

New Stealth Features at North Korean Sohae Satellite Launch Center

June 6, 2017

ROUGH DRAFT-1

James Oberg

June 6, 2017

ROAD TO THE LAUNCH PAD



Photo: James Oberg

In April 2012 I walked up this roadway to the Sohae rocket launch pad along with four dozen foreign newsmen; in February 2016 this was the route for a VIP tour of the next satellite launch rocket. Some things such as the road and natural landscape were unchanged, and some – such as the height of the rocket’s gantry tower – are different. Contrasting the differences can give a multidimensional portrayal of North Korea’s mysterious space program.



Video: North Korean News Agency

WHAT IS THE JUSTIFICATION FOR THE ENORMOUS EXPENSE OF NORTH KOREAN 'SPACE EXPLORATION'

[in my estimation of prioritization]

- 0. Glorification of Kim dynasty cult
- 1. GLORIFICATION OF CURRENT GOD-KING
- 2. Attaining capacity to terrify and even harm the US
- 3. Defiance of foreign devils and fanning domestic xenophobia
- 4. Development of something to sell overseas [eg, to Iran]
- 5. Cover for illegal overseas purchases of rocket components
- 6. Serving 'Military First' doctrine [spinoff to missiles]
- 7. Exemplifying JU-CHI 'Self Reliance' doctrine
- 8. Reward/punishment mechanism to keep regime military and civil service personnel in line and off-balance
- 9. Cover for attendance at international space technology seminars and gatherings for access to foreign technology
- 10. Using space-based objects for foreign reconnaissance
- 11-98 Miscellaneous
- 99. Using space-based objects to improve living conditions

SATELLITE LAUNCH

Early attempts were from missile test range on east coast

Transition to west coast facility [Sohae] in 2012 [first launch]

Construction of facility had begun before 2005

Advantage: LONG open ocean [non-overflight] south azimuth

This advantage could have been valuable for ICBM testing alone

SECOND ADVANTAGE – access to ‘sun-synchronous’ orbits

Near-polar orbits inclined slightly retrograde for desired planar shift

Typically between 95 and 98 degrees depending on planned altitude

Preferred orbital path for earth surface observation satellites

Unique orbital feature provides stable same time-of-day over targets

Simplifies long-term monitoring of surface activities

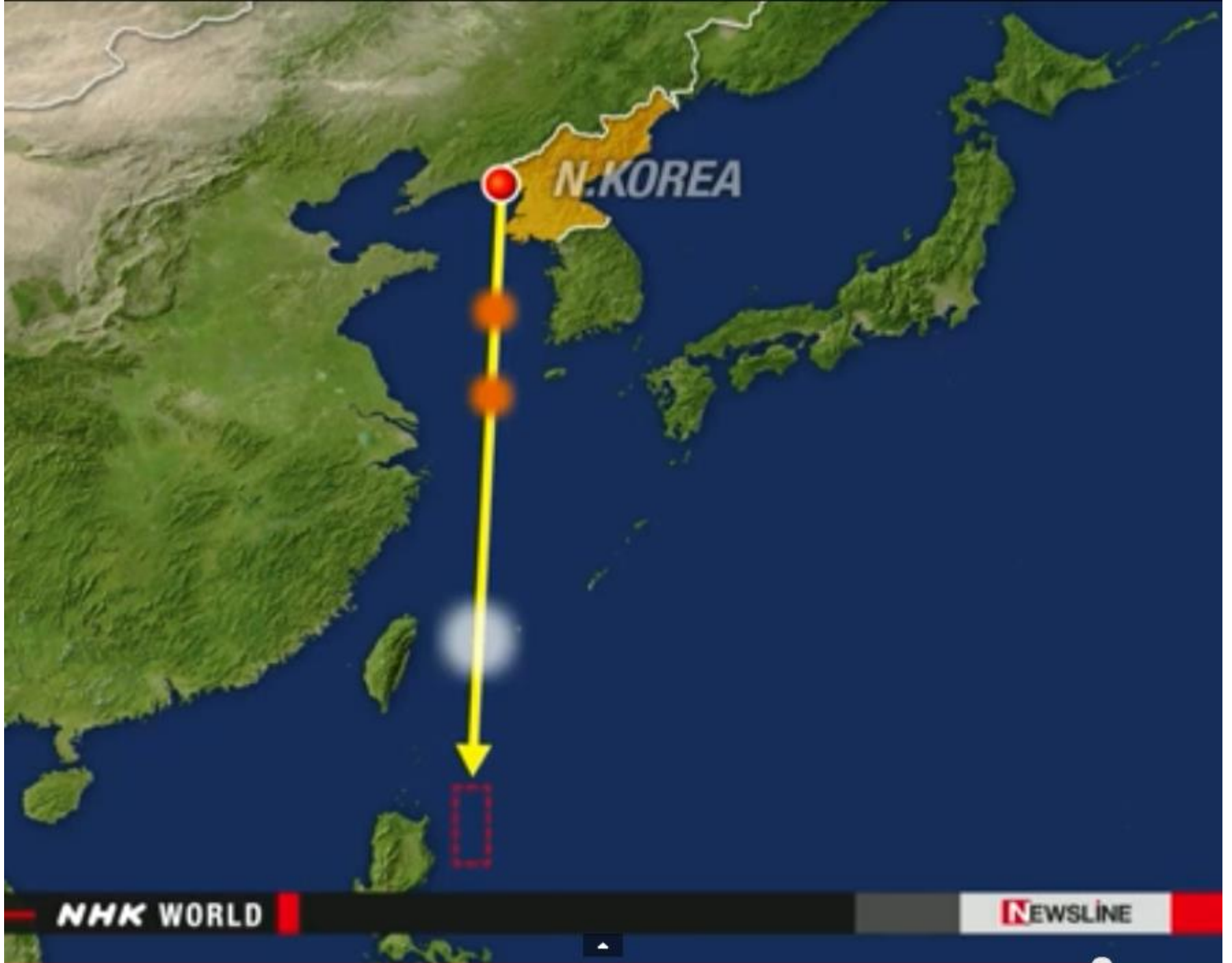
Examples: Cropland, water resources, ALSO construction work

COROLLARY ADVANTAGE – Easy to advertise as ‘peaceful intent’

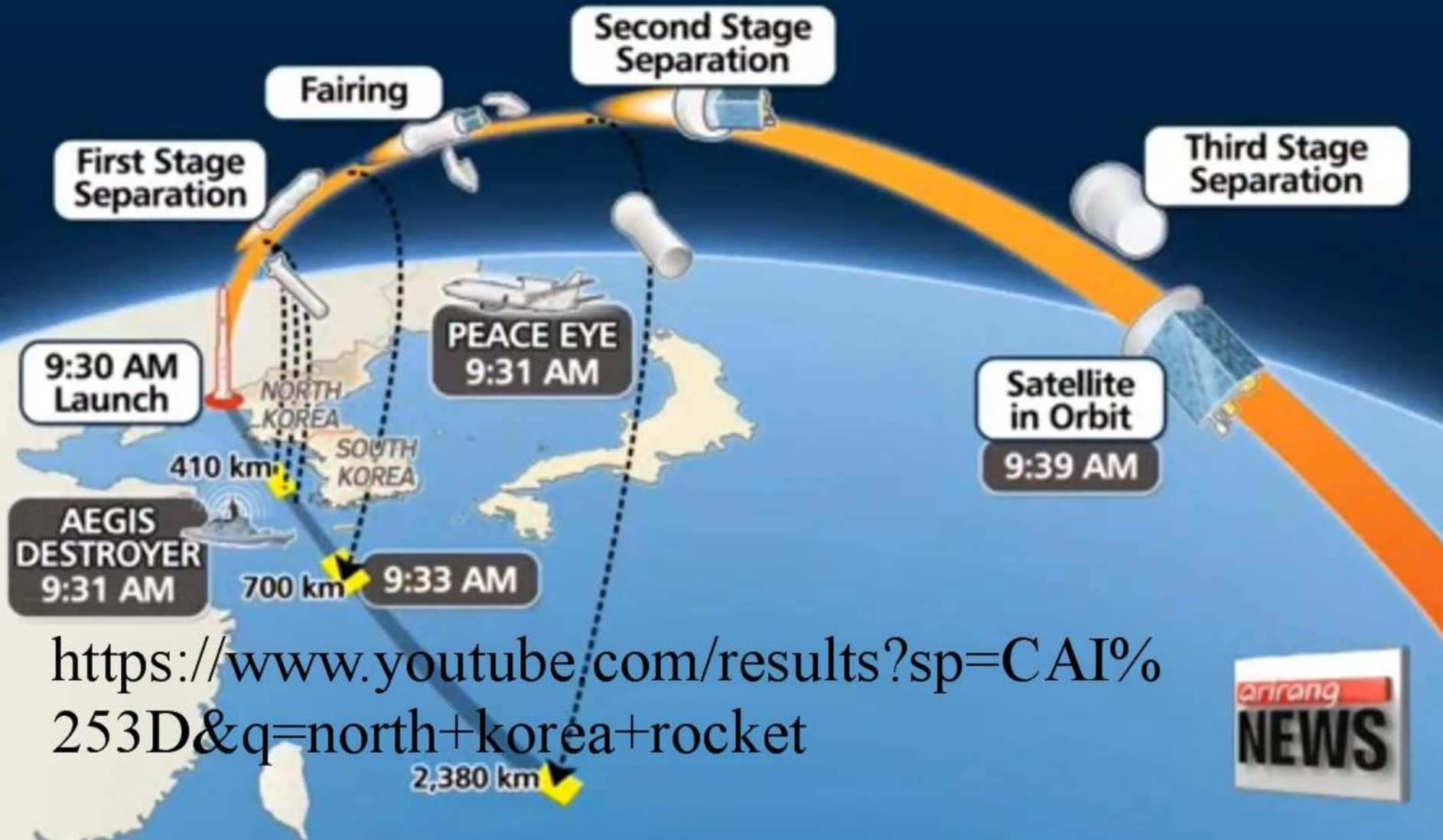
Geographic accident HAPPENS to allow first orbit pass near Wash DC

Implications of that widely-unrecognized feature are TBD





Ascent events, foreign observers



Modifications to Sohae launch site

[between 2012 and 2016]

- 1. Railway line extended all the way to the pad.
- 2. Underground parking for trains/cargo at pad
- 3. Two booster/payload processing buildings added to the pad.
 - Curious roof structure on movable one
- 4. Gantry tower height increased
- 5. New rocket base support structure, still not mobile
- 6. Full-height tight-fitting hard doors to swing closed over gantry contents [replacing canvas weather covers]
- 7. Apparent underground propellant transfer lines railhead to pad [replacing tank trucks for transport]
- 8. Totally new observation pavilion and launch control room [“NADA facilities”]
- 9. Old Launch Control Center converted to Kim dynasty shrine and museum
- 10. Roof over old railway terminus to conceal unloading operations
- 11. Former engine static test stand modified for warhead RV thermal protection system testing under rocket engine firing

2012 layout [wall map photo, James Oberg]

ROTATED 90 DEG TO ALIGN WITH
SATELLITE IMAGERY TO FOLLOW.

