taylor" were contacted, and McDonald held long phone conversations with both of them, which he recorded with their permission. In a turnaround that greatly surprised NICAP investigators and other UFO colleagues, he apparently accepted Strong and Taylor as independent, reliable witnesses and seemed assured of their intelligence, observational powers, and honesty. Yet Strong, Taylor, and Fort Belvoir officials never offered any firm documentation, and many NICAP investigators and other UFO researchers remained unconvinced.

Strong's description of windless, cold, and humid meteorological conditions on the day he reportedly saw the smoke ring at Fort Belvoir also apparently convinced McDonald that a stable smoke ring could result from an explosion of a device such as described by Taylor. In addition, a written confirmation to Ralph Rankow from Colonel J. H. Jackson at Fort Belvoir led McDonald to accept that a stable vortex ring could form and be enveloped in cloudlike vapor under the right circumstances (Jackson, 1968).

McDonald rapidly developed an intense interest in researching this new aspect of vortex rings, for to him it was new scientific information. By early 1971, he was planning to present a proposal to the National Science Foundation (NSF), which included the subject of vortex rings. A brief note found in his files during archiving revealed his intentions, but no evidence has been found that the NSF ever accepted the proposal (Druffel, 1997).

McDonald suspected that Heflin had photographed the smoke ring while attending an air show at some different location and was attempting to pass it off as part of a set depicting the overflight of a UFO. Many UFO investigators, including those from NICAP, objected to the "atomic bomb simulator" explanation because there was no documentation that it had actually existed, only verbal testimony and Colonel Jackson's letter. Strong's and Taylor's credentials were never completely checked out, and Colonel Jackson's verity on the matter could not be confirmed.

NICAP investigator John Gray wrote to McDonald regarding Photo 4, emphasizing two points: First, the most logical theory pertaining to the origin of the black smoke ring is that it was the same band of particulates that enveloped the object in Photos 1 through 3; and second, McDonald's objection to the clouds in Photo 4 could be answered by the fact that the cloud formations depicted in *McDonald's* enlarged copy of that photo were darker than those in NICAP–LANS' copies because of differences in processing.

Gray said

> If Photo 4 is not acceptable evidence to support the sighting, then… it should be set aside as questionable evidence considered not relevant to the case. With the human element involved in an inexplicable event, science should not expect its explanation to be more than the expression of an opinion. This is the practice you have followed, and rightly so, in your public statements concerning the reality of UFOs. With Rex Heflin's reputation at stake, any explanations issued by science must be based on certainty. If his sincerity cannot be disproved or his insincerity cannot be proved, then it behooves

science to shelve his case until disclosure of further evidence rather than run the risk of besmirching his character (Gray, 1968).

Ground Saucer Watch Declares Heflin Photos Hoaxed

Idabel Epperson, John Gray, Zan Overall, and other LANS members remained convinced of Heflin's integrity, as did most researchers in the UFO field. His first three photos of the metallic craft survived as an example of an apparently genuine UFO and continued to be printed in UFO research journals and magazines world wide. McDonald died in June 1971, but his doubts about Photo 4 caused some lay researchers to attempt reanalysis of the entire set. In the mid-1970s, William Spaulding, a lay UFO researcher who headed a group called Ground Saucer Watch (GSW) in Arizona, obtained copies of Heflin's photos from an unspecified source and had them computer enhanced. Like most copies circulating at that time, they were probably at least fourth generation. First generation copies were rare and carefully guarded by the researchers who possessed them, because the originals of Photo 1, Photo 2, and Photo 3, which showed the flying craft, were no longer available. Heflin had retained his original of Photo 4, which showed the smoke ring.

The GSW computer enhancement was apparently conducted by Fred Adrian, the organization's Photographic Consultant. In a mid-1970s issue of the GSW "News Bulletin," the Heflin photos were included among a list of UFO photos, which in GSW's words, "represent both crude and grandiose hoaxs [sic] or photographic anomalies and should not be considered evidence of UFO existance [sic]" (Spaulding, 1975). This widely disseminated assessment of the Heflin photos was based on what Spaulding termed "a string," which allegedly extended from the top of the photo down to the object.

Spaulding claimed that "the string" had been found on four separate sets of the Heflin photographs. Idabel Epperson and David Branch of LANS and researcher David Schroth, among others, challenged Spaulding's findings, pointing out that several photo experts, including Robert Nathan, had looked for but found no evidence of a string or any supporting mechanism associated with the object. All of NICAP–LANS' photogrammetrists had worked with *confirmed* first-generation copies, which had been made directly from the originals before they disappeared.

The strong objections to GSW's methods of analysis resulted in an admission by Spaulding that possibly the linear structure seen on his enhanced copies was a scratch rather than a string. He also stated that there was a "slim chance" that all of the four sets of photographs were from the same unspecific source. Spaulding never publicly withdrew his assessment that the Heflin photos were hoaxed, however, and the situation caused continuous controversy in the UFO research field. Many otherwise objective researchers tended toward the hoax explanation while the original investigators and many other

UFO researchers continued to regard them as among the best UFO photos ever taken.

The Original Photos Reemerge

The disappearance of the original Polaroid photos thwarted attempts to restudy them in greater depth as photogrammetric technology advanced. Heflin continued to work for the Orange County Traffic Department for 15 additional years. Eventually, after 3 decades of working outdoors on the streets and freeways of southern California, he developed a serious health condition, i.e., an accumulation of tetraethylene lead in his bone marrow. It is a condition that is being diagnosed in increasing numbers of people who have worked for decades outdoors in heavy automobile traffic. It has no cure and no standard medical treatment.

