

Strange Spinoff of the Space Age: ACCIDENTAL OBSERVATIONS OF ARTIFICIAL SPACE CLOUDS

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February 11, 2017

DRAFT-4

“Space clouds” are unlike rocket plumes

- Because they are not ejected energetically for propulsion, these clouds expand and dissipate more slowly
- Since they are not associated with the launch phase, they can occur long afterwards [minute, hours, days, or more] and so can be seen in the skies of regions from away from launch sites
- Because they usually are directional from vents on non-stabilized vehicles, with significant rotational rates, they can trace out geometric patterns
- They can also appear spherical or hollow-spherical
- Practical purposes include safing booster by dumping excess fuel, eliminating waste fluids [usually water], evaporative cooling
- Accidental releases may never be documented

“Space clouds” are not earthly “clouds”

- They are free-flying unconstrained particulates
- They have no mutual attractive or associative forces
- Two flows can interweave and affect particle motion by collision
- Altitude and brightness can vary enormously
- They are not opaque like water clouds but portions can be bright enough to mask out light from dimmer stars behind them
- Russian scientists [eg Yuliy Platov] suggest neologism ‘cosmosol’ to acknowledge uniqueness of the object [analogous to ‘aerosol’]

WHY PERFORM FUEL DUMPS?

Because of unpredictable variations in engine performance and real-time steering, required fuel load is uncertain to a small degree, perhaps 1 - 2 %

To make it worse, running out of either propellant -- fuel or oxidizer -- creates a bad mixture ratio in the thrust chamber that can make it blow up.

So a 'margin' of better-safe-than-sorry propellant is always carried.

In recent years it was realized that this leftover fuel could go unstable after a few months and explode, littering the orbit with shrapnel.

So now the tanks are vented as soon as the rocket has deployed its payload - - whence the cloud, sometimes spiral-shaped.

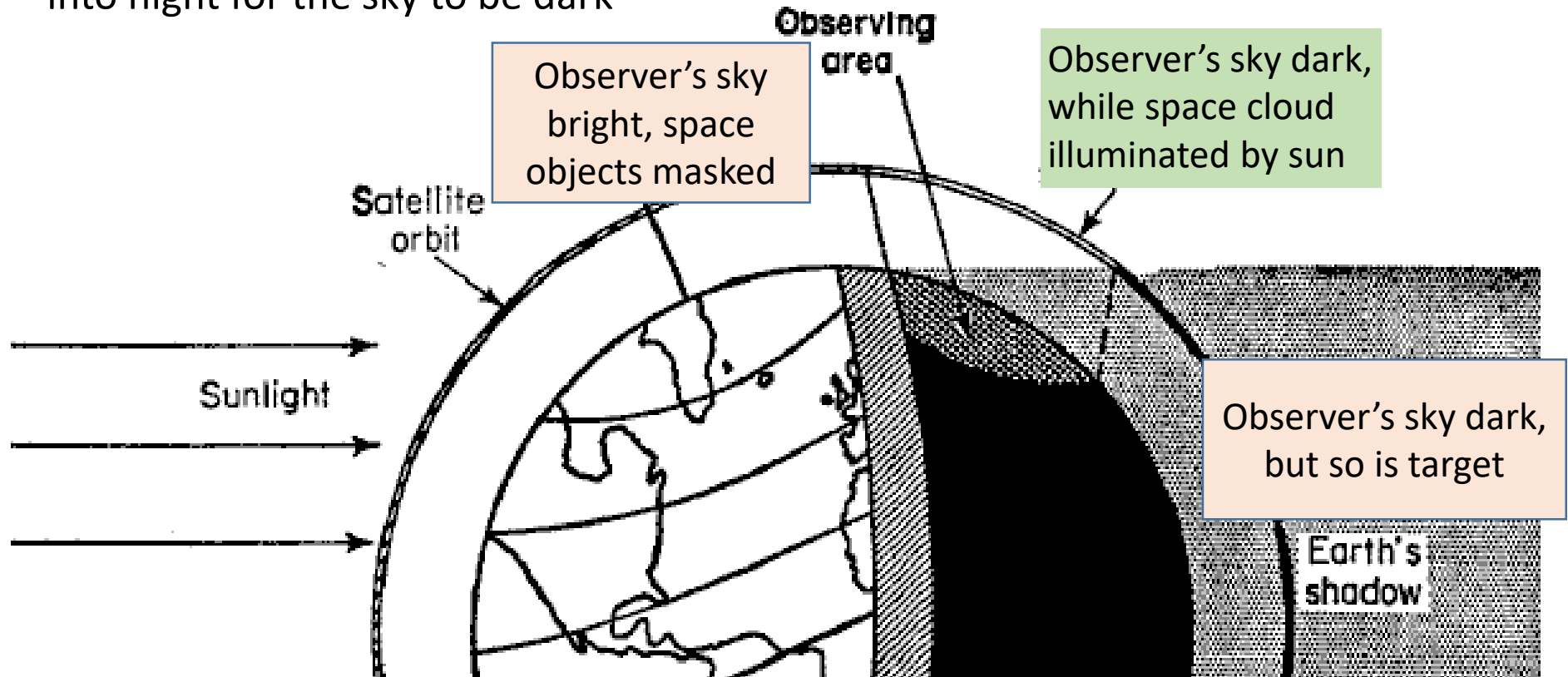
In some cases, clever mission designers point the venting forward to slow the booster a bit, dropping it to a safe path lower than the payloads -- that usually requires keeping it stable during the minutes of the dump, creating a v-shaped [read 'triangle'] cloud.

Requirements for visibility

- MOST cloud-generating events will NEVER be seen from the ground
- Several circumstances must ALL occur together to create opportunity
- First, the observer's sky must be dark, since daytime sky brightness will mask any light coming from a diffuse 'space cloud'
- Second, the sky must be clear
- Third and probably most important, the cloud must be sunlit
- These conditions coincide with those for observing ANY earth satellite
- However, 'space clouds' are MUCH less frequent than satellite overflights
- Space clouds can vary in brightness depending on amount of fluid dumped AND range-to-observer, so while some are large, bright, and fast-moving, many others can be dim, small, and nearly stationary in the sky

twilight visibility – a special circumstance

As with observing artificial satellites, the cloud must be high enough to be sunlit while the observer is far enough into night for the sky to be dark



Determining illumination conditions

- Numerous internet and mobile apps
- I use www.heavens-above.com
- Select 'new observing point'
- Select 'Sun' conditions
- Enter desired date/time
- Also generates night sky charts for any desired location/date/time

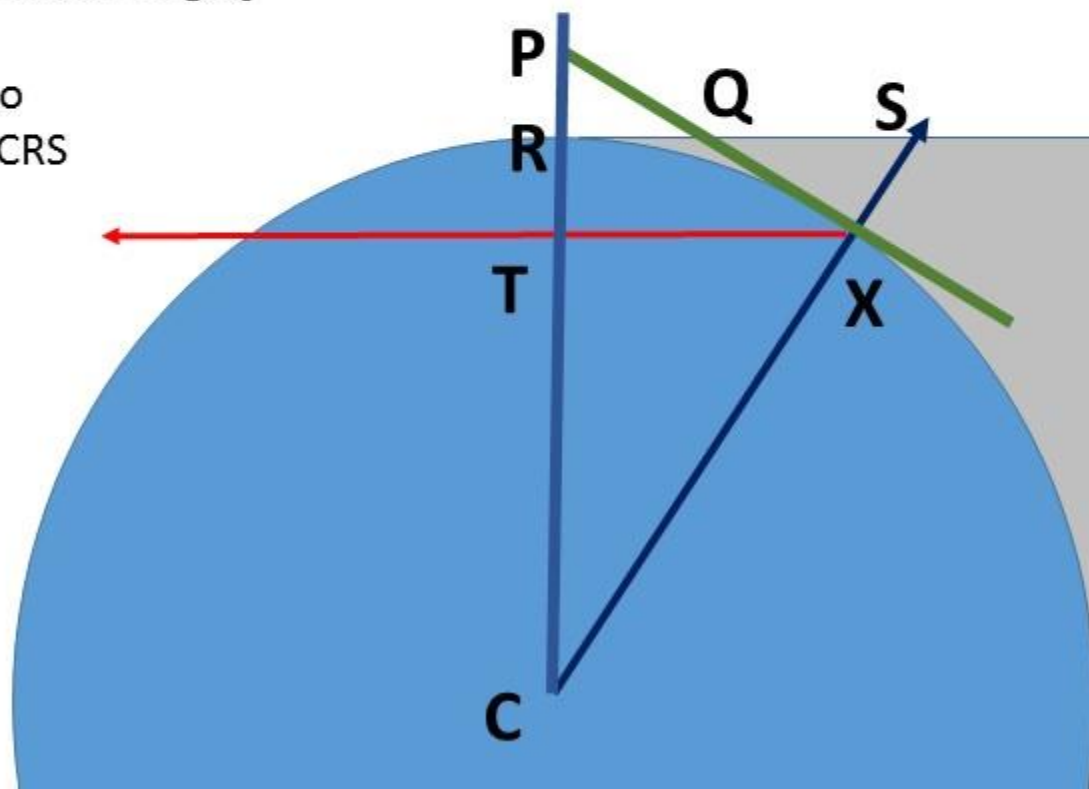
As clouds 'float' in space orbits, when passing in view of any point on Earth's night side, how can one calculate if they will still be lit up by sunlight?

Problem: Solve for XS.
Given $CR = CX = \text{earth radius}$
and $\angle PXT = \theta$ [sun depression angle]

Notice similar triangles, so
and $\angle PXT = \angle PXC = \angle CRS$

Taking triangle CRS,
 $\cos \angle RCS = CR / CS$
Hence
 $CS = CR / \cos \theta$
So $XS =$
Radius $\times (1/\cos \theta - 1)$

Radius = 6371 km

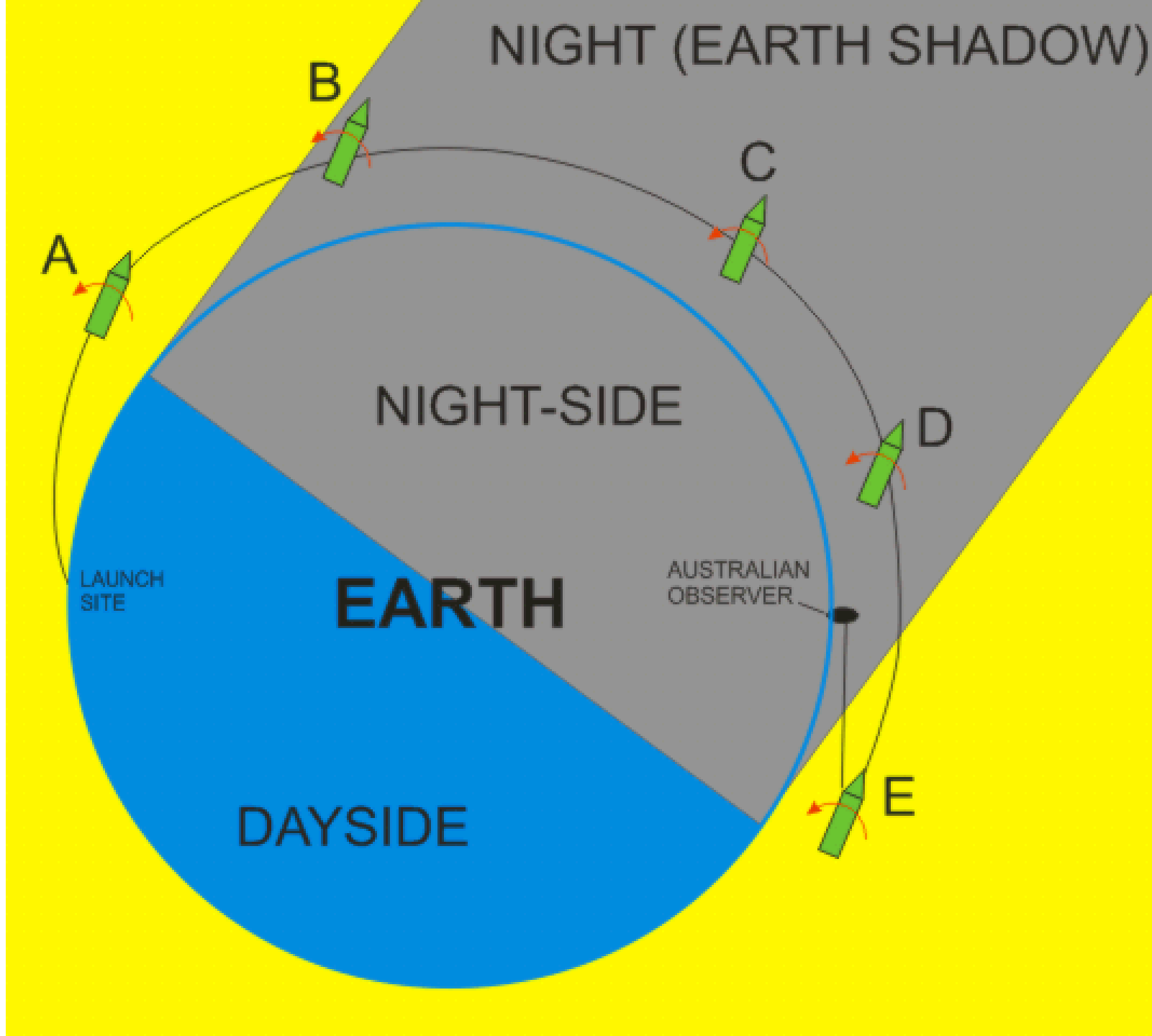


TYPICAL 'SHADOW HEIGHT'

5.0°	15 km
10.0°	79 km
15.0°	195 km
20.0°	367 km
25.0°	603 km
30.0°	913 km
35.0°	1314 km
40.0°	1827 km

ATMOSPHERIC REFRACTION
AND SUN'S ANGULAR SIZE
WILL CREATE SOME SPILLOVER
SPREAD OF SUNLIGHT, LOWERING
THE ILLUMINATED ZONE SOMEWHAT
[APPROXIMATELY ONE DEGREE].

Alternate graphic
of observation
zone



Recent event – GSSAP Satellite Arrives in GEO

Scott Tilley at <https://www.youtube.com/watch?v=QsKqsv69yJ8>

Taken by Chad Blakley on November 11, 2016 @ Abisko National Park, Sweden, at the same time that Atlas V's second Centaur stage had just completed its activities. Some are saying that this is the Centaur venting propellant post-mission. Source spaceweather.com



Fuzzy naked-eye
object but not
in-your-face
spectacular



Historical overview -- Events to be discussed

[meant to be illustrative of typical events]

- September 21, 1961 – Soviet missile test over the Pacific
- Nov 27, 1963 -- Venting US Centaur upper stage over South Atlantic
- November 30, 1964 – Zond-2 booster cloud seen from Caucasus
- August 11, 1968 -- Centaur failure, spiral seen from Cuba to West Africa
- December 21, 1968, Hawaii and Britain – Moonbound Apollo-8 fuel dump
- June 12, 1980, Argentina, Soviet Molniya booster fuel dump
- Aug 12, 1986 Japanese H-1 booster prop venting over eastern US
- Aug 27, 1987 Japanese H-1 booster prop venting over eastern China
- March 17, 1987 Alaska, Zenit booster fuel dump
- Sep 14, 2006 spinning comma cloud, Tomsk, Russia,
- June 5, 2010, spiral cloud over SE Australia
- December 23, 2011 Siberia, Meridian-5 booster explosion in space
- Nov 11, 2012 China, Ariane-5 fuel dump
- September 1, 2013 Melbourne, Australia, Chinese rocket fuel dump
- Sep 30, 2013 southern Africa, Space-X booster fuel dump

September 21, 1961 – First well-documented cloud

- Soviet long-range missile vented fuel post engine cutoff
- Observed from ships and airliner in mid-Pacific
- Caused by Soviet long-range missile test hitting near Hawaii
- Investigated and properly assessed by USAF 'Project Bluebook'
- Major UFO study groups rejected that explanation
- Reason: they were clueless about what rocket clouds looked like
- So were most other people -- and little has changed since then
- Obtaining precise records of missile event times took decades

1961 Sep 21 – first detailed account of rocket plume observation

- Reports from the Federal Aviation Agency, and the U.S. Navy Oceanographic Office publication “Notice to Mariners,” establish the following facts.
- At 1700 Greenwich Mean Time, the S.S. Iberville, north and east of Midway Island, noticed **a white object about 20 degrees above the NW horizon**. Its apparent angular size was about 1 degree (**twice the apparent size of the full moon**). For about 10 minutes, the UFO was observed passing over the ship headed southeast. As it neared the ship’s meridian, it resembled **a huge halo with a bright object in the center**. The apparent size increased to over **four times the size of the full moon**.
- At the same time, a British Overseas Airways Corporation (BOAC) airliner about 800 miles northeast of the ship saw the object **overtake the plane**. From a steep angle above the plane, the UFO continued southeasterly and disappeared over the horizon. Capt. H. F. Griffin described the UFO as “like **a large smoke ring** about 2 degrees in diameter [about 4 times the size of the full moon].” He said **the center of the ring was clear sky**, and once a star was visible through it. A ray of light seemed to project downward from the object.
- A Pan American Airways plane, about 400 miles southeast of Capt. Griffin’s position, confirmed the report. The pilot reported **a doughnut-shaped object** moving easterly about 10 degrees above the horizon.
- http://www.astronomyufo.com/UFO/SUNlite5_5.pdf

Iberville report – full text

- At 1700 G.M.T. on September 21, 1961, while in lat. $31^{\circ} 30' \text{ N.}$, long. $175^{\circ} 30' \text{ E.}$, a few minutes before morning twilight, a white opaque mass about twice the size of a full moon appeared in the northwest at an elevation of about 20° .
- It continued to climb toward the zenith and at about an elevation of 40° , the mass opened gradually to appear as a huge halo with a satellite in the center having very nearly the brightness of a first magnitude star.
- By the time it reached the zenith, it had more than doubled in size reaching its maximum at the zenith and then diminishing as it proceeded to the southeast.
- As it diminished it continued to decrease in size but did not appear to shrink into a corona as it had appeared but rather faded out completely at an elevation of approximately 20° .
- The entire mass was in view for approximately 8 to 10 minutes.

