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THE US-KOREA INSTITUTE AT JOHNS HOPKINS SAIS

VERBATIM TRANSCRIPT OF
A 38 NORTH PRESS CALL
"NORTH KOREA'S SECOND ICBM TEST"

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On July 28, North Korea conducted a second ostensibly successful demonstration of a missile with intercontinental range. Following opening remarks by Michael Elleman on major takeaways from this test and implications for North Korea's ballistic missile program and Joel Wit on responses the Trump administration should take with a shortening timeline, there is a Q&A session with journalists.

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MODERATOR: We are here, obviously, because North Korea continues to keep testing missiles, regardless of what's happening on the sanctions front, so last week we saw the second test of the Hwasong-14, and Mike had an analysis that we did quickly last week, that looked at, sort of, the performance measures of what we could tell so far, and over the weekend we were able to get video and look a little bit closer.

And we just released an article, a few minutes ago actually, that talks about some of the deficiencies or limitations of the Hwasong-14 that were not mentioned in Friday's article.

So, our speakers today, of course, are Mike Elleman from IISS, who is one of our 38 North analysts on the missile front. And Joel Wit is with us as well, and he will be commenting more on the policy implication side of things.

So, Mike, I wonder if you can start, and maybe just highlight a couple key points from your article today, and maybe one or two key takeaways of what this means for North Korea's technical development.

MR. ELLEMAN: Sure. Thank you. And thank you for everyone joining in.

Late Friday afternoon, video of what appears to be the warhead – the Hwasong-14's warhead – reentering the atmosphere. And, in looking through the video quite carefully, we're able to extract a number of conclusions.

One, as one would expect, when the reentry vehicle hits at about – an altitude of about – 25, maybe 20, kilometers, it begins to rapidly heat up, to such a temperature that it starts radiating light, or glowing. And this is what the camera located, I think, in the Aikito Hokkaido Prefecture was able to pick up, and it followed the descent over about a four-second period, maybe about 3-1/2 seconds.

When the reentry vehicle passes about the altitude where there's some cloud cover, the glow kind of flashes brightly. It's most likely due to the reflections off the clouds. It could also be the beginning of the warhead breaking up. We can't be certain of that, because the fidelity of the images is limited.

But then, as it further descends, you see, kind of, an incandescent cloud trailing the reentry vehicle and you see small bright objects, radiant objects, that are shedding off the RV, or the reentry vehicle. And then it suddenly begins to turn very dim. That should not occur. If the reentry vehicle had remained intact, it should continue to glow until it impacts the ocean.

But this is not what happened. It seems that about an altitude of four to five kilometers, it probably broke up into small pieces, and that would have occurred just before the reentry vehicle would have passed, kind of, a small mountain range that is located in between where the camera was fixed and where the reentry vehicle impacted. The curvature of the Earth also would have prevented us from seeing the final two kilometers of descent.

Why are we certain this is a reentry vehicle, not a meteorite? The timing and the location seemed to perfectly coincide with when the RV would have descended, about 47 minutes after the launch of the a Hwasong-14.

So, I think with that, I could entertain questions or Joel, if you have something to say, if there is something I should add to the discussion.

MR. WIT: No, why don't we just go ahead with questions on that?

MODERATOR: I was going to say, Mike, I think one of the first questions that comes up, given this, is "So, how close do you think North Korea is to actually mastering a reliable reentry vehicle? What would be, sort of, your guess on timing for this?"

MR. ELLEMAN: Well, a lot will depend on how much they actually learn from this particular test. There has been some speculation that the first test of the Hwasong-14, the reentry vehicle also –

(Audio dropout.)

MODERATOR: You cut off audio.

(Pause.)

MODERATOR: Mike, we lost audio for a minute. Hang on just a second.

MR. ELLEMAN: Hello, can you hear me now?

MODERATOR: Okay, now we can hear you. If you could re-start you answer, because we lost audio for a minute.

MR. ELLEMAN: Yeah, it kind of came on and told me – (laughs) – anyway…

Yeah. There's some speculation that the reentry vehicle for the first Hwasong-14 missile test may have failed, but there's no way for us to verify that. We were just very fortunate, for this test that we saw, there was some video coverage of it.