Suffering from fatigue, breathing difficulty, and other symptoms associated with this medical condition, Heflin moved to a small town in northern California around 1985. Here, the air was relatively pure, facilitating breathing, and an experimental treatment for the condition was available at a local hospital on an outpatient basis. His doctors informed him that lead poisoning in bone marrow, although becoming more and more prevalent, was not recognized as a verified medical condition by the AMA or any health insurance programs, including Medicare. The serious health conditions it caused, such as high blood pressure, strokes, and other debilitating illnesses, were not covered either. Heflin became solely responsible for his own medical bills associated with the bone marrow condition, which he could sorely afford on his fixed retirement income.

One day in 1993, while Heflin was sitting in his northern California home, the phone rang. When Heflin answered, a woman's voice asked, “Have you checked your mailbox lately?” Before he could answer, the call was abruptly terminated. He went to the mailbox and found it empty. About half an hour later, the same unidentified woman called again with the same question. This time, Heflin found a plain manila envelope in his mailbox. It had no postage or other marks that would indicate how it had been delivered. To his surprise, it contained what appeared to be his three lost Polaroid photos.

He examined them carefully and concluded they were indeed the three original photos that had been taken by the self-styled NORAD agents in 1965. Their size, texture, and general appearance precisely matched Photo 4, which he still retained. He had numbered the photos when they were first in his possession, marking them 1 through 4 with blue ink in the lower left-hand corner. The three photos that had been mysteriously returned had his markings 1 through 3 in the identical place as the 4 on his smoke ring photo. The 4 is the only marking on the back of this photo.

There were, however, other markings on the backs of the originals of Photos 1, 2, and 3. Each had “original” printed in capital letters across the top, by someone who had used a white grease pencil; the imprint of the letters showed

slightly on the photo side. Each of the three originals also had the number 13 written lightly on the back with soft black pencil; these markings did not disturb the photo side. Heflin had not put any such marks on the backs of the photos; they had apparently been marked by those unknown persons who had possession of them for the previous 28 years. There were also several distinct fingerprints on the surfaces of the photos.

The photos were in very good condition considering their age and apparently had been well taken care of. Heflin's Photo 4 had developed light brown stains around the smoke ring. He considered this the result of its age and due to the fact that several photo analysts had made close-up copies of it, subjecting the smoke ring image to bright light. The three returned originals also showed similar light brown stains, particularly along the lower portions. The object (UFO) in these returned photos was not so deeply stained as the smoke ring in Photo 4.

Heflin was now in a quandary. To add to his financial problems, his pension and other funds resulting from his long-term employment in Orange County had been temporarily cut off because that California county was in bankruptcy. Heflin suspected he would not live many more years and wondered what to do with the newly returned originals of his UFO photos. He, like many UFO researchers of his acquaintance, considered them to be perhaps the finest photographic UFO evidence in existence.

Reanalysis of the Heflin Photos in the 1990s

Soon after the original Polaroid photos surfaced, one of the authors of this paper (R.M.W.), an aerospace scientist and physicist who had conducted an independent analysis of the photos in the 1960s, learned about their return from author Martin Caiden. Another of the authors (A.D.), a veteran UFO researcher who participated in the original LANS–NICAP investigation, contacted Rex Heflin with the suggestion that the originals be analyzed with state-of-the-art computer-enhancement equipment. The third author (E.K.) offered his expertise in computer enhancement techniques.

Heflin agreed to a reanalysis of his photos. He also expressed his concern that all four originals be preserved for the future, so that they would be available to other scientists who wished to study them, particularly as new photogrammetric technology develops. Heflin knew and trusted Wood and Druffel as veteran UFO researchers who were thoroughly familiar with the case. He entrusted the four originals into Druffel's care, who in turn offered him $850 for his upcoming series of medical treatments—an act of friendship rather than a formal sale. They are now among the acquisitions of Druffel's SKYNET Library. After the authors' analyses of these photos are completed, first-generation copies will be available to other scientists and accredited researchers who wish to study them.

It was now possible to reanalyze the photos, working from the originals rather than copies of uncertain generation. Also highly advanced computer-

enhancement equipment is now accessible, technology not available in the 1960s and 1970s. Our three-person team restudied the facts of the case from original NICAP documentation and applied our efforts toward unanswered questions, such as the problem of the Photo 4 smoke ring, which McDonald had raised; the problem of the apparent differing sky conditions; the "string," which Spaulding and GSW claimed to have found; the "wedge of light" on the bottom of the UFO in Photo 2; and any other aspects that could be found and/or answered.

General Techniques

Photographic preparation. In preparation for digitization of the images, several large high-resolution prints were prepared from the original Polaroid photos. A supervised professional photographed the original photos and prepared negatives by standard techniques. Large prints (8 by 10) were then made with standard exposure times that gave optimal overall contrast, and then two additional sets of prints were prepared with twice and half the standard exposure times. Though the standard exposure prints best reproduced the main features of the photographs, the longer and shorter exposures better represented contrasts in the darker and lighter regions, respectively.

Image digitization. All of these prints were then scanned into digital format with a commercial UMAX 6-SE scanner interfaced to a Macintosh PowerBook 1400c running System 7.5.3 and Adobe Systems PhotoShop 4.0.1 with the VistaScan 2.3.3 scanner control plug-in. The sensitivity of the scanner was calibrated against a pattern of standard grays (0%, 20%, 40%, 60%, 80%, 100% reflectance), and a gamma setting of 1.60 was found to deliver a linear digital response over this pattern. This ensured that the digital data best represented the photometric intensities in the image. Each 8-by-10-inch print was then scanned at 300 dpi (dots per inch) spatial resolution and 16-bit grayscale resolution. Since the grain of the Polaroid resolution was visible at 150 dpi, higher resolutions were not practical. The resulting data were stored in standard, uncompressed TIFF graphics files. Though this resulted in exceptionally large files, this format ensured data integrity.