September 21, 1961

NICAP == Why it couldn't be manmade

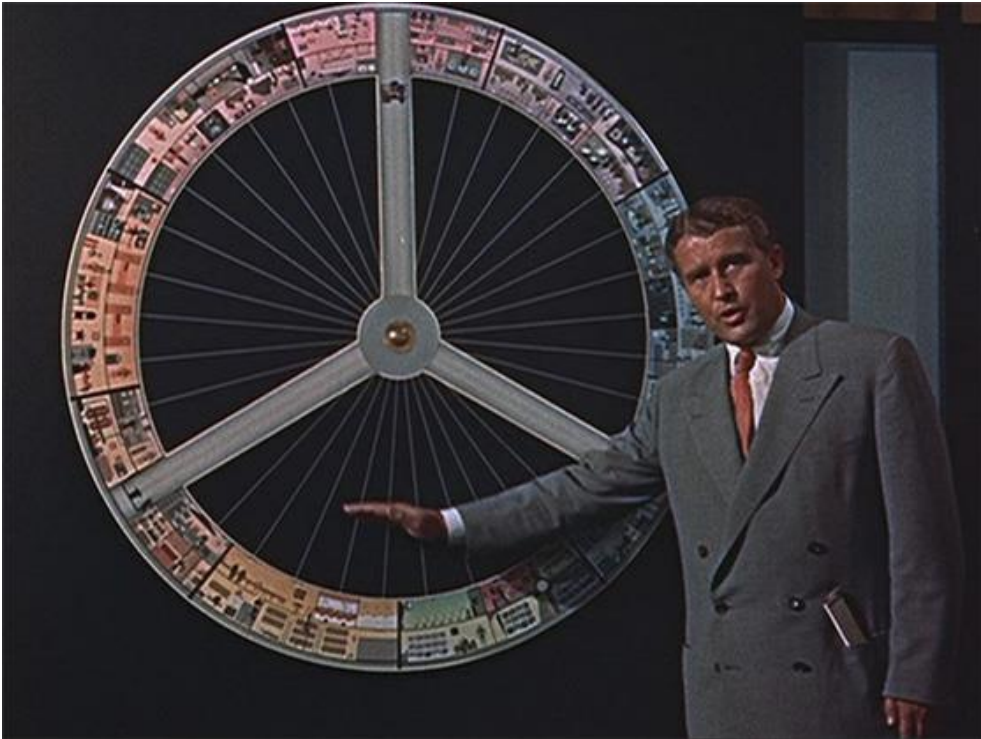
[NATIONAL INVESTIGATIONS COMMITTEE ON AERIAL PHENOMENA]

- NICAP would add the following comment about the case in their UFO evidence document: “The Soviet Union announced a few days later that they had successfully test fired a multi-stage carrier rocket over the Pacific (exact date not on record). However, the reported size of the UFO was **far too large** to be explained as a rocket payload.” [quoted by Printy]
- Printy quotes their UFO Investigator, the following:
 - 1. “Based on first reports, these points seem evident: **The object was not an ICBM missile.** Nor was it a satellite re-entering the atmosphere. **These appear only as small balls of fire,** briefly visible.
 - 2. “The reflected light was from the sun, which was an hour below the horizon. The UFO had to be very high to catch its rays.
 - 3. “At such a high altitude, the unknown device had to be extremely large (at least several hundred feet in diameter) for its edges and the hole to be so clearly seen by the BOAC crew. **The size and description rule out** all earth-made rockets, satellites, or Echo-type balloons.”

NICAP SUGGESTED DONUT SHAPE COULD BE EVIDENCE FOR AN ALIEN SPACECRAFT

“The ‘doughnut’ shape the jet crews reported is similar to the future space-base proposed by rocket expert Wernher von Braun [JEO – photo below] --a huge doughnut-shaped ring containing compartments for crews and equipment and rotating to create gravity. At a distance, the connecting framework would be invisible, and from far below, the space-base would appear just as Capt. Griffin described the UFO.

“More advanced space engineers, experimenting on another planet, could have evolved the same type of space-base. It is possible that what the jet crews saw was such a spacecraft from another world. “ -- NICAP



**INSTEAD, THE REPORTED
SHAPE WAS ONE OF THE
EARLIEST ‘SPACE AGE’
ACCOUNTS OF WHAT
WOULD OVER DECADES
AND ALL AROUND THE
WORLD BECOME A
‘NORMAL’ VISUAL SKY
PHENOMENON OFTEN
ASSOCIATED WITH
INCREASING ROCKET
AND SPACE ACTIVITY**

Sep 29, 2013 fuel dump
over Madagascar.... [SpaceX]

<http://wikkit.tumblr.com/day/2013/09/29>

http://66.media.tumblr.com/084ff37750e52874c80e8486011c8ae5/tumblr_nx6tt0iPIC1u99kf2o2_1280.jpg

September 21, 1961

PROJECT 10073 RECORD

1. DATE - TIME GROUP 21 September 1961 21/1700Z	2. LOCATION 38.00N 161.00W 34.55N 154.40E (PACIFIC)
3. SOURCE Military	10. CONCLUSION Other (MISSILE ACTIVITY) Missile exercise in area at time of sighting.
4. NUMBER OF OBJECTS One	
5. LENGTH OF OBSERVATION 6 Minutes	11. BRIEF SUMMARY AND ANALYSIS Object appearing as large circular area of high intensity light. With dark outer rim traveling at orbital speed leaving faint glow or trail. Doughnut appearance. Observed to E and looked like light as it got closer it was brilliant with the center missing. 2nd report of object appearing like smoke ring 2 deg in diameter. Not like Aurora. Ring darker than rim around ring. Object moving ESE.
6. TYPE OF OBSERVATION Ground, Air-Visual	
7. COURSE ESE	
8. PHOTOS <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
9. PHYSICAL EVIDENCE <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

PROJECT 'BLUE BOOK' REPORT

September 21, 1961

From "Jonathan's Space Report"

1961 September 21 16:30 Z - .

Launch Complex: Baikonur LC31.

LV Family: R-7. Launch Vehicle: R-7A.

LV Configuration: R-7A E15003-03.

R-7A II-7 test - .

Nation: USSR. Agency: RVSN.

Apogee: 1,350 km (830 mi).

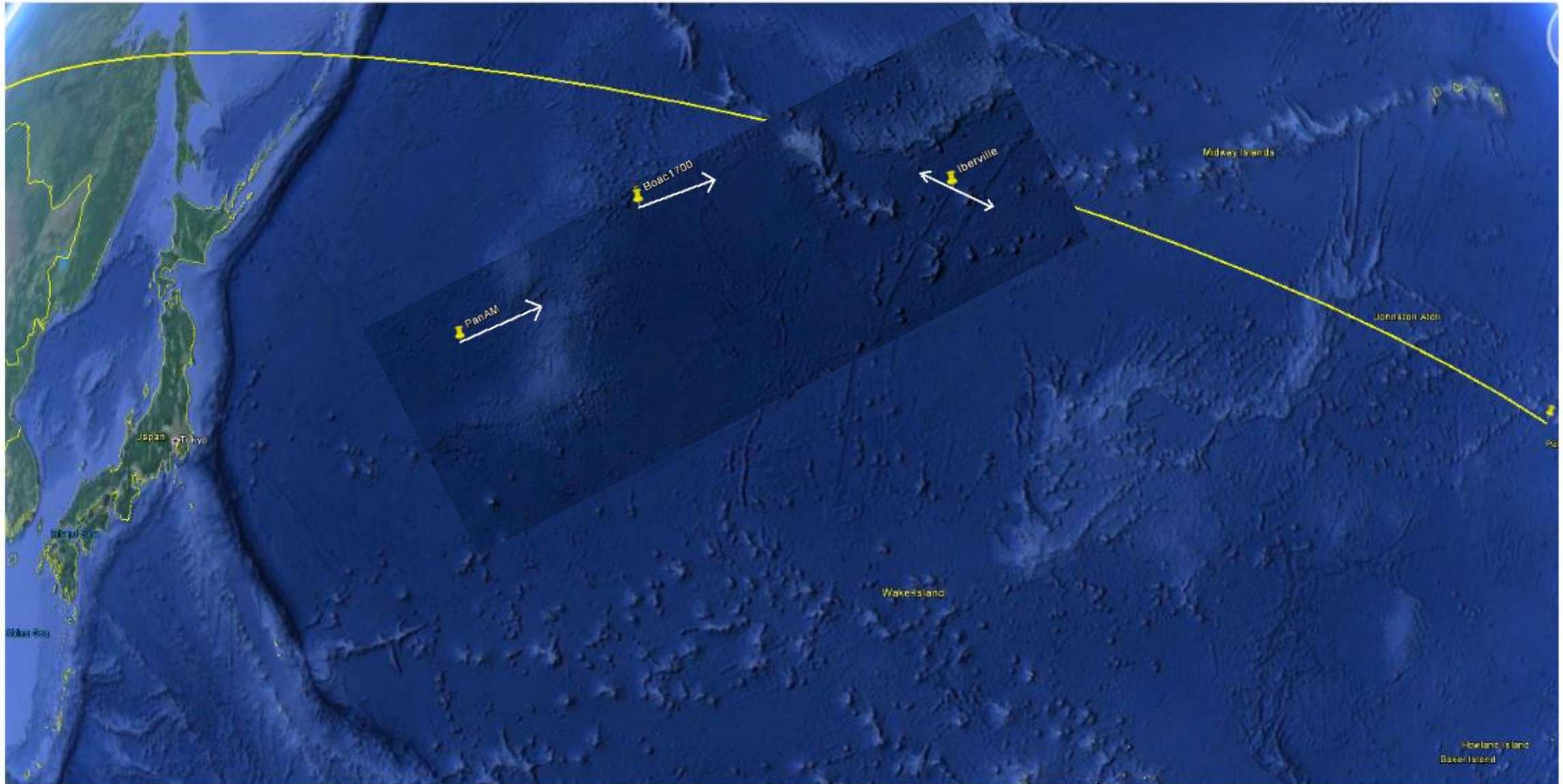
Summary: R-7A readiness verification test.



[http://www.russianspaceweb.com/
images/r7a_launch_2.jpg](http://www.russianspaceweb.com/images/r7a_launch_2.jpg)

September 21, 1961

First trajectory reconstruction = Printy



September 21, 1961

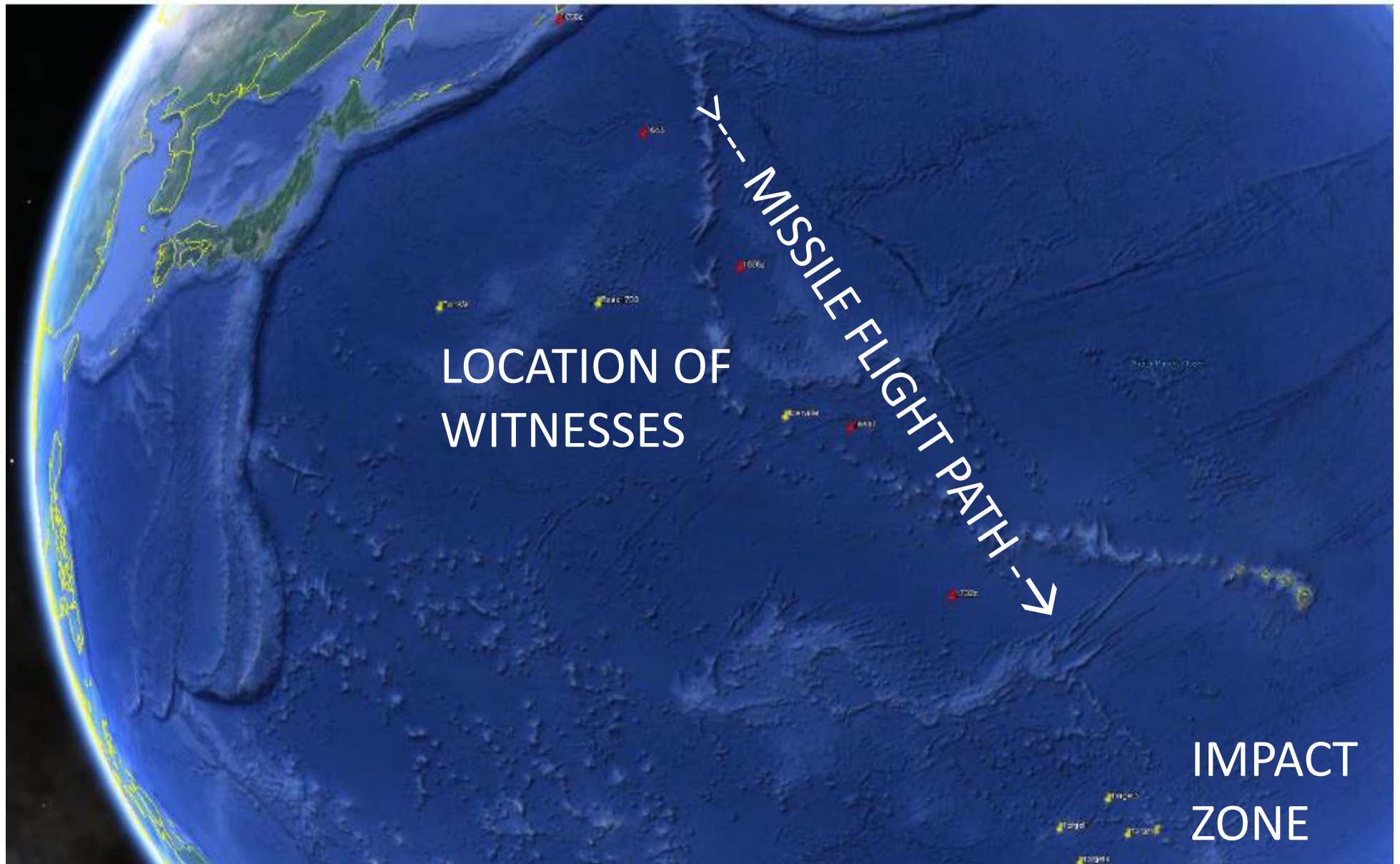
Additional research by Ted Molczan

http://www.astronomyufo.com/UFO/SUNlite7_1.pdf

- Ted Molczan decided to make a FOIA request for a report by the title of “Soviet launch vehicle tests in the Pacific Ocean” by W. Hrubciak dated 30 December 1965. [Hrubciak, W. Soviet launch vehicle tests in the Pacific Ocean. Aerospace Technology Division. 30 December 1965. Now available WWW: <http://www.dtic.mil/get-tr-doc/pdf?AD=AD0626845>]
- This report confirms that there was a missile launch test on September 21, 1960 and that its impact point was at a location defined by the following boundaries:
- North latitude - 10 deg 20' , 9 deg 10' , 11 deg 30' , 8 deg 5'
- West longitude - 170 deg 30' , 166 deg 45' , 167 deg 55' , 169 deg 20'
- This is not far from the location Printy determined from the media reports

September 21, 1961

Molczan data confirms initial Printy estimates



Based on the information in the report and McDowell's data, Ted Molczan had enough information to compute a probable ephemeris for the missile launch. The altitudes for every three minutes starting at 1650Z were:

Time	Altitude (mi)	Altitude (km)
1650Z	737.9	1187.5
1653Z	691.6	1113.1
1656Z	604	972
1659Z	475.3	765
1702Z	307.2	494.4

Printy: “The ground track is very interesting when compared to what the observers reported. Molczan made the following comments regarding his computed trajectory and the reports filed by the aircraft and SS Iberville”:

- 1. Pan American Airways 878
- The crew reported that at 17:00 UTC “the object appeared about 10 degrees over the horizon and well east of the aircraft”. The ephemeris reveals that the R-7A missile descended through 10 deg elevation seconds after 16:59 UTC, near azimuth 95 deg. The agreement is excellent.
- The departing azimuth given by the ephemeris, ~120 deg, is in reasonable agreement with the crew’s report in the PBB case file, “The complete phenomenon moving ESE with a bearing of about 100 degrees.” ESE is 112.5 deg, so definitely in the ballpark.

2. BOAC 582 witnesses versus reconstruction

- According to the NICAP report, the crew reported “Suddenly we saw this bright ring in the sky, about 50 deg up.” They also reported that it was travelling in the same direction as the plane, and that it “went over the horizon in seven minutes.”
- The plane’s bearing was 83 deg magnetic, 84.4 deg true. The ephemeris shows that the object overtook the plane on its port side. The report lacks details, but it is reasonable to guess that the sighting began no earlier than the time when the object had reached a point 90 deg from the bearing, on the port side, or azimuth 354 deg. That occurred near 16:52 UTC, when the object was at 40 deg elevation above the horizon (about 37 deg above local horizontal).
- The ephemeris shows that the missile continued to climb in elevation until shortly before 16:55 UTC, when it reached its maximum elevation, 54.1 deg above the horizon (~51 deg above local horizontal). At that point it was near azimuth 45 deg. The ephemeris elevation is in excellent agreement with the reported elevation of the object.
- The ephemeris shows that the missile passed below the visible horizon at about 17:02:45 UTC. Referring to the above information, it could easily have been in view for the reported 7 minutes.

