

North Korean 'Satellite' Launch Campaign April 2012 James Oberg



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News advisory – March 16

- 1. The official North Korean news agency has announced plans to launch the Kwangmyongsong-3 satellite in mid-April.
- 2. The North Korean "satellite program" is mostly -- if not entirely -- show.
- 3. Although North Korea claimed that two earlier launches -- in 1998 and 2009 -- successfully put payloads into orbit, there is no evidence for this. Official US and Russian space tracking systems saw nothing. More to the point, the powerful world-wide nets of amateur visual and radio space observers made strenuous efforts to see the payload and hear its alleged radio signals, and were completely unsuccessful -- proving, from private experts, they were never there.
- 4. The symbolism is stronger than the reality. "Kwangmyongsong" means 'Bright Star' or "Guide Star" and in NorKor state-sponsored myth is the birth name for Kim Jong-Il, son of the communist regime's founder. The first launch marked the 50th anniversary of the founding of the Pyongyang regime. The second launch followed the first successful Iranian satellite launch using a rocket built with massive North Korean assistance.

http://img.modernghana.com/images/content3/240x_mg_k52riv7ihc_p.jpg





News advisory – March 16 [continued]



- 5. Western concern that a satellite launcher implies intercontinental missile range may be overblown, since small satellites can be launched with rockets nowhere near powerful enough to throw half-ton weapons halfway around the world.
- 6. The small lifting power of the rockets allegedly used in the first two satellite launch attempts, and the Iranian satellites, has led some cynics to look at how small a warhead would have to be, to reach the US -- and dubbed it "the terrifying golf ball of death".
-
- 7. While it is remotely conceivable that a 100-pound warhead [which would consist mostly of heat shield for atmospheric reentry] could carry biotoxins or other lethal cargo, with an impact accuracy measured in tens of miles at best, it might be a nasty threat to a target such as Los Angeles. And also a good target for the US anti-missile system now operational.

News advisory – March 16 [continued]

http://www.noquarterusa.net/blog/wp-content/uploads/2009/04/webkoreanmissile_edited-3.jpg



- 8. The biggest mystery of the first two satellite launches is whether there ever WERE any satellites aboard the rockets, or whether the "satellites" were merely "window dressing" to give an excuse for a rocket test.
-
- 9. If so, the excuse didn't work, and the US and Japan, and the UN, expressed grave alarm at those launches, "satellites" or no. This infuriated the north Koreans -- as does ANY suggestion that the satellites "failed".
-
- 10. My own suspicion is that the satellites **did** exist, and **were** really intended to reach orbit.
-
- 11. But they both failed, so the launch team then just told Kim Jong-Il that they had succeeded [how could he tell?]. Any Western claims that they had failed were easy to brush off as hostile propaganda. North Korean opened a museum of the satellites, and took crowds of people outside into public squares at night to ooh and aah as the satellites passed overhead [everybody in the crowds claimed to have seen the satellites go by -- no surprise].

Kwangmyongsong-1

- First satellite, a basic sphere

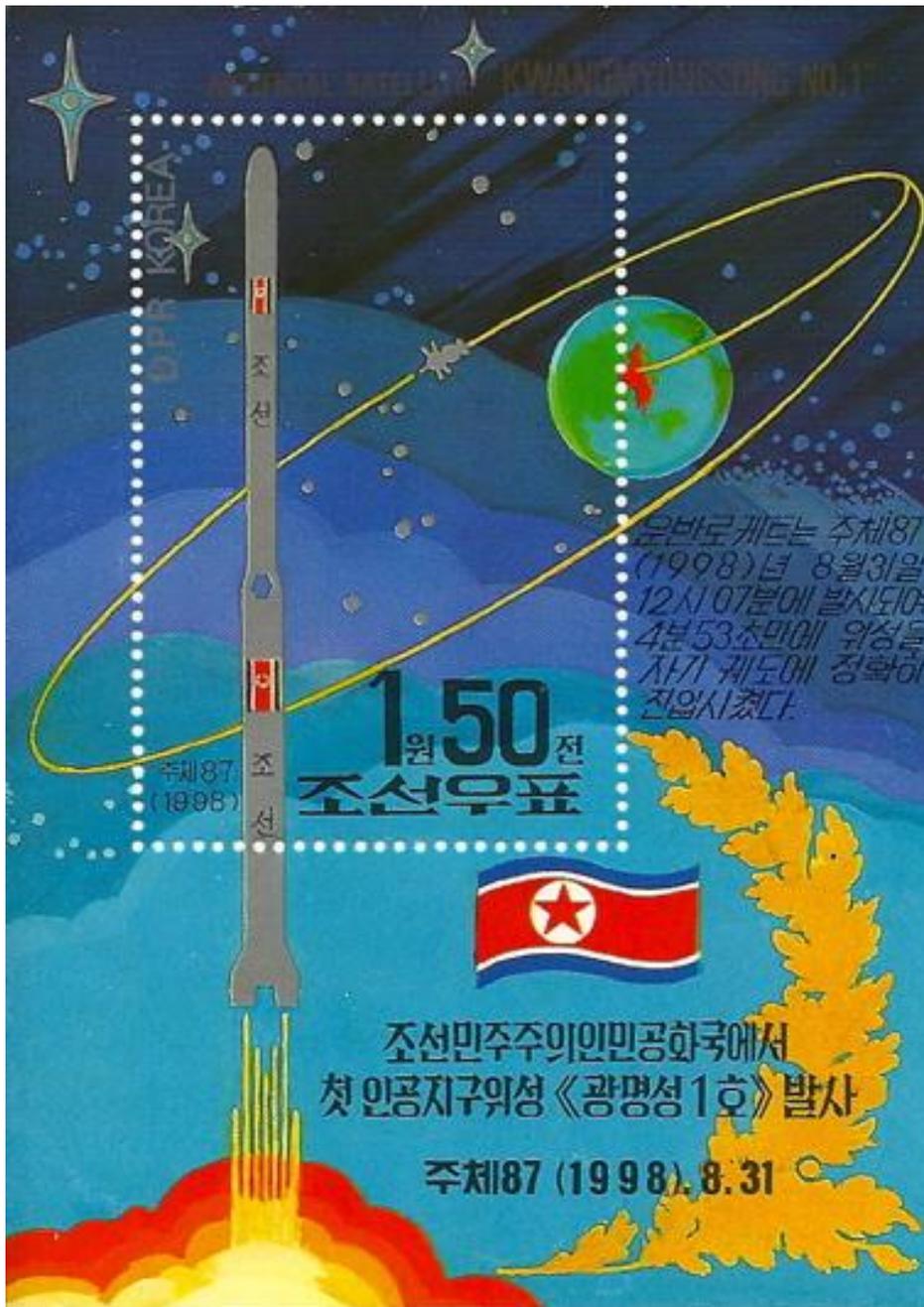


A book published in North Korea showing Kwangmyongsong in orbit on the cover. The title is "Man-Made Earth Satellite" and the publisher is the Science Encyclopedia Collaborative. Published in 1999, it is 96 pages.



DPRK missile/space chronology

- May 1993: The DPRK test-fires a medium-range Rodong ballistic missile into the Sea of Japan.
- August 1998: The DPRK launched the first man-made satellite Kwangmyongsong-1, which it said was a successful launching. But the United States and South Korea said what the DPRK had fired was an intermediate-range Taepodong-1 ballistic missile, part of which flew over Japan and into the Pacific Ocean.
- July 2006: The DPRK launched several ballistic missiles, including an advanced long-range Taepodong-2 missile. But the launch of Taepodong-2 was an apparent failure, and the missile landed in the Sea of Japan.



- The most remarkable success gained in the forced march this year is artificial satellite “Kwangmyongsong 1” which was launched into orbit on August 31. The scientists and technicians of Korea launched into orbit the first artificial satellite, a product of their own wisdom and technology, fully demonstrating the national power of Korea with a powerful scientific and technical force and the solid foundations of the independent national economy. — [KCNA, December 31, 1998.](#)

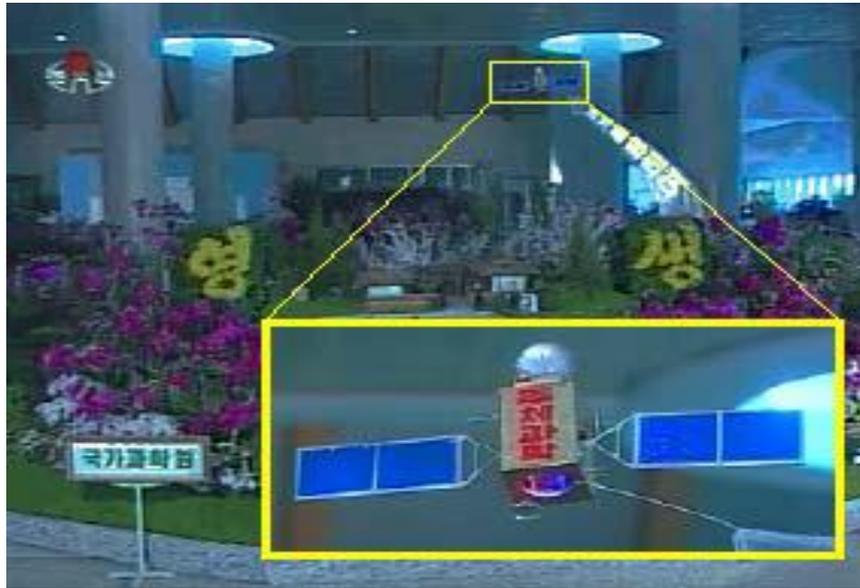
First launch site



- "Taep'odong" is the old geographical name of the launch site Musudan-ri.

North Korea used its launch site at Musudan-Ri for the 2009 rocket launch

Kwangmyongsong-2



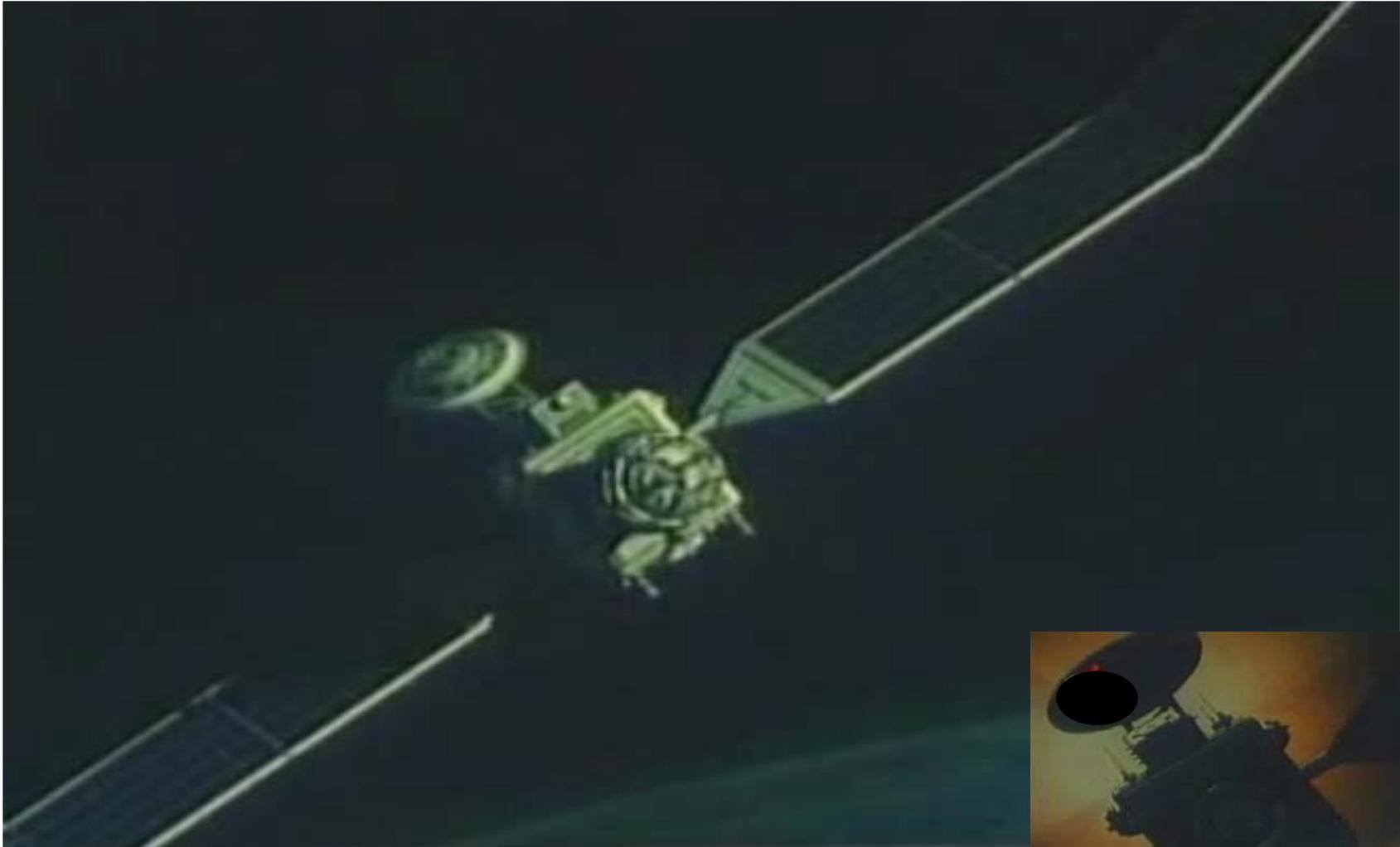
- Heavier satellite on more powerful booster
- April 15, 2009 State Academy of Sciences display contains satellite model [presumably the one just launched]