Nonlinear scale -stretch enhancement. These data were initially examined within PhotoShop and specific issues were explored through nonlinear scale-stretch enhancement. The latter technique is particularly important in emphasizing low-contrast details within intermediate shades of gray while retaining the overall contrasts of the original image. Nonlinear scale-stretch enhancement involves the reassignment of the narrow range of gray that contains the detail in question to a much wider range. Intensities outside this range are linearly compressed to tighter ranges. For example, to emphasize detail consisting of shades of gray between 45% and 55% reflectance, these data can be reassigned as shown in Table 1 and Figure 5. Essentially, detail represented by variations of only 10% reflectance can be enhanced to a plainly visible 50% variation. This technique is demonstrated in Figures 6 and 7. Figure 6 contains

TABLE 1
Reassignment of Intensity Values by Nonlinear Scale Stretching

Original reflectance range	Reassigned reflectance range
0%–45%	0%–25%
45%–55%	25%–75%
55%–100%	75%–100%

a bright "A" and a dark "C" against a gray background. Between these letters is a diffuse "X" defined by a contrast of only 10% reflectance. Reassignment of the intensity values as detailed in Table 1 and Figure 5 results in Figure 7, in which all three letters are clearly visible. This enhancement reveals the "X" without sacrificing the original clarity of the "A" and "C." This is not yet a packaged technique and does require some experience. When applied correctly, the enhanced image still fairly represents the original data.

General Observations of Original Images

Heflin Photo 1. The standard exposure image (Figure 1) clearly shows the well-known object. The object (enlarged in Figure 8) has a general shape like that of a hat seen from the side with a domelike feature on its top surface. The top edge and lower brim appear to be reflecting the diffuse sunlight, suggesting they have a metallic luster. The large reflection off the top of the object

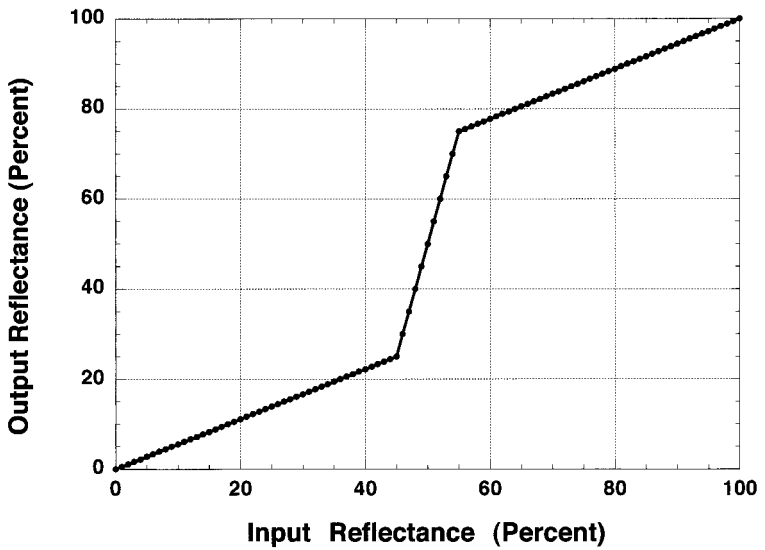

Fig. 5. Plot of reflectance in nonlinear scale stretching that emphasizes detail between 45% and 55% reflectance.

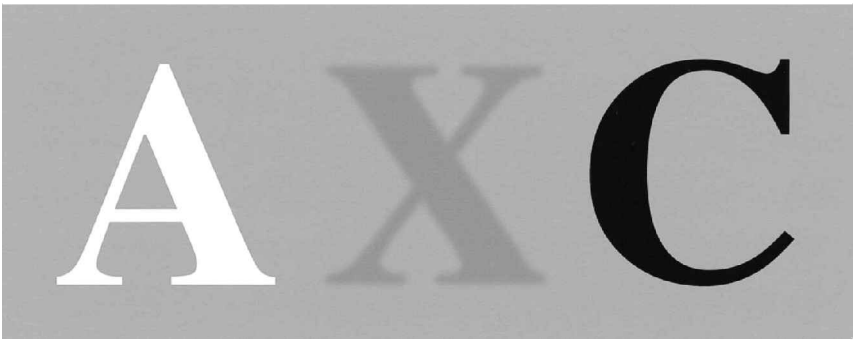

Fig. 6. "Original" image with diffuse "X" between a bright "A" and dark "C."

and the somewhat darker region just left of it is consistent with a dome-like structure.

The surrounding context of the object reveals a good deal about the conditions of the sighting. This picture was shot through the front window of a truck parked on the side of a road lined with telephone poles. In the distance, there appears to be a freeway with three cars and one truck clearly discernable. This is consistent with the picture being taken north on Myford Road with the Santa Ana Freeway in the distance. The obvious shadow of a pole in the foreground and the regular spacing of others alongside the road suggest that the truck was parked near the base of a pole. The angle of the shadow is consistent with the claimed date, time, and location of the sighting. The contrast of the shadow is weaker than that expected for direct sunlight; the reflectance within the image of this shadow is 50%–60% of that outside it, suggesting the shaded area was lit with a significant amount of indirect light and the direct sunlight was somewhat attenuated. This seems consistent with a thin haze or a lightly overcast sky. The intensity of light on the road stretching into the distance appears to be

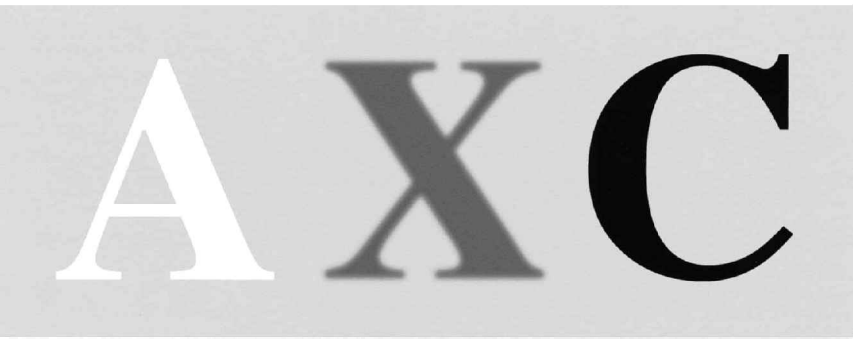

Fig. 7. Nonlinear scale-stretch enhancement (Table 1) of "X" in Figure 6.