3. S.S. Iberville witnesses versus reconstruction

- Quote of the notice to mariners report from Printy's SUNLite report:
- <<<< *At 1700 G.M.T. on September 21, 1961, while in lat. 31° 30' N., long. 175° 30' E., a few minutes before morning twilight, a white opaque mass about twice the size of a full moon appeared in the northwest at an elevation of about 20°. It continued to climb toward Ted the zenith and at about an elevation of 40°, the mass opened gradually to appear as a huge halo with a satellite in the center having very nearly the brightness of a first magnitude star. By the time it reached the zenith, it had more than doubled in size reaching its maximum at the zenith and then diminishing as it proceeded to the southeast. As it diminished it continued to decrease in size but did not appear to shrink into a corona as it had appeared but rather faded out completely at an elevation of approximately 20°. The entire mass was in view for approximately 8 to 10 minutes. >>>>*
- The ephemeris shows that the approaching missile climbed above 20 deg elevation near 16:52:15 UTC, at azimuth 331 deg. That is closer to NNW than NW [JEO: 315 deg], but in the ballpark.
- The departing missile descended below 20 deg elevation near 17:01:35 UTC, at azimuth 135 deg. The ephemeris estimates the duration above 20 deg as 9m20s, in excellent agreement with the reported 8 to 10 minutes.
- The object's azimuth as it departed, 135 deg, was almost exactly SE, as reported.

September 21, 1961

Still “unidentified” in UFO data bases....

- Still listed unexplained <http://www.nicap.org/waves/1961fullrep.htm>
Sep 21, 1961 Pacific pilot = “Airline pilots, ship, reported a bright white circular UFO. “
- **September 21, 1991.** - On this day [in 1961] at around five o'clock in the afternoon the passengers and crew of two Boeing 707 airliners, a BOAC flight and a Pan Am flight, witnessed a bright white UFO with a halo while flying over the **Pacific Ocean** northeast of **Midway Island**. (Sources: NICAP *UFO Investigator*, November 1961, p. 1; Robert Gribble, *MUFON UFO Journal*, September 1991, p. 11).
<http://ufoinfo.com/onthisday/September21.html>
- **Another website:** “Pacific Ocean—In the pre-dawn sky, a round object like a bright "ring" in the sky, with sharply outlined edges and a "very clear hole" in the center, quickly outdistanced two Boeing 707 jet airliners, as well as many other planes, between Wake Island and Honolulu”. <http://www.waterufo.net/item.php?id=732>
- This reference: George D. Fawcett, *Psychic Observer*, Vol. 3, No. 11, Southern Pines, N.C., November, 1962. [Reference in *Psychic Observer* for the above text not given]

conclusion

- Printy – “This sighting WAS caused by a Soviet missile test just as Project Blue Book had concluded but NICAP failed to properly evaluate. I consider this case closed.”
- Thanks to work by Printy and Molczan
- Original Blue Book assessment confirmed
- Original NICAP rejection of prosaic explanation – refuted
- Final verdict took decades to await full data AND competent investigation
- To be fair, the prosaic cause was unknown at the time and not anticipated by any outside observers
- Fifty years later, that excuse is no longer justified

Contemporary significance of this case

- TBS

Nov 27, 1963

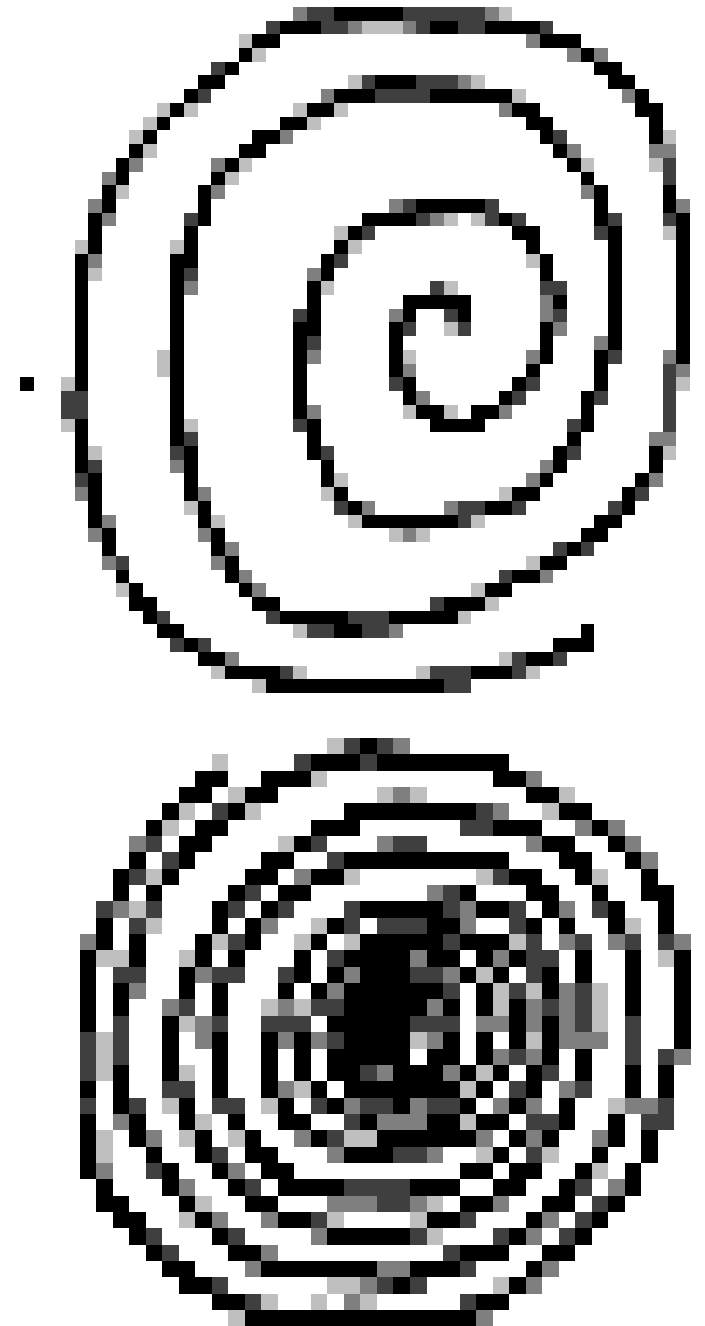
*From William R. Corliss' **Handbook of Unusual Natural Phenomena** (1977)*

What was seen by the ships was undoubtedly an American rocket, **Centaur 2**, launched from Cape Kennedy at 1900 GMT on 27th November 1963. The times and positions indicated by the three ships agree very closely with calculated values. The odd appearance cannot be explained precisely but it is no doubt associated with the fact that the rocket when seen was still under power or had very recently been so. (**Marine Observer**, 34:181-183, 1964)

<http://abob.libs.uga.edu/bobk/rocket.html>

1963-047 1963 Nov 27 1903:23 1963-047A AC-2 Instrumentation Ring AC-2

<http://planet4589.org/space/log/launchlog.txt>



OBSERVATION REPORTS

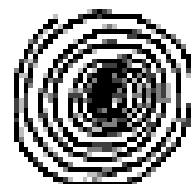
- m.v. **British Oak**. Position of ship: $24^{\circ}27'N$, $17^{\circ}14'W$. == A point of light of about 2nd magnitude with an elliptical glow of approx. 3° diameter and **concentric circles** of light was observed through binoculars at 1925 GMT. It was first seen bearing 230° at 18° altitude and disappeared 4 min. later bearing 190° , altitude 8° . The sky was cloudless and the atmosphere clear.
- m.v. **Ripon**. Position of vessel: $10^{\circ}5'N$, $15^{\circ}59'W$. == At 1926 GMT an illuminated body was observed bearing 270° , altitude 30° . It appeared at first to have a suffused glow around it, but as the object moved parallel with the ship's course, **the glow assumed the definite form of a tight spiral of blue-white light**. The **spiral** expanded to a maximum radius of about 5° with about **12 turns visible** at one time when bearing 200° , altitude 20° . The size afterwards diminished until the body faded from sight bearing 155° , altitude 12° , at 1931. As the object moved in azimuth, it also appeared to be gyrating about a centre in an anticlockwise direction and to vary in brilliance. At its brightest the object had a brilliance less than Venus and greater than Altair; its track passed between these two bodies. There was a cloudless sky and bright moonlight at the time. The whole phenomenon gave the impression of looking into **a conically formed spring** and was indeed a most sensational sight. We can only conjecture that it was an artificial satellite 'gone wrong' or passing through a cloud of meteoric dust.
- m.v. **Pennyworth**. Position of ship: $7^{\circ}39'N$, $14^{\circ}13'W$. == At 1900 GMT for approx. 5 min. a bright object having a magnitude greater than any other star or planet was seen in the sky. It appeared to be stationary in the west at an elevation of 40° , for about 2 min. It then moved off rapidly in a SE'ly direction, disappearing about 2 min. later. The bright light from the object radiated outwards, like the ripples from a pebble thrown into a pond; **at first in concentric circles, then in a spiral and finally in concentric half-circles**. The general impressions of the phenomena seen are shown in the accompanying sketches. The object was definitely not a meteorite, and the course was too erratic for an earth satellite.

M.V. RIPON

1. 1926 GMT BEARING 270°
ALT. 30°

2. 1927

3. 1928 BEARING 200°
ALT. 20°



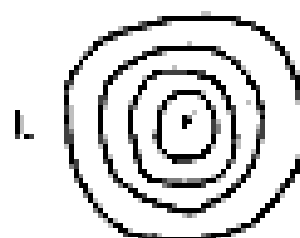
4. 1929



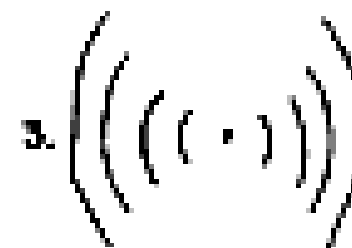
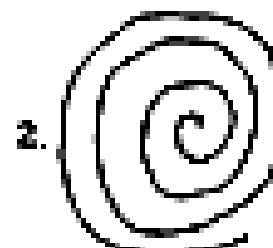
5. 1930 BEARING 155°
ALT. 12°

M.V. PENNYWORTH

1900 GMT ALT. 40°



DIAMETER
10°-15°



THESE IN
EQUAL PERIODS
OF TIME

Spiral trails of ascending rockets seen at sea

Contemporary significance of this case

- tbs

November 30, 1964 – Zond-2 booster cloud seen from Caucasus

On November 30, 1964, at 6 p.m. local time [GMT 15:00] (an hour after sunset), at the Shamakhinskiy Observatory in the Caucasus Mountains of Azerbaijan, astronomers M. Gadshiyev and K. Gusev saw an object moving from west to north.

The head of this object was twice the diameter of the moon. It looked like a ring with a sharp internal edge and a diffuse outer edge. In the center was a starlike object, which appeared as a point even through a telescope.

It left a tail that was visible for more than 15 minutes.

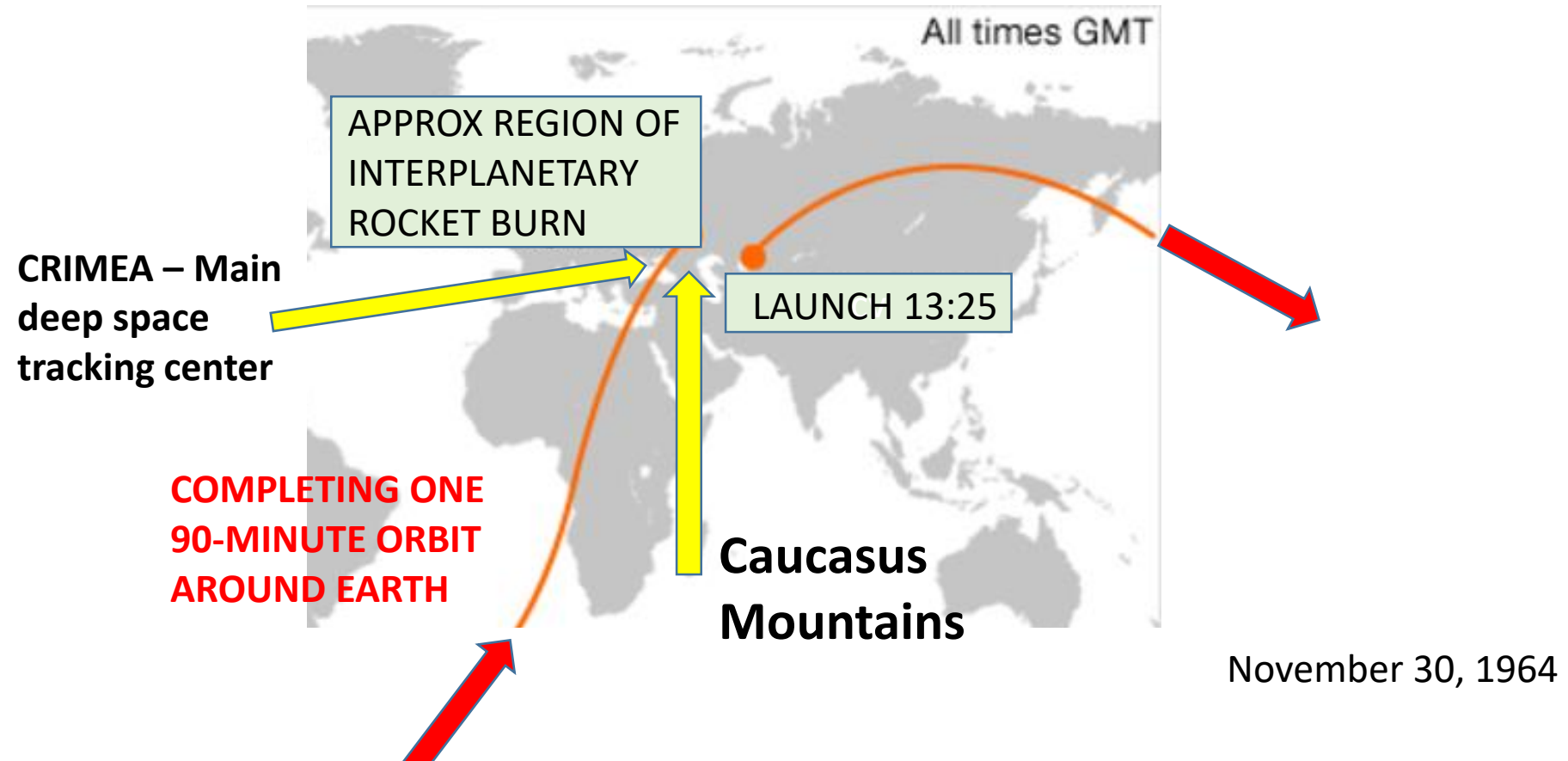
While the sighting baffled astronomers then, we now know that it correlates with the launching of the Soviet Zond-2 interplanetary probe. It had blasted off from the Baykonur spaceport an hour earlier, circled Earth once, and fired its last stage engine to break free of Earth's gravity.

The apparition seen in Azerbaijan was the postburn surplus fuel dump.

The likely culprit

1964-078 1964 Nov 30 1325 1964-078C Zond-2

<http://planet4589.org/space/log/launchlog.txt>



Contemporary significance of this case

- tbs

August 11, 1968 ATS 4 Centaur failure, spiral:

- REPORT FROM GUANTANIMO BAY, CUBA: The subject UFO was sighted at 110028Z by numerous personnel aboard ship in the GTMO area and by others aboard the Naval base. The object was sighted to the north of NAVBASE GTMO approximately 60 degrees above the horizon, and on a course of 130 degrees true. The object was glowing brightly and emitted what appeared to be a spiral trail of smoke or vapor.
- Crewmen aboard the USS Barry and Lasalle managed to obtain Kodachrome photographs of the subject object.
- The reported time of the sighting was 1968 Aug 11 at 00:28 UTC.
- For a time, I suspected debris from the 1965-082 launch, but was not convinced of a correlation, and the "spiral trail" was more suggestive of propellant venting than a re-entry. Before checking for possible sources, I decided to look for other possible sightings.
- http://www.nsa.gov/public_info/files/ufo/navy_report_cuba.pdf

Ted Molczan // 11 Mar 2014 // <http://satobs.org/seesat/Mar-2014/0077.html>

Sighting 2: USNS Roosevelt Roads, Puerto Rico

- Molczan found a report in the Project Blue Book case files, of a similar, near contemporaneous sighting, by CDR. R. H. Healy, at USNS Roosevelt Roads, in Puerto Rico, located near 18.22 N, 65.66 W - about 1,000 km to the east of Guantanamo. It was not investigated by Blue Book, but filed for information. The six page record of the sighting begins here:
<http://www.fold3.com/image/1/9677187/>
-
- The documents reveal that Cdr. Healy initially wrote to NASA's Kennedy Space Center, 10 days after his sighting. KSC responded with a form letter advising that UFO investigations were a USAF mission, and suggested he contact the Foreign Technology Division (FTD) at Wright-Patterson AFB. On 1968 Oct 23, he apparently forwarded a copy of the same report he sent to NASA, which seems to explain how it ended up in the Blue Book files.