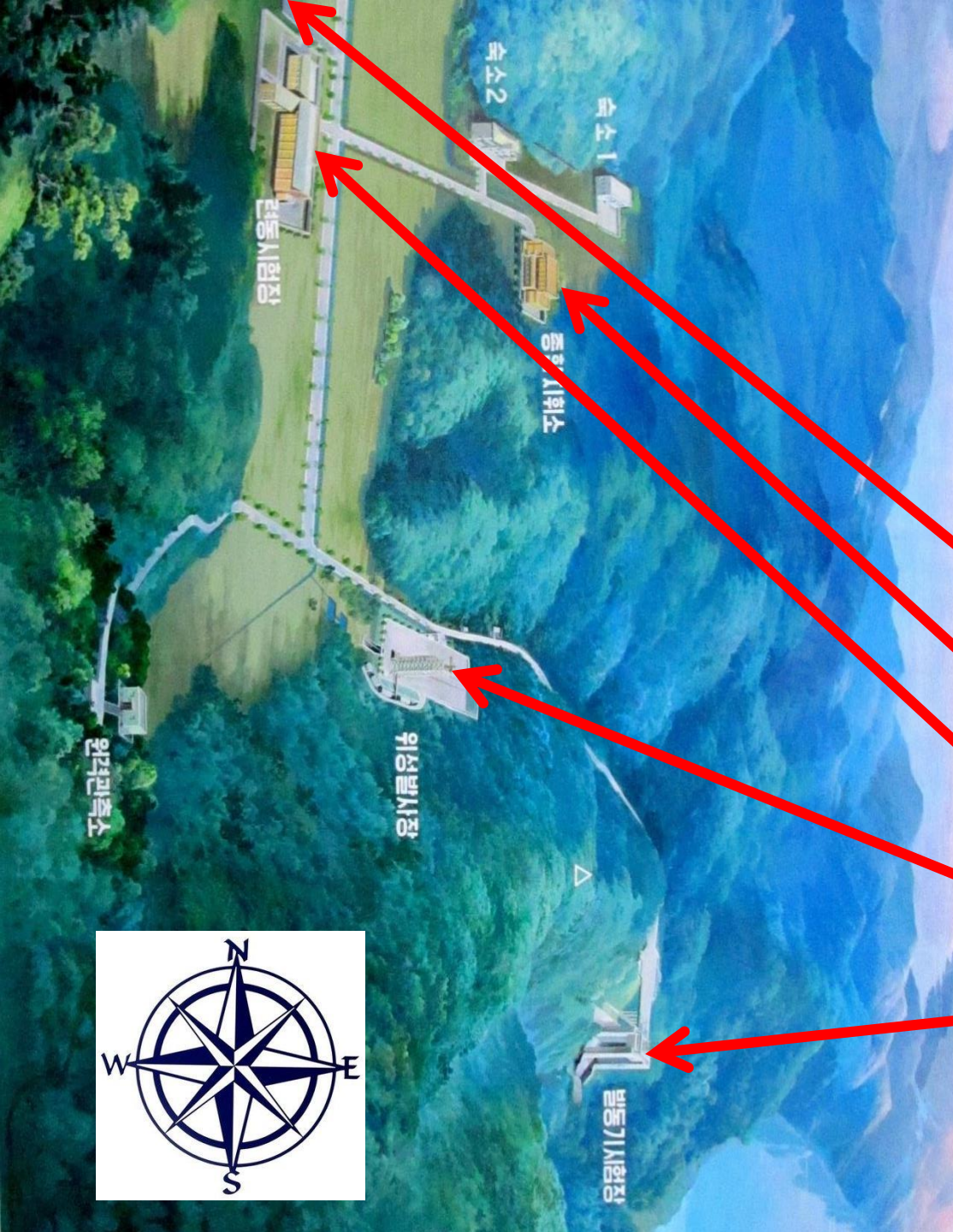
RAILWAY TERMINUS

LAUNCH CONTROL CENTER

VEHICLE ASSEMBLY BUILDING

LAUNCH PAD

STATIC TEST STAND



NADA Facilities
and Helipad

VIP housing
area

Launch
Pad

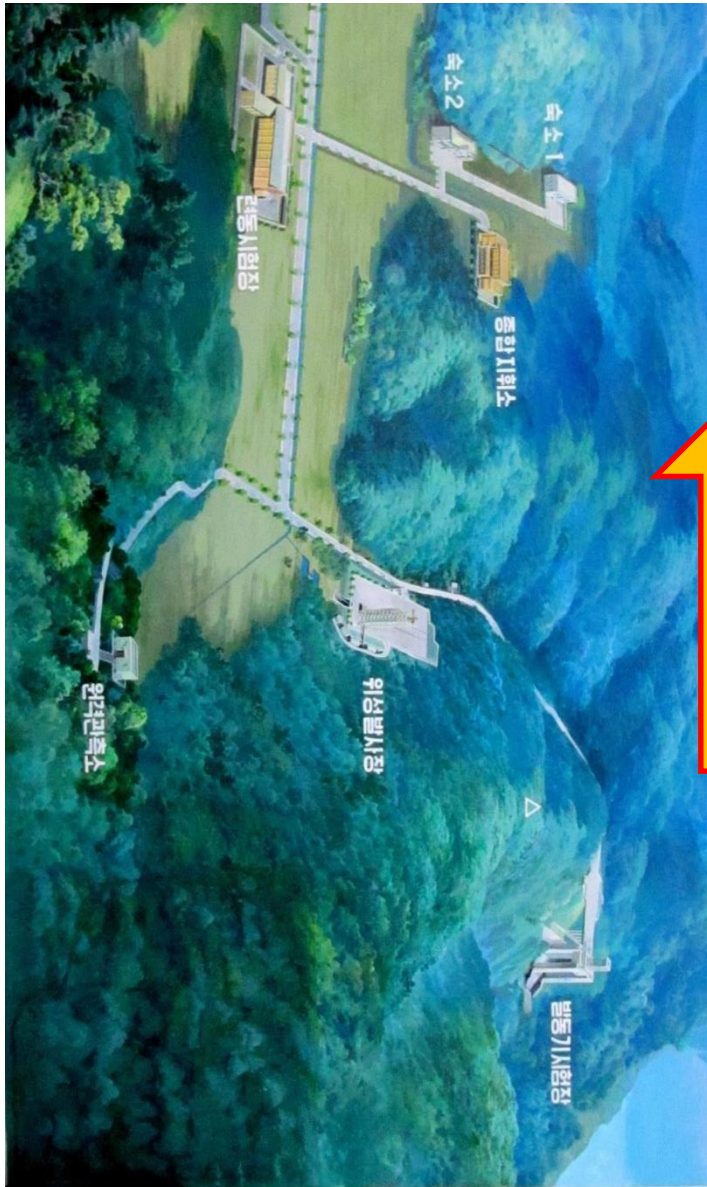
Vertical
Engine Test
Stand



Wide area
overview,
early 2016



Orientation



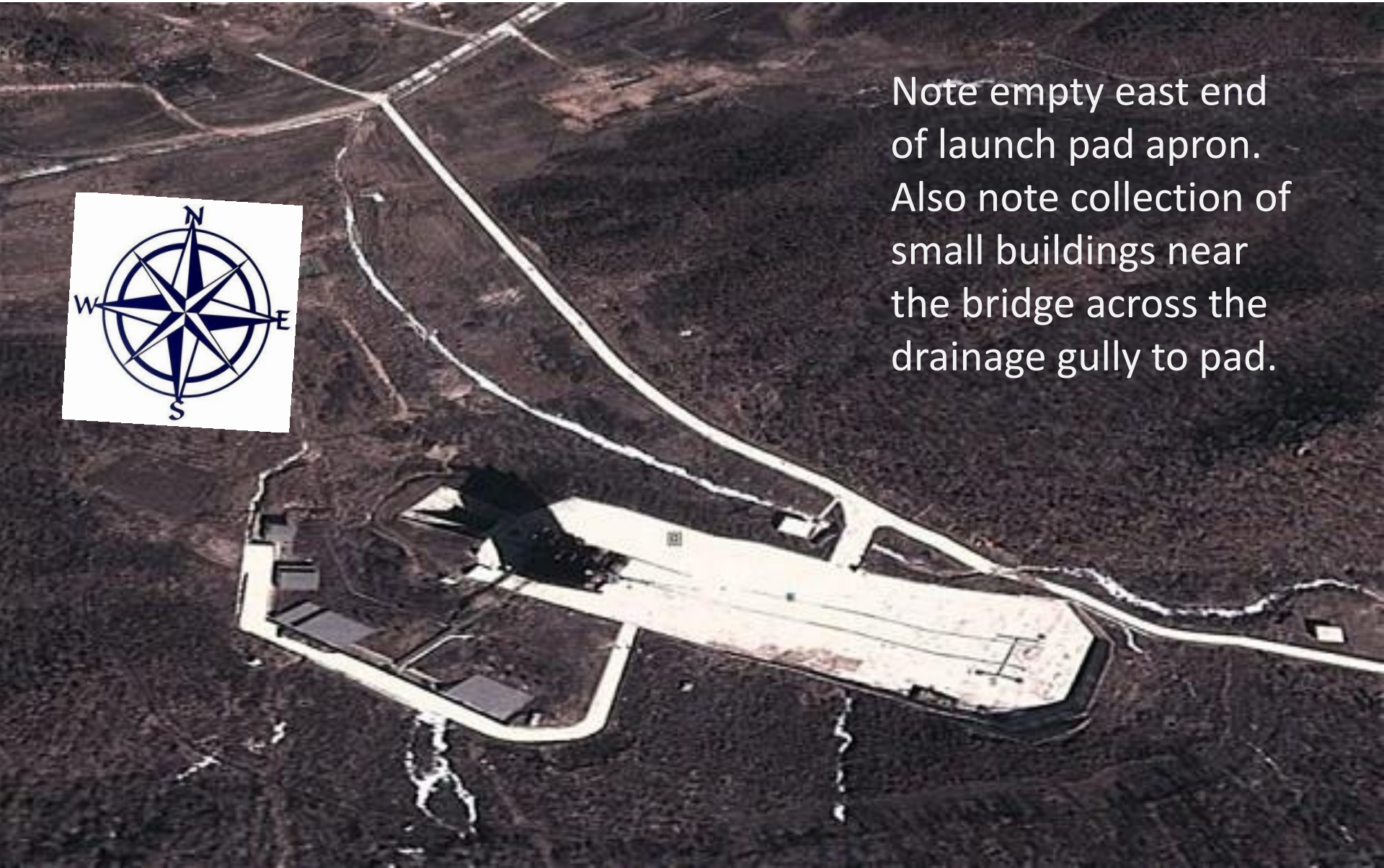
Assembly building and rail terminus here; all traffic to pad via motor vehicles.