Launch simulation



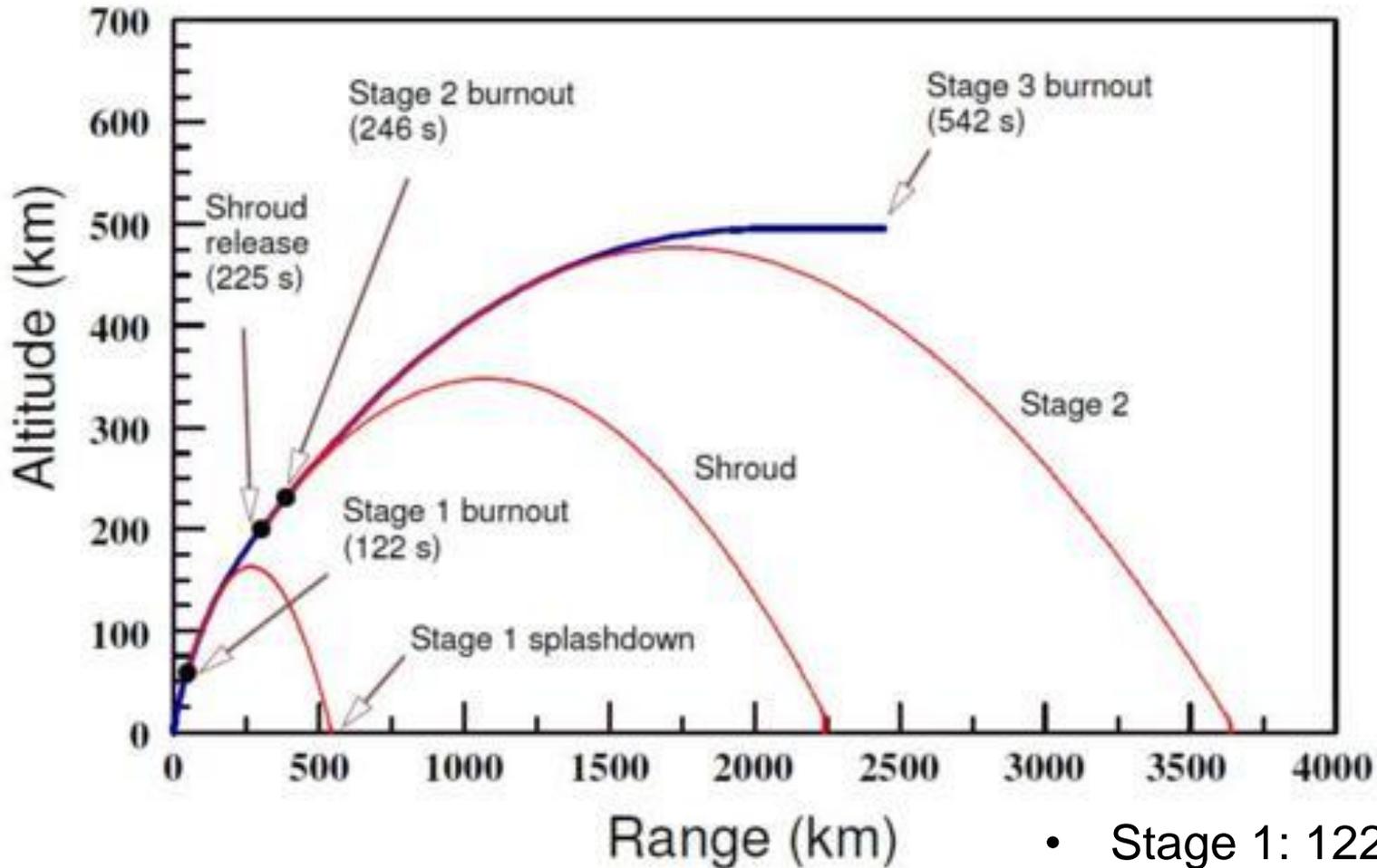
- Fairly sophisticated graphics depicting complex but apparently well-designed satellite



- **Art of Kwangmyongsong-2 satellite with deployed arrays, antenna –**
- **Prototype communications satellite**



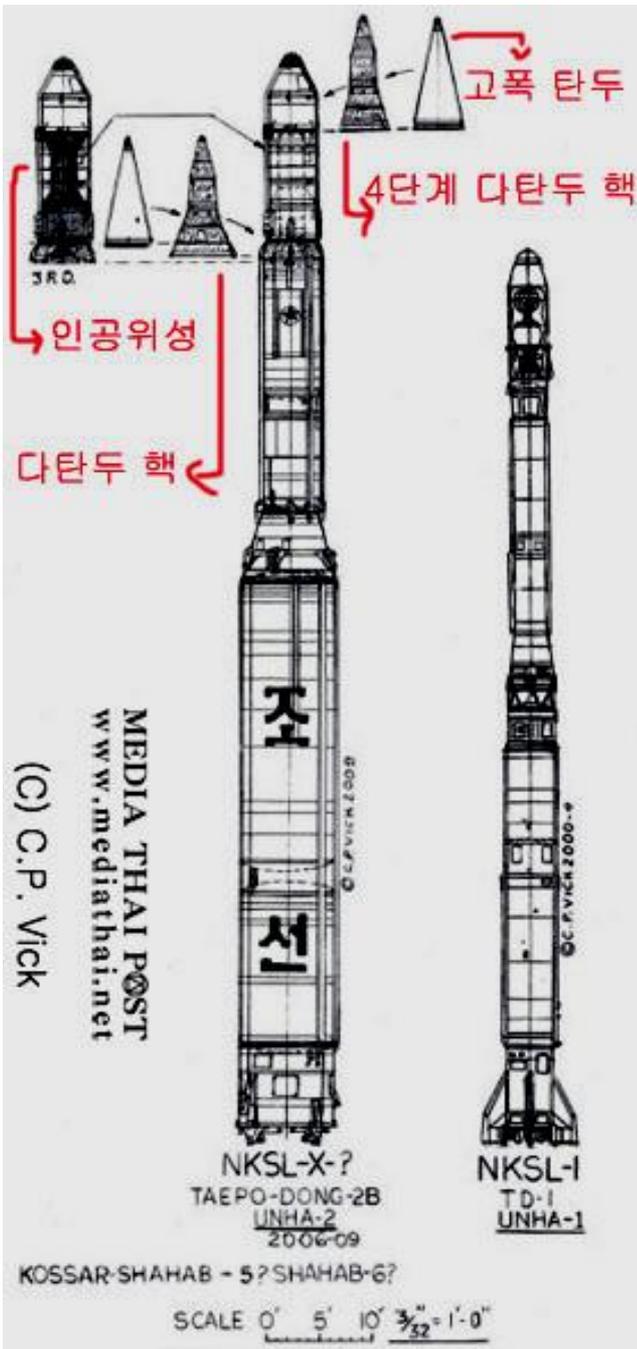
Unha-2



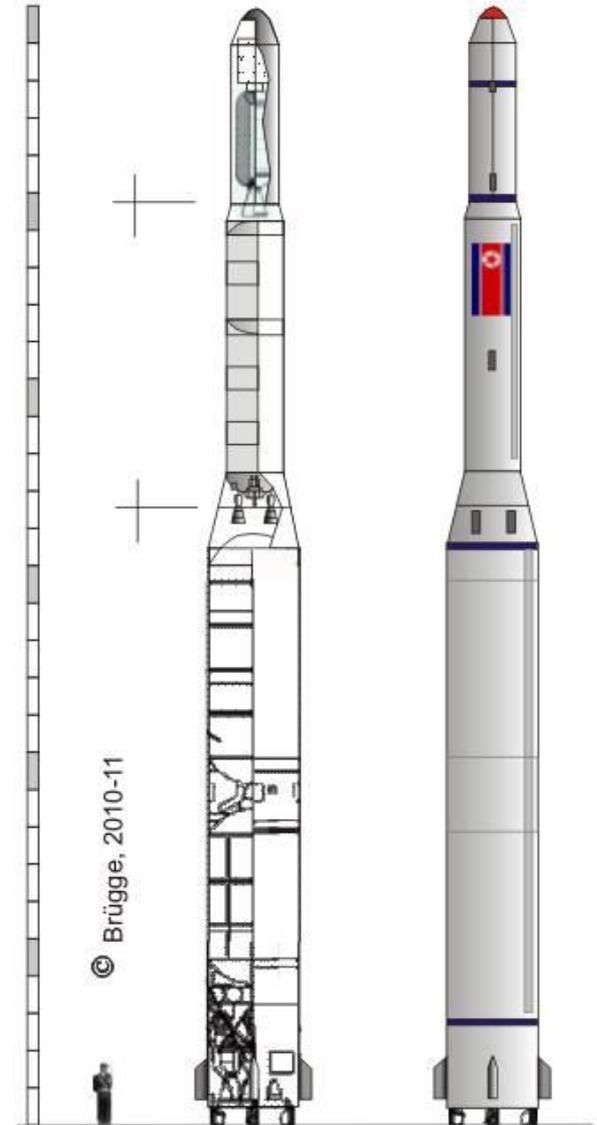
- Stage 1: 122 to 135 sec
- Stage 2: 246 to 300 sec
- Stage 3: 107 sec?

http://media.tumblr.com/tumblr_m1ak2iRBbR1qbnrqd.jpg

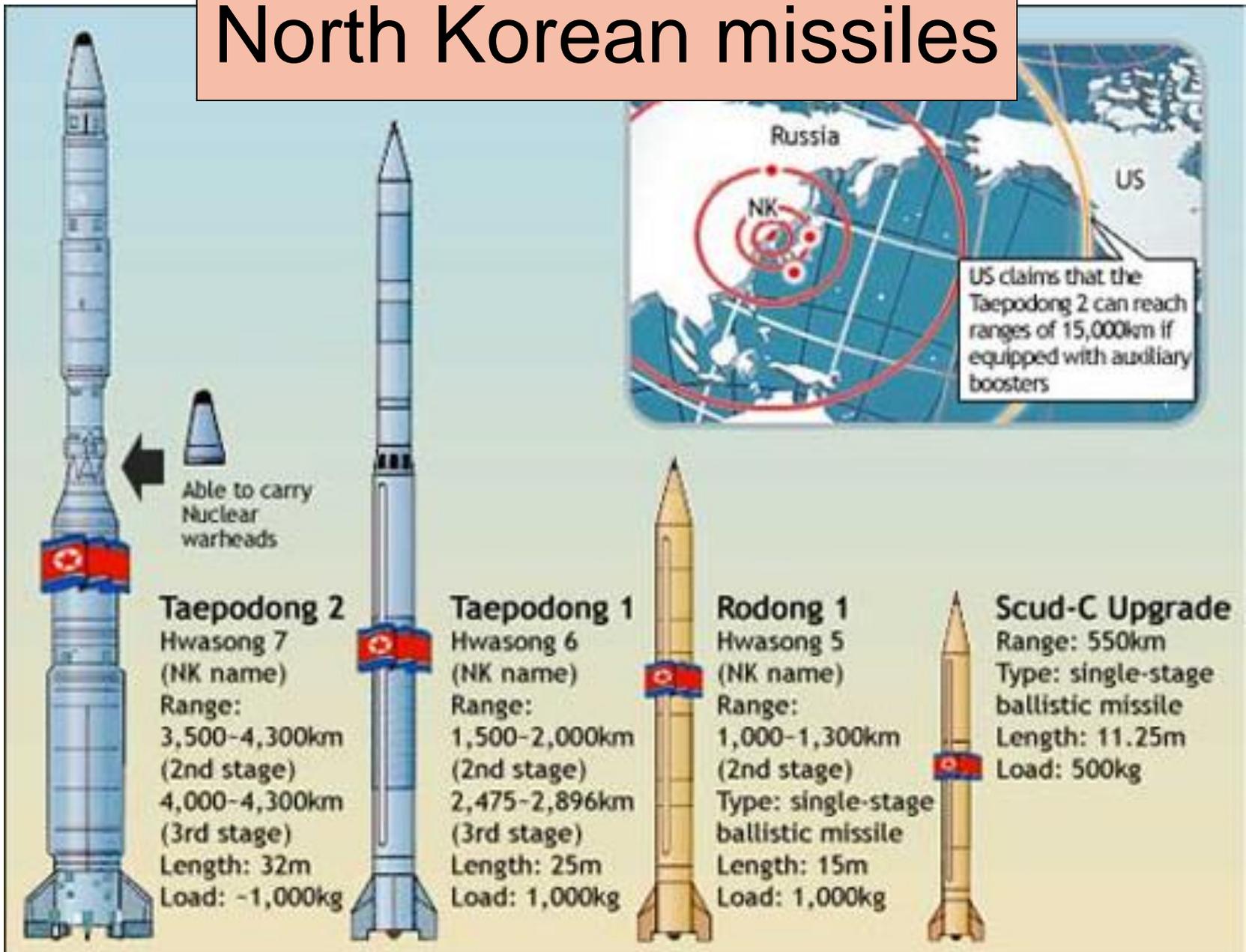
- Unha-2, 3 booster



New booster is significantly larger than one used for first satellite launch but is still about half the power of first US ICBMs fifty years ago.

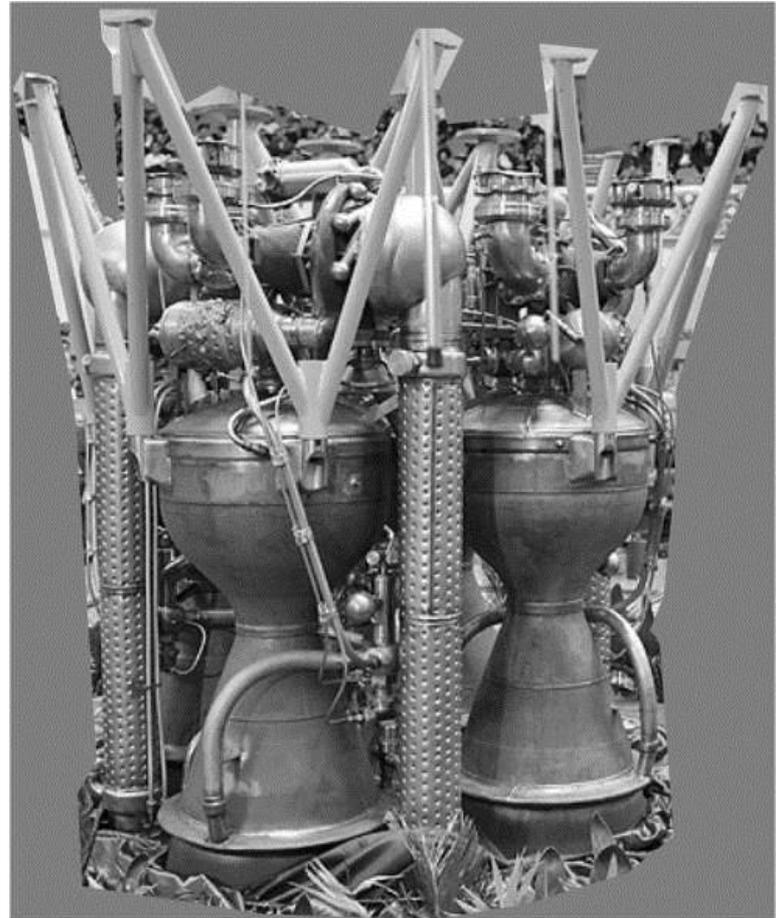


North Korean missiles



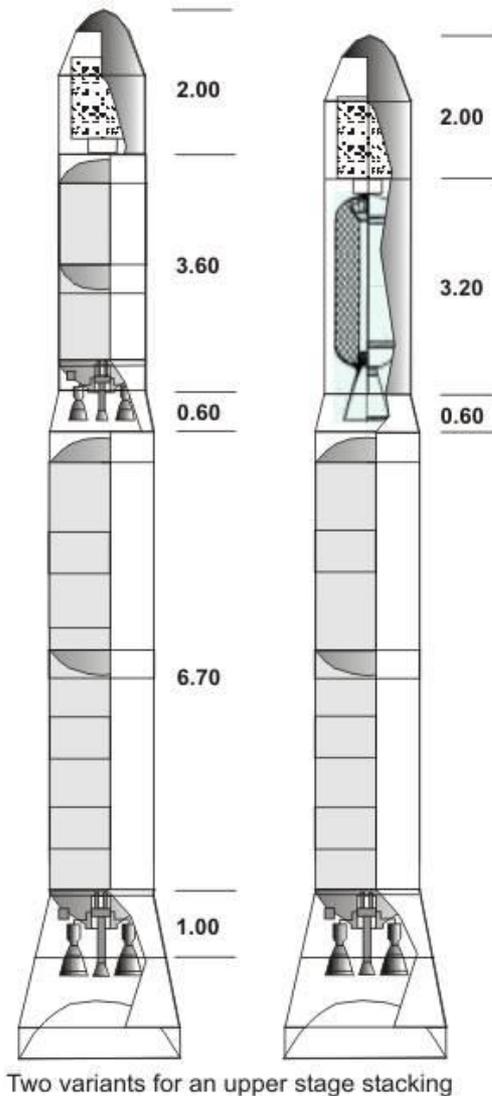
First stage engines

- Believed to be 4 upgraded 'Scud' engines
- Similar to layout for Iranian Simorgh booster
- Propellants UDMH and AK-27 [nitric acid]