Healy report “UFO sighting of 10 Aug 68”

- At approximately 2025Q on 10 Aug I saw a phenomenon in the sky I feel I should report to you. When I went out of my house I saw a narrow, bluish-green band of light to the WNW that I at first thought was the aurora borealis - I realize it is a northern latitude specialty. It ran from the horizon over Pico del Este Mt. to a point 60 deg above and over my quarters at the U.S. Naval Station Roosevelt Rds P. R. I then noticed a bright, yellow-white light, with an elliptical halo around it, slightly above the mountain and in the band of bluish-green light.
- I called to my wife, as I thought maybe I was seeing my first flying saucer, and when I did so I took my eyes off the object, and lost it. She noticed a white light which appeared to be the size of a first magnitude star moving in the band of light.
- It was then I realized that it was probably a satellite and that the band of light was more than likely reflected from the sun which had set an hour or so earlier.
- When the white light reached directly overhead it disappeared. There were no clouds. The band of light ran from 20 deg - 30 deg of arc in front, to the same distance behind, and moved through the sky with the white light, the "tail" disappearing also at the overhead point. The white light transited the sky at about the same rate that I observed an Echo satellite pass years ago in the Pacific.

August 11, 1968

Molczan report:

- The reported time of the sighting equates to 1968 Aug 11 at 00:25 UTC. As with the Cuban sighting, there was strong evidence of venting, so I decided to check for recent launches that might correlate, which led me to ATS 4. I was puzzled by the sightings having occurred well after a GTO burn would typically have been planned, until I remembered that this had been one of the failed ATS missions. The historical record confirmed that the Centaur-ATS 4 stack had been left stranded in LEO. The available TLEs reveal a close correlation in time and track with the sightings from Cuba and Puerto Rico.

Atlas-Centaur also observed from Africa

- From Sierra Leone, a report of a large bright halo - impression of ripples in a pond:

<http://www.fold3.com/image/1/9737436/>

From Liberia, a report of a luminous spiral tail:

<http://www.fold3.com/image/1/9737453/>

PROJECT 10073 RECORD CARD

1. DATE 27 November 1963		2. LOCATION Kenema, Sierra Leone, <i>AFRICA</i>		12. CONCLUSIONS <input type="checkbox"/> Was Balloon <input type="checkbox"/> Probably Balloon <input type="checkbox"/> Possibly Balloon <input type="checkbox"/> Was Aircraft <input type="checkbox"/> Probably Aircraft <input type="checkbox"/> Possibly Aircraft <input type="checkbox"/> Was Astronomical <input type="checkbox"/> Probably Astronomical <input type="checkbox"/> Possibly Astronomical <input type="checkbox"/> Other <i>ATLAS/CENTAUR</i> <input type="checkbox"/> Insufficient Data for Evaluation <input type="checkbox"/> Unknown	
3. DATE-TIME GROUP Local _____ GMT <i>27/1903Z</i>		4. TYPE OF OBSERVATION <input checked="" type="checkbox"/> Ground-Visual <input type="checkbox"/> Ground-Radar <input type="checkbox"/> Air-Visual <input type="checkbox"/> Air-Intercept Radar			
5. PHOTOS <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		6. SOURCE Civilian			
7. LENGTH OF OBSERVATION N/A		8. NUMBER OF OBJECTS 1		9. COURSE W	
10. BRIEF SUMMARY OF SIGHTING Object observed coming from West passing at speed of a/c. Gave off light at regular intervals. Had large bright halo. Trail had ripples. SEE MONROVIA CASE FOR R2 LAUNCH DATA.				11. COMMENTS Object conforms with ATLAS/CENTAUR- 2 Missile launch and subsequent passage over Sierra Leone.	

ATIC FORM 329 (REV 26 SEP 52)

August 11, 1968

PROJECT 10073 RECORD CARD

1. DATE 27 November 1963		2. LOCATION Monrovia, Liberia, Africa		12. CONCLUSIONS <input type="checkbox"/> Was Balloon <input type="checkbox"/> Probably Balloon <input type="checkbox"/> Possibly Balloon <input type="checkbox"/> Was Aircraft <input type="checkbox"/> Probably Aircraft <input type="checkbox"/> Possibly Aircraft <input type="checkbox"/> Was Astronomical <input type="checkbox"/> Probably Astronomical <input type="checkbox"/> Possibly Astronomical <input checked="" type="checkbox"/> Other <u>Missile</u> <input type="checkbox"/> Insufficient Data for Evaluation <input type="checkbox"/> Unknown	
3. DATE-TIME GROUP Local _____ GMT 27/1925Z		4. TYPE OF OBSERVATION <input checked="" type="checkbox"/> Ground-Visual <input type="checkbox"/> Ground-Radar <input type="checkbox"/> Air-Visual <input type="checkbox"/> Air-Intercept Radar			
5. PHOTOS <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		6. SOURCE Multi			
7. LENGTH OF OBSERVATION		8. NUMBER OF OBJECTS One	9. COURSE SE		
10. BRIEF SUMMARY OF SIGHTING Luminous spiral tail or exhaust hovering and great speed reported. Sky clear bright 3/4 moon. Elev estimated 15-40 deg above horizon.				11. COMMENTS Atlas/Centaur-2 Missile.	

ATIC FORM 329 (REV 25 SEP 52)

<http://www.fold3.com/image/1/9737453/>

August 11, 1968

December 21, 1968 moonbound Apollo-8

- James Cornell, public relations director of the Center for Astrophysics (formerly the Smithsonian Astrophysics Laboratory) in Cambridge, Mass. His newsletter *Centerline* had published a remarkable series of photographs of the "translunar injection" burn of Apollo-8 when it left its parking orbit and headed out on mankind's first voyage to the moon in December 1968.
- The photos, taken by a Smithsonian observation station in Hawaii shortly before dawn local time, showed a remarkable sequence of shapes and clouds as the rocket fired and then shut down.
- Another series of photographs showed Saturn third stages far out in space, venting great clouds of excess propellant, in 1969.



Observations & imaging from Hawaii

The first post-launch sightings involved either the trans-lunar injection (TLI) burn of the S-IVB engine or the dump of excess fuel from the stage shortly afterward. The first post-launch sightings are represented by a spectacular series of predawn photographs from the Smithsonian Astrophysical Observatory (SAO) station on Maui. The first one shows the TLI burn near 15:44 UT on Dec 21. As the spacecraft passed Hawaii, the changing perspective put the camera view looking up the sunlit exhaust plume.

John Stonesifer, NASA Recovery Team Leader, deployed to the South Pacific aboard the carrier USS Yorktown, both for planned recovery and in case of early mission abort. He reports that the crew had an excellent view of TLI from the carrier deck (and that a similar sight was visible from the Hornet for Apollo 11). He notes somewhat ruefully that "My biggest disappointment was that with all the NASA photographers aboard as part of our team we did not get any photographs of the sightings".

December 21, 1968



Fuel dump from England

As the spacecraft began its climb outward from Earth, several amateur astronomers in the UK photographed a fuel dump from the expended S-IVB stage shortly after 18:00 UT on December 21, 1968.

This event was seen, without prior notification, by F. Kent, Alan Heath, and M.J. Oates, who reports catching the cloud visually while getting off a bus. photograph above is by M.J. Hendrie.

"At Colchester, England, M.J. Hendrie took a three-minute exposure beginning at 18:16 Universal time on december 21, showing blowout of excess fuel from the third stage. The view is 5-1/2 degrees wide, and Theta Aquilae is at right of the chimney."

December 21, 1968



S4B fuel dump

In Kent, well-known amateur astronomer Cdr. H.R. Hatfield made several tracking photographs. One of them was published in the Daily Mirror, along with an unusually detailed background, shown here as scanned and contributed by Paul White. From the accompanying text, this was a 3-minute exposure with Pentax camera and 150mm lens guided visually on the spacecraft (which was visible telescopically although not distinct in the wide-field picture).



FOR COMPARISON

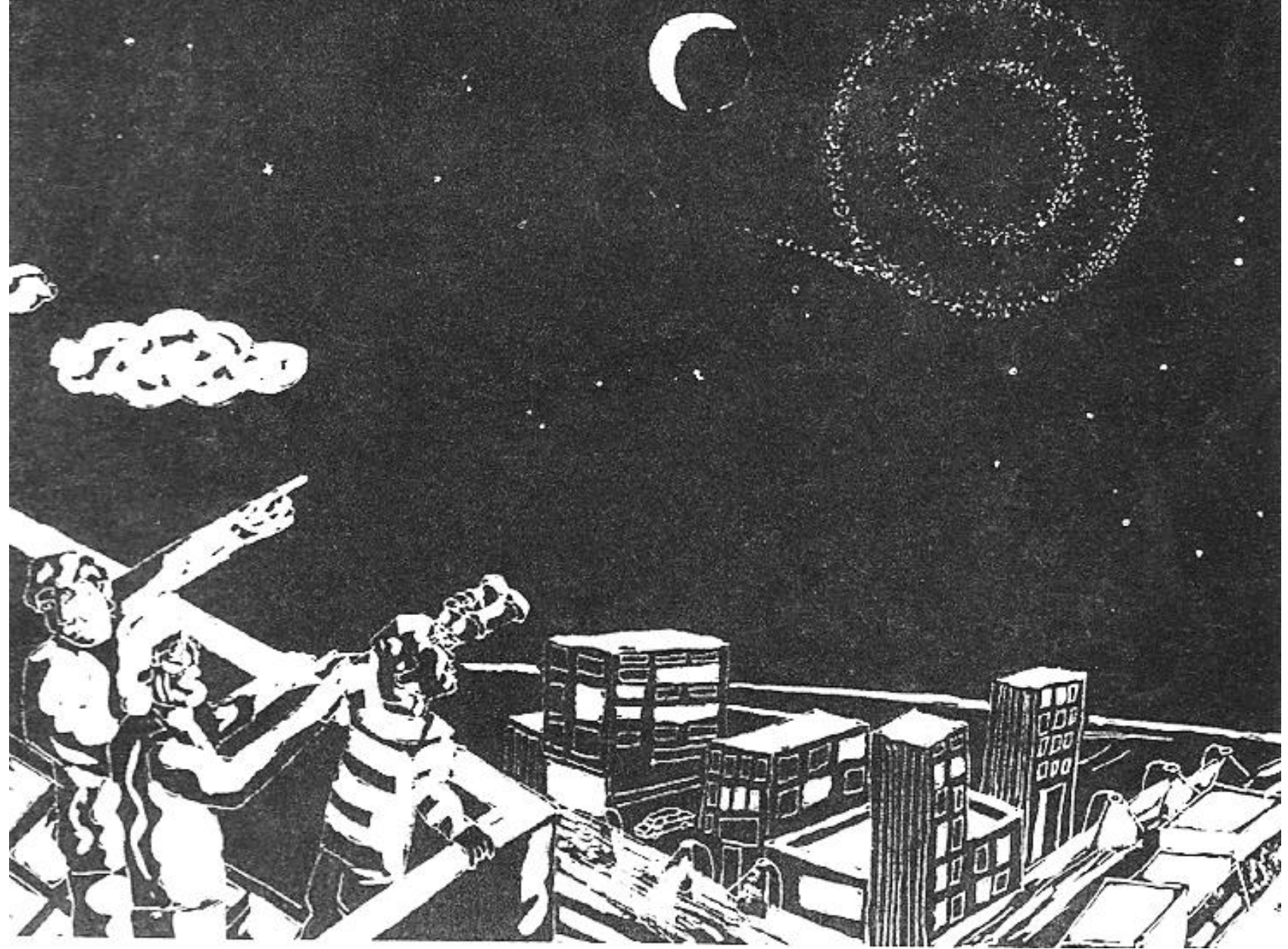
Backlit fuel dump from shuttle external tank, as seen from nearby in orbit

After separating from NASA's Space Shuttle Atlantis (STS-122) the external tank popped its relief valve and sprayed -- vented into space -- liquid oxygen and liquid hydrogen. This photo was snapped on 7 February 2008 by an astronaut orbiting aboard Space Shuttle Atlantis.

<http://chamorroible.org/images/photos/gpw-20060917-NASA-S122-E-005032-Space-Shuttle-Atlantis-STS-122-external-tank-separation-venting-20080207-medium.jpg>

December 21, 1968

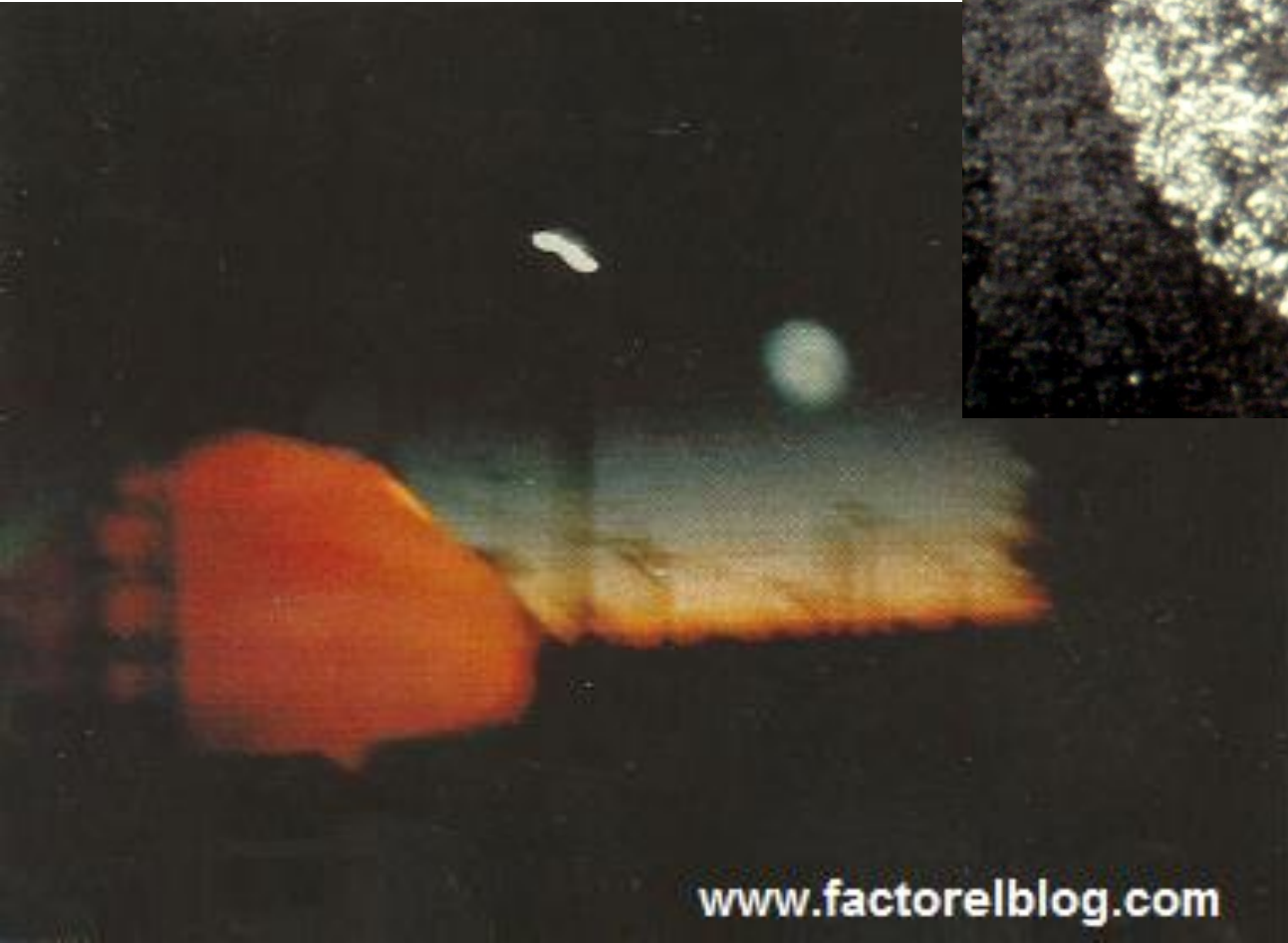
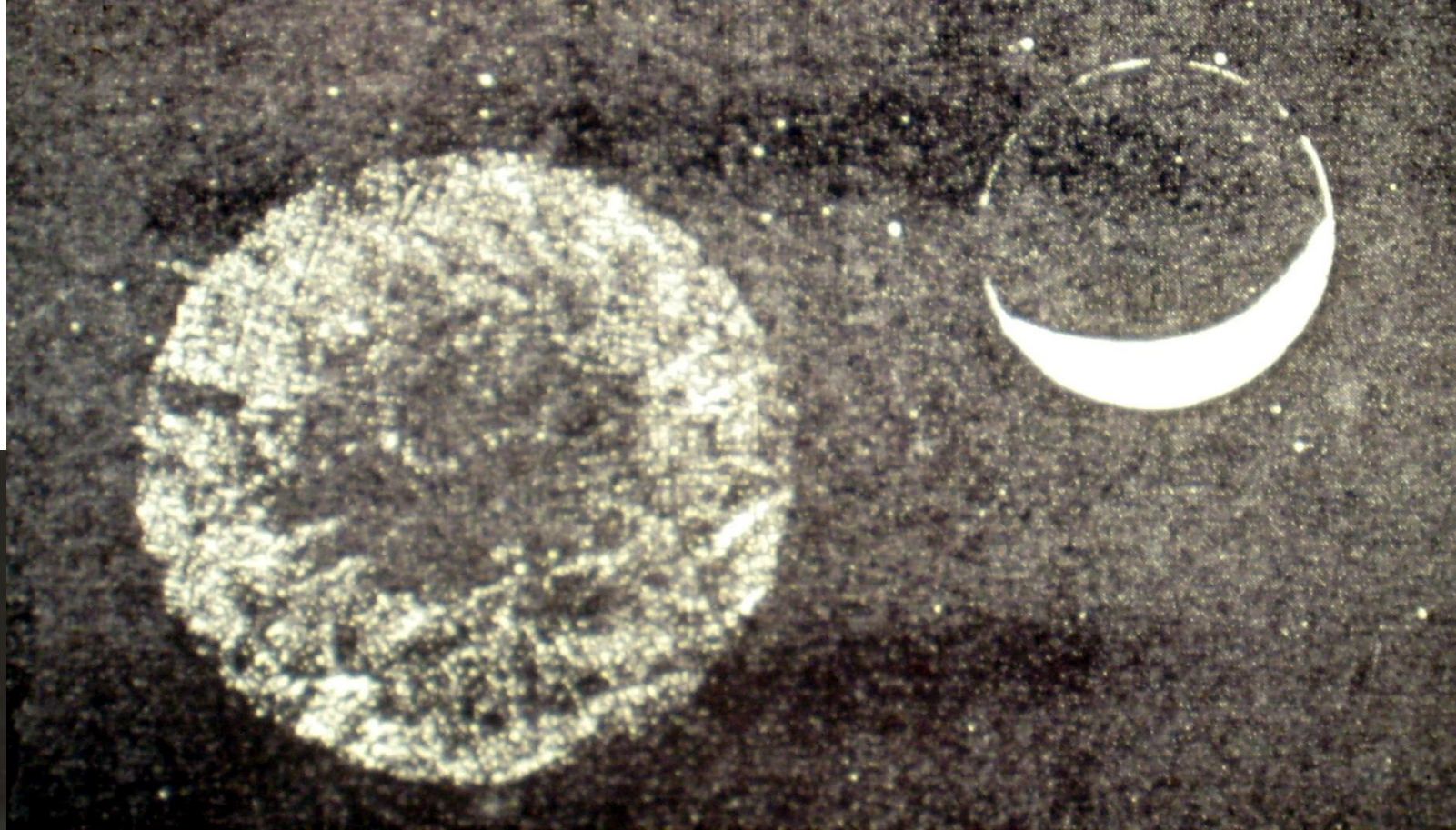
June 14, 1980 –
South America --
Soviet Molniya
fuel dumps