Pad area in 2012



Note empty east end of launch pad apron. Also note collection of small buildings near the bridge across the drainage gully to pad.





Pad in mid-2015



**LEFT OF YELLOW
ARROW NOTE
NEW RAILWAY
LINE ALL THE WAY
TO THE LAUNCH
PAD, WHERE IT
GOES UNDER
COVER AND
STOPS AT
'ELEVATOR'**

Position of movable platform and 'elevator' overlaps extension of rail line along northern edge of pad apron . Note removal of small buildings near bridge.



Snow melt off
Launch Pad

Vehicles or
equipment

Personnel





Rail-mounted
Transfer Structure

Gantry tower with
covered work platforms

Processing Building

New fuel/oxidizer bunker

Tanker truck at old
fuel/oxidizer bunker

New fuel/oxidizer bunker



New fuel/oxidizer bunker

Tanker truck at old fuel/oxidizer bunker

New fuel/oxidizer bunker

Tanker truck at old fuel/oxidizer bunker

Gantry Tower with Covered Work Platforms

Better view of new rail line and covered line along edge of pad leading to under the movable structure.

The launch site is a concrete structure 185 m long and 54 m wide, and the new facility enabling technicians to assemble and inspect missiles horizontally is just 120 m away.



New fuel/oxidizer
bunkers

Work platforms on
the gantry tower
still folded on
February 6.

Top look at
gantry tower

Small truck
or container

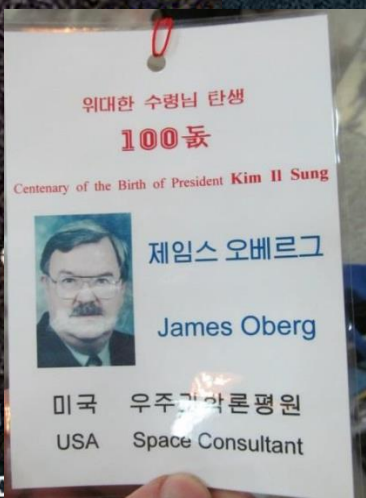
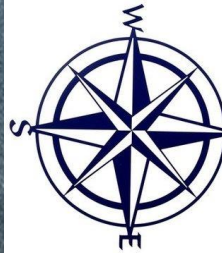


<http://38north.org/2016/02/sohae020816/>

SIDE-BY-SIDE

CAUTION: Very high relief of terrain can make viewed distance between linear features seem to change, but this could be due to perspective of viewing angle.

Side-by-side of 2012, 2016 views of pad. Note removal of tracks from mobile launch platform. **INSET:** Oberg's badge for visit



Sohae launch pad [April 2012] – empty east end [INSET – two new buildings seen in 2016]



These twin rails for expected rocket mobile launch platform were removed, and new pair installed along north edge for movable support structure

VIEW IS APPROXIMATELY EAST

**JAMES OBERG PHOTO
STANDING BACK TO ROCKET**

Only view of movable building at gantry [from video]



VIEW FROM EAST END OF PAD
LOOKING APPROXIMATELY WEST

Overbright [70%] details
and image artifacts



Overhead satellite
imagery suggests
east side is fairly
featureless and
boring [more later]

Ready to begin.....

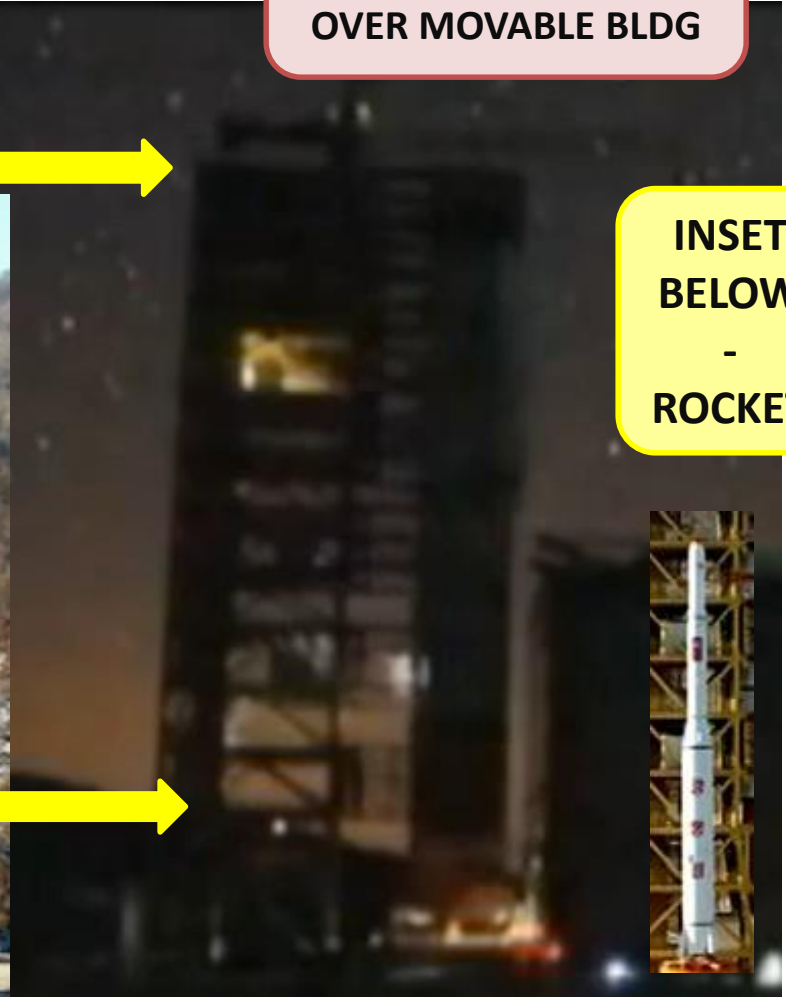


MOBILE SUPPORT BUILDING NEXT TO
GANTRY ALLOWS HEIGHT ESTIMATE
[TBS]

MOBILE BUILDING IS *ALMOST* TALL
ENOUGH TO HOUSE FULLY STACKED ROCKET

COMPARING HEIGHTS OF GANTRY, ROCKET, AND MOVABLE SUPPORT BUILDING

NOTE CRANE ARM
EXTENDED STRAIGHT
OVER MOVABLE BLDG



INSET
BELOW
-
ROCKET

NEW ROCKET BASE DOES NOT
APPEAR TO BE MOVABLE

New rocket base support structure



TOP: Post-launch photo.

RIGHT: Pre-launch VIP pad walk-through.

Shows deployed lay-down corners, and in the wheel wells, also a support post, not a wheel. It appears that structure emplaced on pad before rocket arrives.

Observe gantry design evolution

The Sohae gantry tower is taller

Structure for much longer rocket added

Musudan [2009], below; Sohae [2012], right

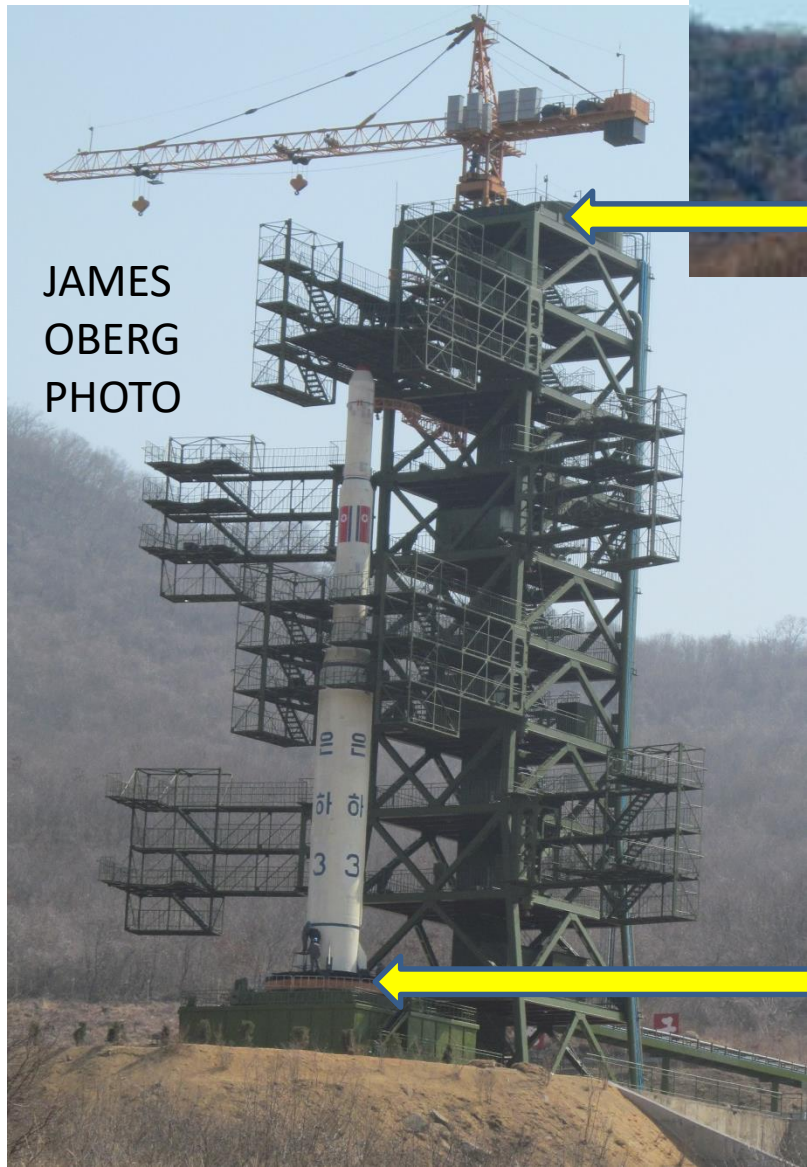


Mobile launch platform inserted under base and wheel tracks for access to as-yet unbuilt vertical assembly building at apron's south end