Now, to answer your question, Jenny, the big challenge is "How much information does North Korea actually extract from this missile test?" We know that it's sending telemetry, you know, data, streaming it down to some ground stations. But, because of the curvature of the Earth, those signals will be blocked by the shadow created by the Earth unless they have a receiving station 300 or 400 – yeah, 300 to 400 kilometers – from where the impact actually occurs.

So, my presumption is that they have a ship out there and so they're getting some data. And they would have seen what happened during the breakup. If that's the case, then I suspect that they could work and develop a better system, that would withstand the heat and the frictional loads, and they would have to test it, probably, two to three more times, assuming they have identified the fix. They would probably need to test it with one or two different reentry vehicle masses, because it plays a major role in how fast, and when, the reentry vehicle de-accelerates and sees its maximum heating loads, et cetera.

So, I would say this might take them another six months. Maybe a little bit longer. But the key is they'll have to do some additional flight tests.

MODERATOR: Okay, great. So, for those of you listening, if you have questions, please feel free to – I think there's a "raise your hand" function if you're on the phone. What is it? Hang on a second; we're switching to Q&A mode, to enable you guys to talk. And those that are on here, yeah, please do just go ahead and type your questions in.

(Pause.)

MODERATOR: Heejun Kim from YTN has a question for you, Mike. It seems that North Korea's camouflage skill is advancing, as they tested the ICBM second launch at Jagang-do not Kusong as expected. How do you evaluate this?

MR. ELLEMAN: Okay. Can you hear me?

MODERATOR: Yes.

MR. ELLEMAN: You can, okay.

Well, you know, the test itself seems to me to have possibly been designed to not only test the missile itself but also to begin training troops on actually how to do firings. Now, how quickly they actually fueled the system, rolled it out and tested it, we don't know. But it seems that they're going to try to operationalize the system as quickly as possible. And this means they may try to do several steps concurrently. That is, do troop training while also testing the missile's reliability and other functions, performance functions.

The launch location is interesting, primarily because it's not where we typically see missiles tested from. So again, this kind of points toward a dual purpose for the test itself. And the fact that they did it at night is interesting. I'm not quite sure how to explain that yet, but I believe my 38 North colleague, John Schilling, has some thoughts on it that might be published soon.

MODERATOR: Yes, we are working on another piece by John Schilling that will come out, hopefully, either later this afternoon or tomorrow morning. But just to pick back up, Mike, you had said that the reason for doing a test in this area probably has a dual purpose. What do you assume that dual purpose is?

MR. ELLEMAN: Well, as I said, they need to test the HS-14, or Hwasong-14, a few more times to establish the reliability of the system, and also to determine whether some of the technologies that they are developing – for example, reentry – or like trying to get a better grasp of the navigation and guidance capabilities – those all need to be part of the missile development effort.

In parallel, they're probably trying to begin training different crews, launch crews, to operate the missile. So this location, I believe it's not normally associated with testing, and it may be that they brought in a new crew of people. I just don't know. But it wouldn't surprise me if they were operating the test for two different reasons.

MODERATOR: Okay. We do have a couple of questions from our phone guests. We're starting

with phone number 818 – go ahead with your question.

QUESTION: Yeah, it's Jeff Daniels at CNBC. A question. So, the more light than would be anticipated or expected, from the video, are we showing, then, that – I mean, in terms of timing, would it be, like, 30 seconds before, or how much sooner would it have been. And, in terms of the heat, is there a way to estimate – would that have been heat sufficient for failure, even further down, or do you think the damage was further up? I'm just wondering what we know, based on that video, in terms of just how much of a failure, perhaps, it was on reentry. Are they still not that far off, making it?

MR. ELLEMAN: Well, typically the reentry vehicles will begin to heat up when they encounter the atmosphere, when it starts getting, kind of, thicker, more dense. That happens around 30 kilometers altitude. It should be warmed up, or heated up, because of the friction with the air, sufficiently to begin glowing and be seen by a camera, that is about 200 kilometers away, when it reaches somewhere between 20 and 25 kilometers altitude.

From there on, it should continue to glow, kind of like increasingly glow, until it impacts the ground or, in this case, the ocean.