“Third stage” a complete mystery

- Unclear whether liquid or solid [more likely]
- Payload attachment never depicted
- Only seen in fully stacked vehicle, with aero shroud

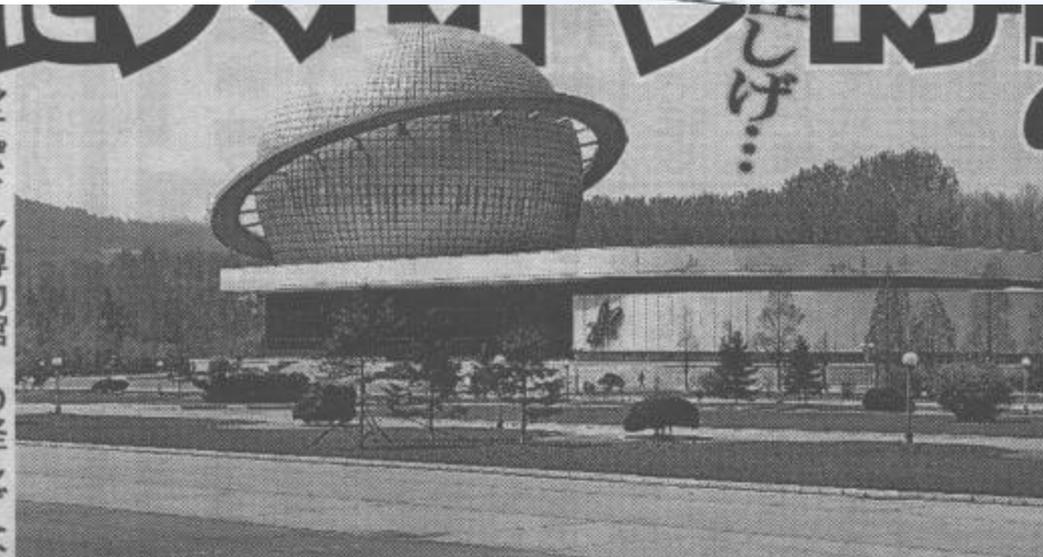


© Brügg, 2011-12





Museum of the satellites “National Taepo Dong Museum”



- It's located in an area of museums in the So'so'ng District in Pyongyang. North Korea calls it the "Electronics Industry Building."
- The museum also doubled as a trade fair venue to show the DPRK's missile technology.

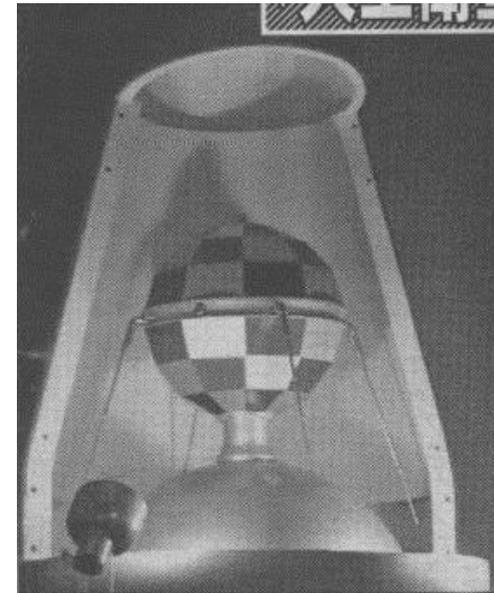
Japanese visit to museum, 2009

- "When you enter the building, you are taken by elevator to the third floor. There they had an exhibit of the Kwangmyo'ngso'ng-1."
- "A realistic model of the satellite and the launch pad and photographs of them are exhibited. The photographs are blow-ups of the TV images broadcast by the Korean Central Television Station." The visitor also said a 20-minute video extolling the Taepo Dong launch is also shown.
- There were pamphlets written in foreign languages.
- "There is also a planetarium, and the night sky over Pyongyang is recreated. You could of course also observe Kwangmyo'ngso'ng-1 moving in its orbit."

[Zakzak Online](#) [Tokyo] Apr 7, 2009



Space shuttle model like one seen at museum



The third satellite launch

- The announcement said the launch would take place between 7 am and noon local time in North Korea between April 12 and 16; The distances of the splashdown zones from the launch site is different than those in the 2009 launch. In particular, the splashdown zone for the first stage is centered at a distance of about 450 km from the launch site and is about 80 km long and 30 km wide. In the 2009 launch, that zone was centered about 625 km from the launch site and was about 250 km long and 20 km wide.
- The splashdown zone for the second stage is centered at a distance of about 2,500 km from the launch site, and is about 475 km long and 100 km wide. In the 2009 launch, that zone was centered about 3,600 km from the launch site and was 800 km long and 150 km wide.
- While the 2009 launch gained some speed compared to this launch from the rotation of the earth due to its eastward launch, that is not enough to account for these differences in splashdown ranges. North Korea needed to change the location of the second-stage zone to avoid landing on the Philippines.
- This difference in the distances of the splashdown zones from the launch site may reflect some changes in the launcher. In order to place a satellite in orbit without being launched eastward, the Unh-3 itself will have to accelerate to a speed about 4% higher than the Unha-2 used in the 2009 launch. North Korea may attempt to get that additional velocity increase from the third stage by increasing the mass of fuel it carries. If so, that could reduce the burnout speeds of the first two stages, which would cause them to fall at shorter ranges. Modeling the launch should shed light on this.
- <http://allthingsnuclear.org/post/19732600512/north-korea-announces-splashdown-zones-for-launch>

**NO IMAGE
AVAILABLE**

“Kwangmyongsong-3 as an earth observation satellite will assess the distribution of forests and natural resources of the DPRK, the level of natural disaster, the crop estimate, etc. and collect data necessary for weather forecast, natural resources prospecting and others. .. It weighs 100kg and will circle along the solar synchronous orbit at 500km high altitude. Its life is two years “

New Launch Site



Location has clear azimuth to the south for polar orbit launchings. From old site, orbit would overfly South Korea [to south] or Russia [to north]

Tongch'ang-dong Missile and Space Launch Facility

Pongdong-Ni / Tongchang-Ni

- The launch facility at Pong-Dong-Ni is located on North Korea's west coast. The name Pongdong-ni comes from the practice of applying names to facilities based on the nearest named population center. Both Pongdong-ni & Kwi-Gol were reportedly partially demolished during the construction of the facility. An alternative spelling, Pongdong-ri has also been used to describe the facility, as have the names Tongchang-ni, Tongchang-dong, and Dongchong-ni. As of June 2009 the actual name of the facility was unclear.
- There was also separate horizontal assembly MIK building and a separate payload and last stage processing center. The separate MIK building for payload processing was likely for the third stage, as well as the payload. The separate MIK building for payload processing would likely be for the third stage, as well as the payload including test firing RCS systems building and explosive processing area buildings. As of 3 June 2009 it was not possible to identify a launch control center or VIP viewing areas. Nor was it possible to identify other sites for mobile telemetry and mobile radar tracking equipment. Launch control facility could have been underground.
-

Launch site layout [as of 2009]





- The location of the launch site allows the North Korea the ability to place a satellite in orbit without overflying South Korea territory. (Image Credit:GeoEye and Google Earth)

- Located on the West coast of the Korean peninsula just 30 miles south of the Chinese border, the new facility has been under construction for several years. It is intended to replace the aging and remote launch site at Musudan-ri on the Northeast coast.

- The launch date has been announced to fall between April 12-16th. The North Korean's plan to place the satellite in orbit in southerly direction thus avoiding overflight of South Korean territory.



39.566 n, 124.7058 e [39-39-33.58, 124-42-21.15]

12 km left to right scale // 150 km NW of Pyongyang

13 KM south of Cholsan, 50 km SE of Dandong on Chinese border



Several
views
'Sohae'
[West
Sea]
launch
site



Umbilical Support Tower

- The fixed steel umbilical support tower approximately 40 meters high, and provides electrical connections, gas pipelines, liquid pipelines, to the launch vehicle. There is not rotating gantry visible
- The umbilical tower has several rotating service platforms, which provide access to the launch vehicle and payload. These swing away from the launch vehicle prior to launch. The umbilical tower probably provides an air-conditioned payload operation area, in which the temperature, humidity and air cleanliness are monitored. An underground cable tunnel connects the umbilical support tower to nearby fuel storage buildings.
- Credit: **Tim Brown, Senior Fellow, Globalsecurity.org**



Detail of the Missile Assembly Building and the new rail-to-road transfer point

<http://sitrep.globalsecurity.org/tongchang-dong2.jpg>

39-40-09.67,
124-42-35.54

Vehicle Processing Building

- http://www.globalsecurity.org/wmd/world/dprk/tongchang-dong_090603_vpb.htm
- There is a 2,200 square meter processing building located about one kilometer north of the launch site. It appears to be a light-clad building that has a processing hall measuring 15 x 55 meters, and probably contains clean and testing rooms. The processing hall is long enough to accommodate Taepo-dong 2 and Unha-2 vehicles. Sometime between 2006 and 2008, a 33 x 15 meter building was added bringing the total length to 95 meters. The facility is protected by a security wall.

High-Bay Processing Building

A smaller building is located on the opposite side of the main access road located almost one kilometer from the launch site that is about 740 square meters in size. It has three supporting halls and two multi-story high-bay processing rooms measuring about 8 x 20 meters and 15 x 10 meters respectively. The exact height is unknown but they appear to be at least 3 or 4 stories high. This high-bay building is also protected by a security wall.



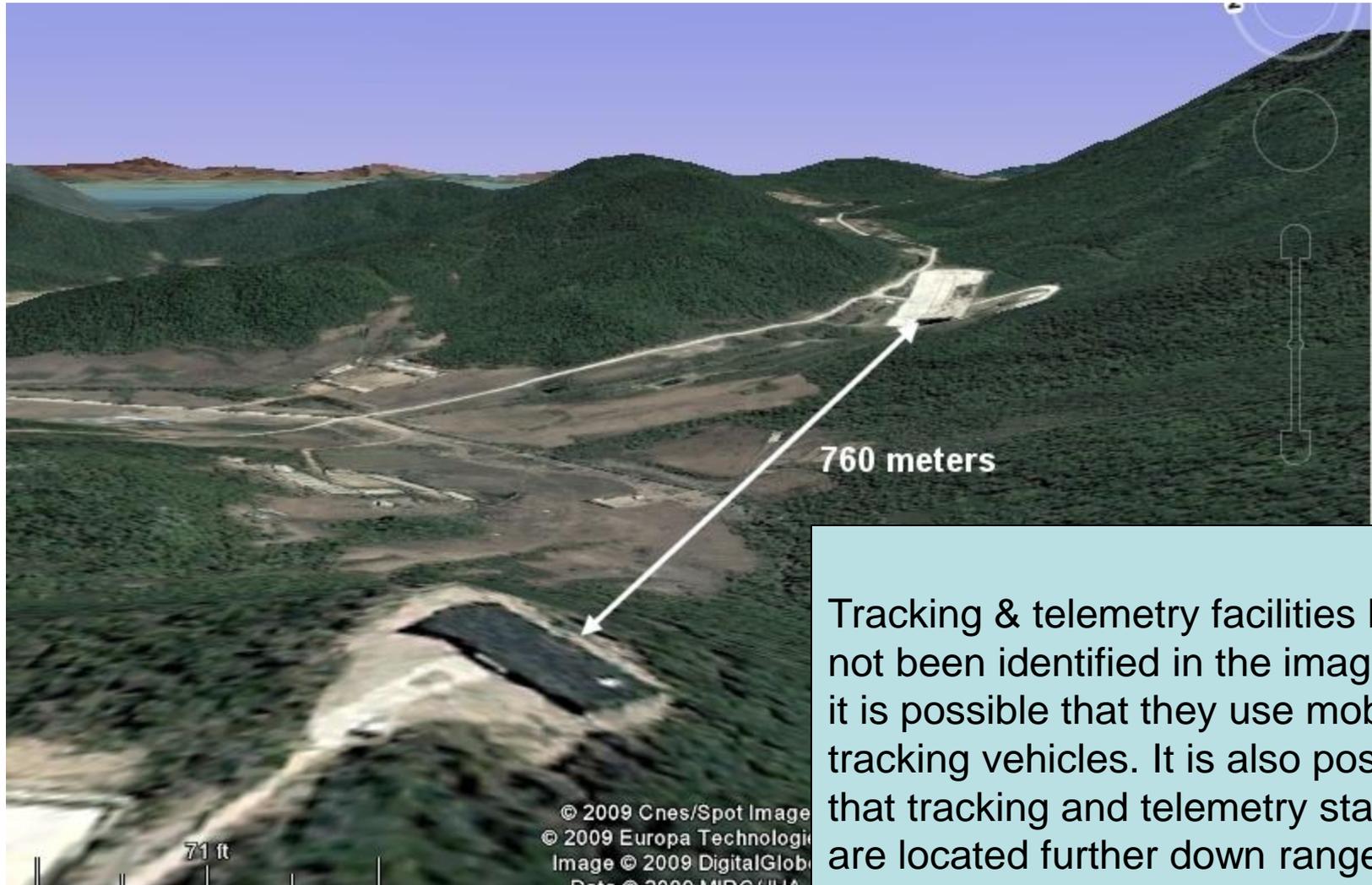
Launch Control Building

A launch control building is located about 760 meters from the launch site on a hill about 90 meters above sea level with a clear line of site of the launch site. The building is about 20 by 12 meters in size and is probably a two story concrete structure. The building is served by a loose graded road and has a small parking area. It is possible that optical tracking cameras are also located at the launch control building.