Sohae tower 2012 and 2016 from 10 to 13 levels

Composite
image



JAMES
OBERG
PHOTO

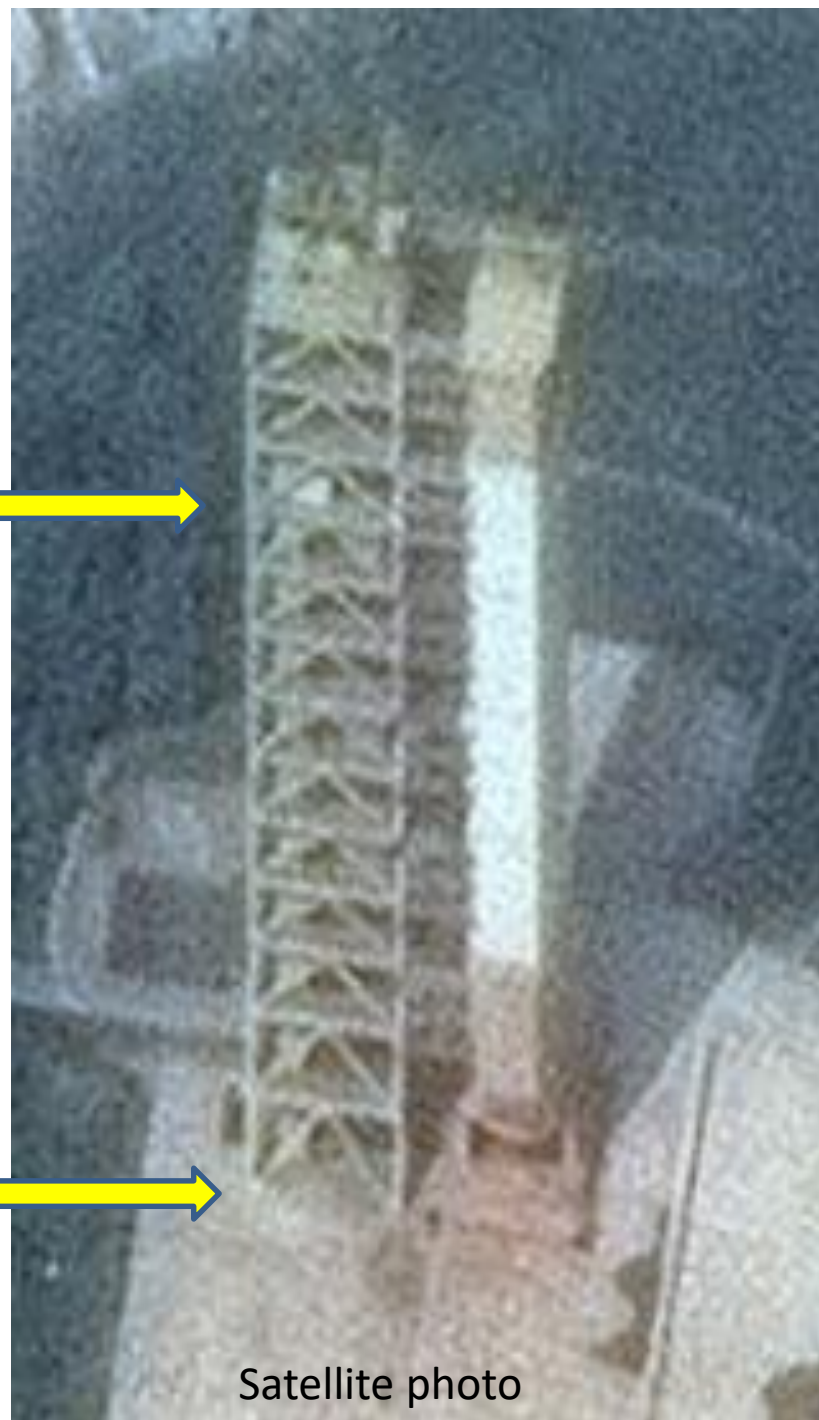


2012 to 2016

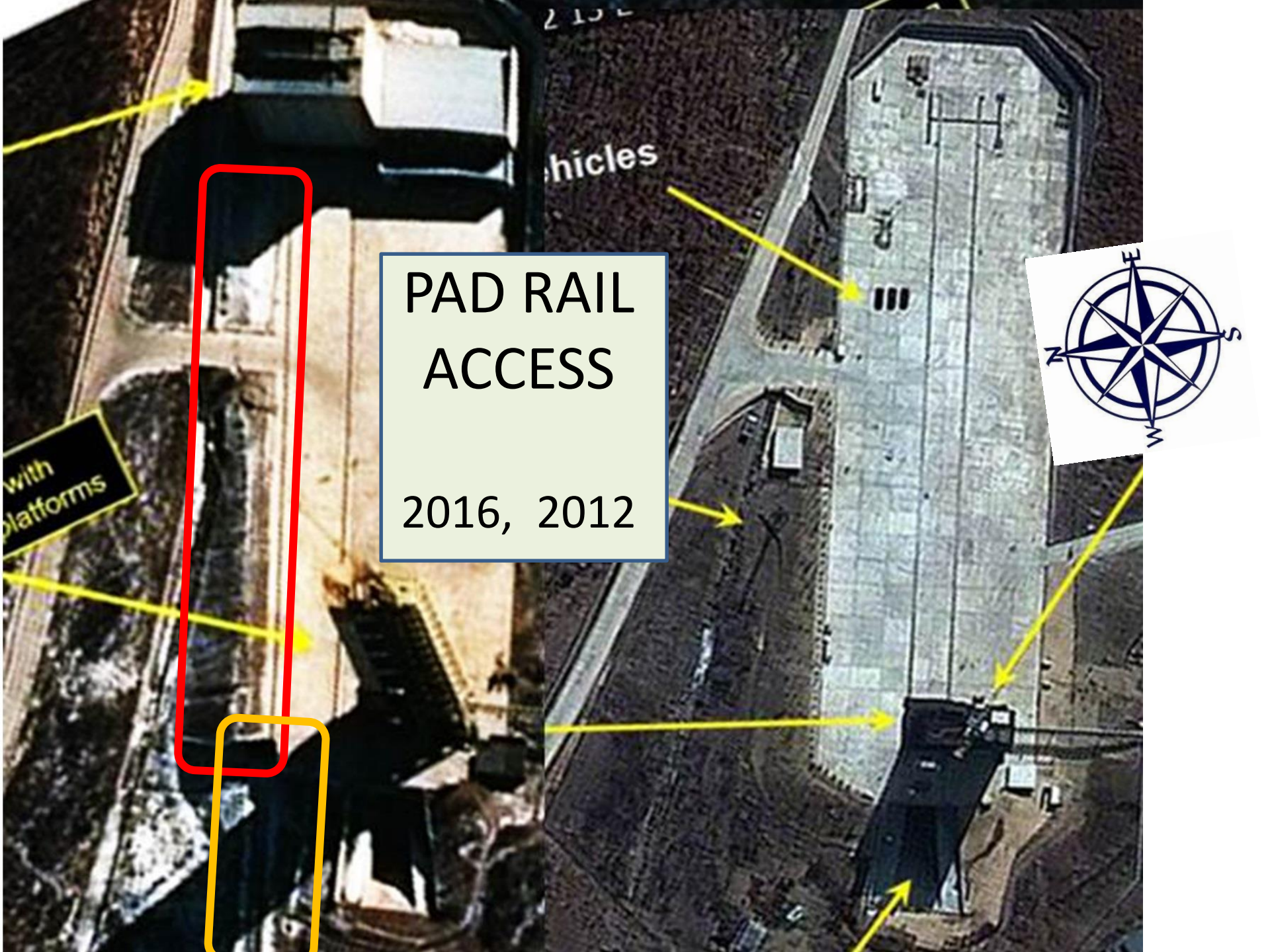


J. Oberg photo

Side view



Satellite photo



with platforms

ehicles

PAD RAIL
ACCESS

2016, 2012



Underground railway station??

- Interesting story about the newly-built rail line to the pad and some underground train station for unloading rocket sections.
- http://english.chosun.com/site/data/html_dir/2016/02/12/2016021201503.html
- By Yu Yong-won / Feb. 12, 2016 12:46 KST
- “North Korea apparently built a secret railway terminal under its rocket launch pad in Tongchang-ri, North Pyongan Province to avoid South Korean and U.S. satellite monitoring. ... Chae Yeon-seok, a former head of the Korea Aerospace Research Institute, arrived at the conclusions by analyzing satellite images of the site over the past year “

BRIDGE TO PAD OVER GULLY

[photo April 2012, j. oberg]



**FUTURE PATH OF
COVERED TRACK**

**VIEW IS ROUGHLY
TO THE SOUTHEAST**



More 2012 views
of pad apron
north edge [site of
future covered
rail line, terminus]