The time it takes this particular – because it was an ICBM kind of velocity, it reenters the atmosphere at just over six kilometers a second, so it probably goes from 25 kilometers altitude to the ground in about six to seven seconds. Let's see, one, two, three, four, five – six seconds.

So you should see a glow for about six seconds. We see it glowing for about four seconds and then suddenly it looks like the reentry vehicle is shedding pieces that are bright objects. And then there's kind of an incandescent vapor cloud that trails the RV.

And when it descended down to about four to five kilometers, it suddenly begins to go dim, and then we kind of lose track of it before it passes behind the mountains that are situated between the camera and the landing zone. So, it appears that the failure occurred probably somewhere in the neighborhood of 10 kilometers to four or five kilometers altitude.

Does that clarify your question?

MODERATOR: Mike, does that mean it had a fairly good performance, or, like, what does that mean in terms of the implication?

MR. ELLEMAN: Well, yeah. Most likely it broke up into pieces. Prior to completely breaking up, it appears to have been shedding some of the outer layers, and then it must have finally disintegrated, because we don't see the radiance. It's no longer radiating any light, because I think it's broken into lots of small pieces, that aren't large enough to be picked up by the camera that – we have to remember, this camera is 200 kilometers, roughly 200 kilometers, from where that reentry vehicle was about to impact. So this thing is – it's very bright when it descends, and then becomes dim.

MODERATOR: Yeah.

MR. ELLEMAN: Which is an indication there's no longer a large mass radiating light.

MODERATOR: So, for Jeff's question, though, I think you did sort of allude to this earlier, to say that most likely they're about, still, around six months away from being able to have a workable – or two to three more tests before having a workable reentry vehicle, is that right?

MR. ELLEMAN: Yeah, I mean, I think that – I mean, this assumes that they're learning something and know – first of all, know that it broke up and, two, know why it may have broken up. I mean, they should have sensors on the reentry vehicle, and they should be beaming that data back to a ground station. In this case, it would have to have been a ship at sea, somewhere within a hundred or 200 kilometers of the expected impact zone.

My assumption is that they probably did. If that's the case, then they can begin trying to identify why it failed, incorporate corrective actions, and then prepare to test it and see how it performs.

There are some interim steps that they would probably try to do some simulations, things of that nature, but it certainly seems, at a minimum, they would have to do two more tests to validate that they have, indeed, fixed the problem. It could be done in three months. It may take six months. If they continue to fail, however, it could take a longer period of time; we just don't know. All we have is evidence that the second test the reentry vehicle failed.

MODERATOR: Okay. As a follow-up question, Nico Pandi had a question, from Jiji Press, asking "Is it possible that they designed the reentry vehicle to break apart on purpose, in order to prevent anyone from recovering it?"

MR. ELLEMAN: Well, it's certainly "possible." But, the reentry vehicle sees, kind of, its highest stress environment, the combination of heating and de-acceleration, at altitude below five – oh, below 10 – kilometers. So they would want, and need, to test it in that environment. So, purposely destroying it before it has a chance to survive or fail would defeat the purpose of the test, I would think.

So, there are things that they could do, when it impacts the ocean. It could disintegrate also. But it's an interesting idea but, again, I don't see the logic in it, in terms of getting information from the test to help them understand whether they have mastered the reentry technologies.

You know, if they were very concerned about protecting the warhead – or the reentry vehicle – from being recovered, there are other trajectories they could have taken instead of landing in the exclusive economic zone of the Japanese. They could have landed it in a more neutral location, where they would have a chance to recover it or disrupt salvage operations done by Japan, the United States, or whoever.

MODERATOR: Okay. We do have one more caller on the line, that has a question. The number is 202-354… Please do introduce yourself before you ask your question. Please go ahead.

QUESTION: Yeah, hi. It's David Brunnstrom from Reuters. Thanks very much for doing this, Mike.

I just wondered, is it possible that the reason that this reentry vehicle broke up was because it was a lighter version of a reentry vehicle, designed as such, to allow the missile to travel further to make the

point that US cities were now in range?

And also if, say, suppose, this missile had been carrying a warhead and this breakup happened, when would the warhead – what would happen to the warhead? Would it explode? If it was five kilometers out and it exploded, would this have any capability of causing damage? Do you understand my question? I mean, would it actually function?