Perspective of the launch control building and the launch site as of 3 June 2009.

Credit:Globalsecurity.org, DigitalGlobe, and Google Earth.



Tracking & telemetry facilities have not been identified in the imagery, & it is possible that they use mobile tracking vehicles. It is also possible that tracking and telemetry stations are located further down range.

Support Buildings

There are numerous support buildings including a compound almost 2 kilometers northwest of the launch site, consisting of over 20 light-clad warehouse style buildings and “E” shaped headquarters and administration building. Between 2006 and 2008, 12 building were constructed adding about 3,500 square meters of floor space of the compound bringing the total to about 5,500 square meters (40,000 square feet). The two largest buildings measure 55 x 13 meters. All the buildings with the exception of the “E” shaped administration building appear to be single story light-clad buildings. The narrow spacing suggests that they do not house missile or launch vehicle stages, but might be warehouse, motor pool or workshops that support the launch center.

Near the launch pad there appear to be dozens of smaller buildings that were probably originally occupied by North Korean peasants that have since been displaced to house and support military and missile support personnel.



Main Gate

The facility has one road entrance guarded by a main gate approx two kilometers north of the launch pad. The road is about 5 meters wide and appears to be concrete. Outside of the main gate, the road is narrower and appears to consist of graded loose gravel.



Static Rocket Engine Test Stand

A static rocket engine test stand is located about one kilometer southeast of the launch pad. There is concrete support pad that measures 40 by 60 meters. A concrete ramp connects the support pad to the engine test pad. The steel superstructure that holds the rocket motor captive measures about 10 by 10 meters.



- http://www.globalsecurity.org/wmd/world/dprk/tongchang-dong_090603_test-stand.htm

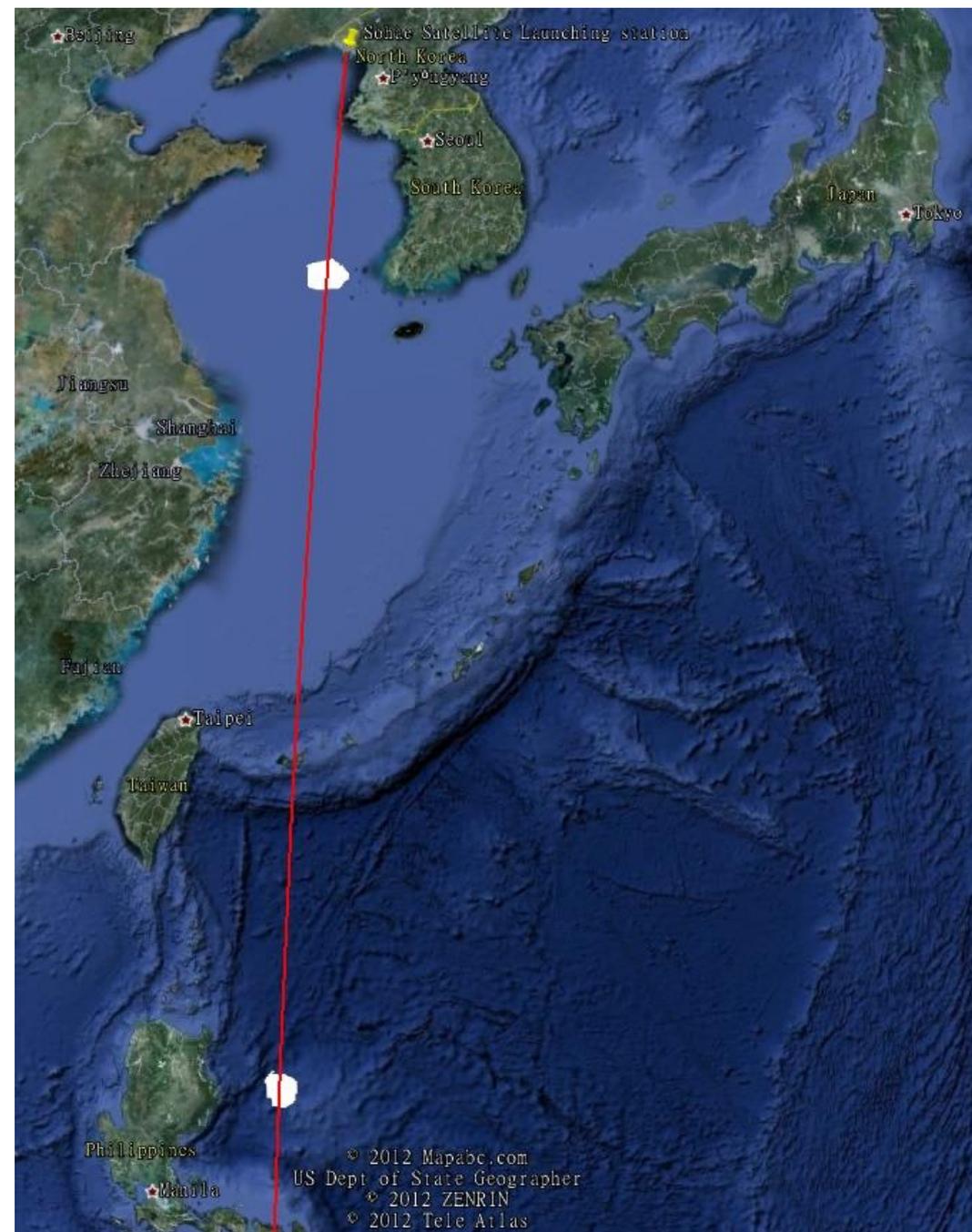
Description of press tour [March 28]

- DPRK's Korean Committee for Space Technology's Space Development Department Vice Director [unnamed] on 28 March, reported by Pyongyang KCNA at 10:43 GMT Mar 28, 2012.
- “Foreign experts and reporters to the satellite launch... will go to the Sohae Satellite Launching Station to witness carrier rocket Unha-3 on the launching pad and Kwangmyongsong-3.”
- “They will watch the preparation for the launch of the carrier rocket with satellite on it in the General Launch Command Centre.”
- “They will also visit the General Satellite Control and Command Centre in Pyongyang and see the satellite being launched in a relevant place.”
- “We will organize special visits going beyond the international usage to show with transparency the peaceful, scientific and technological nature of the satellite.”

Viewing the launch

[from the launch site area]

- 1. No clue about how far press will be allowed to stand – traditionally, range can be between 1 to 12 miles or more [5 to 60 seconds sound delay]
- 2. Presumably the better transportation access is north of pad area so view would be towards the south. But coastal areas, including south of pad, may also be optional.
- 3. Rolling topography may not allow view of rocket pre-launch.
- 4. Mid- to late-morning liftoff will place Sun in the southeast to high south and this could significantly interfere with camera tracking
- 5. Missile type does not lend itself to very bright flame or white exhaust trail – could be quite difficult to track visually.
- 6. Rocket will climb vertically but soon pitch over towards horizon and then visibly seem to ‘descend’ [viewing angle parallax]; maximum elevation depends on range to launch but can be up to 70° [close in] or as low as 45° [more distant].
- 7. For coverage of contingency events, viewing elevation angles as low as possible to horizon are highly desirable
- 8. To determine actual range to liftoff, I intend to run several audio tape recorders to precisely measure sound delay. Also, I will try to get a compass bearing from observation post to liftoff site.



- Ascent trajectory

- White areas indicate stage impact zones.
- NOTAMS have already been issued
- Visibility even along early overwater track is highly unlikely



Notice to Airmen/Mariners

NAVAREA NO.12-0174 Date:2012/03/19 12 UTC

YELLOW SEA AND NORTH PACIFIC, LUZON.
ACCORDING TO INFORMATION FROM NORTH
KOREA VIA IMO, ROCKET LAUNCHING.
IMPACT HOUR 2200Z TO 0300Z COMMENCING
DAILY 11 TO 15 APR.

IMPACT AREAS BOUNDED BY

A. 35-12-25N 124-52-23E

35-12-13N 124-30-34E

35-55-20N 124-32-10E

35-55-10N 124-50-25E.

B. 15-08-19N 124-46-15E

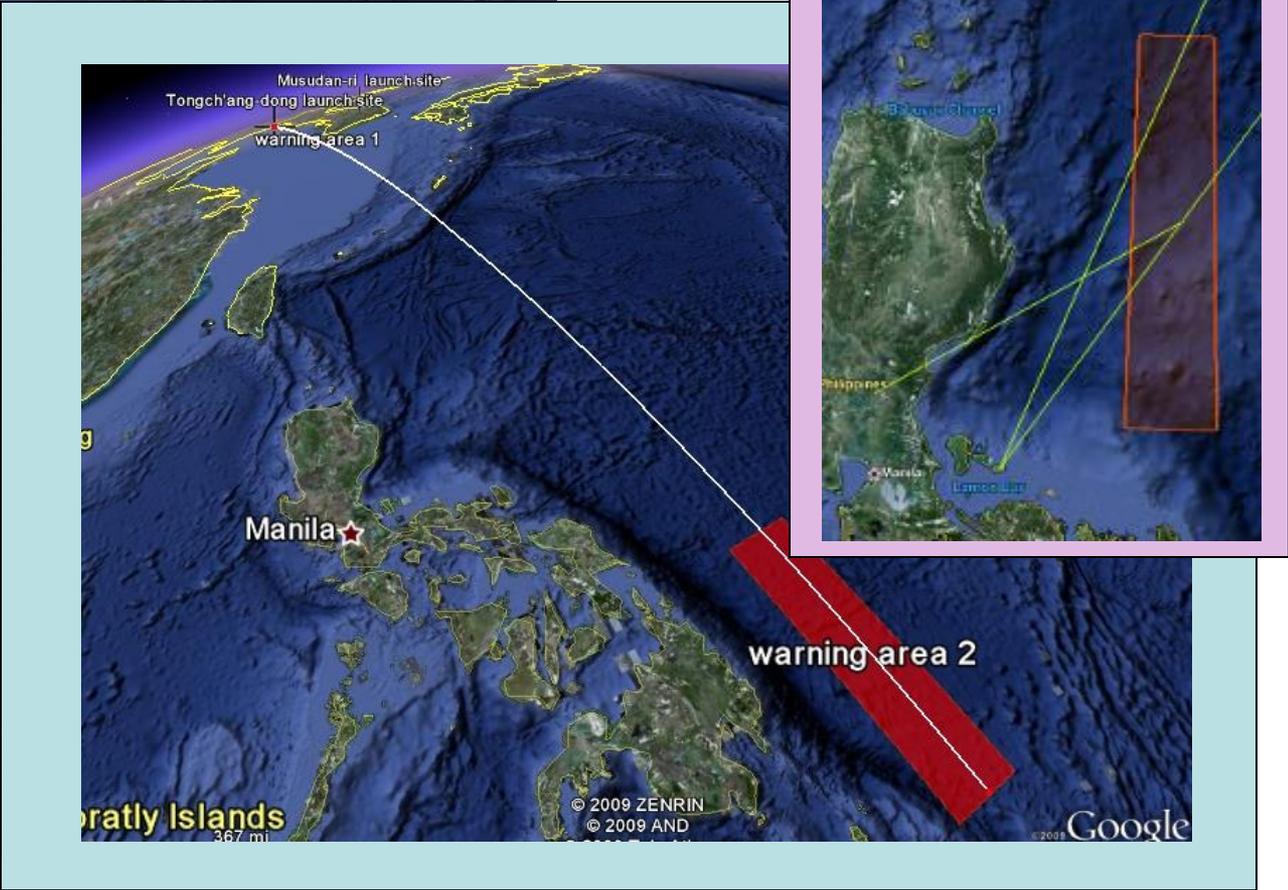
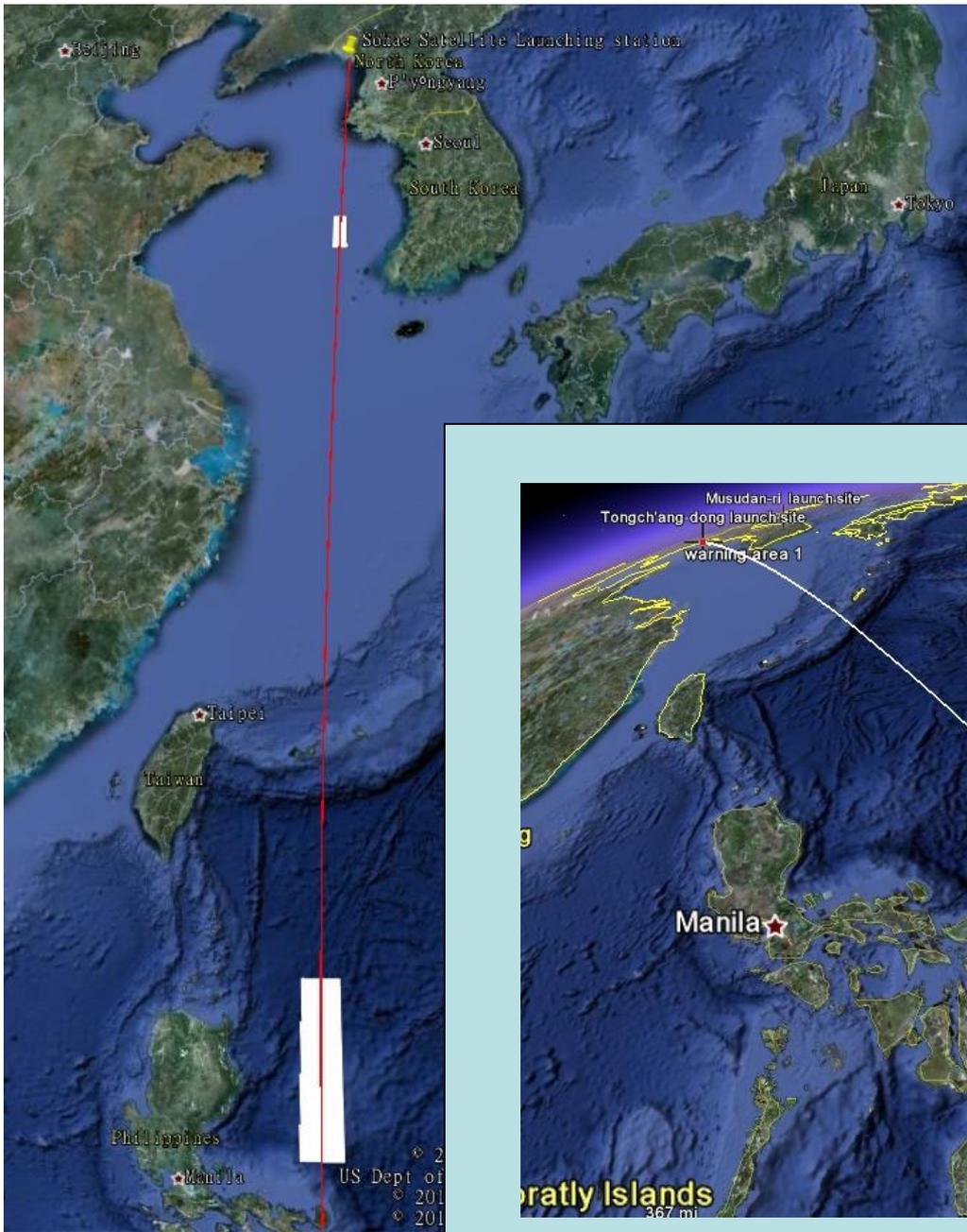
15-09-35N 123-45-27E