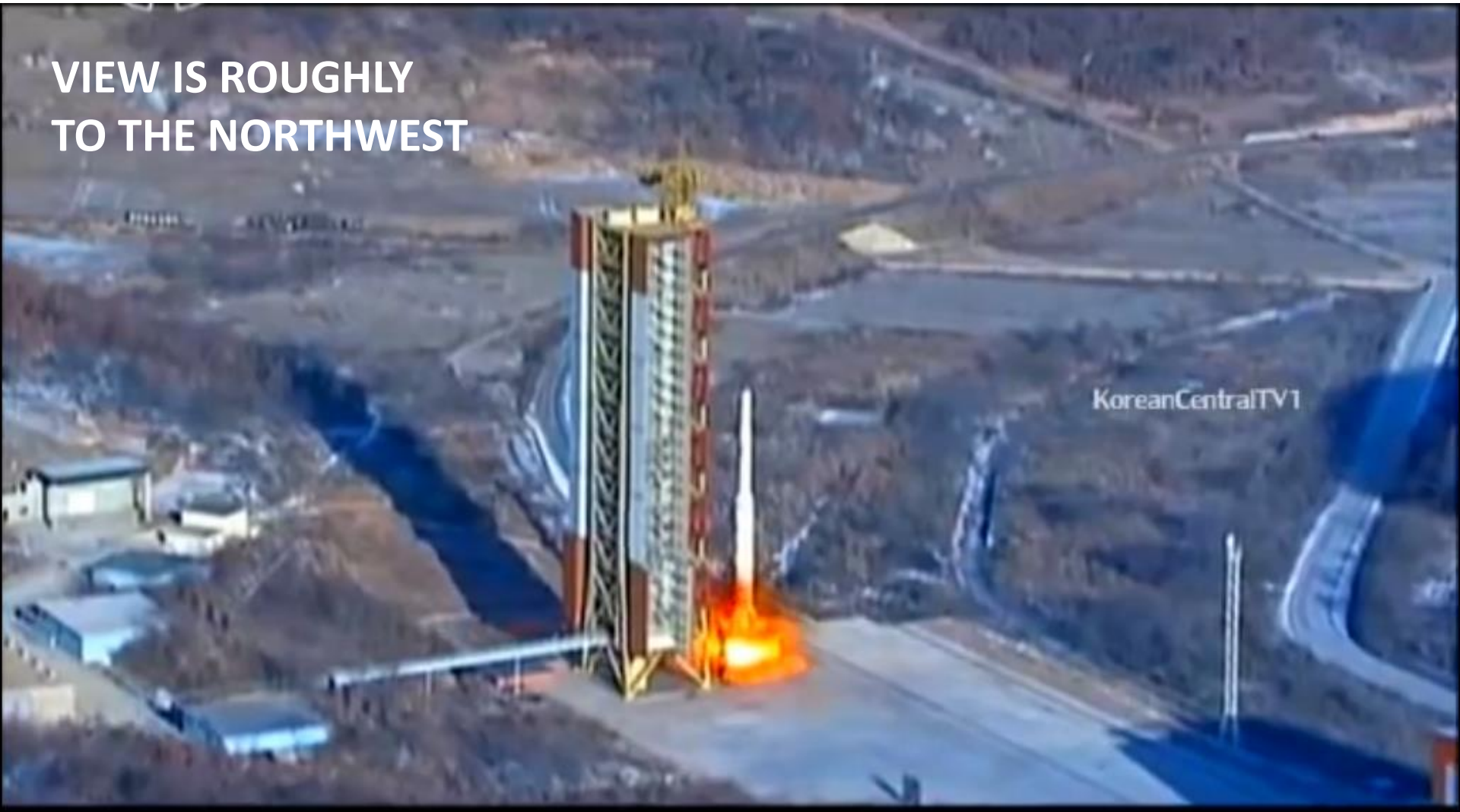
**2012 VIEW WEST
FROM THE BRIDGE
NEW RAIL LINE WOULD
BE INSTALLED BETWEEN
APRON NORTH EDGE
[LEFT] AND RUNOFF
SNOW MELT GULLY
[RIGHT] REQUIRING
THE REMOVAL OF
BUILDING AND
RELOCATION
OF TOWER.**

**[IMAGE STITCHED
FROM TWO SHOTS]**

**VIEW IS ROUGHLY
TO THE WEST**

2016: Railway approach full length

VIEW IS ROUGHLY
TO THE NORTHWEST



KoreanCentralTV1

UNIQUE LOW ANGLE
ON PROPELLANT
FACILITIES

NOTE HIGH RAILWAY
EMBANKMENT AND
TWO OVERPASSES

NOTE BROWNISH
COVER OF RAIL LINE

NOTE SHADOW OF
MYSTERY ROOF
STRUCTURE

First frame of rocketcam view



Two new support buildings

1. Horizontal checkout building

[note low bay and high bay sections]

2. Movable support building

[designate them NE {north-east} and SE {south-east}]

Apron width
approx 54 m



VIP group enters assembly hall



VIP group in large empty hall

Scale/layout consistent with entire BLDG 'SE'



Rocket for VIP walkthrough
[possibly in 'SE' building]
[note DIFFERENT ceiling lights]



VVVVVVVVIP



Compare -- 2012 assembly hall



2016 - So where is this?
[observe ceiling lights]



2016 - Empty high bay hall



敬愛する元帥様の鉄石の意志は少しも揺るぎませんでした

2016 - Where is this?
Probably the gantry tower.





NEW TOWER
SWING-ARM
STRUCTURE
[for weather
protection
and hiding
any rocket]

“NADA Building” [‘Norkor NASA’] VIP viewing stand AND new launch control center



Sohae Control Center



Airbus Defense & Space / 38 North
February 7, 2016



Two vehicles near the NADA building.

Image includes material Pleiades © CNES 2016.
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Facing launch pad



'NADA' building, smaller unknowns



白頭の天出偉人の不変の信念と強い気性が、ここ衛星発射場に刻まれました



人工地球衛星の発射日とそれに向けた各種の日程を確定して
下さった敬愛する元帥様は



KRT



NHK WORLD

from TOKYO

2016: NEW Kim space museum

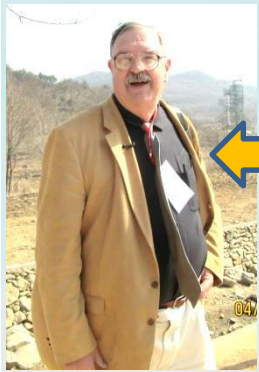
FROM VIDEO IT APPEARS TO BE IN ORIGINAL LOCATION OF LAUNCH CONTROL CENTER WITH NEW FRONT FAÇADE AND COMPLETELY REBUILT AND REFURNISHED INTERIOR



2016 VIP tour in front of museum [shows surroundings, allowing orientation]



2012 LAUNCH CONTROL CENTER



LAUNCH CONTROL CENTER, 2012



Same VIP quarters in front of LCC, new museum



**PHOTO BY JAMES OBERG,
APRIL 7, 2012, near the LCC**



**NORTH KOREAN VIDEO,
KIM VISITS SPACE MUSEUM,
Released Feb 11, 2016**

Vehicle

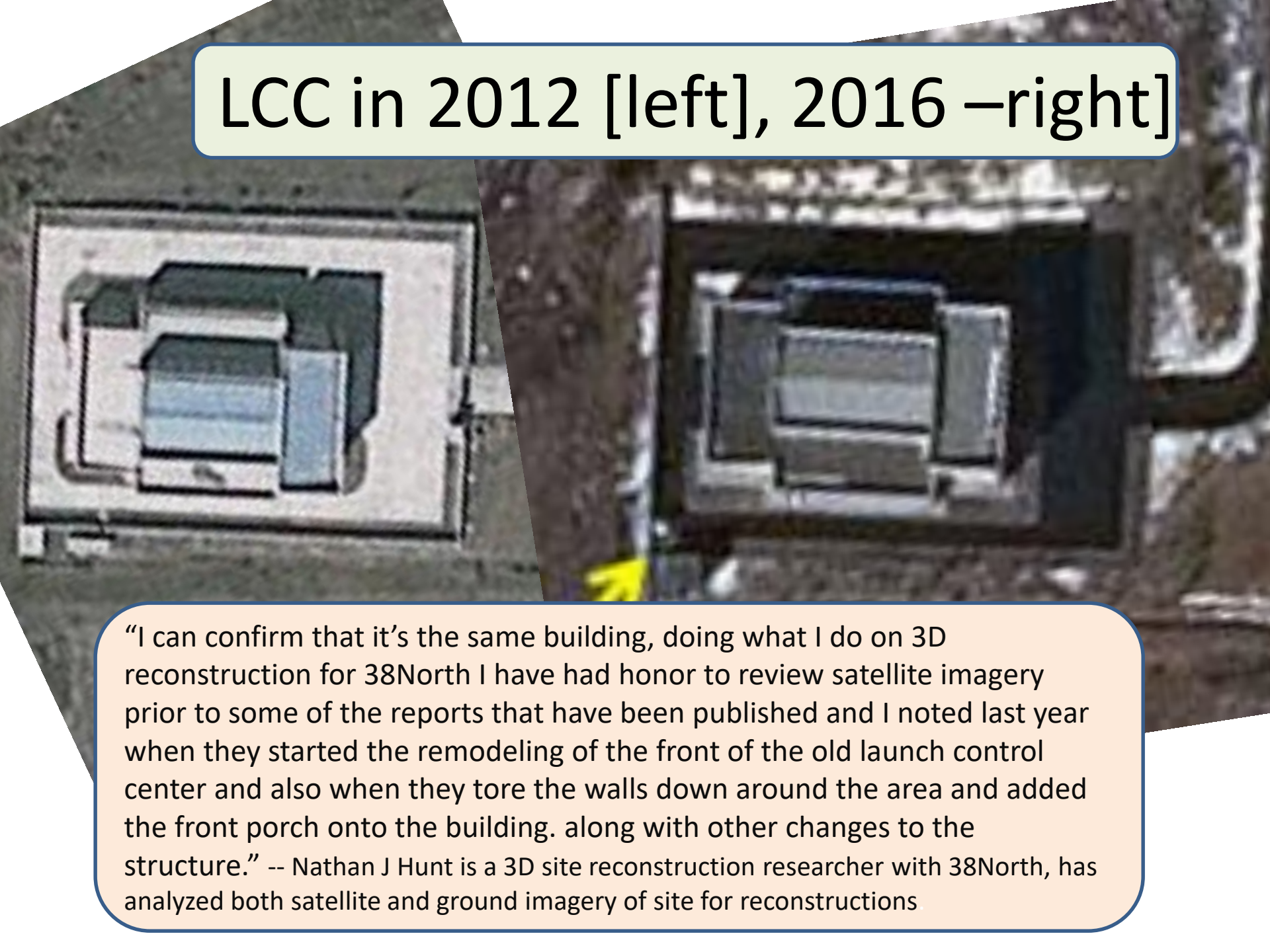
Satellite Control
Building

VIP Housing

“It is unclear what the current purpose of this building is with mission control now seeming to be at the new NADA building and the completion of a satellite control facility in Pyongyang. It has been suggested that this is, and may have always been, the payload (satellite) processing building.”

One vehicle is present in the VIP housing area on both February 6 and 7. No vehicles are present in either image at what has previously been identified as the Satellite Control Building. [\[1\]](#)

LCC in 2012 [left], 2016 –right]



“I can confirm that it’s the same building, doing what I do on 3D reconstruction for 38North I have had honor to review satellite imagery prior to some of the reports that have been published and I noted last year when they started the remodeling of the front of the old launch control center and also when they tore the walls down around the area and added the front porch onto the building. along with other changes to the structure.” -- Nathan J Hunt is a 3D site reconstruction researcher with 38North, has analyzed both satellite and ground imagery of site for reconstructions

Historical background

- Tbs
- Tbs
- Tbs

Control center developments [author's identifiers for five facilities]

- CC1 – Northeast of Pyongyang, operated 2005[?] – 2012 in two configurations, A & B
- CC2 – Sohae 'Launch Control Center', 2012
- CC3 – Massive hall and museum, Pyongyang
- CC4 – Sohae, 2015, VIP viewing and hall
- CC5 – Sohae, 2016, actual new LCC?