MR. ELLEMAN: Yeah, I can't be certain, but my – I mean, it would be very difficult to maintain the functionality of especially a nuclear device if the reentry vehicle broke up, because as soon as that vehicle broke up, if the bomb itself were exposed to these very severe conditions, it would be torn apart. The fusing mechanism would be gone. The battery or power source that provides the impulse to initiate the conventional explosive, which then initiates the nuclear bomb, I just don't see how it would work.

Now, one thing the North Koreans may or may not do is they could – if they have trouble making a survivable warhead, they could detonate the bomb at 10 kilometers altitude. Now, it would lose a lot of its effectiveness, but that's an option. But I don't think that that's what they would ultimately want their nuclear-armed missile to do.

In short, if the reentry vehicle breaks up, the bomb is not going to be useful, and it's not going to detonate.

QUESTION: Thank you for that. What about this question of whether or not they could have put a lighter payload on the top of the missile deliberately, in order to make it travel further, to demonstrate its capabilities of reaching more US cities, so therefore the reentry vehicle would have been too light to withstand reentry?

MR. ELLEMAN: Well, I mean, that is certainly a possibility. When you go to a lighter warhead, assuming the shape remains the same, the overall size or the cross section is the same, what they call the "ballistic coefficient" becomes lower, so it's slowed down at a higher altitude. But again, we're talking the difference between eight kilometers versus six kilometers where it receive, I guess, the maximum loads from de-acceleration.

So, I don't know how that, in itself, would cause it to fail, unless they took out structural elements and some of the heat shielding, to make that reentry vehicle lighter. If that was the case, then yes, it could certainly play a very dramatic role in causing this one to fail. And that's why an important question is "Did the first reentry vehicle survive?"

I'm sure some of the foreign intelligence groups that are monitoring these tests know. But do the North Koreans know? I don't know. That I can't determine.

MODERATOR: Sure. Okay. Mike, that leads us to kind of a broader question, from Thomas Watkins of AFP. So, he is wondering what your assessment would be, then, as to how long until North Korea has a credible nuclear-capable ICBM that could hit the United States, as sort of a broad question.

MR. ELLEMAN: You know, I tend to believe the recent US Defense Intelligence Agency assessment that by late this year or sometime next year they should have a system that's what I call

"reliable enough." That is, it's been demonstrated to have a reliability where the missile will more often succeed in its mission than fail.

Now, this hinges on a number of other issues. They still have the reentry technology to master, or so it appears, based on this past test.

There's a question of whether they can make the warhead small enough. We know that this missile can reach the West Coast of the United States, with a reasonably-sized nuclear device. That is, if it's in the neighborhood of 800 kilograms for the total package – that includes the reentry components and the bomb itself. To reach the East Coast, the reentry vehicle needs to be less than 500 kilograms total. That means it's a very small bomb.

So, when we look at what it can threaten, we have to keep in mind that the total weight of the warhead is very important, in terms of the range this missile was capable.

Reliability is a difficult topic to address, primarily because it has to be reliable in all of its functions. I mean, when you think about it, a nuclear-armed ICBM, it's compromised of maybe six elements. You have the launcher. North Korea has that; they've shown it. It has to have a propulsion system. They've shown, demonstrated, that. It appears to be working reasonably well. Navigation and guidance, we don't know the status of how well or how accurate this missile could become. If we just based on the Unha satellite launcher, we can get an approximate estimate. But it's not very accurate, but probably accurate enough for a nuclear device.

You have the warhead mass, reentry technology, which we've talked about. And then reliability. You have to demonstrate that reliability under a range of operational conditions. You know, winter, summer, snow, day, night, et cetera. That just requires a number of tests.

But the total number of tests is driven by your requirement, or the criteria, for reliability. If you want 90 percent reliability like the US, the Soviets, the Chinese, the French, have demanded, you have to do two dozen tests, over two to three, four, years.

If you want something that's reliable enough to deter an aggressor, you can probably get by with five or six tests. Well, they've done two. There are components that appear not to work quite so well. My guess is they need to do another handful of tests, and this would likely take them into next year.