Full report:

http://satobs.org/seesat_ref/misc/molniya_clouds_over_south_america.pdf

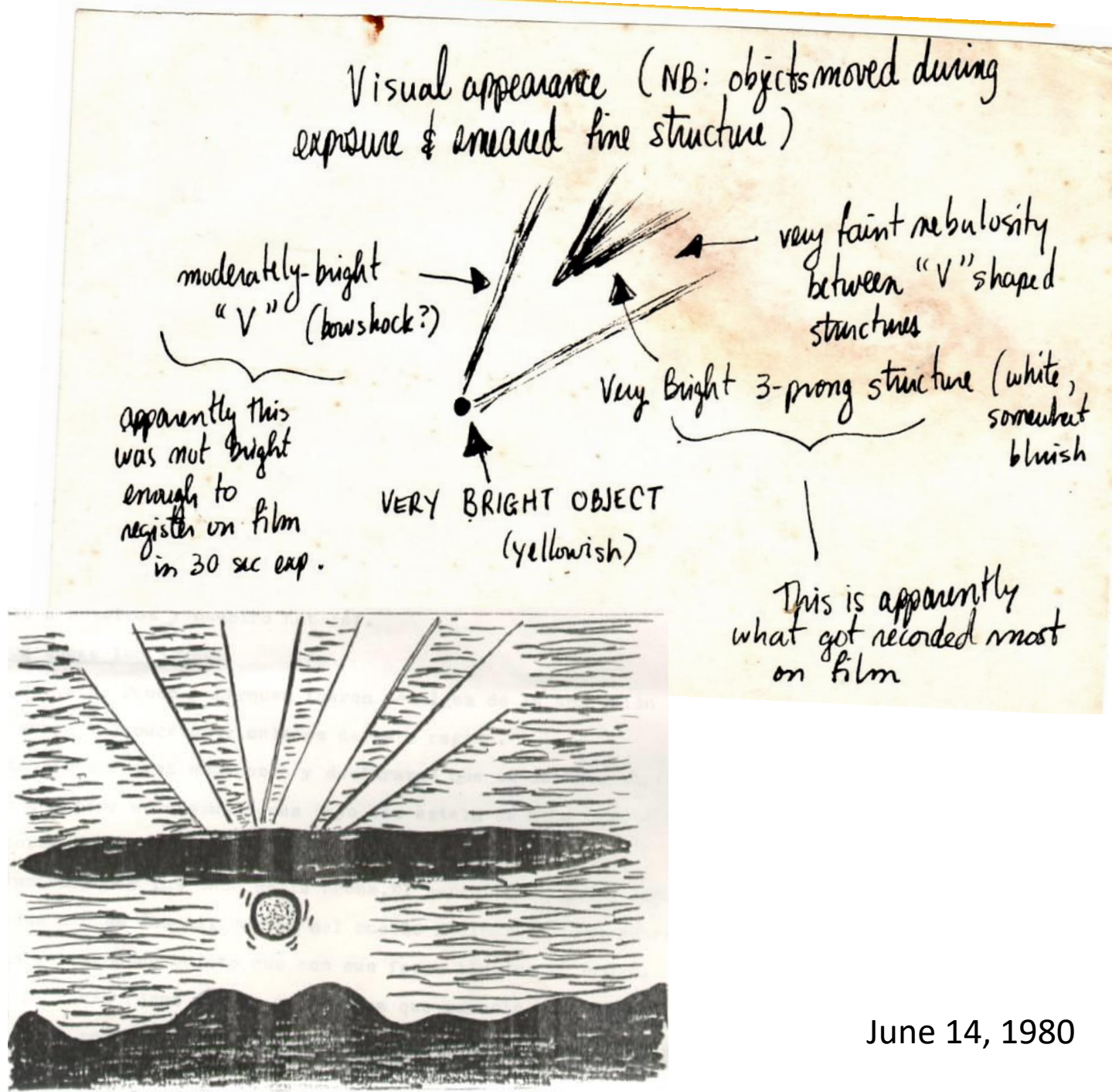
Hollow cloud
drifts below
setting moon



Exact same shape
and motion repeated
half a dozen times
over the decade



Booster's fourth stage was restarting to carry payload higher, then dumping fuel



June 14, 1980

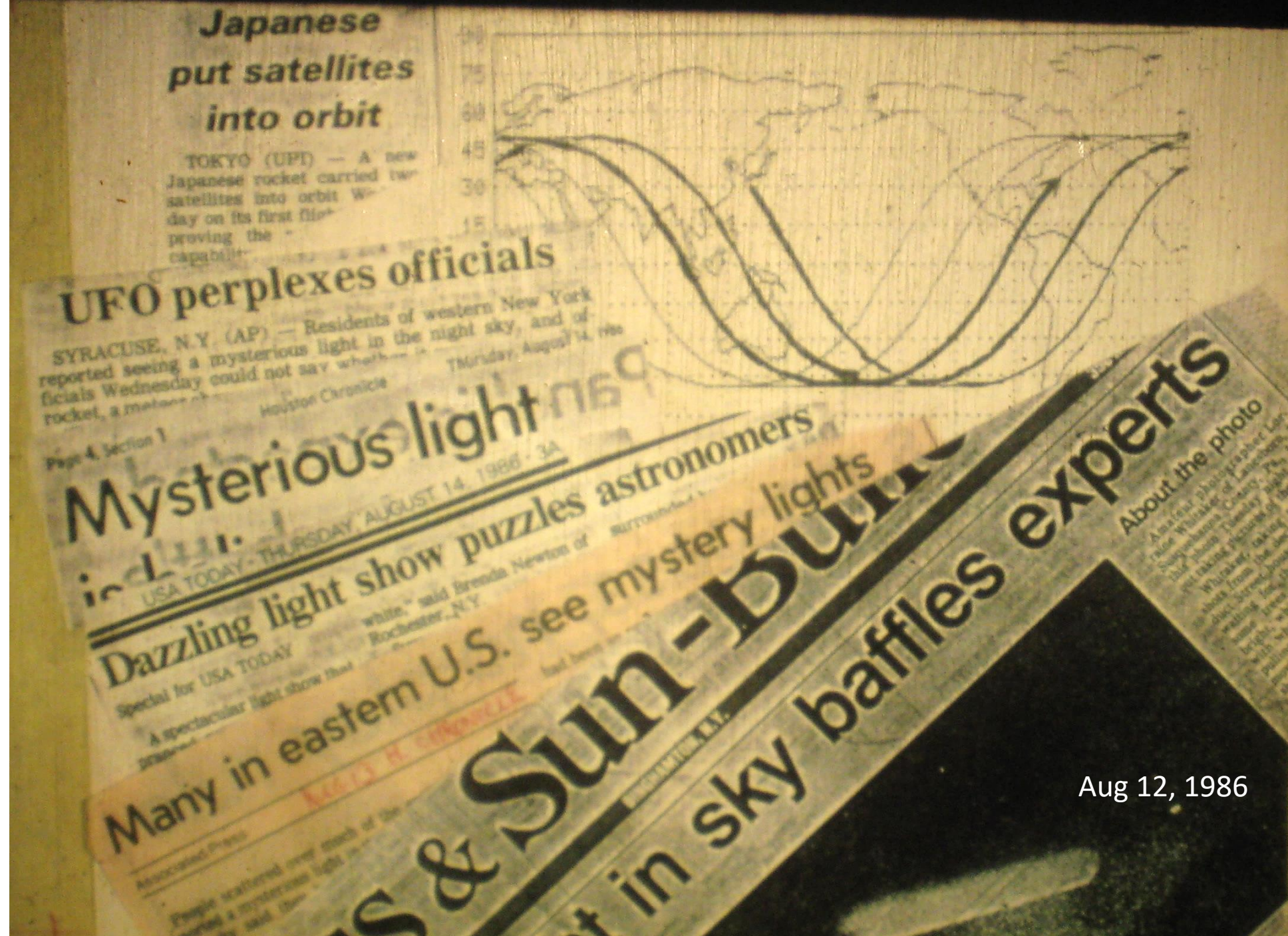
Japanese H-1 booster

Second stage prop venting

- Aug 12, 1986 over eastern US
- Aug 27, 1987 over eastern China
- Other launches [not checked]



Aug 12,
1986
over
eastern
US



Aug 12, 1986

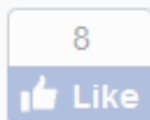
Aug 12, 1986

The Great East Coast UFO of August 1986

Feature

James Oberg

**SKEPTICAL INQUIRER Volume 10.4,
Summer 1986**



An Illuminating UFO case raises several interesting points.

At about 10 P.M., EST, on Tuesday, August 12, 1986 (0200 UT, August 13), nearly the entire eastern half of the United States was treated to a spectacular celestial apparition. Millions of people were outside looking for Perseid meteors, and many of them had their astronomical instruments and cameras at the ready. So when a bright cloudlike UFO (for it was a genuine unidentified flying object, at least for a day) appeared in the eastern sky, moving from right to left, it had probably the largest audience of any UFO ever witnessed in North America. Sightings occurred from Georgia (Florida was socked in with clouds) to Louisiana to Houston, Texas, to Tulsa and Oklahoma City, to Illinois, Kentucky, Michigan, Ontario and Quebec, and all points in between: South Carolina, Virginia, Massachusetts — the whole eastern seaboard.



http://www.csicop.org/si/show/great_east_coast_ufo_of_august_1986

1986 perseid blob

A night sky photograph with a dark blue background. Two bright, glowing white objects, referred to as 'blobs', are visible. One blob is on the left side, and the other is on the right side. A vertical orange line runs down the center of the image. The text '1986 perseid blob' is in the top left, and 'Aug 12, 1986' is in the bottom right.

Aug 12, 1986

Eyewitness accounts

- “...a pinpoint, a moving spiral, a glowing cloud, and a big ball of fire.”
- “... an orangish nebulosity surrounded by an irregularly shaped white cloud elongated vertically, with a dim starlike nucleus.”
- “...It started to get bigger and it had a tail. By the time we got out of the truck, it had begun to spiral. It lasted for a few minutes, then became like a dim star and floated toward the west.”
- A “reflection of the moon off a cloud, but it was very iridescent, very vivid.”
- “...witnesses said an object appeared to have exploded in the sky and then moved into a cloud.”
- “It started out as a pinpoint of light. It was as if it were releasing some type of reflective gas into the air, and as the gas was released into air, it was as if it was spiraling around the pinpoint of light.” The spiral was “like pouring milk into coffee.”

Several interesting reports involved coincidences.

- An air traffic controller in Syracuse, reported three different-colored lights randomly moving and hovering for 45 minutes (but it turned out he was watching B-52s land at nearby Rome AFB, several hours after the real UFO).
- In Clark County, Kentucky, residents were panicked by an explosion while the light show was going on — but the sheriff later got an anonymous phone call confessing to setting off illegal fireworks.
- “... people said their homes shook and windows vibrated as if there had been an explosion or earthquake. They said the whole sky lit up. All these people weren’t imagining or seeing things. Some of them were very terrified over it right after it happened.”

Author's concluding comments in 1986 article

- Another interesting phenomenon was the way in which UFO groups seemed to get a type of description different from those reported to the national news media....
- In these accounts, subconscious interpretations by the collectors had evidently colored the straightforward, pure perceptions, and without other accounts the stories collected by the UFO groups could well have coagulated into a “true UFO” if the solution had not been published so quickly. This is a long-recognized (but evidently still serious) problem with anecdotal data collection.

Actor Dan Aykroyd reports telepathic message from fuel cloud

- Clearly refers to the Aug 12, 1986 event
- http://www.jamesoberg.com/aykroyd_ufo.pdf
- I woke up in the middle of the night and I said to my wife, they're calling me.... And twelve thousand people shared this urge. And they went out ...They went out, in the sky they saw this pink spiral in the sky, huge, miles, like two miles long
- the next day in the media - in newspapers and radio - all over upstate New York and Ontario and Quebec and Vermont, people spoke about this urge they had to go out of their houses at 3:00 in the morning and look up into the sky. that was in the mid-80s. In fact it was a pink spiral that appeared in the sky
- the Air Force said that a Chinese rocket had exploded over New York state
-

Became wrapped in folklore exaggerations

- tbs

Aug 27, 1987
repeated over
eastern China



August 27, 1987 – near Shanghai

- In Zhejiang province, a power generator reportedly failed. People reported that their wristwatches stopped. Eyewitnesses at an airport spoke of the "dazzling brilliance" of the object, which was "hovering about 900 meters from the end of the runway." Two people in Shanghai reported seeing portholes on the central body.
- A military pilot on air patrol spotted the object and pursued it for several minutes.
- "It was descending," he recalled. Then it reversed course and ascended "much faster." Finally, he said, "after 45 seconds, I was unable to keep up with it."
- https://web.archive.org/web/20000816002835/http://www.space.com/sciencefiction/phenomena/ufo_china_000126.html

Shanghai Gets Its First Look at UFO: 'Comet With a Tail Like an Umbrella'

August 30, 1987 | United Press International

- BEIJING — Shanghai residents say the city got its first visit of an unidentified flying object but military officials who tried to track the mysterious spinning "plate" revealed no details of their findings, the New China News Agency said Friday.
- Several witnesses claimed they saw a UFO passing over the city for about 40 minutes Thursday evening, the agency said.
- "It was like an oval plate and sometimes a comet with a tail like an umbrella," the news agency quoted one onlooker as saying.
- Another witness said the object looked like a flying orange but he saw it for only a few seconds before it spun clockwise and flew eastward, the agency said.
- A People's Liberation Army officer revealed that military aircraft took off to trace and observe the object, but he said no further information was available.
- Officials at a Shanghai meteorological station also reported sighting the UFO.
- "It was the first time for a UFO to visit the city," one meteorologist told the news agency.
- http://articles.latimes.com/1987-08-30/local/me-4866_1_ufo

UFO sighted over Shanghai

BEIJING, Saturday, Aug 29, 1987 (Reuter).

Chinese fighter pilots tracked an unidentified flying object that appeared over Shanghai on Thursday night for seven minutes before it vanished in the East China Sea, the China Daily said yesterday.

The UFO was described by one of many witnesses as looking at times like an oval plate and at others like a comet with an umbrella-shaped tail.

China Daily said its staff member Mr Yao Kang saw the UFO above People's Square in central Shanghai while he was walking with his wife and baby shortly before eight o'clock on Thursday night.

"I looked up and saw an amazing reddish orange basin-shaped luminary hanging in the sky over the south-west of the square," he said.

"Above the bright basin-like object was a misty parachute with a diameter of about one metre. It looked like a lump of milky white gas."

The paper said military jets took off immediately to track and observe the UFO. The UFO disappeared in the East China Sea seven minutes later, but not before the pilots were able to corroborate the descriptions of witnesses on the ground.

Mr Shu Jiabin, chief engineer of the Shanghai Meteorology Bureau, said the UFO was probably caused by meteoric ice.

<https://trove.nla.gov.au/newspaper/article/132156081>

UFO CHASE IN CHINA

Gordon Creighton

(Translation from Chinese. G.C.)

FLYING SAUCER REVIEW,
Nov-Dec 1987

We have recently had our "Air Force Chase of the Pingpong Balls" over Brazil, and now in a fresh batch of press-clippings for which we are most indebted to our Consultant/Correspondent in Japan, Mr Yusuke J. Matsumura, we have details of a similar but smaller "Air Force chase" in China. Rather than making a general summary of these reports, as I would normally have done, I have on this occasion taken the unusual step of translating the entire batch of clippings in great detail, because I feel this present case gives us an excellent opportunity to observe how the Chinese authorities are coping with the pesky UFOs.