CC1 – NE of Pyongyang

Significant differences
between April & Dec 2012
configurations of center
[no appearance in 2016]



[ABOVE] April 2012



[LEFT]
December 2012

- Left & right walls altered
- Control consoles replaced
- Floor tile edges darker
- Main screen projector gone
- Multi-screen front displays?
- Right wall units atop platforms



CC2 A & B Launch Control Center [Sohae]

April 2012 [left]

December 2012 [below]

Unchanged: floor paneling, walls,
free-standing equipment, main
control panel, front TV screens,
corner floor-to-ceiling wire run.

DIFFERENT: Controller consoles,
tables/chairs, front bottom panel,
nature of personnel at consoles.



CC3 – downtown Pyongyang [2015]



KIM IL SONG IS WATCHING OVER US



CC1



CC2



CC3



Feb 4,
2016



CC4
[possibly CC5 also]

Inside CC4, Sohae VIP gallery



CC4



KoreanCentralTV1

CC3



CC3, Pyongyang, 2016



CC3, Pyongyang, 2016



CC3, Pyongyang, 2016



CC3 [only guys with glasses, headset]



CC4



CC4



CC4



CC4



CC4

English Video Here



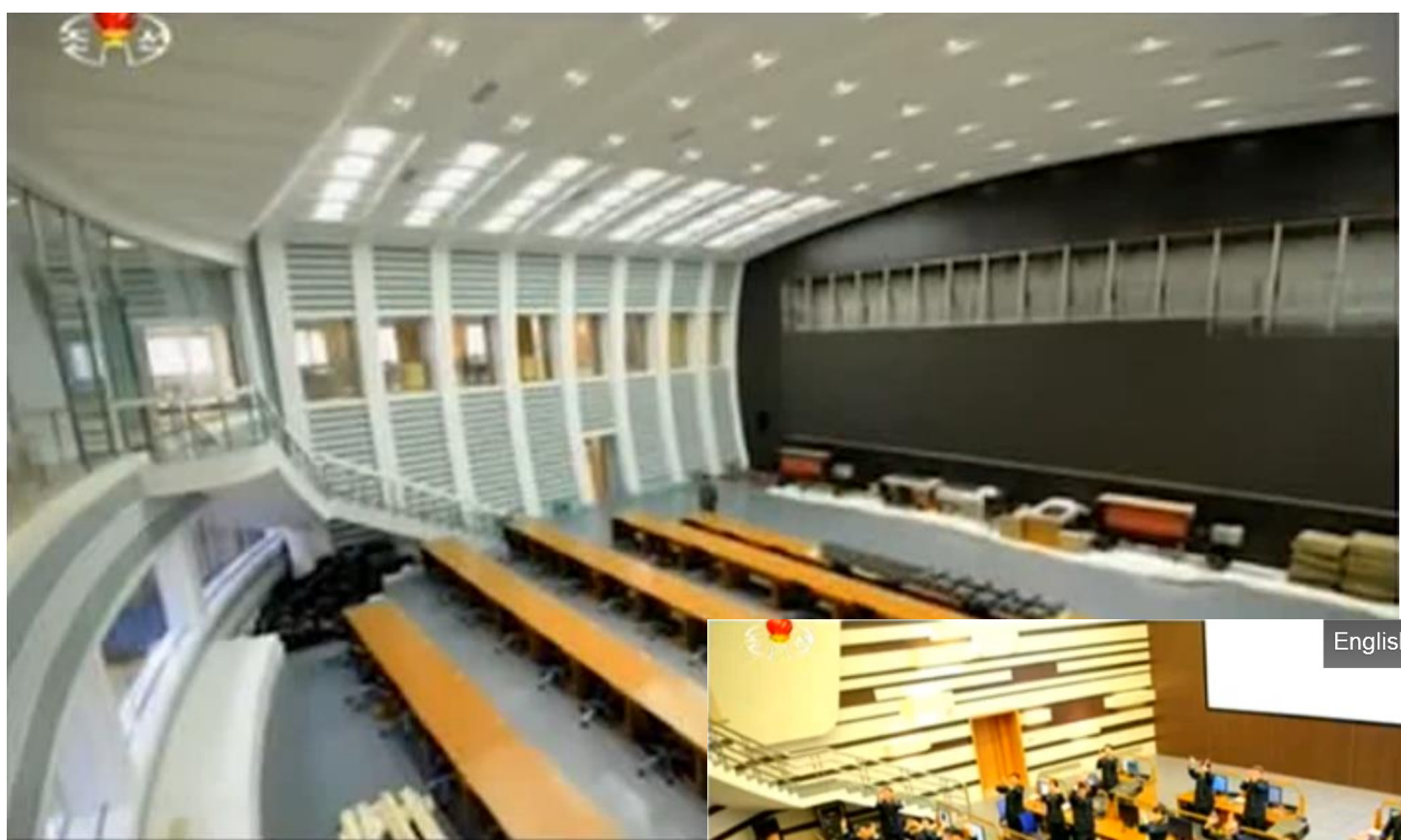
CC4



CC4







[English Video Here](#)

**Pyongyang [above],
2016 facility [right]**

2016 facility [right],
Pyongyang [below]



CC3 entrance hall



新たに研究 開発した地球観測衛星 次期月 4号の成功裏な

CC3



CC3 [2016] entrance hall



CC4 [one headset per row is all]



Mystery small control room CC5??



CC5??



CC5?? [no headsets]



CC5??



CC5??