So, that's a projection. I'm sorry for the long-winded answer, but it really depends on what the criteria the North Korean – you know, Kim Jong Un – has established for this system. But I think an early deployment next year is possible.

MODERATOR: Okay, great. I think we have a few more questions but before we jump into that, Joel, maybe it would be good to have you jump in here. Some of our questions now are turning a bit more to the policy implications. What do we do about this and, given Trump's comments this morning about "The US will handle it; we handle everything" sort of thing, kind of where does this leave us now in terms of options, going forward?

MR. WIT: Okay. Thanks, Jenny. Pardon me if my voice comes and goes. I'm suffering from a

little laryngitis. Anyway, I assume I'm not on mute now, so I'm going to just keep talking.

So, it's interesting, President Trump's comment. We'll get to that in a minute. But I just wanted to make a couple of big points.

The first point is that looking ahead, if we were looking into a crystal ball and we had a reliable one, we could have predicted everything that's happened in the past six months. The North Korean strategy for those six months has been to feel its way forward, to see if there was running room caused by problems between the United States and China, and if there was running room, he would start testing an ICBM. And that's exactly what's happened.

There was some US-Chinese cooperation coming out of the summit. It looks like that's deteriorated and it may have disappeared, predictably, because China was never going to do as much as President Trump thought they were going to do. And the North Koreans are using this running room. But, at the same time, I want to emphasize, for eight months they have held the door open for dialogue with the United States. And I think that's just to keep their options open and to explore what other possibilities there might be, besides moving forward with their program.

Secondly, given that situation, it's entirely predictable, or has been entirely predictable, what our policy would be. There have been some flickers of hope that the Trump administration was exploring something different from before, but I think those are rapidly being extinguished. We have the sanctions threat which, of course, has been used for years. That's not going to work. We have the threat of military force. That's come and gone. For decades we've had that threat, when we've been confronted with difficult situations in North Korea. And that's not going to work.

And then, of course, there's the constant drumbeat about getting China to do our job for us. And people are twisting themselves into pretzels trying to figure out angles for getting China to cooperate, but they're not going to cooperate as much as we want them to.

The third point is that the situation is bad now and it's going to get worse in August, and it's going to get much more dangerous in August, and that's because, as many of us know who follow this closely, August is exercise season, and there's going to be a large US-South Korean joint exercise in August. And so that could create even more tension, and I think we need to be very careful about aggravating the situation.

A last point. You know, President Trump says, "Well, we're going to handle this." Well, I don't see any sign of doing that in a coherent way. I mean, talking to Prime Minister Abe is good, but the main actors here are the United States and South Korea, and so President Trump and President Moon should be talking, not President Trump and Prime Minister Abe. They need to talk immediately and to keep up a continuous conversation, not just between the two of them but also including senior aides like the Secretary of State, who appears to be largely invisible on this issue. And others too. And establish a channel where those officials can work together. And, you know, the Secretary of State should be on an airplane tomorrow, flying to the region, to try to figure out what to do about all of this.

Those are the things that we should be doing. But, above all, while we need to protect our allies, we need to protect our own security, we need to figure out how to step up the diplomatic side of things and to have a real dialogue with North Korea, to see what's possible, moving forward.

So, on that note, I'm going to – I'll stop, Jenny.

MODERATOR: Okay. Thanks, Joel. There's one question from Jesse Johnson. "Do you think that by inaction on sanctions and other means of pressuring Pyongyang, that Beijing is inadvertently communicating that it's willing to accept an arms race in Asia, and the rising possibility of armed conflict? And could this be an approach that, perhaps behind the scenes, might offer some leverage for Washington, in terms of getting Beijing to act?

MR. WIT: Well, I'm not sure about the leverage part of this, but let me explain what's going on with the Chinese. It's very clear – and, once again, you don't need a crystal ball. If you've done this issue for any length of time, you can see exactly what's happening with the Chinese, which is they are very frustrated and angry with the United States, because they're willing to take tactical steps to increase pressure, not the kinds of steps we want them to take but at least some steps, and they've done that in the past few months.

But there's a bargain here. There's a quid pro quo here. And their quid pro quo is that the United States needs to have a real dialogue with North Korea. On top of that, I think the overall state of US-Chinese relations is not good and it may deteriorate even more.