This little batch of recent reports from China which I give below shows that the Chinese authorities are employing the usual methods to dissuade the public from interest in the subject. It is evident, from the large amount of newspaper space devoted to the case, that they are distinctly worried about it. And no doubt realize that their old hackneyed "explanations" are ceasing to convince. It is therefore all the more amazing that the Chinese press-censors should have been so slipshod and so careless, as they have done in this case, by letting several nice little cats out of the bag. These little cats (so well known to us from all over the world!) are: (1) The reports that, after the UFO had passed through clouds, the clouds still glowed; (2) the reports that many eyewitnesses said their wristwatches stopped; and (3) the reports that, on the Island of Shengsi, off the coast of China, there was a brief electricity blackout as the UFO passed over. All three of these remarkable phenomena, say the Chinese experts, were purely due to chance. — EDITOR

http://www.ignaciodarnaude.com/avistamientos_ovnis/Creighton,UFOs%201987,China,FSR1987V32N6.pdf

Aug 27, 1987

1. WEN WEI PO, Shanghai, August 28

SHANGHAI VISITED LAST NIGHT BY UFO.
“FLYING TOWARDS SOUTH-EAST: SIZE OF A
WASHBOWL, WITH DARK CENTRAL SPOT”:
SOME SAY “LIKE A SPIRAL WATCH-SPRING”

WEN WEI PO Reporter: At about 7.58 p.m. last night an unidentified flying object passed over the City. From 8.00 p.m. onwards the paper received numerous phone calls reporting it.

One caller at Shangnan Xincun in the Pudong area said it was of the apparent size of a washbasin with a dark central spot and emitting dazzling flashes of light. He watched it for some two or three minutes until it vanished in the south-east.

A reader named Zhou at Zhongguxiang in the Qingpu area gave a very clear account. His description of its appearance agreed with that of the first-named caller — “like the spiral spring of a watch”. The under part gradually became more vague, and then assumed the shape of a round tail. The strangest feature was that, after it had passed through the clouds, *the clouds still continued to glow*. This witness, immensely shaken, told us that never before in his life had he beheld such a flying object.

There were also many phone calls from residents of the Jiangwan and Caojiadu districts.

We telephoned to the Shanghai Weather Bureau, the Shanghai Observatory, and the Yushan University. They all said they too had received numerous similar phone calls, but that at present it was still difficult to give a clear and definite explanation.

2. WEN WEI PO, Shanghai, August 29

Today, this same paper reported that the staff of the Shanghai Observatory had issued a statement that the object seen was probably a man-made missile or the debris of a missile. (The paper, however, now mentioned — for the first time — that various people had reported *electricity failures* as the UFO flew over.) The paper now explained that, in the view of the experts, should any such electricity failures have occurred anywhere, then these were strictly by pure chance, and could not possibly have had anything to do with the flying object.

The paper goes on to mention that, in 1985, an unknown flying object had also caused a great commotion in Shanghai, and the Observatory staff had discussed it and come to the decision that it was a meteor.

Since 1986, says the paper, the Shanghai Observatory has received more than twelve reports of UFOs. The Observatory experts view these phenomena not as objects from Outer Space, but as possibly due to “some natural phenomenon arising from the Earth’s own atmosphere.”

Furthermore, according to a telegram from a correspondent in Shengsi County, when this UFO passed over that area, at the local electricity generating-station, where the machines were running quite normally, *there was a sudden failure; and instantly the entire island was plunged in darkness. Most people’s wrist-watches stopped*. All that was to be seen in the sky was the small object, “shaped like a spinning-top, of maybe the size of a helicopter” spinning away fast from west to east. Owing to the power failure, most of the military and the civilian population on the island all saw the phenomenon.

Aug 27, 1987

4. WEN WEI PO, Hongkong edition, August 29

UFO NEAR SHANGHAI. "ROUND LIKE A WASHBASIN, EMITTING ORANGE-YELLOW BEAMS." MILITARY AIRCRAFT SENT UP TO INVESTIGATE

From our Shanghai Correspondent, August 28:—

At 8.00 p.m. on August 27, in the night sky over Shanghai a bright flashing unidentified flying object made a fleeting appearance and then was gone. In many places, folk strolling and enjoying the evening air saw the strange sight in the heavens. A man living in Pudong said: "At about 7.56 p.m. more or less, a spiral-shaped flying object suddenly appeared over Bailianjing, its size being about that of a net-ball, shooting out bright flashes, it moved off, still spinning, towards the south-east. In Nanhui County, crowds of people reported that at about 7.55 p.m. it appeared overhead there. The visual judgement of eyewitnesses was that it was at a height of about 4,000–5,000 metres. It was ellipsoid, and its (apparent? ED) diameter was about 30 cms.—50 cms. At the rear end there was an orange-yellow beam from an aperture that

looked about the size of a washbowl.

The fisher-folk on the Island of Shengsi saw it at 7.57 p.m. It was bigger and brighter than the planet Venus. They said it had three pale white apertures and was of spiral shape and spinning as it went, very fast.

When it passed over the Island, all the electric lights went out, and came on again about one minute later. The Electricity Supply Office said there had been no suspension of operations by them. There were also reports that a UFO had been seen at Hangzhou.

As we understand, when the UFO appeared over Shanghai, the Shanghai Air Force Headquarters at once sent up an aircraft to pursue and investigate the

UFO. The pilot's description of the object corresponded pretty well with accounts given by many eyewitnesses. By 8.30 p.m., it had vanished eastwards over the sea.

According to the investigations made by the astronomers, this was not a shooting star, nor a comet, but it could possibly have been a man-made object (such as a rocket, etc). or the debris of such, falling and reflecting the light of the Sun.

Already in 1985, Shanghai had a UFO sighting which caused quite a stir. On that occasion the Shanghai Observatory said that it was a fireball. Since 1986 the Shanghai Observatory has seen about a dozen unidentified flying objects. As regards the present case, we must await their final decision after they

have collected more data on the occurrence.

Newspaper coverage

大公報

Ta-Kung-Pao
海外航空版
(Overseas Edition)

報 匯 文

六期星

日九廿月八年七八九一元公

報 公 大

一期星

日一卅月八年七八九一

UFO大鬧華東地區

空軍機師談追蹤經過

適巧空中執勤 追蹤歷時兩分餘鐘

【本報上海二十九日電】駐滬空軍某部飛行員毛學成二十七日跟蹤不明飛行物體連兩分四十五秒。毛學成今天向人們敘述觀察到飛行物體的情況。

毛學成是位全天候飛行員，已飛行十多年，有豐富的飛行經驗，他說：「二十七日晚七點三十五分，我奉命駕機起飛，執行空中巡邏任務後，以時速八百公里的速率，由崇明島上空向正南方的機場返航。

當我飛越長江上空時，突然發現右上空、嘉定上空，有一個很亮、很刺眼的飛行物體，它既不像飛機，也不像導彈，倒像一個照明彈，大小和形狀比一般圓形草帽大一點兒，我立即加大油门，以九百公里的速率，與它形成一百度加角，緊急追趕。此時，時針指在七點五十七分，我經過仔細觀察，發現不明飛行物體在下落，亮點部分顏色呈桔黃色，後面拖着的螺旋形尾

巴也呈桔黃色，整個物體作順時針旋轉，但尾巴並不旋轉，朝東南方向飛去。七點五十九分，它變換在我飛機的左前方。此刻，它還由下降變為上升，速度比下降時要快得多。又過了四十五秒，我沒有追上它，這時已到機場上空，於是請求著陸，並報告了上述情況。我臨著陸時，飛行物體已在川沙縣上空，逐漸看不清了。」

【中新社福州二十九日電】福建省福州及閩北的政和、松溪、柘洋等地於八月二十七日晚八時左右相繼發現不明飛行物。

據《福建日報》報道，這一不明飛行物呈橢圓形，通體發出桔紅色的光，從輪圓的兩側散發出白色的光。該飛行物由西向東運行，八月二十七日晚七時五十九分出現在政和縣東洋村北面上空，有六十多

Jen-Min Jih-Pao
28/8/87
Wen-Wei Pao
29/8/97
Ta-Kung Pao
31/8/87

Aug 27, 1987

ASTRONOMERS COME UP WITH PROPER EXPLANATION

In a separate news item, the same issue of the Hongkong WEN WEI PO of August 31, has the following:—

Central News Agency Telegram from our Shanghai Correspondent, August 29:—

Some of the Shanghai astronomers have now made a preliminary analysis of the sighting of a UFO over that city on August 27, and consider it was possibly a man-made object (such as a rocket, etc.), or maybe the debris of such. Their reasoning is as follows:—

“The spiral-shaped unidentified flying object seen on the 27th was, in the first place, certainly no aircraft, since aircraft are not spiral and cannot spin. Secondly, it cannot have been a fireball, because when a fireball enters the upper atmosphere it is very fast and exceedingly bright as it burns up.

“Thirdly, it could not have been a comet, since a comet is shaped very much like a broom hanging in the sky; it has a head and a tail, and it does not spin.

“Consequently, it may possibly have been a man-made object (such as a rocket, etc.), or debris of same. The pieces could be of very differing shapes and sizes, and could be spinning.

“The height would be in excess of several hundred kms., and it would shine in the rays of the Sun.

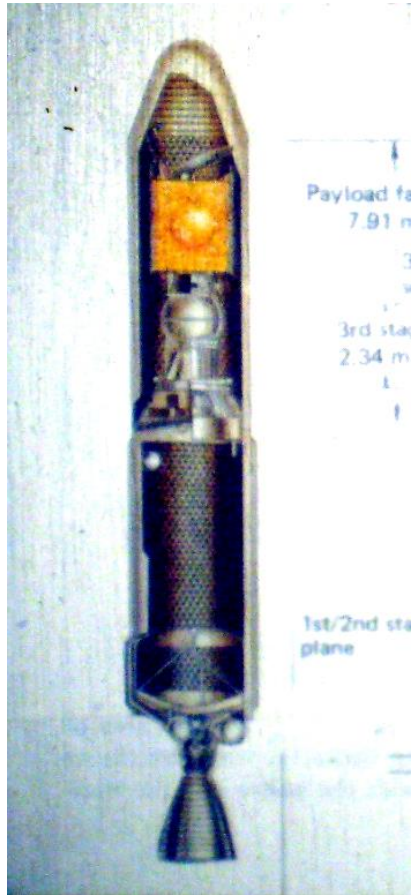
The scientists say that the accounts given by many eyewitnesses were basically all very similar, which proves that it was not an illusion. The eyewitnesses had very varied estimates of the altitude of the UFO, naked eye estimates in these matters being very unreliable.

As for the reports that in various places, when the thing passed over, there were electricity failures, the scientists say that this could simply be due to chance.

Staff of the Shanghai Observatory also said it could have been some natural phenomenon occurring in the upper levels of the Earth's atmosphere.

There was a great sensation in Shanghai over an unidentified flying object in 1985. On that occasion the Shanghai Observatory decided that it was a fiery meteor.

Shanghai UFO coincides perfectly with Japanese launch



1987-070 1987 Aug 27 0920 1987-070A
Kiku 5 ETS-5 S18316 H-1 H-17(F) TNSC
N S WWW-NASDA

ILLUMINATION CONDITIONS TBS

Aug 27, 1987

Complete list of H-1 launches

[not searched for other possible 'UFO reports']

Date/Time (GMT)	S/N	Payload	Orbit	Remarks
12 Aug 1986, 20:45	15(F) 1986-61A	EGP (Ajisai)	LEO	9 SRMs, 2 stages
27 Aug 1987, 09:20	17(F) 1987-70A	ETS-5 (Kiku-5)	GTO	9 SRMs, 3 stages
19 Feb 1988, 10:05	18(F) 1988-12A	CS-3A (Sakura-3A)	GTO	9 SRMs, 3 stages
16 Sep 1988, 09:59	19(F) 1988-86A	CS-3B (Sakura-3B)	GTO	9 SRMs, 3 stages
5 Sep 1989, 19:11	20(F) 1989-70A	GMS-4 (Himawari-4)	GTO	6 SRMs, 3 stages
7 Feb 1990, 01:33	21(F) 1990-13A	MOS-1B (Momo-1B)	LEO	9 SRMs, 2 stages
28 Aug 1990, 09:05	22(F) 1990-77A	BS-3A (Yuri-3A)	GTO	9 SRMs, 3 stages
25 Aug 1991, 08:40	23(F) 1991-60A	BS-3B (Yuri-3B)	GTO	9 SRMs, 3 stages
11 Feb 1992, 01:50	24(F) 1992-07A	JERS-1 (FUYO-1)	LEO	9 SRMs, 2 stages

Aug 27, 1987

Contemporary significance of this case

- tbs

UFO reports

Savoonga GMT – 9 hrs Sunset 20:28 local,
at 23:55, sun azimuth 318, elevation -21,
overhead Earth's shadow height 407 km



- [17 March 1987 23:50 - Savoonga, Alaska, USA - \[63.70, -170.48\]](#) Fog or smoke. Call to Nat'l Guard, very large UFO blows smoke or vapor from front to rear, 30k' altitude. An unidentified object was sighted, that had an unusual appearance or performance. One object, of huge size, was observed by one witness on the shore.
- <http://thecid.com/ufo/chrono/chrono/1987.htm>

March 17, 1987

Sky and Telescope // James E. Oberg

Spacecraft Activity as "UFOs" //February 22, 1988

http://www.jamesoberg.com/88_sky-tel_ufo.pdf

http://www.jamesoberg.com/alaska_ufo.pdf

- On March 17, 1987, the pre-midnight passage of a "UFO" over Alaska was widely seen because residents of western parts of the state were outside to cheer on the Iditarod dogsled racers.
- The "UFO" was like "an aircraft landing lights as seen through a fog", a witness reported; another person saw a "bright aqua-blue-green colored oval-shaped object approximately the size of two football fields with three lights on the side and an egg-shaped cloud around and leaving a smoke trail behind."
- Many people made stabs at estimating size (by guessing at range): it was "round and bigger than a jet-liner," one said; to another, the object "seemed to be bigger than a 747 jet at that altitude." Another witness claimed: "There seemed to be a bright cloud of smoke thrusting downward with one red and one white light."
- But what they were all seeing was a fuel dump from the last stage of the USSR's Kosmos-1833, launched from central Asia shortly before.

March 17, 1987

VILLAGERS REPORT A MYSTERIOUS GLOWING UFO OFFICIAL AGENCY EXPLANATIONS CITE BOOSTER ROCKETS AND METEORITES

Anchorage Daily News (AK) - March 21, 1987

Author/Byline: HAL BERNTON Daily News reporter; Staff

Shortly before midnight Tuesday, several dozen villagers from four Northwest Alaska communities reported seeing **a glowing, haze-shrouded object** flitting through the Arctic sky.... The reports describe an object bedecked with flickering lights that at times appeared to hover, then move rapidly across the sky.

[snip Marlin Paul description] Five other Elim residents, as well as Iditarod mushers Joe Runyan and Ted English, also reported seeing an unidentified object. Their descriptions of the objects varied.

Charlie Saccheus, Elim's postmaster, described **a cylinder-shaped object with a bluish-green light flying at an altitude of about 5,000 to 7,000 feet.** "It looked sort of like those space rockets," Saccheus said.

[snip Savoonga accounts]

<https://drive.google.com/file/d/0BxmtmisS21kKTllxZmV1X2xpR00/view>

March 17, 1987

Marlin Paul description

- The official explanations, however, are rejected by Marlin Paul, an Elim National Guard sergeant and Iditarod Trail Sled Dog race official. He reported spotting an unidentified flying object while manning a race checkpoint three miles outside his village.
- Paul, who reported sighting the object at 11:56 p.m. Tuesday, described a bluegreen globe. "It was basically shaped like an egg in a frying pan," he said. "The yolk part was spaceship and the white part of the yolk was a glowing cloud around the ship."
- Paul, stationed at the checkpoint with his wife, said he first saw the object over hills northwest of town. It then moved straight above him. It stayed in sight for 15 minutes before disappearing in the southwestern skies, he said.
- Paul said the object gave off a glow that bathed several miles of snow-covered tundra in a green light. He estimated the size of the object as bigger than a football field.
- "A satellite isn't that big when it comes in," Paul said of the National Guard's explanation. "If it were a satellite, when it comes back to earth, it would disappear in a split second. This hovered low over the hills, then it moved up, climbed and moved backwards."
- Meteorites, he said, "don't stop in midair, then start moving. When a meteorite falls, it falls with a red tail. I know what a meteorite is and it falls fast."

March 17, 1987

Savoonga accounts

- Further west, in Savoonga on St. Lawrence Island , a group of villagers spotted something in the sky as they gathered outside a local teen center.
- "It was really a weird thing to see. It was just kind of glowing," said Leroy Seppilu, Savoonga's postmaster.
- At first the object was partially obscured by a cloud, he said. Its glow turned the cloud green, he said.
- "It started moving towards the southeast, speeded up and then rapidly disappeared," Seppilu said.
- Other Savoonga residents described a bright round object bigger than a jet, according to National Guard reports. In Tununak, where the object was spotted at midnight, villagers described a bright white light resembling a satellite, part of which glowed, the National Guard said.