Fig. 8. Enlargement of object in Heflin Photo 1 (Figure 1).

relatively even indicating that the haze/overcast is also mostly uniform. Also of note, distant features (including what appears to be a line of trees) seem partly obscured by a ground level haze.

The brilliant and directional reflections from the rim of the object suggest that the incident light is somewhat directional, and it too should be casting a shadow. There is indeed a diffuse dark patch to the left of the white pipe below the object, but it is not clear if this is indeed a shadow. If this patch were the shadow of the object, this would place the object almost at the distance of the pipe.

Heflin Photo 2. This picture (standard exposure shown in Figure 2) was clearly taken out the passenger side of the truck still parked on the side of a road lined with poles (as can be seen in the mirror reflection). Given the apparent shape of the object from the first photograph, this image seems to show the object (enlarged in Figure 9) with its shaded underside tipped toward the camera but still showing its upper rim. Like the first image, this scene appears to be lit with diffuse, mostly indirect light consistent with a hazy or lightly overcast sky. The further pole visible in the rear-view mirror seemed to cast a diffuse shadow though the closer one did not cast a clear shadow. The light in-

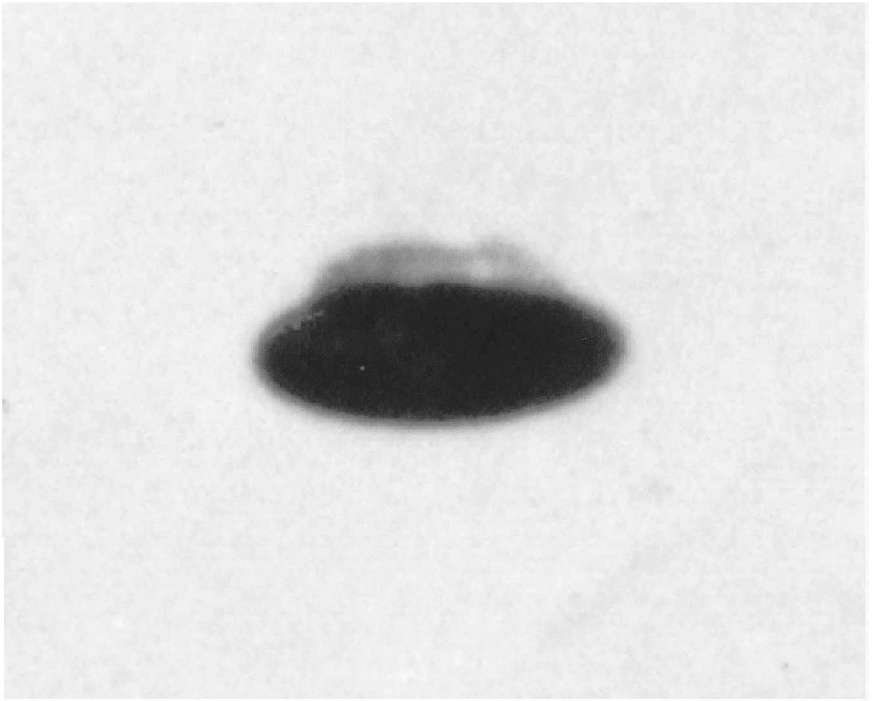

Fig. 9. Enlargement of object in Heflin Photo 2 (Figure 2).

tensity in the shadow of the further pole appeared to be about 70%–80% of that outside it, suggesting less direct light than in the first image. This variability in the shadows suggests the overcast may have been broken enough to allow through variable amounts of direct light while the indirect light remained roughly uniform. As in the first image, distant tree lines are partly obscured with ground-level haze.

Heflin Photo 3. This photograph (standard exposure shown in Figure 3) is much like Heflin Photo 2 in that it was taken out the passenger side window at the same scene except from a slightly different angle. The foreground shrubbery and background features in Heflin Photos 2 and 3 easily match indicating the truck had not moved. Using the background tree lines as a reference, the object appears further in the direction faced by the truck. When measured against background features, the relative diameter of the disk rim appears to be nearly identical in Heflin Photos 2 and 3, suggesting the object is about the same distance in both photographs. Given the apparent shape of the object from the first photograph, the object (enlarged in Figure 10) appears to have its upper surface slightly tipped toward the camera. The diffuse general light-

Fig. 10. Enlargement of object in Heflin Photo 3 (Figure 3).

ing and ground-level haze in this image appear almost identical to that in Heflin Photo 2 suggesting similar conditions.

Overall, these photographs appear to have been taken in the same location and under the same hazy/overcast weather conditions. The shape of the object is also consistent through the images. These features support the claimed continuity of the Heflin Photos 1–3 sequence.

Heflin Photo 4. This photograph (standard exposure shown in Figure 4) exhibits a dark, distorted ring against a patchy overcast sky. The ring consists of a thin puckered torus surrounded by an uneven sheath of haze. Its general appearance seems consistent with the slow disintegration of a tightly circulating smoke ring. As mentioned, the obvious mottled appearance of the background sky has led some researchers to challenge the claim that this photograph was part of the same sighting. This issue is addressed in the next section of this paper.

Enhancements of the Sky Around the Object in Heflin Photos 1, 2, and 3

It is important to note that the Polaroid camera used to take these photographs used a unidirectional automatic light sensor to set film exposure. The

TABLE 2
Details of Nonlinear Scale-Stretch Enhancement of Heflin Photo 1

Original reflectance range	Scaled reflectance range
96%–93%	100%–98%
93%–65%	98%–48%
65%–3%	48%–0%

Note: Results shown in Figures 11 and 14.

shaded interior of the truck likely led to a low-light reading and inadvertent overexposure of the first three images. Such an overexposure would "wash out" important contrasts in the relatively bright sky but not obliterate them. To reveal the contrasts of the background sky, nonlinear scale-stretch enhancement techniques were applied to the longer exposure reproductions of the first three Heflin images as outlined in Tables 2 through 4. (The longer exposures accentuate contrasts within the lighter regions.) The results from these enhancements of the Heflin Photos 1, 2, and 3 are shown in Figures 11, 12, and 13, respectively. The stretch parameters were selected from average intensities representing the light and dark regions of interest. Figures 14 through 16 show corresponding enlargements of the object and surrounding sky.