So, in those kinds of circumstances, the Chinese are going to press their policy default button, which is to take their foot off the sanctions pedal, delay at the UN, and wait to see what Washington does. But they're not going to take the steps we want them to take, particularly if we don't meet our end of the bargain and, in their view, our end of the bargain is a dialogue with North Korea.

MODERATOR: Great, thanks. We're going to go to the phones again. The number starting with 770, please introduce yourself before you ask your question. Please go ahead.

QUESTION: Hello. It's Alex Lockie from Business Insider. I have a question for Mr. Elleman about the reentry vehicles and the Hwasong-14.

My question is if they will be able to get a good reading – well, my impression is that the lofted missile, you have a reentry vehicle that's going through a lot less atmosphere and that if they were actually to shoot it on a reasonable trajectory, it would have to cut through a lot more atmosphere, and just how that translated from the lofted testing to a real-world scenario.

And secondly, there was some analysis done by Ralph Savelsberg and James Kiessling in "BreakingDefense," saying that – basically pointing to the Hwasong-14 being way smaller than other liquid-fueled ICBMs. So basically I'd like to know when they do get a functional ICBM, is it the Hwasong-14 or is this just, kind of, a platform they're using to test technologies that will lead up to a final missile?

MR. ELLEMAN: Yeah, thanks for that question. Let me address the second part initially.

The Hwasong-14, I think, is – well, my analysis is that it is capable of reaching the West Coast with a reasonably-sized warhead, somewhere in the 700 to 800 kilogram range, for the entire reentry vehicle.

It would be about a 500-kilogram bomb. So, I mean, my guess is this is an interim capability that they want to field as quickly as possible.

The engine that powers the Hwasong-14 can be – they can couple it and use two of them. It's going to give a slightly larger diameter missile, so it may not be mobile, but with that as a basis for the first stage, they could build what I'd call a "heavier ICBM," one that can certainly cover the entire United States, and probably have the capacity to carry, in addition to the warhead, things like decoys and other penetration aids, to try and defeat missile defense.

So, over the course of the next five years, I would be surprised if we don't see a larger ICBM tested, but for the time being the Hwasong-14 is their interim capability, that could be used to threaten the United States, as the DIA has asserted, as early as next year.

On the reentry kind of dynamics, yes, reentering the atmosphere, when you've – you know, basically almost coming down at 90 degrees, or perpendicular to the Earth's surface, you experience different types of stress. The warhead will slow more quickly and it will heat more quickly. So, in some ways, it's a little bit more stressful.

But, because it passes through less atmosphere – you know, it's not cutting through – it's cutting through at a minimum distance when it's lofted – when it comes in at a flattened out trajectory, it will experience a longer heating time and mechanical loads or de-acceleration loans over a longer period of time. So, in a sense, it can actually become hotter when it's on a maximum energy trajectory or standard trajectory, whatever you want to call it.

There's also the issue of how the reentry vehicle handles the heat. When it comes straight down, the loads are very symmetrical. When you come in at a shallow angle, as you would with a maximum-range trajectory, you get asymmetric loading, and that needs to be accounted for as well.

And the bottom line is if they want to have high reliability and understand that it's reliable, they're going to have to launch a missile on a flatter trajectory. It doesn't mean it needs to a maximum range, but it just needs to be much flatter, at some point, to make themselves feel comfortable that the technologies they develop will survive the rigors of reentry.

MODERATOR: Great. I would add to that the estimates that were done by Ralph Savelsberg and Jim Kiesling too are on the very low end of what people are estimating this missile to be. So, they've put it at 1.5 meter diameter, where everyone else has it at least 1.7 over up to, like, 1.9. So there isn't really a consensus yet that this is a smaller missile, and I think right now they are the only ones who are saying that it's that small, 1.5.

Joel, there's a follow-up question for you from Jesse Johnson. So, early in the Trump presidency, there was talk that, as an iconoclast, that Trump might actually have a shot at solving the North Korean nuclear crisis. At what point, if any, would you foresee the Trump administration or any other future US leader taking a page from Nixon and having a kind of "Nixon goes to China moment" with the North?