- <http://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1987-027A>
- Launch Date: 1987-03-18 at 08:29:00 UTC, Zenit booster,
- Altitude 851 km X 878 km, 101.9 minutes, inclination 71°
- Note overhead Earth's shadow height 407 km

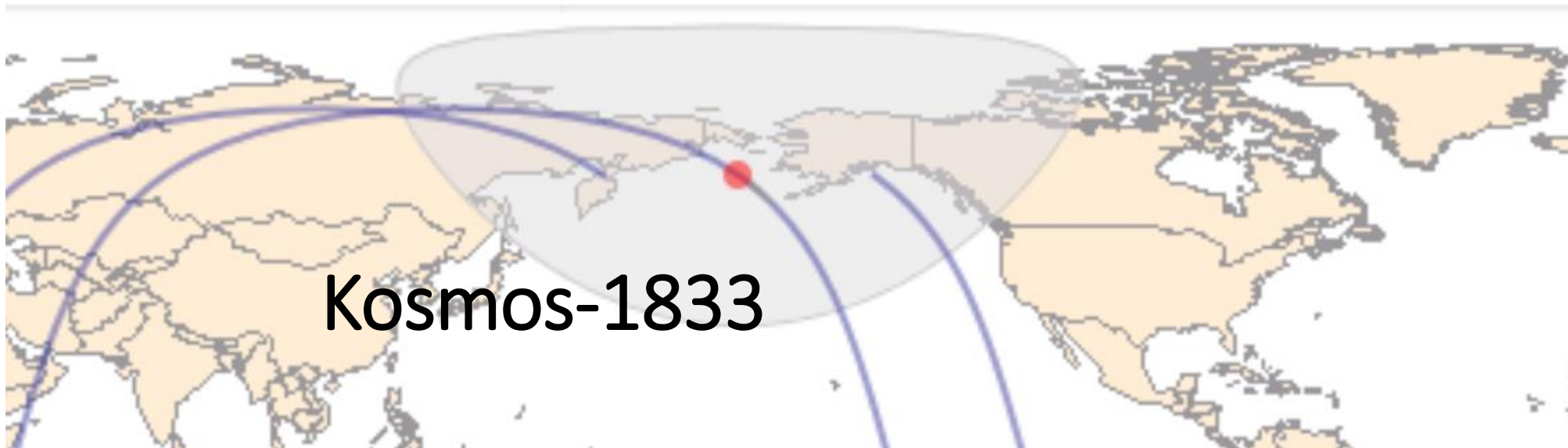
1833	position	Wednesday, March 18, 1987 at 8:55 am UTC
------	----------	--

<http://www.wolframalpha.com/input/?i=position+of+satellite+Cosmos-1833+on+March+18,+1987+at+08:55+UTC>

Show DMS

Show 3D

Orthogra



March 17, 1987

Contemporary significance of this case

- tbs

[multiple reports] Soyuz booster “comma cloud”

- Classic case – Tomsk, Russia, Sep 14, 2006
- Now-standard appearance of ‘fat comma’ shape at end of Soyuz booster launch
- Occurs 9 minutes after launch 1800 km downrange from launch site
- Traceable to planned booster fuel venting for separation from payload
- Lasts 10-15 seconds [depending on fuel quantity]
- Full report <http://satobs.org/seesat/Oct-2016/0094.html>
- **Soyuz launches observed for decades have been characterized by this mysterious ‘final flourish’**

June 5, 2010 Australian spiral



<http://www.ufo-blogger.com/2010/06/spiral-ufo-object-spotted-over-eastern.html>

June 5, 2010

Originating spacecraft

2010-026	2010 Jun 4 1845:00	2010-026A	Dragon Qual Unit
Dragon Spacecraft			

<http://planet4589.org/space/log/launchlog.txt>

Meridian-5 launch failure

- December 23, 2011
- Third stage exploded halfway through final burn
- Created expanding fuel cloud with stage tumbling and spewing in the center
- Widely captured on pocketcams and dashcams [including one fortuitous sequence of moment of explosion]
- Cloud was tracked across Urals towards Altai Mountains
- Cloud was observed slipping into Earth shadow
- Terminal fireballs of reentry also captured
- Full report at http://satobs.org/seesat_ref/misc/meridian_crash_2011_draft.pdf

WIDELY IMAGED BY
CAMERA, POCKETCAM,
AND DASHCAM

December 23, 2011



**LOW LATERAL ANGULAR RATE =
NEAR HEAD-ON APPROACH**

**CENTRAL BLOB HAS
ALSO FADED OUT**

Photographers captured expanding cloud sinking into Earth's shadow

Nov 11, 2012 – Ariane seen from China [actually high over equator, in southern sky]

- Photo – Li Peng
- Beijing UFO Research Society: "The 'rays' were most likely the rocket jettisoning boosters or other parts and entering low Earth orbit after being launched 30 minutes previously" It's also possible that the swirls of light came from fuel or vapor emanating from the upper stage.
- Link to video =
<https://web.archive.org/web/20121204021428/http://forum.nasaspaceflight.com/index.php?PHPSESSID=4a5de26daf6f8a2029c5e6f42a4596fa&action=dlattach;topic=29857.0;attach=480369>
- <https://web.archive.org/web/20140123202817/http://www.nbcnews.com/science/chinese-ufo-linked-rocket-1C7338065>



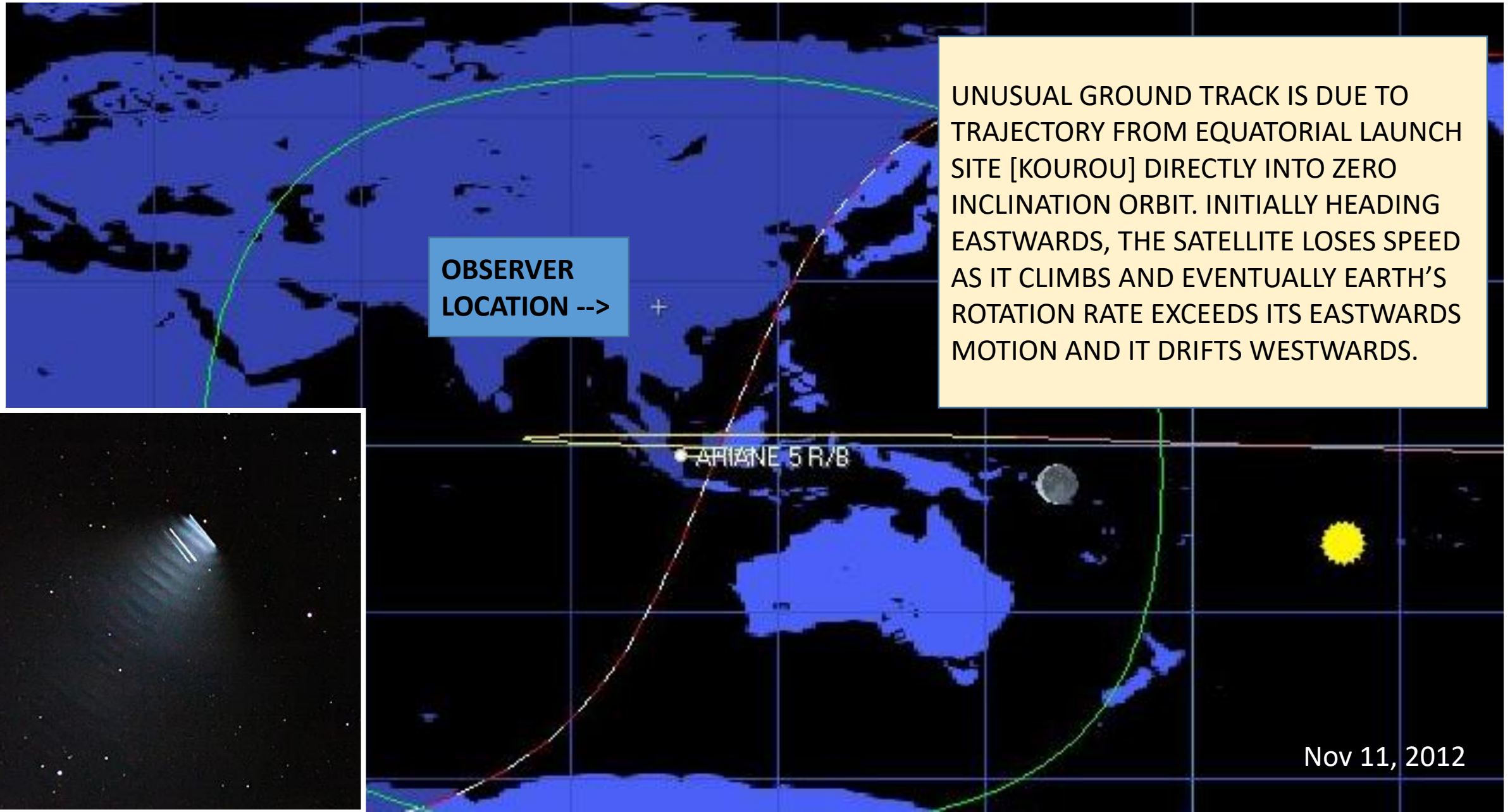
Note from a China space-watcher

- Some guys in different places in south-western China were making observations on the same day of this launch when they saw something like a bluish reflection moving slowly in the dark sky east of Sirius at about an hour after the launch (~22:20 UTC),
- ...and it was so strange that it made quite a detailed discussion at a Chinese astronomy forum, eventually making it to the news two days ago!
- Luckily the detailed analysis of the height of the UFO and the timing of observation leads me to conclude that this was the ESC-A upper stage 30 minutes after all the fuel leaked out via passivation. This was essentially confirmed after I pulled out old TLEs and running through a satellite prediction software.

Some detailed discussion here (in Chinese): <http://www.astronomy.com.cn/bbs/thread-246548-1-1.html>

- <https://web.archive.org/web/20121204021428/http://forum.nasaspaceflight.com/index.php?topic=29857.90>

ESC-A upper stage ground track on way to GEO



Contemporary significance of this case

- TBS

September 1, 2013 – Chinese rocket over
Melbourne, Australia, becomes instant classic.

Video of Yaogan 17 rocket fuel dump

- Ted Molczan's original report
- The fuel dump by the CZ-4C upper stage that launched China's third NOSS-like triad was seen over Australia, and a long video was made by Lou20764, from Melbourne. The event occurred on 2013 Sep 01 about 19:49 UTC (Sep 02 05:49 local time).
- The video is here: https://www.youtube.com/watch?v=FryZrDKwv_o
- Lou20764 seems to believe he saw some sort of ET craft, and so far has been refractory to other ideas.
- When Jim Oberg posted a congratulatory note on his having captured the fuel dump and requested some technical details, Lou20764 deleted his messages and blocked him from making further comments.
- Unfortunate behavior, but it should not prevent us from enjoying the latest fuel dump imagery.
- <http://satobs.org/seesat/Sep-2013/0067.html>

https://www.youtube.com/watch?v=FryZrDKwv_o

Copyright Lou20764 (2013)



UFO ****AIRCRAFT CARRIER SIZE**** "2" CAMERAS!! -Melbourne
Australia SEPT 2 2013 **EXCLUSIVE**



UFO 'Lou's Channel

UFO LOU's
video

September 1, 2013

UFO ****AIRCRAFT CARRIER SIZE**** "2" CAMERAS!! -Melbourne Australia SEPT 2 2013 **EXCLUSIVE**



UFO 'Lou's Channel

 **Subscribe** 17,404

257,769 views

 Add to  Share  More



Published on Sep 1, 2013

I recorded the ISS approx 20 minutes earlier as proof - (Will keep raw footage with 'time' start.)

Note the 'corona' as opposed to the ISS?

First camera is a Samsung SDC-435 - Second camera is a P8079HP 3 stage generation 1 night vision tube with a 50mm slr lens.

I watched this 'thing' visually and it just lit up the sky.

This is the real deal Neil. Been doing this for about 5 years now, full time, never ever seen anything like this.

If 'anyone' can explain what is larger, slower than the ISS in orbit, please let me know?

Sorry about the swearing, but it is what it is.

UPDATE LINK -

<http://youtu.be/dKettuYEWic>

Category [Science & Technology](#)
License [Standard YouTube License](#)

SHOW LESS

“This is the real deal Neil. Been doing this for about 5 years now, full time, never ever seen anything like this. If 'anyone' can explain what is larger, slower than the ISS in orbit, please let me know?”

“Comments are disabled for this video”

Comments are disabled for this video.

September 1, 2013

Chinese
satellite
venting fuel
or
'something'
else - You
decide.



UFO Lou - '***COLOSSAL SIZE OBJECT IN EARTH ORBIT**
Melbourne Australia (Revisited)

https://www.youtube.com/watch?v=-h_X9XhAxJU&t=364s

September 1, 2013

Internet sensation

September 5, 2013

Huge UFO Filmed By Two Cameras Over Melbourne, Australia On Sept 2, 2013.



www.ufosightingsdaily.com

UFO Over Melbourne, Australia Sept 2, 2013.

Date of sighting: September 2, 2013
Location of sighting: Melbourne, Australia

<http://www.ufosightingsdaily.com/2013/09/huge-ufo-filmed-by-two-cameras-over.html?m=0>

September 1, 2013

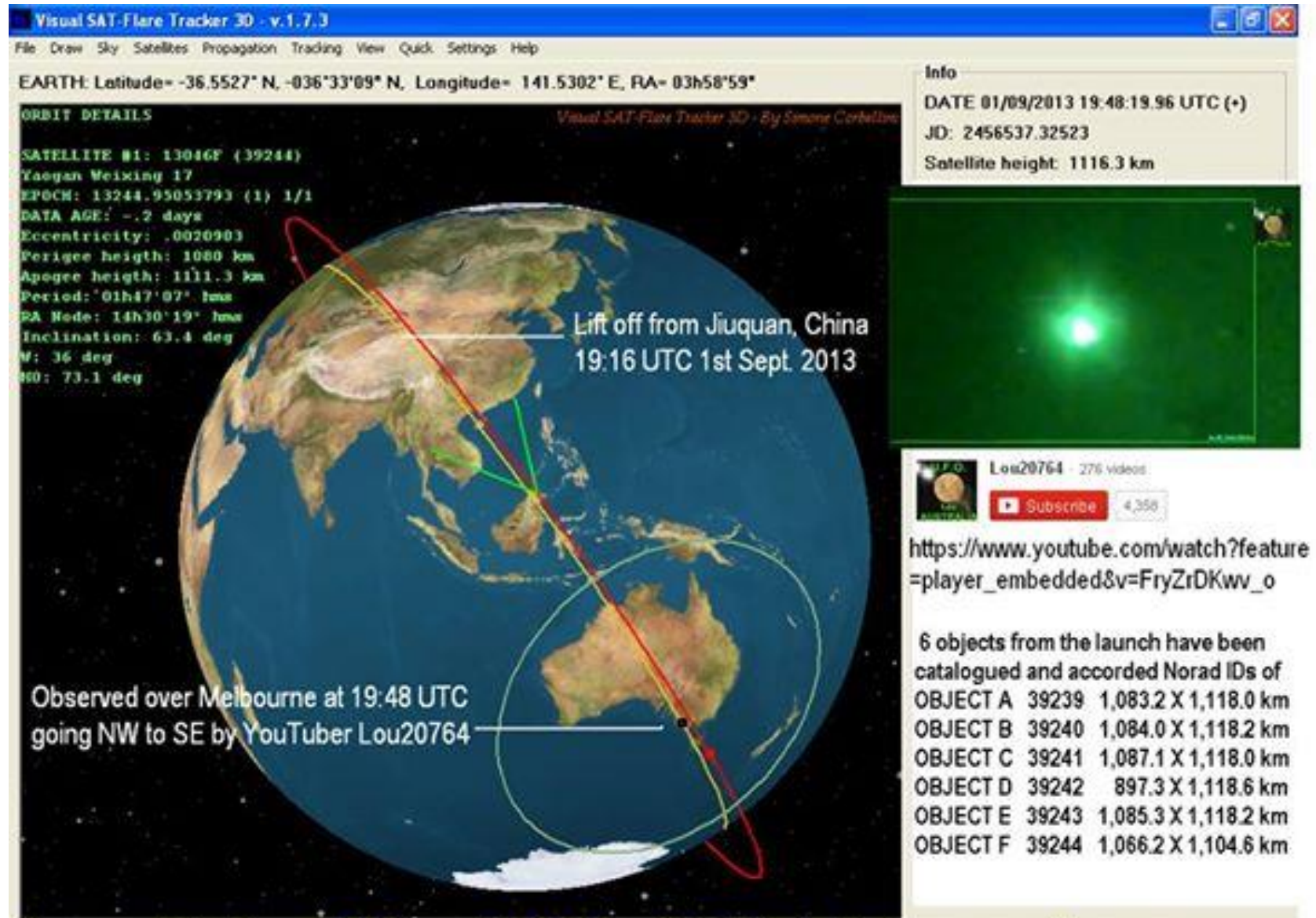
In-depth skeptical treatment

- <http://badufos.blogspot.com/2013/09/aircraft-carrier-sized-ufo-filmed-by.html>
- <http://www.abovetopsecret.com/forum/thread968566/pg1>
- ‘Mystery Cloud’ Appears Over Eastern U.S. And Canada
<http://www.space.com/299-mystery-cloud-appears-eastern-canada.html>
- “Smoke Rings” over Africa and Europe
<http://transientsky.wordpress.com/2009/10/21/smoke-rings-over-africa-and-europe/>

Satellite fuel Dump

<http://epvoxpopuli.proboards.com/index.cgi?board=thomas&action=display&thread=540>

Ground track



Yaogan Weixing-17 (Norad 39239 to 39244) sighted over Melbourne shortly after launch from Jiuquan space launch centre, China.