The first important observation that can be made from these enhancements is that no supporting strings or wires are evident in the background sky around the object in any of the photographs (Figures 14 through 16). Since the enlargement and enhancement clearly show the grain in these photographs, further scale-stretch enhancement would be unproductive. Prior claims of a supporting wire in the Heflin Photo 1 were likely due to problems introduced during multiple-generation reproduction and/or handling of intermediate generations.

The second important observation is the mottled texture of the background sky in all three photographs. Though some of this mottling may be due to degradation of the photographs, comparison of the second and third images (Figures 12 and 13) shows general similarities in the background sky. This is consistent with the other photometric evidence of overcast conditions. Over-

TABLE 3
Details of Nonlinear Scale-Stretch Enhancement of Heflin Photo 2

Original reflectance range	Scaled reflectance range
73%–68%	100%–96%
68%–57%	96%–46%
57%–3%	46%–0%

Note: Results shown in Figures 12 and 15.

TABLE 4
Details of Nonlinear Scale-Stretch Enhancement of Heflin Photo 3

Original reflectance range	Scaled reflectance range
76%–74%	100%–99%
74%–63%	99%–49%
63%–9%	49%–0%

Note: Results shown in Figures 13, 16, and 17.

all, this seems to support Heflin's account of overcast conditions during the sighting.

Surprisingly, the enhancement of Heflin's Photo 3 revealed what appeared to be a tattered smoke trail (visible in Figure 16 and better shown in Figure 17). The position of this trail is consistent with the deduced travel of the object roughly in the direction faced by the truck (discussed above). No trail is evident in either of the Heflin Photo 1 or 2. This is consistent with Heflin's claim that the object blew off, or otherwise left behind a ring of smokelike vapor as it moved quickly away. The presence of smoke in Heflin Photo 3 also offers some continuity with the smoke ring pictured in the Heflin Photo 4.

Fig. 11. Nonlinear scale-stretch enhancement (Table 2) of background sky detail in Heflin Photo 1 (Figure 1).

Fig. 12. Nonlinear scale-stretch enhancement (Table 3) of background sky detail in Heflin Photo 2 (Figure 2).

Fig. 13. Nonlinear scale-stretch enhancement (Table 4) of background sky detail in Heflin Photo 3 (Figure 3).

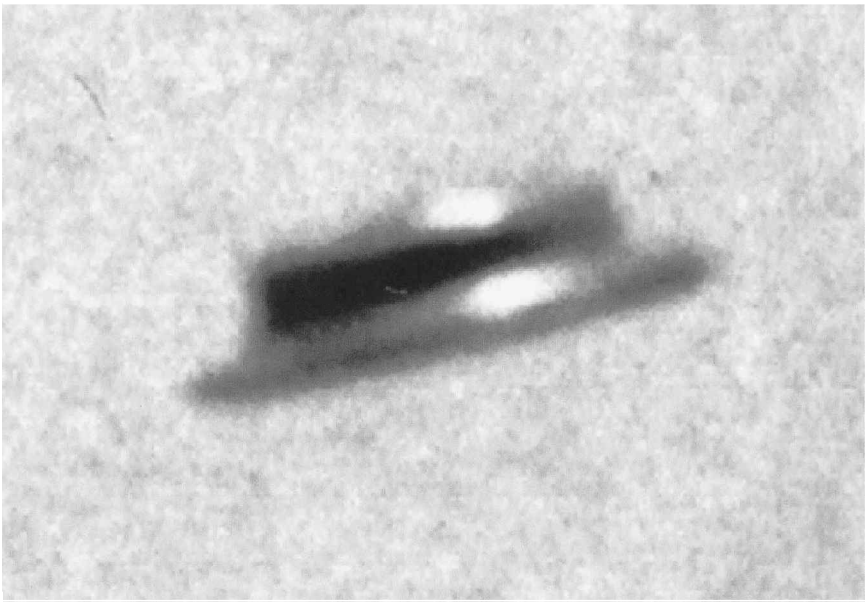

Fig. 14. Nonlinear scale-stretch enhancement (Table 2) of background sky detail in Heflin Photo 1 (Figure 8).

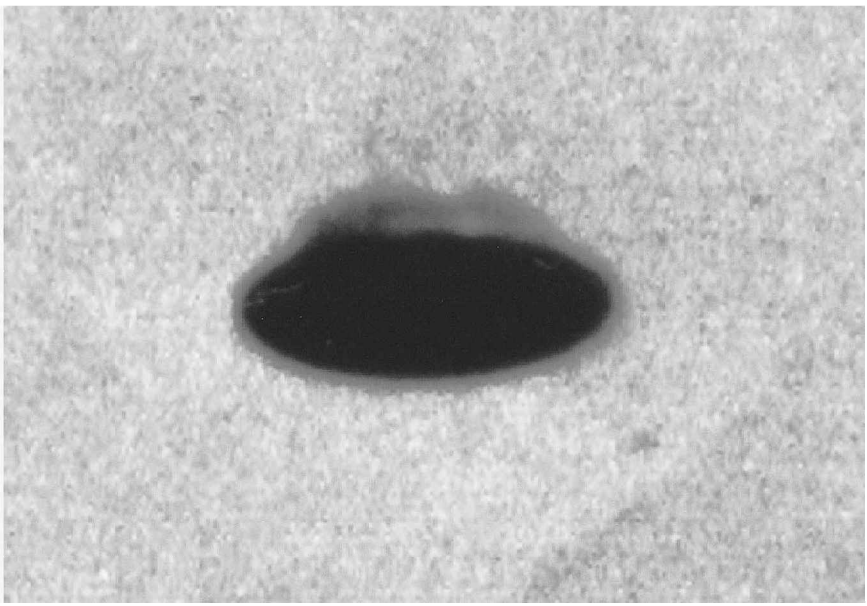

Fig. 15. Nonlinear scale-stretch enhancement (Table 3) of background sky detail behind object in Heflin Photo 2 (Figure 9).