MR. WIT: You know, I don't have that crystal ball, so I really can't predict. I mean, sure, if you want to fantasize, it's probably the best point in time for a US president to do it, because Trump is going

to be insulated from any sort of Republican criticism, which has always been the fear of Democrats, in the past. And, you know, he's a guy who "thinks out of the box," although often that gets him into a lot of trouble.

So yeah, you know, he may be the right person to do it. But I can't even touch that prediction.

MODERATOR: All right, fair enough. Mike, there's a question from Tom O'Connor from Newsweek. "So, 'Strategic Sentinel' recently released a report using enhanced imagery of Kim Jong Un's map, to suggest that the missile should have landed in Japanese water. This is from the July 4th test. If you're aware of this report, can you expand on this, and what do you think was behind the decision to land the missile inside Japan's exclusive economic zone this time?"

MR. ELLEMAN: Yeah. I mean, I haven't – I skimmed over the article at some point over the last day and a half. (Light laugh.) I just don't remember, because I've gone through several.

But, the first test, I think their objectives may have been different than they were for the second test. You know, we've been – if we look at the performance of the second test, they added some engines to the upper stage, so it now, instead of one engine, it has – or actually a pair of engines – it now has four. This allows it to reach greater range. They seem to have lightened the payload as well, from probably roughly 500 to 600 kilograms down to around 300, is what my modeling shows.

So, they were trying to go a little bit higher and a little bit further, probably to demonstrate the capacity, to the United States.

This – I mean, there's a limited, I guess, area that they can test in unless they want to overfly Japan or some other country. So, landing in Japan's economic zone was probably a consequence of just not having enough room. It could also have been a miscalculation of the guidance and control system. It may not be as effective as they would like it to be, and thus, if they wanted to come up short of the economic zone, maybe – not a "failure" but the poor navigation, guidance and control system just wasn't able to keep it short of the economic zone.

But I think, personally think, they just don't care if they land in the zone. I think their major worry is overflying Japan, or worse still, actually accidentally landing in Japan.

And I think this latest test, by the way, if it had gone off course, it could easily have landed in Russian territory. I mean, the angle at which they launched it, it passes – its ground track is within like 50 or 80 kilometers of Russian territory, which is a little bit surprising to me.

MODERATOR: Okay. There's another question, by Kim Dosier from The Daily Beast. She says that, "The Pentagon today said that this test is the longest flight ever by a North Korean ICBM, but they didn't say what height it flew. So, how high do you think it went, and do commercial satellites measure that information, or is there any way to know without access to military intelligence?"

MR. ELLEMAN: I relied – (laughs) – completely on what's been reported. I think the South Korean government has issued an estimate. I keep seeing somewhere between 3,700 kilometers, 3,800 kilometers. I believe the North Koreans actually published some information too.

Yeah, unless you have radars, and fairly powerful ones, it's difficult to know how high it passed. And I'm not aware of any commercially-available radar data.

What I will say that's rather interesting is the Russian government seems to take a stance that this was not an ICBM test and that it didn't reach the altitudes that have been claimed by North Korea, South Korea, I think Japan – which I find quite astonishing and frightening. Either the Russians aren't picking it up, which I doubt, or they're just… creating alternative facts.

So yes, there's no way, I know of, to independently verify how high it reached.

MODERATOR: Okay. And then, just for clarity's sake, given the diagnostics of this test, how much of the US West Coast do you think this could reach?

MR. ELLEMAN: (Light laugh.) Well again, it's highly dependent on how heavy the reentry vehicle is. I mean, the distance it can travel is very sensitive to even a 10 kilogram change in mass, and we don't know what, in the end, the size of the bomb and the size of all the reentry components will be. It's just – we would be simply speculating if we said we knew what the masses would be.

So therefore, it's kind of a question that can't be answered with any real fidelity, but I think, assuming a 500 kilogram bomb, which gives you about a total of 700 kilograms – 150 kilograms for the reentry vehicle itself – San Francisco, Los Angeles, Seattle, would be threatened. Possibly San Diego. Salt Lake City may be out of its range. Does that help?

But again, I'm speculating and assuming a mass for the warhead.