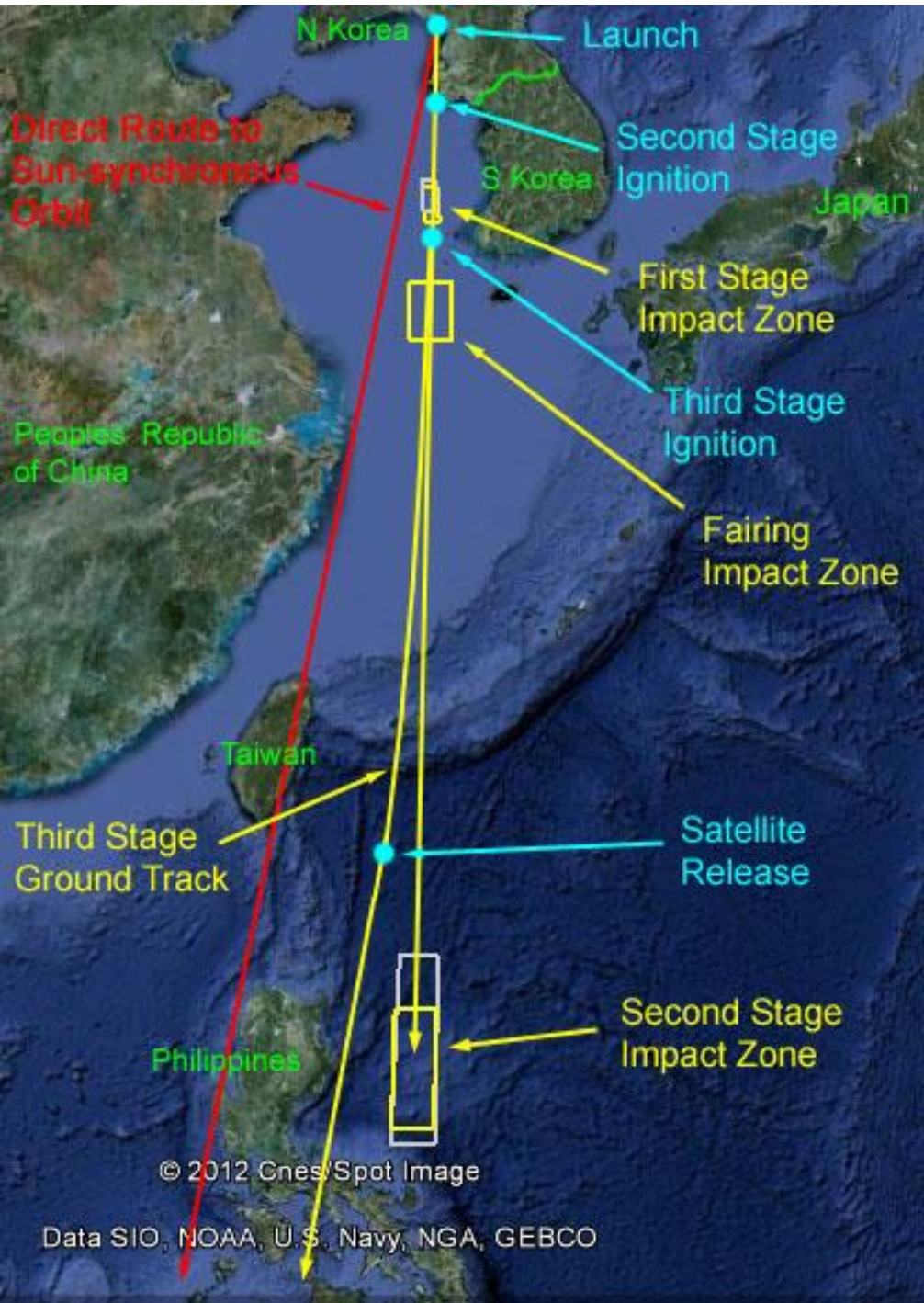
Launch and ascent details

- tbd

Sophisticated trajectory

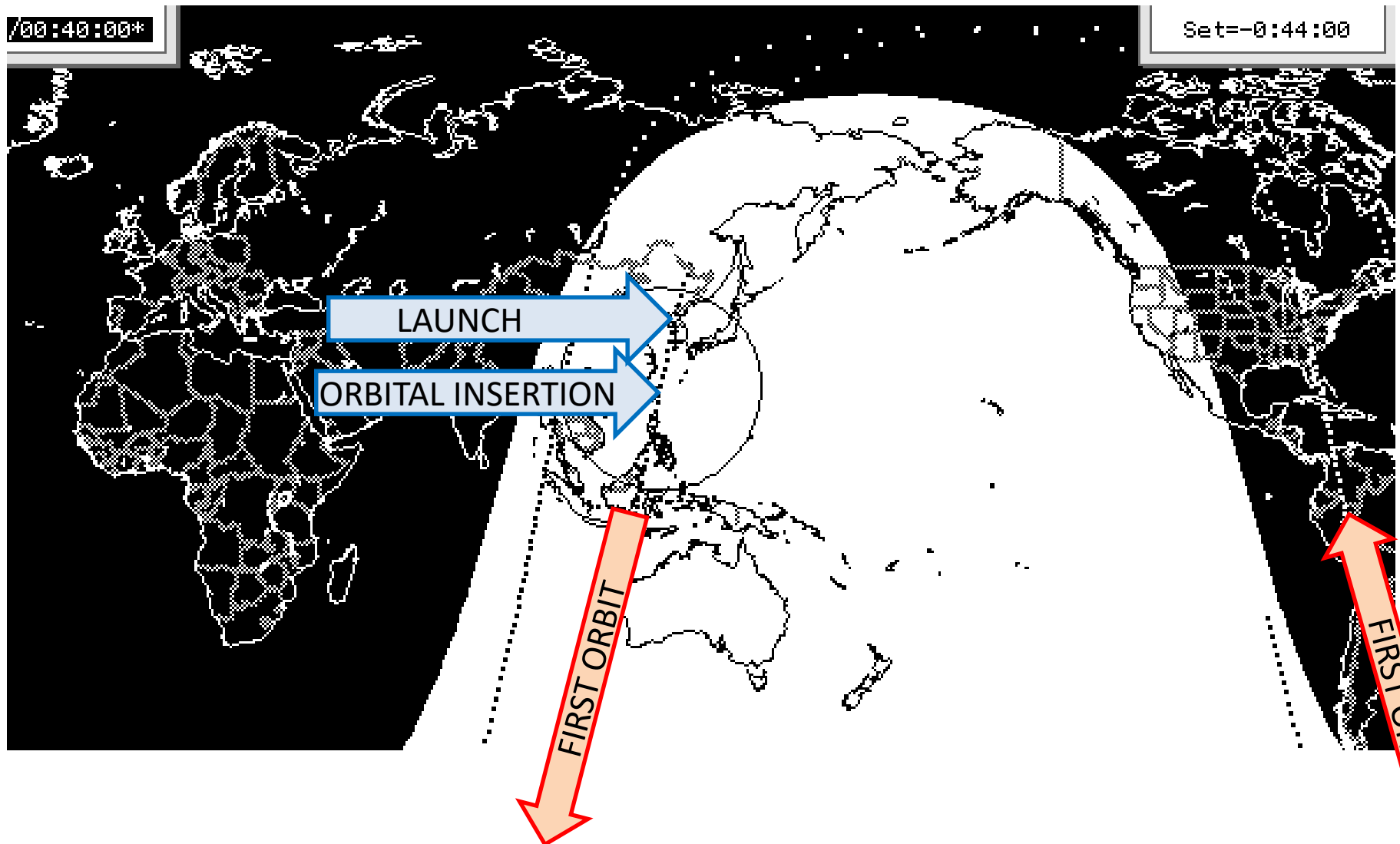
Third stage performs 'dog leg' directional change to achieve desired 97 deg 'sun synchronous' orbit while avoiding overflight of countries.

Potential exists to drop off experimental reentry vehicles [RVs] with second stage, to fall unrecognized in debris clouds to impact off Luzon.



<http://www.zarya.info/images/UnhaYaw32a.jpg>

Orbit versus surface illumination



CC3 display world illumination



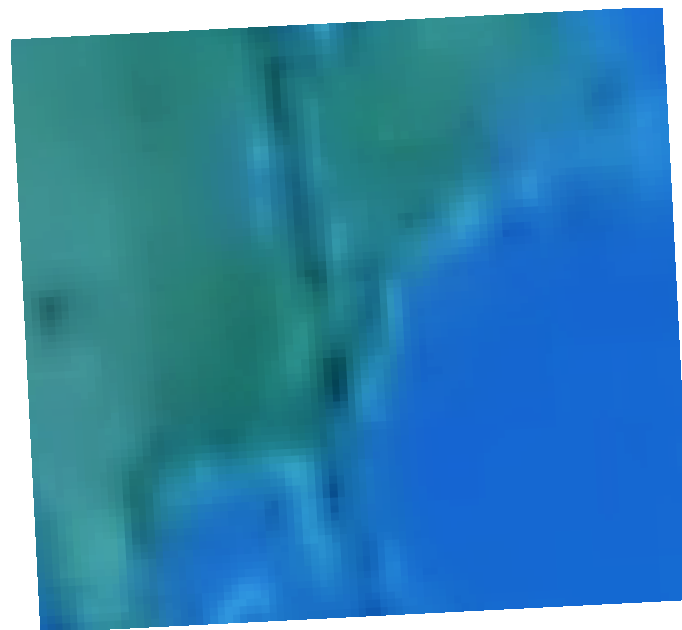
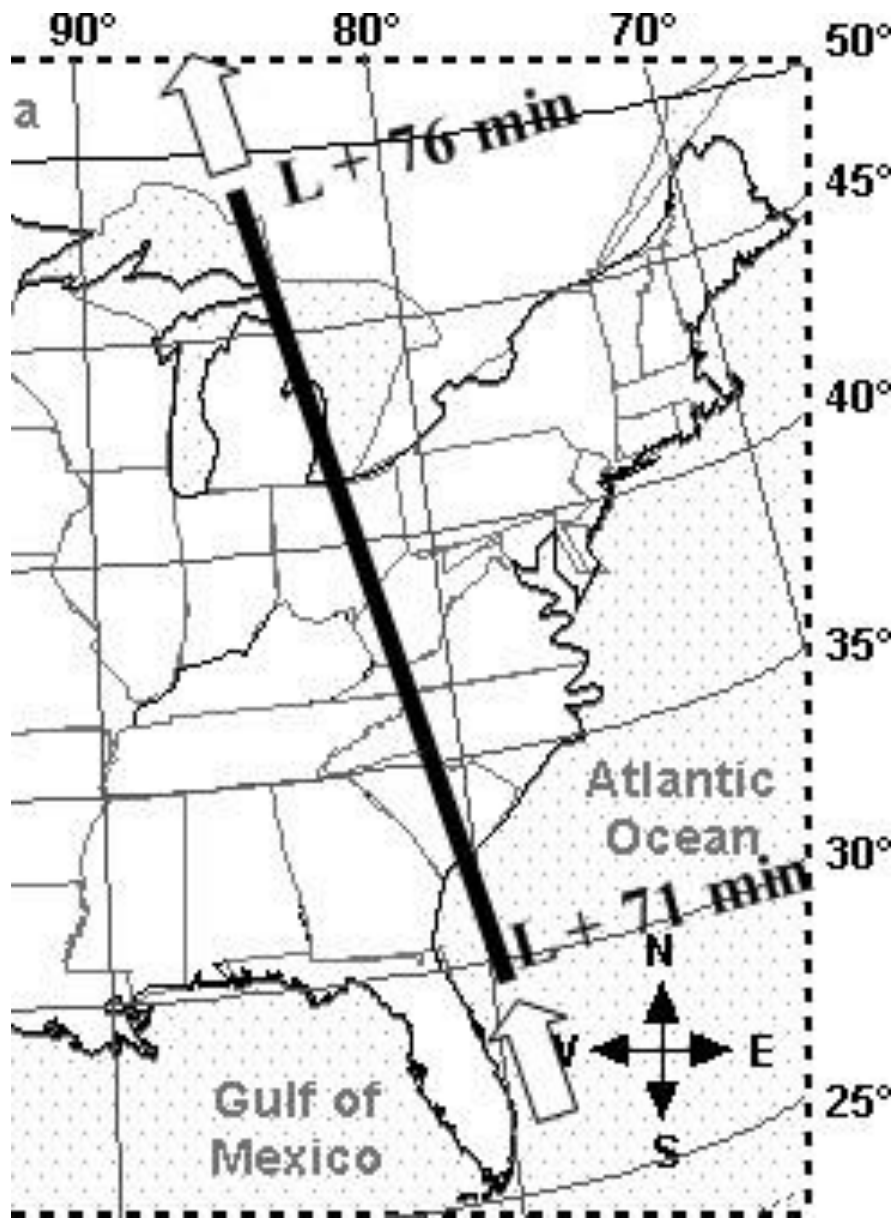
Korean rocket writing

- Earlier rocket inscription reads "조선" which is Choson, or North Korea.
- It says "광명성", that is, Kwangmyongsong.
- official state media announcement called it Kwangmyongsong ("운반 로켓 광명성호 / Unban Roketu Kwangmyongsong-ho", or carrier rocket Kwangmyongsong

FIRST PASS 70 MIN AFTER LAUNCH

200 MILES WEST OF DC

[below: extreme blowup of
NorKor control center display]