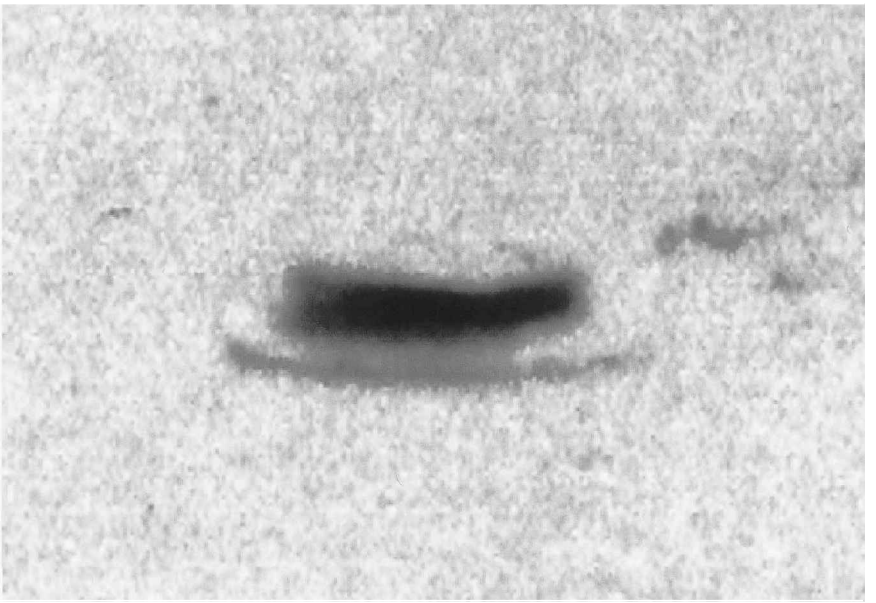

Fig. 16. Nonlinear scale-stretch enhancement (Table 4) of background sky detail behind object in Heflin Photo 3 (Figure 10).

Enhancement of Object in Heflin Photo 2

As noted earlier, another interesting feature of the Heflin account is the description of a rotating beam of light from the underside of the object about the time of the second photograph. To best reveal such a feature, the enlarged view of the object from the Heflin Photo 2 was subjected to nonlinear scale-stretch enhancement (Table 5). To test for this possible feature, nonlinear scale-stretch–enhancement techniques were applied to the short-exposure reproductions of the second Heflin image, as outlined in Table 5. The result is shown in Figure 18. This image does exhibit a line or wedgelike feature in the left to upper-left portion of the object's dark underside. This supports Heflin's account.

TABLE 5
Details of Nonlinear Scale-Stretch Enhancement of Heflin Photo 2

Original reflectance range	Scaled reflectance range
100%–22%	100%–50%
22%–9%	50%–0%

Note: Results shown in Figure 18.

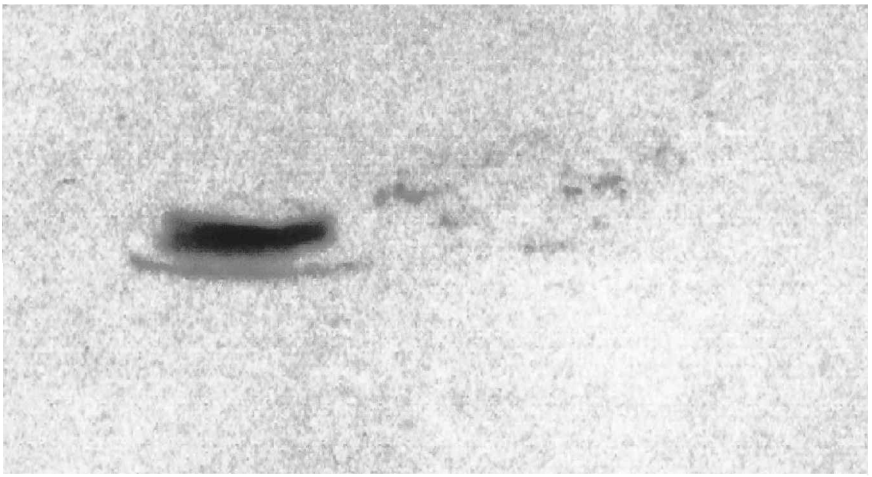

Fig. 17. Nonlinear scale-stretch enhancement of background sky detail behind object in Heflin Photo 3 showing length of "smoke trail."

Further Enhancement

While direct examination and nonlinear scale-stretch enhancement of the Heflin photographs allow a number of important issues to be explored in this case, enhancements of the object itself are still blurred by possible focus error, lens aberrations, motion, and particle content in the air. Detailed examination of this blur by techniques such as edge analysis could reveal important information about the object such as its distance from the camera, physical size, and relative motion. This analysis would also facilitate image restoration through public domain techniques such as the Maximum Entropy Method (MEM). The MEM would both confirm characterization of the blur distorting the object and could clarify the image to reveal important details of the object. This work is underway and will be reported in a later communication.

Reanalysis of Heflin Photos Answers Historical Objections

As noted above, the computer-enhancement process established what appears to be a definite link between Heflin Photos 3 and 4 (Figures 3 and 4). The absence of a definite link had eluded James E. McDonald during the 4 years he studied the photos. The trail of black particulate matter in Heflin's Photo 3, which is seen streaming behind the unidentified craft (Figure 16), and which is also denser than the immediate area just behind the craft (Figure 17), confirms Heflin's statement that the object left behind the smoke ring as it was departing.