MR. WIT: Let me just add that we're going to publish this article by John Schilling, and he has a chart that shows the performance as a function of the payload size and the number of engines on, I guess, the second stage. So, you can see from that chart the distances involved, but there's nothing on the East Coast represented on the chart. Except – I'm sorry – New York. New York is represented, but that's essentially if they put a Coke bottle in the reentry vehicle and call it a warhead.

MODERATOR: All right. Yeah, we're hoping to get that out if not late this afternoon, the first thing tomorrow morning.

Let's go back to the phones real quick. The number starting with 646, please introduce yourself and ask your question.

QUESTION: Hi, this is Tom O'Connor from Newsweek again. Thank you, everyone, for having this. I love you guys.

I guess my question would be, I submitted this online before but I guess we didn't get to it, so my question is, based on these recent reports that the Hwasong-14 can travel up to 9,500 kilometers, and with this current rate of ICBM testing and, obviously, the improvements that we're expecting in the next few months, I'm guessing – I mean, it was just kind of answered, the names of cities that are threatened – but I'm guessing with that, with that 500 kilogram bomb, if that's what we're assuming, what kind of damage

we would see, as far as on a tactical level, just based on testing and what we know about missiles here? I guess, yeah, just kind of the tactical damage that could cause, the devastation. Thank you very much.

MR. ELLEMAN: Oh, that's another loaded question. (Pause.) Yeah, I mean, we're getting into dangerous speculation at this point, because all of the bombs that North Korea has tested to date have been, by nuclear standards, relatively small. You know, I think 10 or 15 kilotons is the maximum yield that they have achieved. That doesn't mean they can't do more, but that's – you're talking, kind of, Hiroshima-Nagasaki-size bombs. It's actually a little bit smaller. So that gives you an idea of what kind of devastation a single nuclear warhead could have. Even a – again, relatively speaking – small nuclear warhead.

MR. WIT: Tom, it's probably a fairly straightforward calculation. There are models that can calculate – you could have a model that says a 20 kiloton warhead lands on Los Angeles and you could do a straight calculation of how many casualties that would cause. But that may be a little over the top at this point, so I'm sort of shying away from doing that calculation.

MODERATOR: Fair enough. We have one more caller. Giuseppe Sarcina, please go ahead.

(Pause.)

MODERATOR: Hello? Giuseppe, are you there?

(Pause.)

MR. ELLEMAN: Does he need to push the star-one to unmute himself?

MODERATOR: Giuseppe, if you are there, can you press star-one? Try?

(Pause.)

MODERATOR: Let's see if he comes back – he can "raise his hand" again. There is one follow-up question, from Jesse Johnson, for Mike. "Amid all of the ICBM talk, the North has an extremely formidable arsenal of short and medium-range missiles that could do serious damages to US forces and allies in Japan and South Korea. Is this threat maybe the more imminent one at the moment, being somewhat ignored?"

MR. ELLEMAN: No, I don't think it's being ignored. At least I haven't been ignoring it. And the people I have talked to that either represent the governments of South Korea or Japan – (light laugh) – or citizens of those countries, are very concerned and have been for quite some time.

What North Korea appears to be attempting to do is deter the United States by directly threatening cities on the continent of the United States itself. And this has several consequences that Joel would be much better at addressing than myself, but there is a security commitment that the United States has, for its allies in the region, including South Korea and Japan, and North Korea may believe that it can decouple the United States from its allies by threatening the United States directly. I don't think they'll succeed, but that might be the aim. And I think this is why people are paying so much attention to it, the

development of the ICBM.

Joel, do you have – you can probably add much – detail –

MR. WIT: No, I think that explains it very well.

MODERATOR: Okay. With that, I think we've gotten through all of the questions. Are there any last questions? Either "raise your hand" or type in…

We've come to the end of our scheduled time, so I think if there's any last questions or anything we didn't cover here, please feel free to email us, and we'll make sure to get a response to you as well. But thank you to Joel and to Mike for taking time to talk with us today. Again, Mike's article just came out this afternoon and we're hoping to get another article out, related to this topic, later today or early tomorrow morning, written by John Schilling.

But for the rest of you, thank you so much for joining us, and we look forward to talking with you again – hopefully not too soon. (Laughs.) All right, thanks a lot, guys.

MR. ELLEMAN: Thank you, Jenny.

END

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