CHINA

SOHAE SPACE
CENTER

CHOLSAN
COUNTY

CHOLSAN
COUNTY

NORTH
KOREA

SOUTH
KOREA

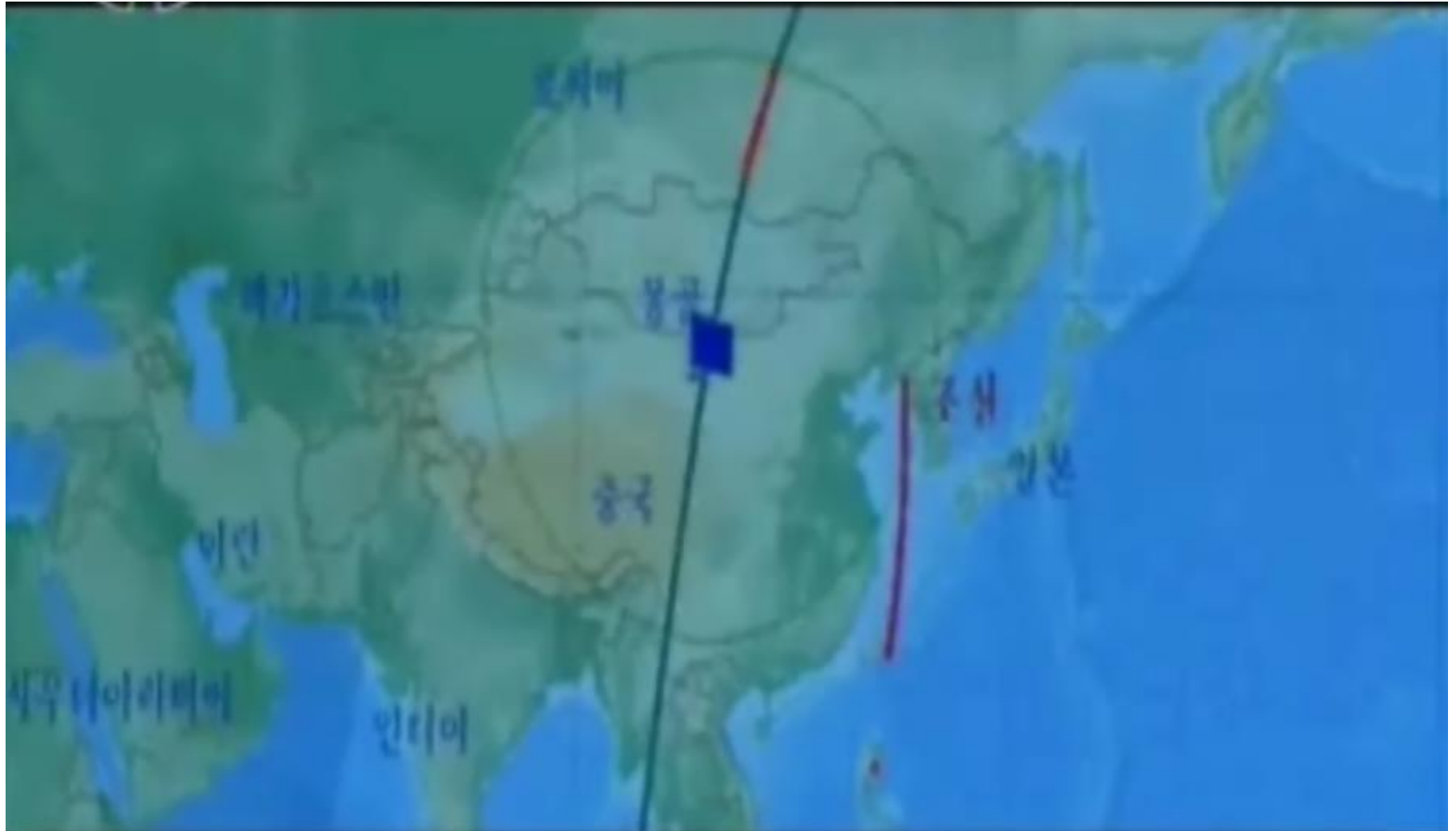
YELLOW SEA



MCC? WORLD MAP



Map detail with radio contact circle



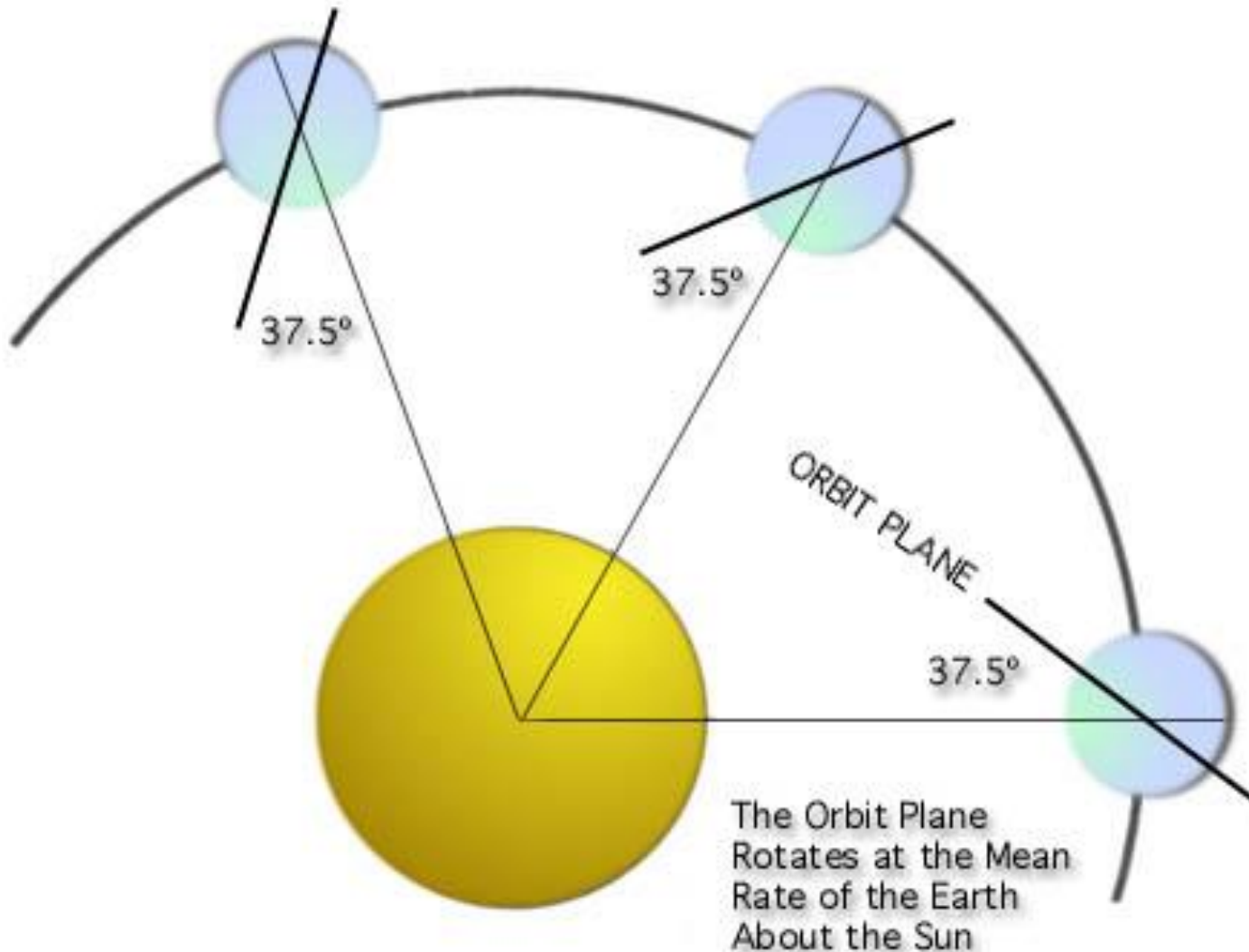
terminology

The space rocket used in the failed launch of Kwangmyongsong-1 also had the characters "조선" emblazoning the first stage (see http://www.b14643.de/Spacerockets_1/Rest_World/Paektusan/Gallery/Tdo_9a.jpg; http://www.b14643.de/Spacerockets_1/Rest_World/Paektusan/Gallery/Tdo_1big.jpg). Therefore, it's possible that the North Korean SLV was originally called Paektusan, and Kim Jong-Il decided to rename it in honor of Kim Jong-un, as Unha, before Kim Jong-un chose to rename it Kwangmyongsong in honor of Kim Il-Sung. The best bet is to call the Kwangmyongsong-4 carrier vehicle Unha-4 because the DPRK news reports describe Kwangmyongsong-4 as an Earth observation satellite and mentioned that Unha-4 would carry an earth observation satellite.

Orbital features

- c/b
- $n/$
- e

Sun-synchronous orbit



ZZZ



glorification



Pyongyang [Ssuk Island] nuclear/space temple



Cathedral of Heavenly Kim



"Yet Another Great Victory Brought About by Our Party's Line of Attaching Importance to Science and Technology"

[Minju Joson](#), Pyongyang, Feb 9, 2016,

“A fundamental source which let the space scientists and technicians fully display their boundless creative wisdom and passion in developing artificial earth satellites was **the leadership of the respected and beloved Comrade Kim Jong Un**, who led them by the hand at every step so that they glorify the immortal feats performed by the general to build a space power while maintaining pure loyalty and lofty moral obligation toward the great Comrade Kim Jong Il who ushered in a new history of space development and brought about the ultra-big event of artificial earth satellites flying from this land for the first time in the 5,000-year history of the nation.

“It was **our respected and beloved Comrade Kim Jong Un** who led the construction of the General Satellite Command and Control Center of the National Aerospace Development Administration to be built excellently as a monumental creation of the Workers Party era, and who also gave scientists and technicians the strength, courage, and wisdom to break through the ultra-cutting edge in space development -- an important project carried out for the dignity and pride of the nation.

“It is thanks to the respected and beloved marshal's far-reaching plan to build a space power and his energetic leadership that our fatherland is vigorously dashing along the road of conquering space and **highly displaying the dignity and majestic might of military-first Korea.**”

"National Aerospace Development Administration"

Feb 14, 2016, banquet and choral tribute

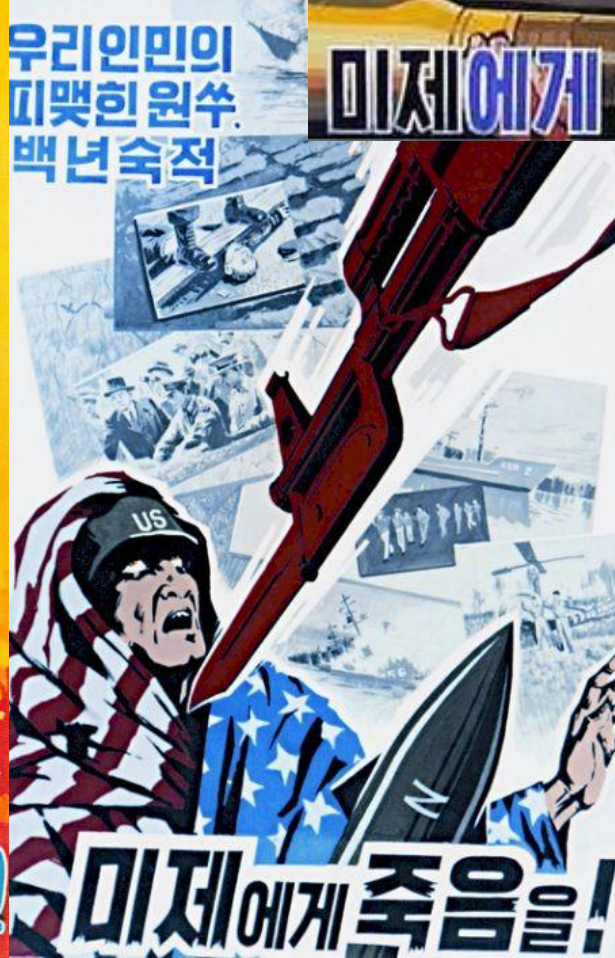


... and dancing girls





NOT A LOT OF
AMBIGUITY AS
TO INTENTIONS
FOR MISSILES



discussion

- 1
- 2
- 3
- 4
- 5
- 6