Although McDonald's refusal to accept Heflin Photo 4 as part of a set was directly responsible for loss of interest in the photos by some persons in the UFO field, this discovery is very important in reestablishing the series of

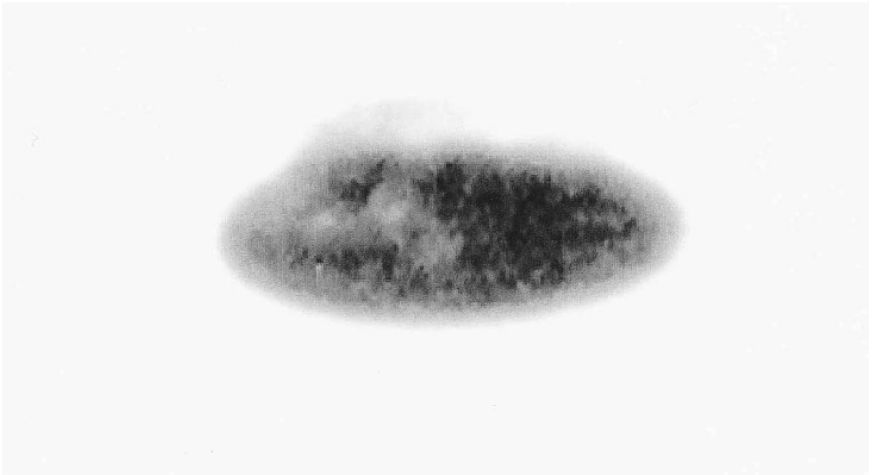

Fig. 18. Nonlinear scale-stretch enhancement of object underside in Heflin Photo 2.

events, as described by Rex Heflin. It also solidly reconfirms Heflin's integrity and reputation for those who had tended to believe that he had "hoaxed" Photo 4. In the raw data from the third Heflin photograph, the intensity values for the trail and background sky are close enough to each other so that the corresponding shades of gray are difficult to distinguish. The trail readily appeared, however, when a computer program reassigned the output intensity range such that the darkest sky pixel became black and the brightest sky pixel became white. In the processed image, the new shades of gray were easily distinguishable and the trail was clear.

Heflin snapped his Photo 3 just before the UFO emitted the smoke ring. In computer-enhanced enlarged images, the material in the smoke trail appears very similar to the particulate matter in the black band surrounding the object, as well as the particulate matter in the smoke ring (Figures 4, 16, and 17). This suggests that the black ring around the object was beginning to separate *before* the object emitted the circular smoke ring. If McDonald had had access to this information and to the information above about the sky background, his doubts about Heflin's Photo 4 would most probably have been satisfied, and he would have been able to accept it as part of a set taken within a time frame of 2 minutes, as estimated by Heflin.

Continued computer enhancement should help us determine the size and distance of the object. Author Kelson has independently detected an unusual "blurring" around the object, particularly in Photo 1, which is not due to ordinary phenomena such as motion or camera focus blur. This problem has impeded efforts to positively confirm size and distance. This blur issue correlates with Robert Nathan's finding, 30 years prior, of a "fuzziness" in the craft

image, which he could not relate to motion either of the camera *or* of the craft. Just what causes this "blurring" remains unexplained.

Contrast studies of the sky backgrounds in all four Heflin photos revealed similar overcast conditions in all of them. Thus, the major point of contention, which prevented James E. McDonald and others from accepting the fourth photo as part of a set, has been answered. Our analysis has also revealed the presence of the "wedge of light" on the dark bottom of the craft in Photo 2, in exactly the same position where Robert Nathan first detected it (Figure 18). This light feature was also detected by author Robert M. Wood in 1968, using the Marine Corps' copies. And our state-of-the-art computer enhancement has failed to reveal any sign of a string or other supporting mechanism, thus verifying NICAP's original analysis and the analyses of other early researchers who studied the photos. Our own enhanced version of the same area puts to rest William Spaulding's contention that the Heflin photos were hoaxed by photographing a small model hung on a string. It also renders unacceptable William Hartmann's "replication" of Photo 3 in the 1969 official report of the Condon Committee (Condon, 1969).

Some Puzzles Still Unanswered Regarding Fort Belvoir Photos

Although our reanalysis of the Heflin photos has answered most of the questions posed in the 1960s and 1970s, some puzzles connected with the whole milieu remain. For instance, the "projections" on the Fort Belvoir smoke ring were never explained to anyone's satisfaction. As described above, they were regularly spaced, appeared solid, and seemed to be projecting out of the vapor cloud. It must be remembered that Jack Strong's easy "solution" of this feature had seemed so implausible to McDonald that he warned his colleague, Clayton H. Reitan, to be wary of possible "phony maneuverings" by Strong. The fact that he later conceded that vortex rings could remain stable under the right meteorological conditions in no way explains the regularly spaced "projections" in the Fort Belvoir photos.

Information about UFO studies at Fort Belvoir, which has surfaced in the field during the past 10 years, was not available to McDonald. In 1985, researcher William L. Moore obtained a formerly secret document, which reveals that the 1127th Field Activities Group (FAG) at Fort Belvoir, Virginia, was an Air Force special projects group connected with UFO investigation. The partially declassified document is entitled "History: HQ 1127th USAF Field Activities Group, Ft. Belvoir Virginia: 1 July–31 December 1960." Although parts of the text are blacked out, it divulges that the 1127th conducted UFO investigations out of Fort Belvoir as far back as 1959 and possibly even earlier (U.S. Air Force, 1960).

Was the 1127th UFO study group active at Fort Belvoir in September 1957, when six "smoke ring" photos were taken by Private Stofko? Were the Fort Belvoir smoke ring photos anything other than a so-called "atomic bomb sim-

ulator?" Why did a vortex ring from an ordinary explosive device develop regularly spaced projections?[3] Might the Fort Belvoir photos have been associated in some way with UFO activity, just as Heflin's "smoke ring" was associated with a solid, metallic-appearing UFO?