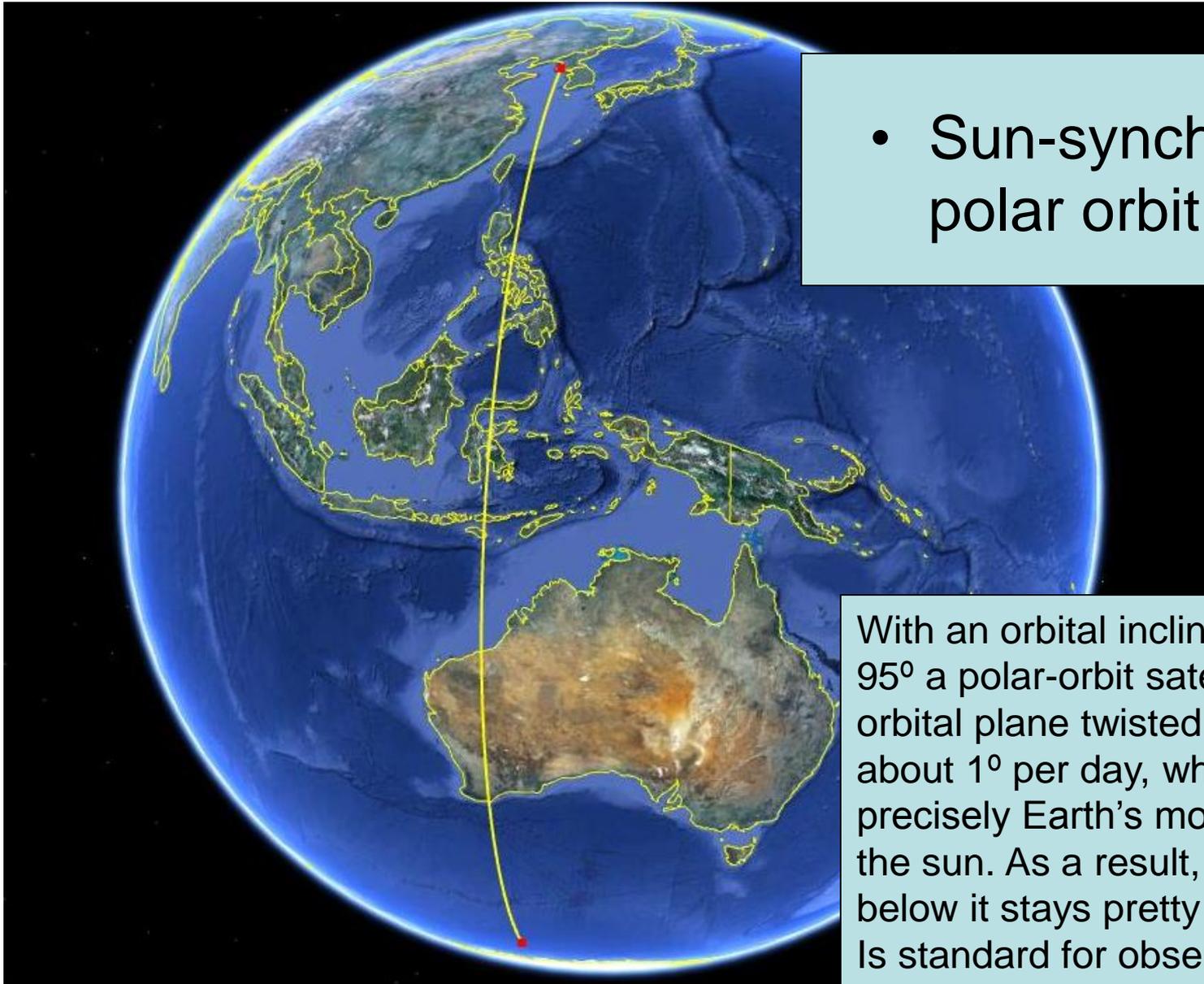
19-24-32N 123-54-26E

19-23-08N 124-45-13E.

CANCEL THIS MSG 150400Z APR.

- The exact drop zones coordinates for "first stage" and "second stage" debris are given in the message to IMO (original information from Sharicoff /NK forum)





- Sun-synchronous polar orbit

With an orbital inclination of about 95° a polar-orbit satellite has its orbital plane twisted westward by about 1° per day, which matches precisely Earth's motion around the sun. As a result, light/shadow below it stays pretty constant. This is standard for observation sats.

Unha-2
[2009]



- Color of flame, smoke, and other vents are important clues to rocket design and primary mission





Launch images of the Unha-2 rocket

[Official photos published by Korean Central News Agency (KCNA)]

<http://english.sina.com/technology/p/2009/0408/232528.html>

Other desirable images

- Pad photos post-liftoff, if available
- Any fueling vehicles
- Antennas, optical trackers, etc.
- Entrances to underground bunkers
- Air vents to underground facilities
- Emergency vehicles
- Workforce uniforms, tools
- Vehicle and personnel passes
- Aircraft in sky, ships off the coast

Comparison – 2009 sat pix



DIFFERENT
launch site
than this year

Photos show launch prep?

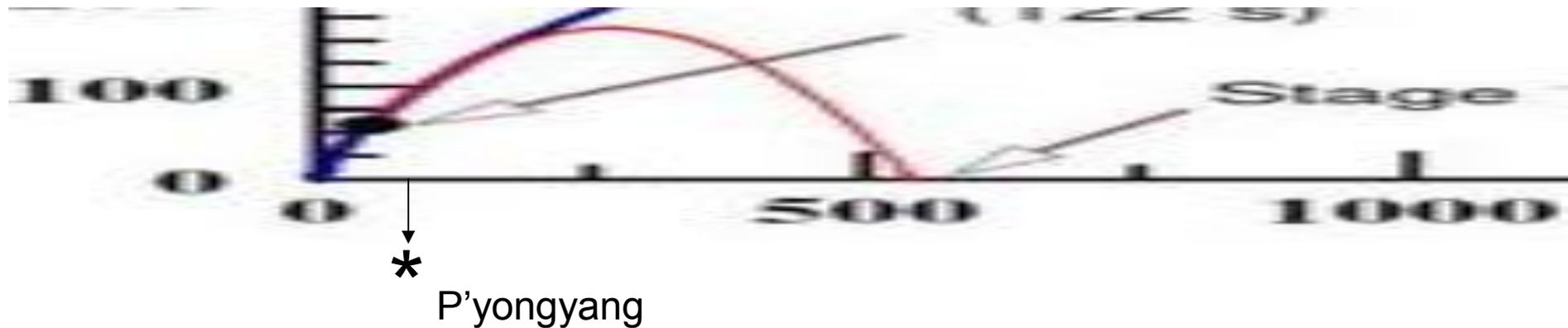
29 March 2012 22.58 EDT // guardian.co.uk,
Trucks, fuel tanks and other movement at Tongchang-ri site indicate
April launch is on schedule, according to analysts



This 28 March 2012 satellite image shows North Korea's Tongchang-ri site apparently being prepared for the launch of a long-range rocket despite international objections. Analysts say trucks and fuel tanks are visible and work is under way on a gantry next to a mobile launch pad. Photograph: DigitalGlobe/AP

What would launch look like from P'yongyang?

Answer: With clear weather, possibly spectacular



P'yongyang is abeam of the ground track about 83 km from the launch site, and approx 67 km off to the side.

At that point the rocket is about 80 km in altitude and will be performing first stage shutdown and second stage separation.

Elevation angle from P'yongyang will be approx 50 degrees high. directly to the west. Movement will be right-to-left.

The morning launch will make the sun be in the southeast.

Analogous launches from such a distance



Delta launch from Vandenberg, 50 miles away, May 5. 2009
http://richardduncan.net/wp-content/uploads/2009/05/dsc_6076a.jpg

CAUTION: The 'Delta' has a set of solid-rocket-boosters that leave a smoke trail, probably more striking than Unha-3.

Vandenberg, 50 miles,
June 27, 2006 [below]

<http://franklin2.tbo.net/blog/?m=200606>

Also caught booster sep.



Post-launch news

Communication opportunities

** The UHF band runs from around 300MHz to 3GHz and has several chunks of frequency reserved for satellite use. It's commonly used by satellites to send data back to earth and is also utilized by the ISS and radio amateurs for voice comm. The X-band is a little more exotic. It runs from around 7GHz to 12GHz and is most often used via satellite for military and government communications.

** North Korea may pick up first signals from a successful launch about an hour and a half after blastoff.

** If forewarned [and that's likely], amateur radio listeners in South America and in eastern North America may be the first to actually hear radio signals.

** Absence of such signals will be a strong indicator of failure

First-stage recovery options

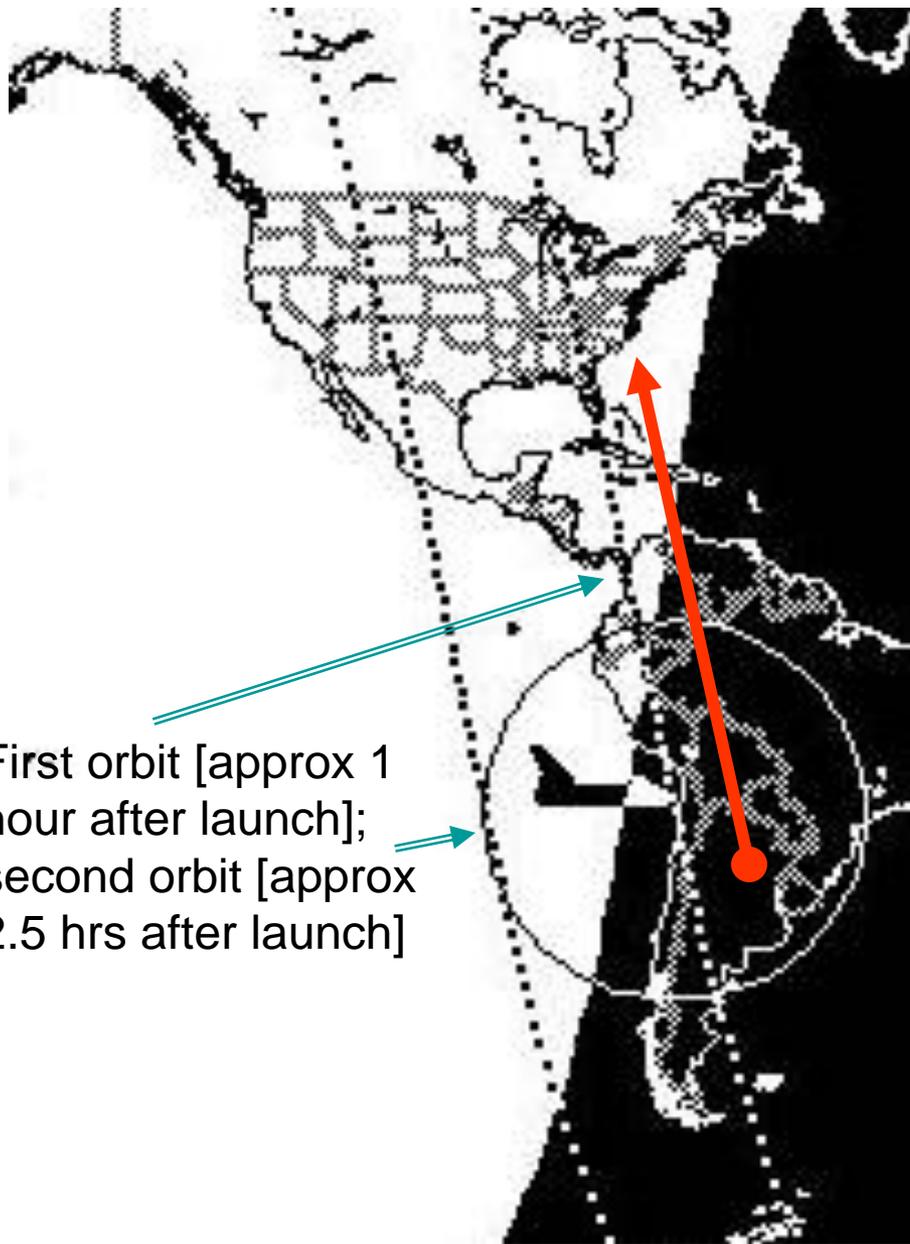
** Significant debris should reach the water off the west coast of South Korea, and may be a flashpoint of regional tensions as competing ship crews try to pick it up or tow it home. Sunken debris [e.g., engines] should be recoverable.