September 1, 2013

UFO ****AIRCRAFT CARRIER SIZE**** "2" CAMERAS!! -Melb... -- Lou20764

Comment from witnesses

- "I saw this also, it was heading east, then turned south east, then just dissolved. It also pulsared twice, bright flash. Woke up the wife and kids and just stared. Massive thing, the video doesn't do it justice..but at least someone caught it. great job Lou. It hanged around for around 10 minutes." He had earlier described it this way: "From south east suburbs here....saw it at 10 to 6am. i had a feeling iss went north, this went south. And did a turn.....woke up wife and kids...we all just watched in amazement...no BS, my dslr couldnt get it...great job mate."
- "Rockdoc" confirmed: "I confirm Lou's sighting, which I saw in Carnegie at 0551 for about 3 minutes. The object appeared to the naked eye as a glowing sphere 0.5deg in size, travelling on a SSE heading at a speed which I estimate no more than 150km/hr. Upon viewing through 20x80 binoculars it resolved into a craft with 3 lights (2 forward and one at underneath at rear). The lighting reflected off haze surrounding the craft and although. The object was very large and made no sound." He added, "I initially spotted the object in the NE from Carnegie"
- 'Chimpy2011' wrote: "Saw it at 5 am this morning walking the dog a pyramid shape but gaseous with a dark semi circle half moon black crescent behind the pyramid which blocked everything out when it - it moved from the west to the south - what the f...k I am totally freaked out by it - the dogs went crazy - tried recording on my phone but couldn't get a lock on it – whoa."

» ufo sighting report

<http://www.ufoevidence.org/sightings/report.asp?ID=13968>

Date:

September, 2, 2013

Location:

Adelaide, South Australia, Australia

Summary:

A red light in the sky moving from the north east to the south west..no noise and moved faster than a plane...disappeared behind the clouds. was visible for about 90 seconds. Southern Adelaide

Date Reported:

9/3/2013 4:42:13 AM

Sighting Time: 7.30pm ***Day/Night:*** Nighttime ***No. of Witnesses:*** 3 ***Duration:*** 90 seconds

Appearance / Description of Object(s)

very bright red light.....faded as it disappeared ...seemed to have a diamond shape to it.

Size of Object(s)

my fingers would have been a centimeter apart...I have no clue of it's actual size

September 1, 2013

Distance to Object(s) & Altitude

The object was below the clouds. It was not as high as a commercial aircraft...

Description of Area / Surroundings

Urban area...outer southern suburbs of Adelaide South Australia...the object came from the direction the hills are in and was heading towards the sea

Full Description & Details

A red light in the sky moving from the north east to the south west..no noise and moved faster than a plane...disappeared behind the clouds. was visible for about 90 seconds. Southern Adelaide...It seemed to have a diamond shape to it. the light began to fade before it disappeared behind the clouds.

Can sighting be explained as any conventional man-made or natural object?

No...I have lived in this area my whole life....we are under a flight path but this object was not travelling in the same direction as aircraft do in this area...I have never seen anything like it before.

Witness Background

I am a Nursery assistant....I was a nurse for 16 years before my career change. My husband owns his own business and our 16 year old son also saw the object after I called him from his room to look.

Views on UFOs, before and after sighting

I am interested in UFO's and watch programs that relate to this subject. I have always been open minded but have never witnessed a UFO before. My view remains the same but now I believe I have seen a UFO for myself.

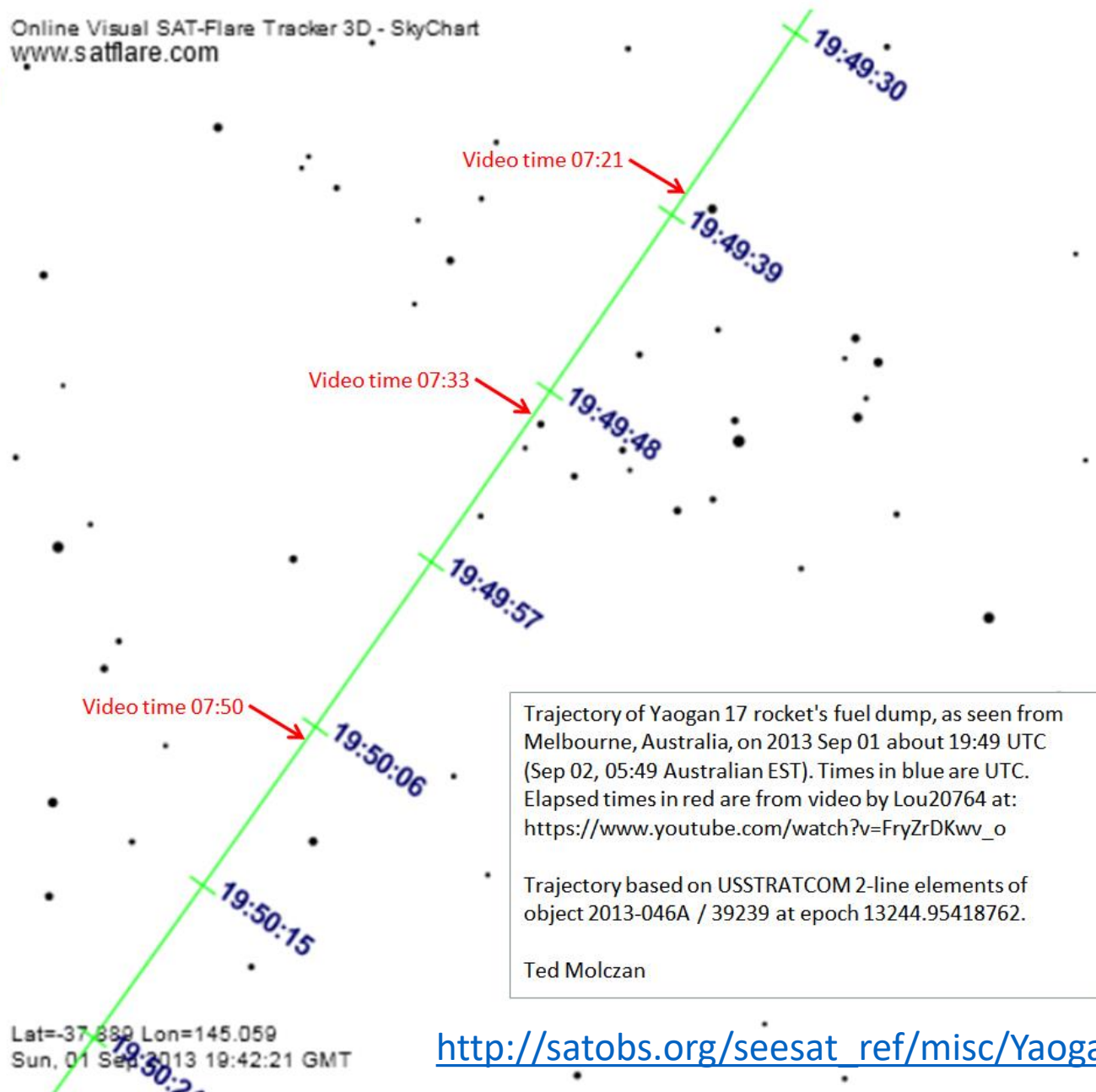
Other Comments

there were no flashing lights and I do not believe this to be an aircraft.

Reported Sighting? No

Your Location: Adelaide South Australia ***Age:*** 41

September 1, 2013



Molczan reads the stars

I have plotted a portion of the trajectory that passed some readily identifiable stars, beginning about 07m20s into the video:

http://satobs.org/seesat_ref/misc/Yaogan_17_fuel_dump.png

September 1, 2013

Molczan confirms maneuver

- “[A] fuel dump and/or fuel-depletion burn is standard procedure for these launches. In fact, it has become standard procedure for most launch agencies, mainly to prevent rocket stages from eventually exploding and adding to the orbital debris population. A secondary purpose is to remove the stage from the orbit of its payload(s), to eliminate any risk of re-contact, i.e. collision.”
- Yaogan 17 was in sunlight at that time (in fact, for the entire pass), which satisfies another key visibility constraint. The plumes of gas from fuel dumps and significant rocket burns briefly grow to a large size, such that when they are illuminated by sunlight and seen against a dark sky, they are readily visible to the unaided eye as brilliant, extended objects. Gas clouds from Centaur stages have been observed with the unaided eye at geo-synchronous orbit range, i.e. $\sim 40,000$ km.
- Having established that Lou20764's video correlates with the time and trajectory of Yaogan 17, and that its rocket's fuel depletion burn and/or fuel dump must have occurred at just about that time, while in sunlight, I can conclude beyond reasonable doubt that is what was captured on the video, and seen by other witnesses in the region. Lou20764 did a nice job capturing the event.
- <http://satobs.org/seesat/Sep-2013/0107.html>

Skype interview for youtube



<https://www.youtube.com/watch?v=hmlLzolG9aM>

September 1, 2013

Sep 30, 2013

- SpaceX over southern Africa

UFO over Indian Ocean? SpaceX Falcon 9 rocket sparks sightings

by ALAN BOYLE, SCIENCE EDITOR

Sep 30 2013, 2:47 pm ET

SpaceX's [first-ever Falcon 9 launch from California](#) gave a big boost to commercial spaceflight — but it also boosted our planet's store of UFO lore.

Reports about a fuzzy-looking unidentified flying object streamed in from observers in southern Africa and the Indian Ocean islands of Mauritius and Reunion. The sightings came about an hour after the Falcon 9 v1.1 rocket's launch from Vandenberg Air Force Base at 9 a.m. PT (noon ET) Sunday.

The [Zimbabwe Mail](#) marveled over the "strange moonlike object" seen from the country's Mashonaland region, as well as from Botswana, Malawi and South Africa. Mauritius' [L'Express](#) wondered whether it was a UFO, a satellite or a star cluster.

A retired astronomer from Cape Town, Greg Roberts, [gave the correct explanation](#) in an interview with The New Age, a South African publication: "It was propellant or rocket fuel" released by the Falcon 9 rocket's second stage.

After sending several satellites into a pole-to-pole orbit, the Falcon's second stage released its leftover fuel, which is standard procedure to avoid a blowup during its atmospheric re-entry.

"This release by chance coincided with sunset beneath that part of the orbit, as the booster and its deployed satellites flew from south to north directly over Madagascar, about 850 miles high," NBC News space analyst James Oberg explained in an email. Sunlight set the cloud of rocket fuel aglow.

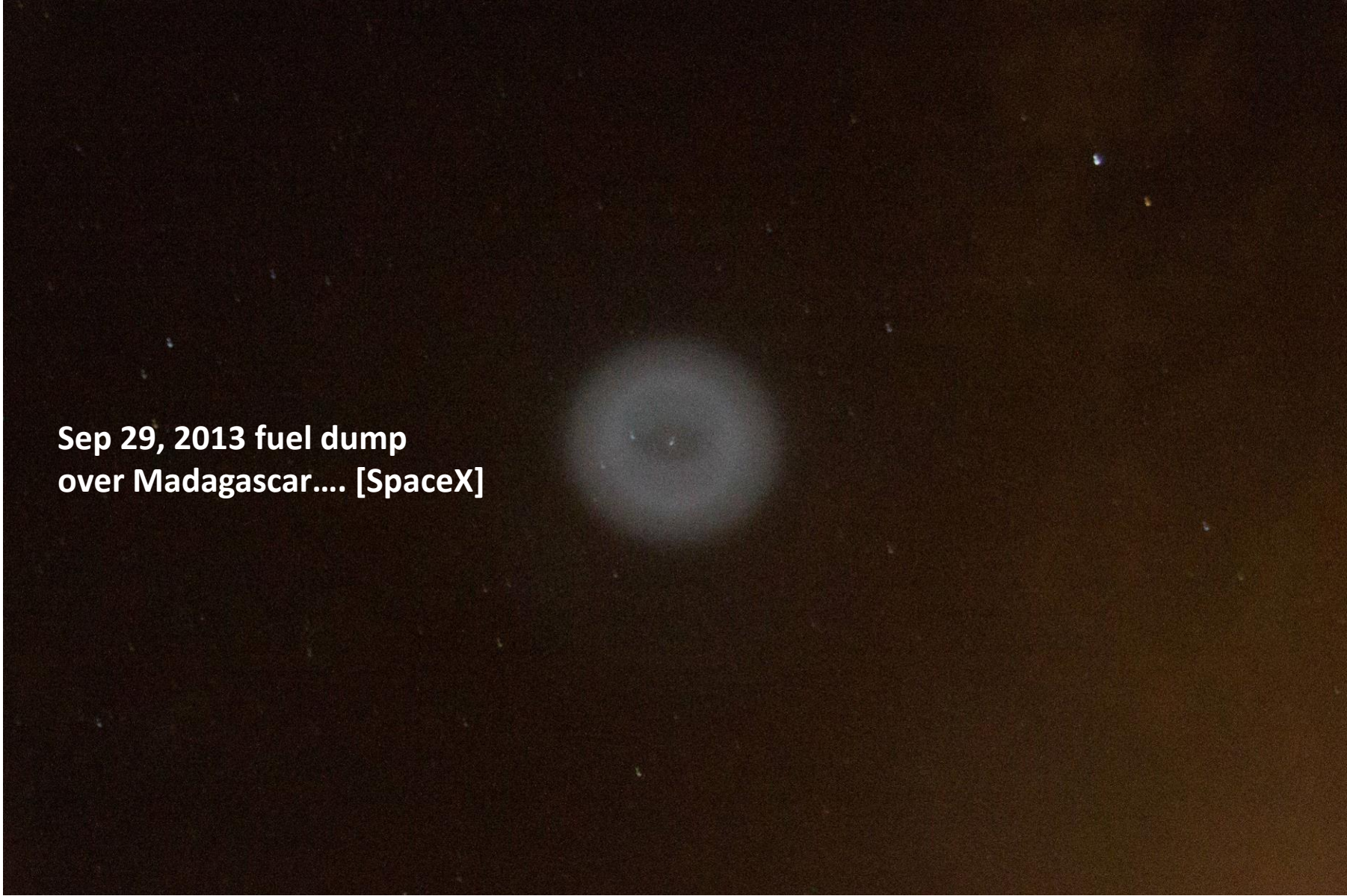
Tip o' the Log to James Oberg

<http://www.nbcnews.com/science/ufo-over-indian-ocean-spacex-falcon-9-rocket-sparks-sightings-4B11297922>

Sep 30, 2013

Reunion island

Sep 29, 2013 fuel dump
over Madagascar.... [SpaceX]



2013-055 2013 Sep 29 1600:13 2013-055A CASSIOPE

<http://planet4589.org/space/log/launchlog.txt>

Sep 30, 2013

Moon-like UFO 'was rocket fuel'



HARARE



text

<http://www.newzimbabwe.com/news-12503-Moon-like+UFO+was+rocket+fuel/news.aspx>

Sep 30, 2013

Discussion....

- Goes nearly straight over Reunion Island. Looks like we have a winner. That cloud is almost definitely propellant from the Falcon 9 upper stage after it failed to restart the engine.
- Edit 2: Wrote up my results and included pictures:
<http://wikkit.tumblr.com/post/62684205892/tracking-a-new-space-ufo>
- There are many other pictures and theories here : <https://>
- Also an article with a few links here :
<http://www.lexpress.mu/node/236109/www.facebook.com/974reunion>

Witness descriptions

- It had what looked like a star in the middle, and was slowly moving through the sky... Stayed there for about 20 minutes... There are a lot of other witnesses in the area, in South Africa, Mauritius...
- https://www.reddit.com/r/Astronomy/comments/1ne46k/saw_this_tonight_in_reunion_island_what_is_it/?sort=old

Norman Sithole, who took the only picture that has come to light of the UFO flying over Zimbabwe, said: "At first I couldn't take the picture. The phone camera was refusing to click.

"Then I managed to get this one image. It was like a circular, bluish flare with something in the middle. It was certainly lower than the moon.

"It was visible for about two minutes, moving slowly, before it zoomed out of sight."

Contemporary significance of this case

- tbs

Summary and conclusions

- Space launch fuel dump clouds have been occurring, occasionally by chance at twilight, since the dawn of the Space Age
- They have occurred over every continent, land and sea, from pole to pole
- They were infrequent and brief and accurate images were rare
- They were usually reported as UFOs, and still are widely listed that way in online data bases
- The range of witness perceptions sparked by the now-well-defined actual appearance of the phenomenon ought to be a valuable lesson on the variability of human perception and memory under such sudden sights, and be applicable to assessing other similar witness reports
- Sometimes the clouds are the result of secret military activity of high interest to the launching nation's adversaries, who might also benefit from concealing their direct interest in them
- In other cases the observations may contain clues as to propulsion system anomalies which befell the spacecraft creating the clouds
- Cultural resistance to accepting the prosaic nature of these events is a sociological and psychological phenomenon worthy of deeper study
- Watching them deliberately is a significant new hobby among amateur astronomers
- Identifying the actual causes from records and geometry is a rewarding field of historical research

What do these events have to do with the UFO puzzle?

- Most of these events caused wide-area 'UFO reports' from eyewitnesses, and some became quite famous worldwide
- To the extent that they were misidentified this way, it is thanks to the diligence and dedication of private citizens interested in that subject that these reports entered the news media, or survived in archives
- This spaceflight phenomenon is NOT the main cause, or even a leading cause, of worldwide UFO sightings
- HOWEVER, its potential value to serious "UFO studies" is potentially profound
- This is because these events provide a unique 'double blind' experiment in eyewitness perception and memory that would otherwise be impossible to perform for logistical and ethical reasons
- Blh blh blah the end