The fact that the 1127th was based at Fort Belvoir, of course, does not prove that it was definitely linked with the Fort Belvoir smoke ring photos any more than Noel Scott's ionized air experiments at Fort Belvoir can be definitely linked with UFO investigations by the 1127th. Many other activities were conducted out of Fort Belvoir besides the Air Force's 1127th. However, the possibilities and questions remain. The declassified 1127th document, generously shared by researcher William L. Moore in 1994, constitutes additional proof that Project Blue Book was *not* the only official group investigating UFOs. This fact is not surprising to us in the 1990s, but it would have been extremely enlightening to researchers in the 1960s.

The 4602nd Army Intelligence Special Services (AISS) was originally charged with the responsibility of recovering "space vehicles" as well as the investigation of UFO reports, according to a 1961 document obtained by researcher Clifford E. Stone, a retired U.S. Army sergeant (Stone, 1995). It is unclear just when the responsibility for UFO investigation switched from the 4602nd to the 1127th or if *both* units possibly were involved in UFO investigations at the time of the Fort Belvoir photos. Documents obtained by McDonald in 1970 from Blue Book archives at Maxwell AFB in Alabama, designated the 4602nd as one of the investigative units for the August 13–14, 1956, Lakenheath–Bentwaters sightings in England, an overseas sighting in which McDonald was highly interested (McDonald, 1970). If McDonald had known about Fort Belvoir's 1127th, he would not have trusted the assurances of Fort Belvoir officials so readily and would have persisted in his efforts to document Colonel Jackson's, Jack Strong's, and Andrew Taylor's statements.

Conclusions

Our team's reanalysis of the set of four Heflin UFO photos lead us to draw the following conclusions: (a) The clouds in all four photos are consistent; (b) we have detected a wake, never before reported to our knowledge, impressively suggesting a real object moving through the atmosphere; (c) the mid-1970s GSW analysis that showed a "string" was a stunning error, certainly not based on legitimate copies, and possibly hoaxed itself, by persons unknown, on the copies Spaulding and GSW used; (d) the notations on the back of the first three photos suggest they were part of a covert analysis; (e) James E. McDonald, erroneously led to believe that the fourth photo was taken at a different time and place from the first three Heflin photos, missed a golden opportunity

[3] One of us (R.M.W.) asks if they might possibly be attributable to regularly spaced barrels containing diesel oil?

to identify the finest photo evidence available at the time; (f) the trail of particulates detected behind the craft in Photo 4 clearly demonstrates that the smoke ring in that photo is apparently the same as the black band of particulates detected in Photos 1 and 3; and (g) all of the photographic evidence remains totally consistent with the statements of the photographer, Rex Heflin.

Our reanalysis of the August 3, 1965, Heflin photos confirms that Heflin's account of the sighting is entirely consistent with his pictures and reconfirms that the witness/photographer was not involved in a hoax. This analysis represents a general study that specifically addressed the historical issues behind these photographs. An in-depth analysis is underway that will characterize the blur of the object and incorporate this information into determinations of size and distance. This analysis will be offered for a forthcoming issue of this journal.

References

Condon, E. U. (1969). *Scientific study of unidentified flying objects.* New York: Bantam Books.
Druffel, A. (1997). James E. McDonald's UFO files. *Mufon UFO Journal,* No. 345, 3–9.
Edwards, F. (1966). *Flying saucers—Serious business.* New York: Lyle Stuart.
Encyclopedia Britannica, 1968 Book of the Year (Special Rep.). (1968). UFO's & the Colorado project, reevaluating the unidentified (p. 123).
Epperson, I. (1966). Personal communication.
Gray, J. (1968). Personal communication.
Heflin, R. E. (1965). Personal communication.
Jackson, Col. J. H. (1968). Personal communication.
Lorenzen, J., & Lorenzen, C. (1966). *APRO Investigator.* Tucson, AZ: Aerial Phenomena Research Organization.
McDonald, J. E. (1953). The earth's electricity. *Scientific American, 188* (4).
McDonald, J. E. (1967). Personal communication.
McDonald, J. E. (1968). Handwritten notes on meeting of Los Angeles NICAP Subcommittee, in "Heflin" file. (McDonald's UFO research files have been recently archived and are available to the public at University of Arizona Library, Tucson.)
McDonald, J. E. (1968a). File "USSR: A. A. Tikhanov; Y. A. Fomin; Fedor Y. Zigel; Gen. Porfiri Stolyarov."
McDonald, J. E. (1968b). "Ft. Belvoir" file.
McDonald, J. E. (1968c). Personal communication.
McDonald, J. E. (1968d). Memo to Dr. William Hartmann.
McDonald, J. E. (1968e). Personal communication.
McDonald, J. E. (1970). UFOs over Lakenheath in 1956. *FSR: Flying Saucer Review* (London), *16*(2), 9–17, 29.
Project Blue Book Files. (1965) Heflin, Rex E. Photo Case. Washington, DC: National Archives.
Rankow, R. (1967). Personal communication.
Reichmuth, Capt. C. F., U.S. Air Force. (1965). In Young, M. (Ed.). *UFO Top Secret.* (138–141) New York: An Essandess Special Edition, 1967.
Spaulding, W. (1975). *August–Summer news bulletin: Result of computer photo analysis.* Tucson, AZ: Ground Saucer Watch, 2.
Spaulding, W. (1977). Personal communication.
Stone, C. E. (1995). Point Piece: Air Force lied about projects, researcher says. *Sunland, California UFO Magazine, 10*(4), 4, 43.
Strong, J. (1967). Personal communication.
Toledo Blade. (1952). They're homemade "flying saucers": Expert makes saucers in glass jar.
U.S. Air Force. (1960). History HQ 1127th USAF Field Activities Group. (Declassified government document.)