** Real time reports from boats and planes near the area may provide rapid clues to what has fallen and exactly where.

Visual observation

** There are NO opportunities for visual observation from North Korea

“Post-insertion” – first radio contact opportunity



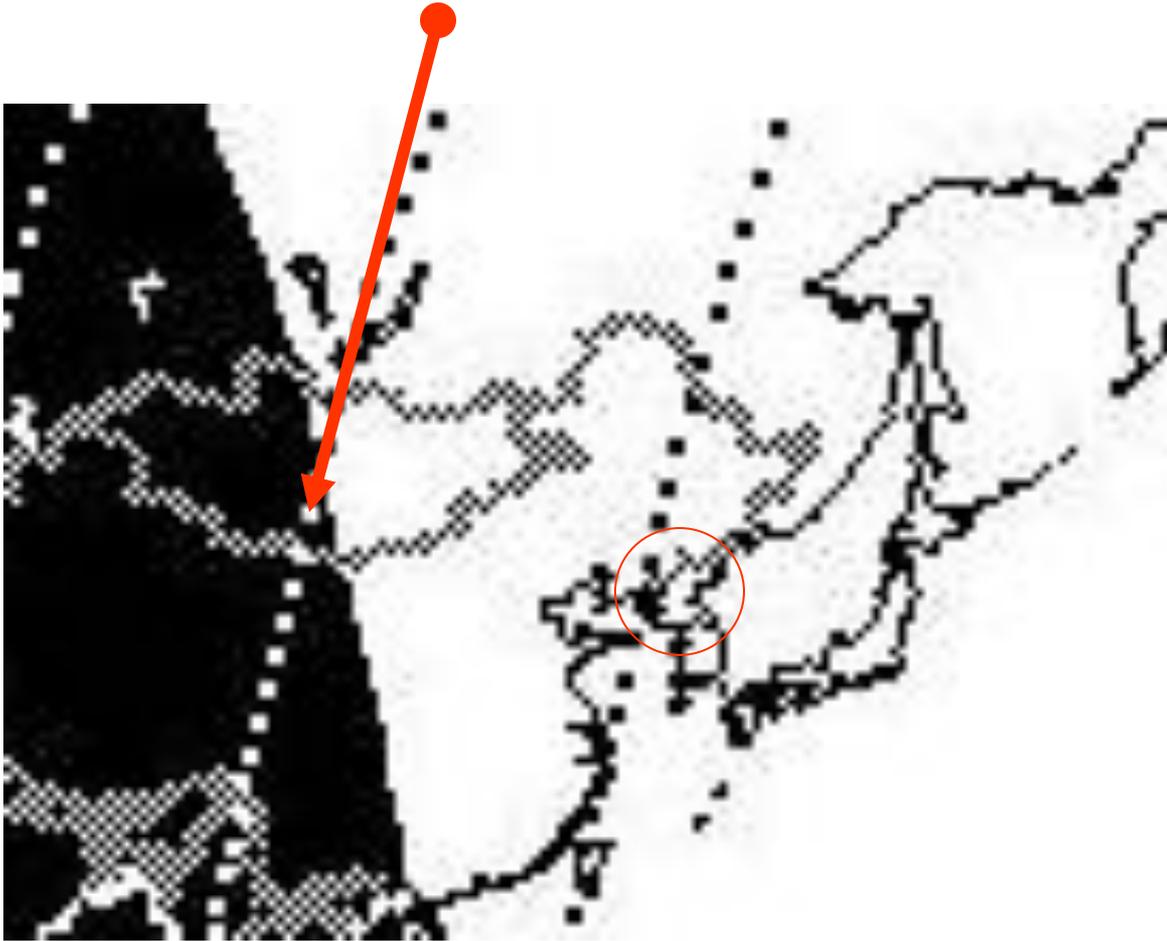
First orbit [approx 1 hour after launch];
second orbit [approx 2.5 hrs after launch]

On very first orbit of the Earth, NorKorSat will move from south to north across South America right up the spine of the Andes, then Cuba and the eastern United States and Canada.

This is dense ‘radio amateur’ country and if they are alerted to tune in, they may pick up signals before the North Koreans do – unless the North Koreans are using their Havana embassy as a listening post. Can we check that?

Somewhere over Argentina it probably must fire a ‘kick stage’ to circularize its orbit. Depending on actual launch time, that rocket firing might be visible from the ground as a ‘UFO’.

“Rev 1” – first radio contact opportunity from North Korea



From launch 01H 36M max elevation 6.0 degrees

Sven Grahn, Swedish space tracker: “If the transmitter is on, the frequency known and the transmitter power high enough it is doable....”

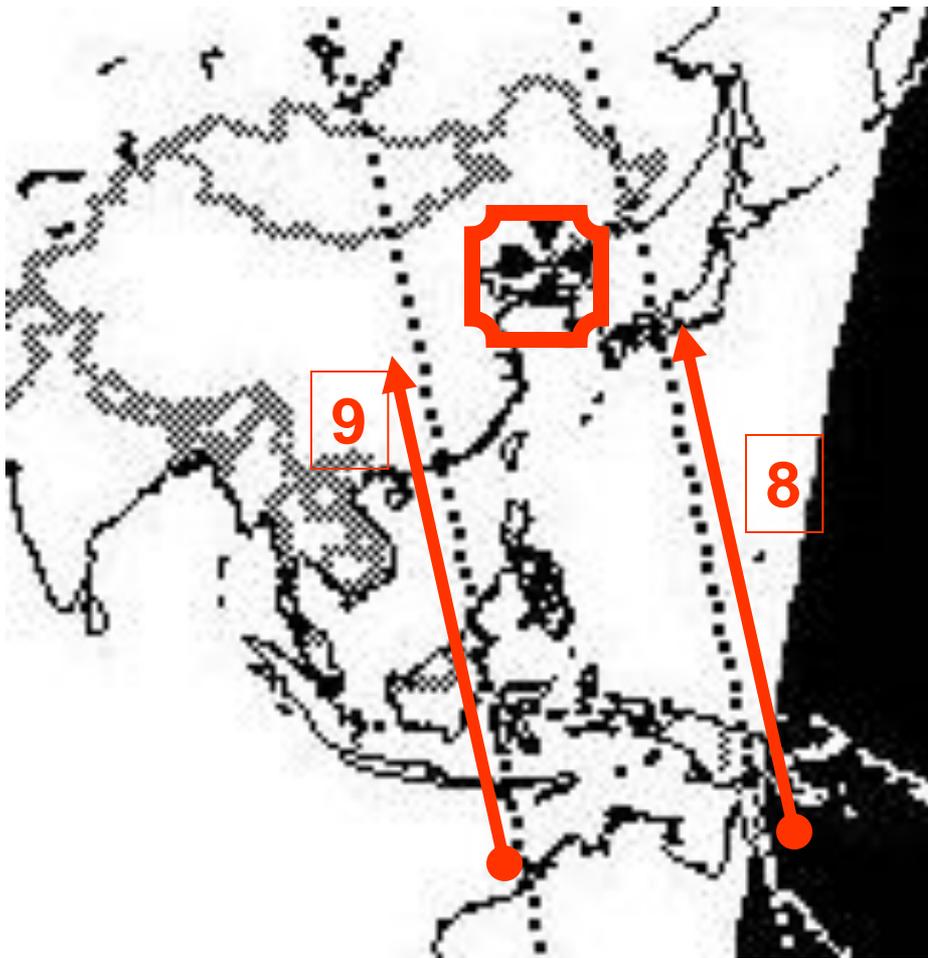
Dan Adamo, NASA MCC: “If all the Koreans want to do is confirm their payload is in something like the planned orbit, they only need is to receive an on-time signal from the expected direction. They may not be able to determine the precise orbit they achieved on the pass in question, but they could at least confirm a partially successful launch.”

High-precision tracking and telemetry

The first solid opportunity for precision communications and tracking does not occur until half a day after launch.

Earth will have rotated halfway around, under the north-south plane of the satellite's orbit.

Two passes from south to north will rise high enough in sky for several minutes of good comm

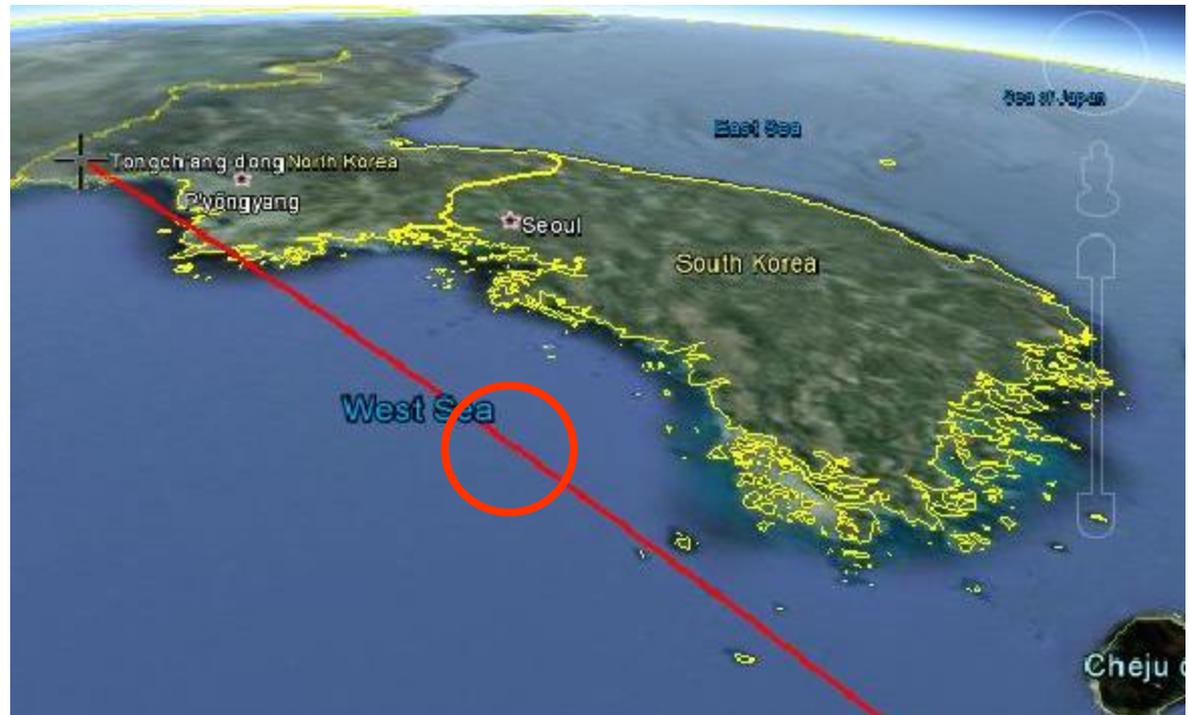
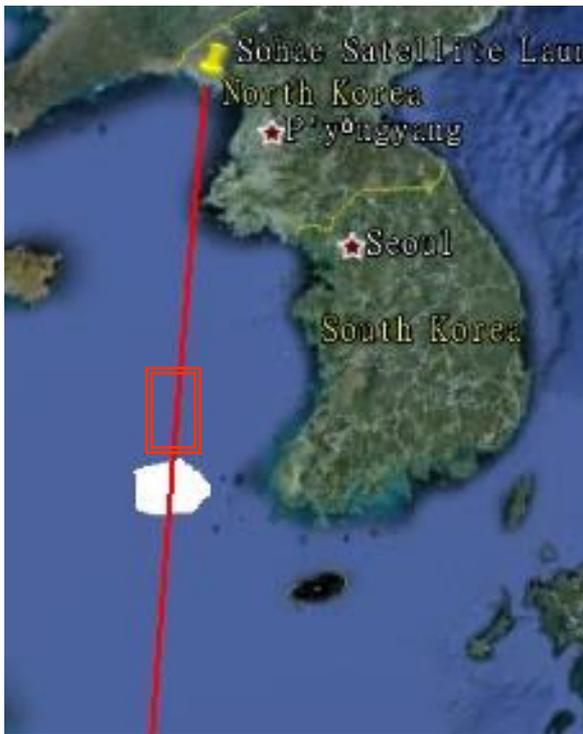


Orbit	Time from launch	max elevation
8	0/10:39:15	29.0
9	0/12:07:55	15.9

Disregard day/night indicators on map

Where will first stage splash down?

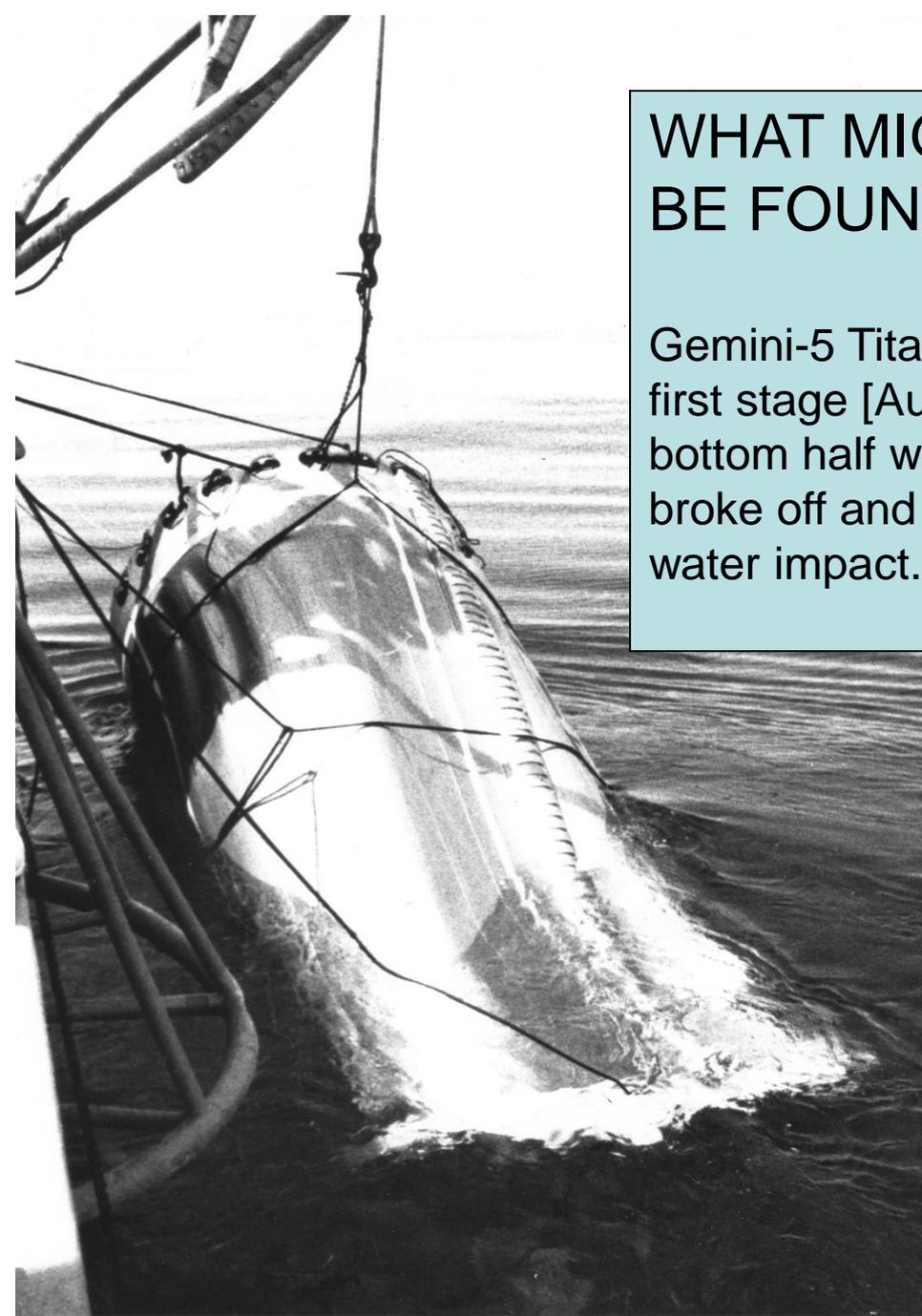
Warning zone is in international waters off west coast of South Korea. Observers in area may see smoke trail, hear sonic boom, even observe splash. Recovery of floating debris could be easy; retrieval of sunken h/w including engines should be entirely feasible, but then North Korean interference is probably certain.



Stage impact zone on website map [above] is too far south, too near SoKorean islands. Plotting actual NOTAMS points gives more northern rectangle.

WHAT MIGHT BE FOUND?

Gemini-5 Titan booster
first stage [Aug 1965];
bottom half with engines
broke off and sank on
water impact.



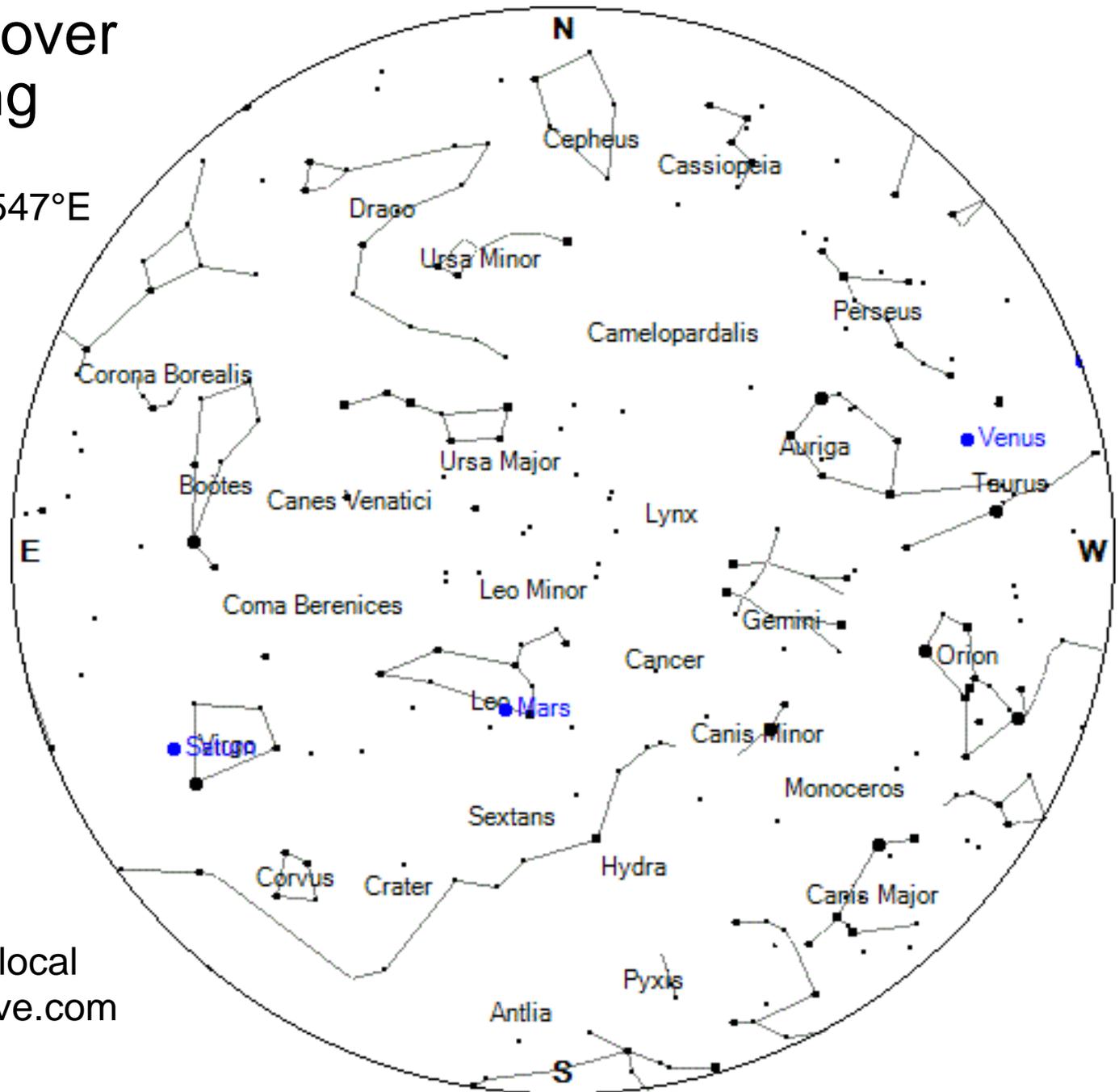
Other floating rocket debris

Aerodynamic shroud fragments and buoyant tanks have been found on beaches long after actual launches and anything floating west of South Korea has high chance of discovery.



Evening sky over Pyongyang

39.0194°N, 125.7547°E



For April 12, 9 PM local
www.heavens-above.com

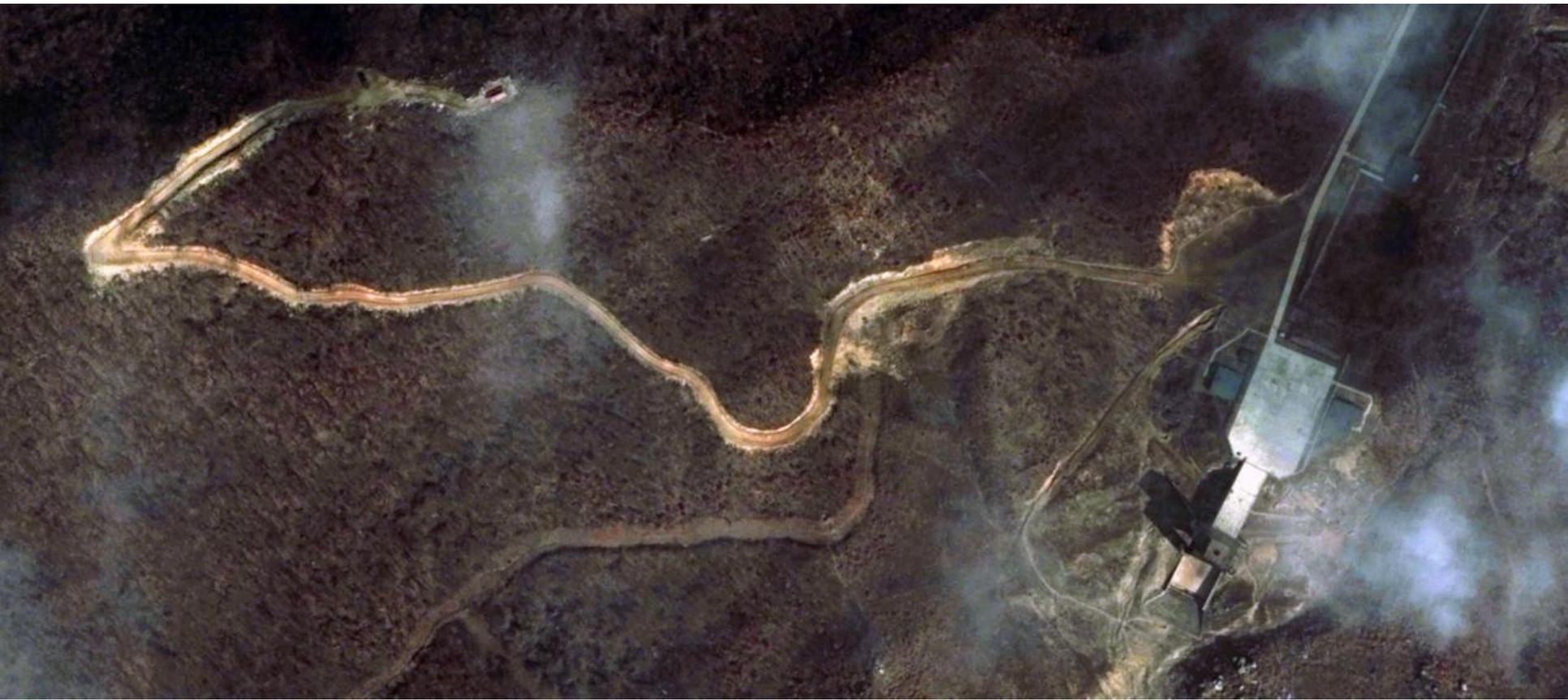
Misidentification of existing satellites

- Press reports allege that for previous satellite launch attempts, crowds were brought outside to watch overhead passes of OTHER satellites
- I have been unable to confirm these stories
- For the orbit specified for the third satellite, there appear to be NO visual opportunities from North Korea, because of its special characteristics as an earth-surface observing mission
- This requires a late morning pass over the area of interest and forces the opposite passes to occur shortly before midnight – in darkness; neither would be visible from area of interest [but possibly elsewhere in the world]
- There ARE bright overhead passes in the April 12-15 period of the International Space Station and the Chinese Tiangong-1 spacelab prototype but they are west-to-east instead of the required north-south orbits

Apr 1 Associated Press story

- U.S.-Korea Institute at Johns Hopkins School of Advanced International Studies reports Pyongyang "has undertaken more extensive preparations for its planned April rocket launch than previously understood."
- "These pictures are new and important evidence that the North's preparations for its rocket launch are progressing according to schedule," said Joel Wit, visiting fellow at the institute and editor of its website on North Korea, "38 North." <http://38north.org/>
- The new satellite images show what are likely empty fuel and oxidizer tanks in previously empty, fenced-in areas, the institute's analysis says. "The tanks were apparently dumped in these locations after their contents were transferred to buildings that will directly fuel the first stage of the Unha-3" rocket, according to the analysis.
- "The large number of apparently empty tanks indicates that the transfer process may have been close to completion."
- Detailed report and photos here:
<http://38north.org/2012/04/tongchang0401/>

“Instrumentation site” southeast of launch pad



This March 28, 2012 satellite image provided by DigitalGlobe shows the rocket engine test stand, right, and instrumentation site, left, at North Korea's Tongchang-ri Launch Facility on the nation's northwest coast



Mobile support equipment

This March 28, 2012 satellite image provided by DigitalGlobe shows a parked trailer and dish antenna, top right, near the assembly building at North Korea's Tongchang-ri Launch Facility



New sat images

This March 28, 2012 satellite image provided by DigitalGlobe shows North Korea's Tongchang-ri Launch Facility, including the launch pad, center left, the rocket engine test stand, bottom, and the assembly building, top in green, on the nation's northwest coast. An analysis of the March 28 images provided to The Associated Press by the U.S.-Korea Institute at Johns Hopkins School of Advanced International Studies shows Pyongyang "has undertaken more extensive preparations for its planned April rocket launch than previously understood." The new satellite images of the North Korean rocket launch site showed a mobile radar trailer and rows of what appear to be empty fuel and oxidizer tanks, evidence of ramped up preparation for what Washington calls a cover for a long-range missile test. (AP Photo/DigitalGlobe)



Booster model



URL: T3DS.com/606083

The3dStudio.com

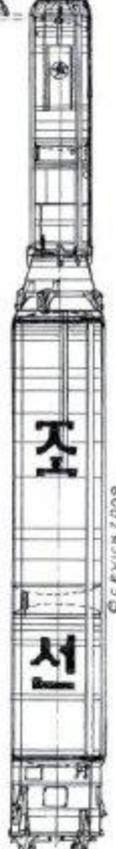
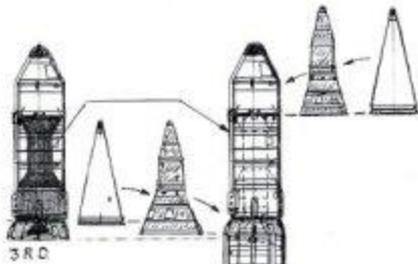
Doubts raised on announced orbit

- Late Sunday night, Canadian amateur space tracker Ted Molczan posted an analysis that questioned the accuracy of officially released orbital predictions.
<http://satobs.org/seesat/Apr-2012/0011.html>
- “The sun-synchronous claim is inconsistent with the NOTAM coordinates North Korea has issued for the impact zone of the rocket's two stages” he wrote [we are in direct touch and he has high credibility with me]
- He suggests the announced impact zones are erroneous.
- “I do not see how North Korea could reach a sun-synchronous orbit from the new launch site without risk to populated areas. Launching directly toward the required 192.3 °azimuth would result in a trajectory that skirts China's east coast near Shanghai. The rocket's 2nd stage would overfly Taiwan.”
- The simplest explanation seems to be that they are only aiming for a basic polar orbit that will NOT be ‘synchronous’ but will slowly drift earlier in the day for each observation pass, over a period of months.
- An innocent explanation for this is that launch azimuth was chosen to ‘thread the needle’ between land overflights [So Korea to left of track, Philippines to right of track] and that’s the best they can do – and the ‘synchronous’ claim is an empty boast.
- In addition, there’s skepticism they can achieve a 500 kilometer circular orbit, which almost certainly requires a ‘kick burn’ halfway through the first pass. This is a highly sophisticated maneuver unlikely to be within reach of a first orbital flight. More likely, the orbit may AVERAGE 500 km high but range between 250 to 750 km or similar.
- Molczan concludes: “It is for North Korea to explain the inconsistency between the orbit it claims to be targeting and the [impact zones] it provided.”

Discussion on 'seesat' amateur group

- Through Monday, several other participants are thrashing out how reliable the math is. See <http://satobs.org/seesat/Apr-2012/index.htm> |
- Experienced observer Bob Christy writes: “The margins are very tight so you can see why neighbouring nations are exhibiting nervousness at the thought of a launch or trajectory error: <http://www.zarya.info/Gallimaufry/Kwangmyongsong3.php>
- These guys are extremely experienced and insightful observers and I am following their discussion closely.

What's on top?

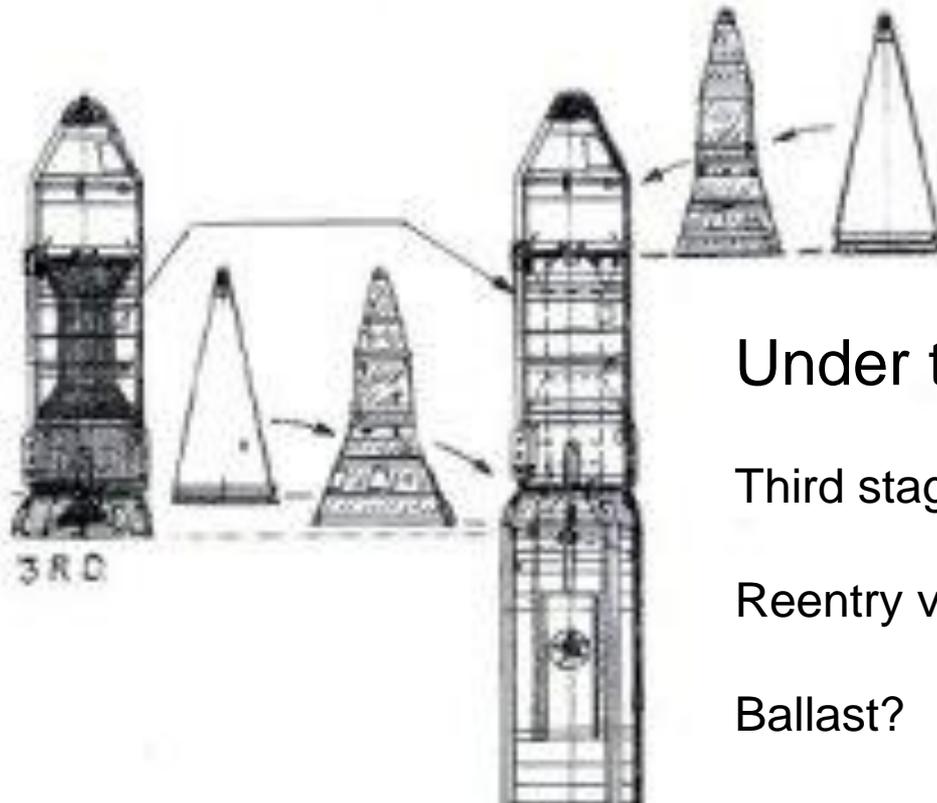


NKSL-X-?
TAEPO-DONG-2B
UNHA-2
2006-09

KOSSAR-SHAHAB - 5? SHAHAB-6?

SCALE 0' 5' 10' $\frac{3}{32}$ " = 1'-0"

©C.P.VICK,2000-4-08
-09



Under the shroud:

Third stage w/ payload?

Reentry vehicle test?

Ballast?

Something ELSE?

How can we tell?

- 1. See it at the launch site...
- 2. See handling/transport equipment...
- 3. See hi-quality imagery of installation....
- 4. See umbilical tower connectors
[telephoto images from the ground]
- 5. Visit fabrication facility and see backup flight hardware, mockups, training units....
- 6. Visit control center consoles and see data readout schematics, indicators, etc.

Other launch questions

- Ascent timeline of events – range & velocity
- Target insertion orbit – altitude, inclination?
- Direct insertion to 500 km, or apogee kick?
- How soon will radio signals begin?
- How soon will they be confirmed from DPRK?
- Are there any tracking ships along ascent path?
- Will DPRK rely on other receiving locations [eg, Havana, Karachi, Iran?]
- For safety, does booster have destruct system?

Questions about payload

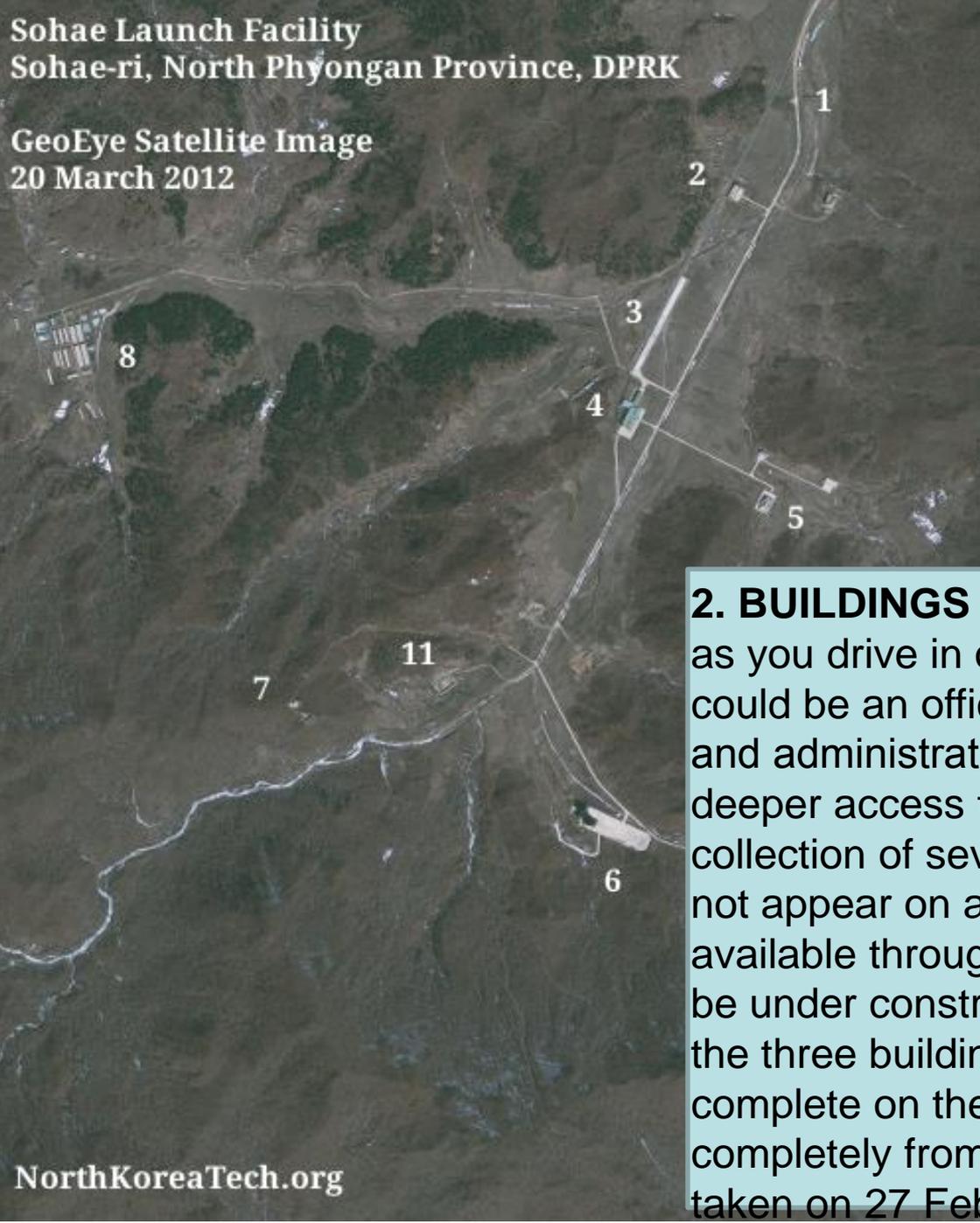
- Where are the pictures/schematics of it?
- Where are the test prototypes?
- What are the camera specifications?
- Where is the payload control center?
- How fast will images be distributed to users?
- What is the typical image sharpness?
- How many images are transmitted per pass?
- Besides DPRK, are there other regions of the world interested in receiving pictures?

Sohae Launch Facility
Sohae-ri, North Phyongan Province, DPRK

GeoEye Satellite Image
20 March 2012

Inside Sohae Launch Facility

posted by [Martyn Williams](#)
on March 27, 2012 at 10:02
[http://www.northkoreatech.org/
2012/03/27/inside-sohae-
launch-facility/
\[martyn@northkoreatech.org\]\(mailto:martyn@northkoreatech.org\)](http://www.northkoreatech.org/2012/03/27/inside-sohae-launch-facility/)



2. BUILDINGS -- Just after the main security gate, as you drive in on the right-hand side, is what could be an office building. Perhaps for visitors and administration work that doesn't require deeper access to the facility. Roughly opposite is a collection of several buildings. These buildings do not appear on a 2009 satellite image of the area available through Google Earth and appear to still be under construction. The roof on the largest of the three buildings appears to be partially complete on the 20 March image, but was missing completely from a satellite picture (not shown) taken on 27 February.

Sohae [northkoreatech.org] continued

1. SECURITY GATE --While there are likely several layered security zones as the facility approaches, this is the recognizable main security gate. It's situated about 2 kilometers from the main launch pad and has an area where visiting vehicles can park. The most recent image appears to show several individuals walking across the paved area.

3. RAIL TO ROAD TRANSFER POINT -- A railway line to the facility is one of the larger projects recently completed. It terminates alongside a long paved area at which goods can be transferred on an off railway cars

5. BUILDINGS -- Directly across the facility's main road from the rocket assembly building are three additional buildings. Two of these also appear to be surrounded by a fence. Close to the eastern-most building is what appears to be a man-made pool of water. A similar pool can be found towards the main launch pad and two additional pools appear close to the railway to road transfer point. Does anyone have any idea what they are for?

11. BUILDINGS -- The final set of buildings worth noting are those between what is assumed to be the launch control room and the launch pad. The buildings could be offices or living quarters for the scientists and soldiers that work at the facility.

Launch preparations underway at Sohae

<http://www.northkoreatech.org/2012/04/06/launch-preparations-underway-at-sohae/>

In previous images construction progress could be seen on a building near the main entrance. An image from February 27th showed the structure without a roof, while a picture from March 20th (taken through light cloud) showed the roof partially constructed. The roof has now been completed:



Change in color of pavement around assembly building

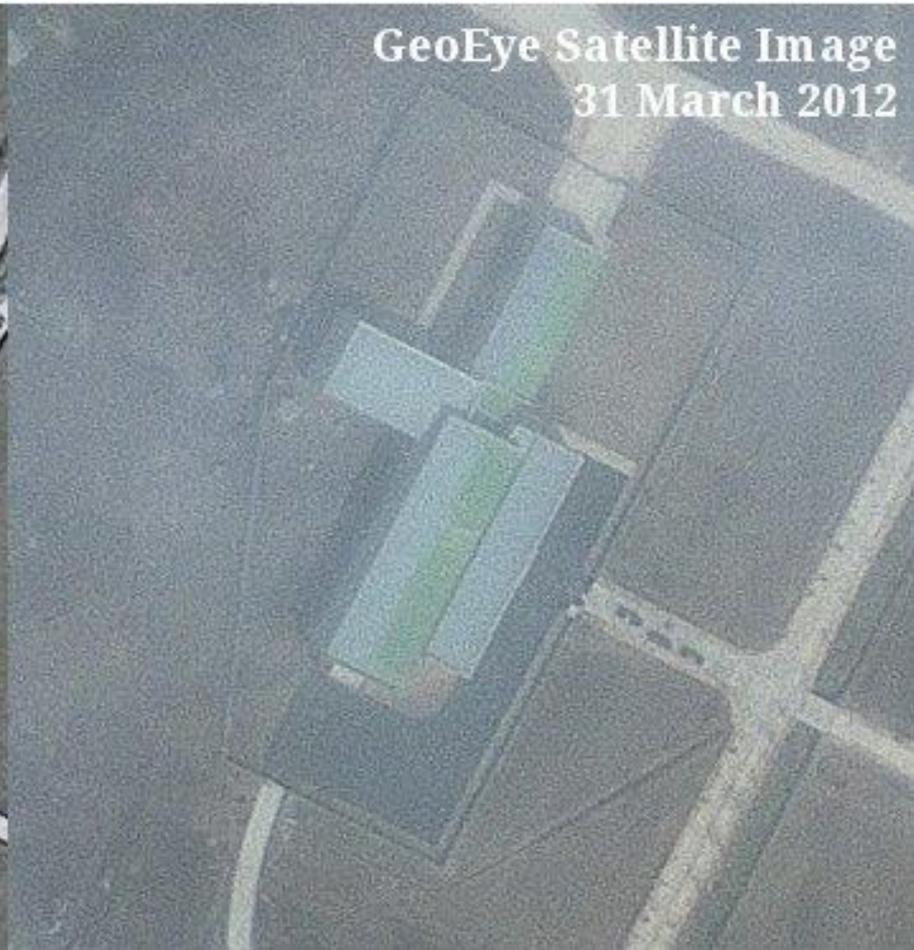
posted by [Martyn Williams](#) on April 6, 2012 at 07:30

<http://www.northkoreatech.org/2012/04/06/launch-preparations-underway-at-sohae/>

GeoEye Satellite Image
20 March 2012



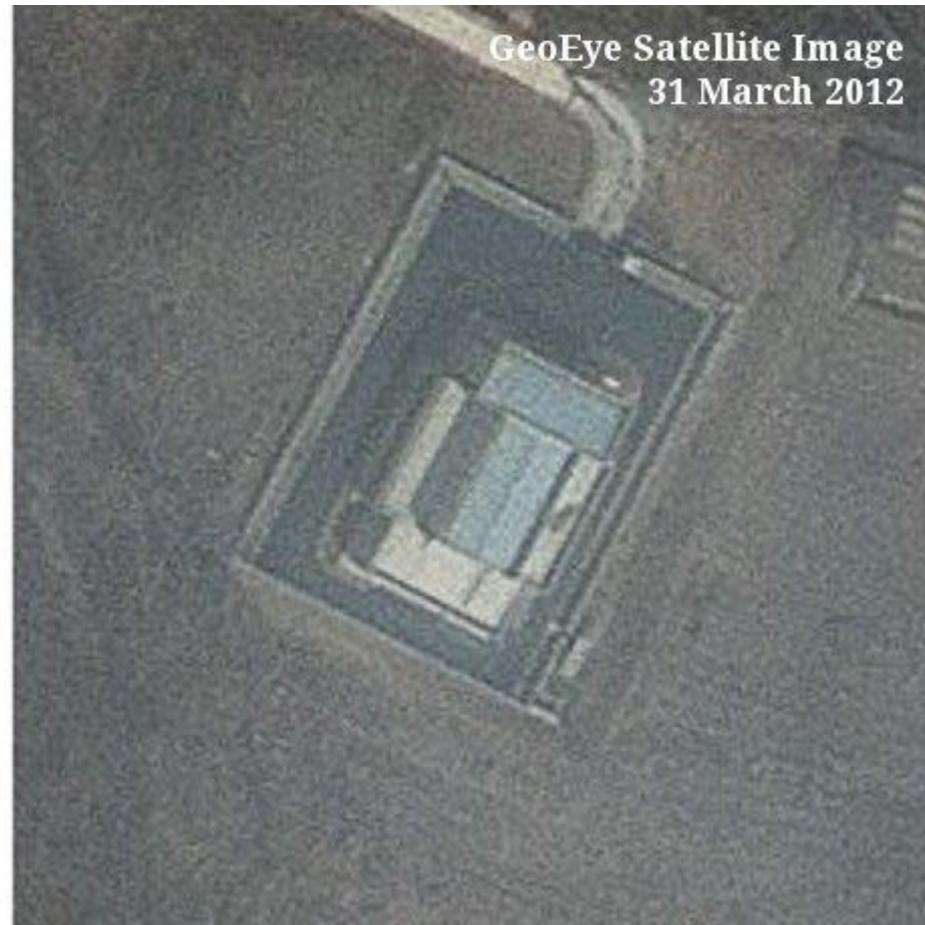
GeoEye Satellite Image
31 March 2012



Change in color of pavement around unknown 2nd building

posted by [Martyn Williams](#) on April 6, 2012 at 07:30

<http://www.northkoreatech.org/2012/04/06/launch-preparations-underway-at-sohae/>



To be updated
after return from visit