Response to “Rush to Judgment: Inconsistencies in South Korea’s Cheonan Report”

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Response to “Rush to Judgment: Inconsistencies in South Korea’s Cheonan Report”

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I. Introduction

The following are comments on the essay, “Rush to Judgment: Inconsistencies in South Korea’s Cheonan Report” by Seunghun Lee and J.J. Suh, which appeared in the Nautilus Policy Forum on July 27th, 2010.This response was made by the ROK Civilian-Military Joint Investigation Group to Dr. Lee and Dr. Suh’s article. The ROK Ministry of Defense also published more information on its account of the Cheonan incident at: http://cheonan46.go.kr/

The views expressed in this article are those of the author and do not necessarily reflect the official policy or position of the Nautilus Institute. Readers should note that Nautilus seeks a diversity of views and opinions on contentious topics in order to identify common ground.

II. Comments by the ROK Civil-Military Joint Investigation Group in the ROK Ministry of National Defense

The assertions of Prof. Lee and Suh on the Civilian-Military Joint Investigation Group investigation results are: First, the JIG's conclusion on the external explosion is groundless. The conditions of the salvaged hull, as well as the bodies of the survivors and deceased crew members, do not indicate the signs of an external impact.

Second, it is not possible to establish a causal linkage between the Cheonan's sinking and the torpedo. The JIG's EDS and XRD analysis data on the adhered substances obtained from the hull, a torpedo and the underwater explosion experiment do not have any linkage with an explosion.

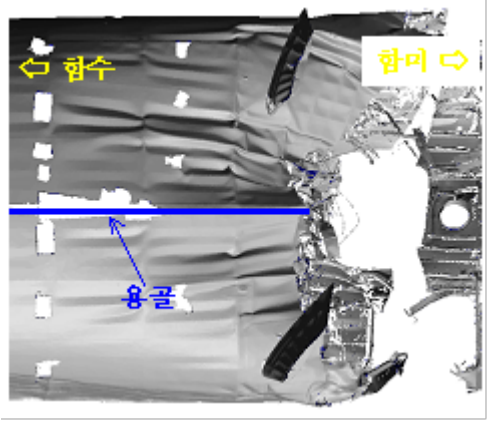
Third, the JIG failed to demonstrate that the torpedo was manufactured by the DPRK. The fact that the inscription "1?(No.1 in English)" was perfectly preserved in the explosion is scientifically unexplainable and goes against a regular court of law.

The ROK Civ-Mil JIG's positions regarding these assertions are:

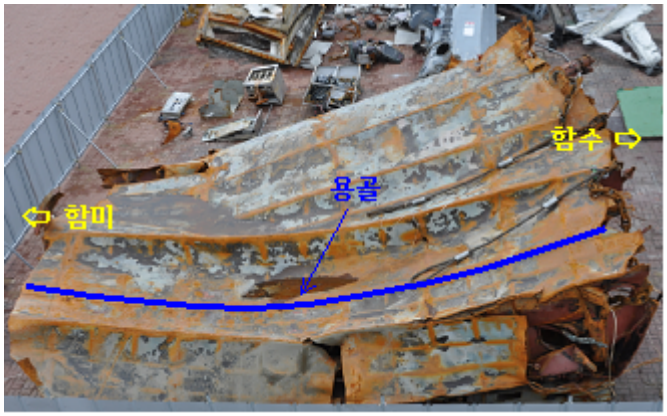
"First, the JIG's conclusion on the external explosion is groundless. The conditions of the salvaged hull, as well as the bodies of survivors and deceased crew members, do not indicate the signs of an external impact."

The ROKS Cheonan was split and sunk due to shockwave and bubble effect generated by a non-contact underwater explosion (depth 6~9m).

A non-contact underwater explosion occurred below the gas turbine room, splitting the hull from the forward and aft sections of the gas turbine room, and partially detaching the gas turbine room structures (Figure 1). The fractured surface is the forward and aft parts of the gas turbine room, and shearing fractures were observed along the area where the gas turbine room was ripped off due to the enormous external pressure exerted from the lower part, and brittle fractures were identified on the rest of the fractured surface. The gas turbine shell plates, under which a non-contact underwater explosion took place, were deformed in concave shape resembling the shape of the bubble (Figure 1). The stern bottom fractured surface, connected to the severed hull, also shows a spherical shape deformation (Figure 2).



Bottom Shell Plates of Gas Turbine Room



Deformation Of Bow Hull Bottom

A shockwave, which is produced by a non-contact underwater explosion, is spherical wave and the pressure inside is very high. However, since the shockwave dissipates swiftly in all-directions and collapses accordingly, it does not apply a significant damage on the hull. Even though the magnitude of bubble effect generated after the shock wave release is less in its pressure, and slower in its speed compared to the shock wave, the process of expansion and contraction of the gas bubble causes damage to the hull, and the hull is severed by the water jet produced from the bubble collapse. This does not deliver a fatal impact to the bodies of the crew members within the ship. The survived and deceased crew members of the ROKS Cheonan suffered fractures, lacerations, and bruises. The physical conditions correspond with what would result from bubble jet effect generated by an underwater explosion. The 8 severely wounded crew members suffered fractures on the lumber (3), rib(2), right clavicle(1), spine(1), and thighbone(1). Fractures, lacerations, and bruises were also observed from the recovered bodies of the 40 deceased crew members.

"The JIG's EDS and XRD analysis data on the adhered substances obtained from the hull, torpedo, and underwater explosion experiment do not have any linkage with an explosion."

Prof. Lee and Suh's arguments are that 1) although crystallized aluminum is visible in XRD [1] data of the adhered substances from the underwater explosion experiment conducted by the JIG, it is absent in XRD data of the adhered substances obtained from the ROKS Cheonan hull and the recovered torpedo part. Therefore, the ROK Cheonan incident was not caused by a torpedo. 2) According to the furnace experiment conducted by them, both crystallized aluminum and crystallized aluminum oxide were generated by the melting and cooling of aluminum. Based upon the reasons above, they asserted that the JIG's report, which found that mostly amorphous aluminum oxide was produced, is invalid, leading to the conclusion that the JIG's data were fabricated.

The JIG explanation for these assertions, however, is that the crystallized aluminum was detected in XRD analysis result of the adhered substances from the underwater explosion experiment, because the presence of only a little amount of adhered substances limited XRD measurements and hence, the analysis had to be conducted while the adhered substances were still attached to the aluminum plate, which was originally placed on the water tank for the experiment.

The detection of aluminum components in the EDS [2] analysis result of the adhered substances obtained from the Cheonan hull and recovered torpedo part, coupled with the lack of such aluminum components in the XRD data (XRD confirms the crystallization of chemical compound), prove that the aluminum oxide was indeed in amorphous form.

On the contrary, the furnace experiment by Prof. Lee is only a demonstration of a change in thermodynamics. In the experiment, aluminum was heated up to 1100 degrees C for 40 minutes, followed by the cooling of the substance for 2 seconds through immersion. As a result, only parts of

the surface were oxidized while the rest simply remained as crystallized aluminum.

An explosion of an explosive containing aluminum typically occurs at high temperatures of above 3,000 degrees C, at above 200,000 atmospheric pressure, and within one-thousandth to one-ten thousandth of a second. Given that aluminum undergoes rapid cooling following a rapid reaction to the oxygen components of an explosive in these extreme conditions, most of the aluminum becomes amorphous aluminum oxide.

It is clear that the data from the Prof. Lee's experiment cannot be used to verify these results, since the furnace experiment carried out by Prof. Lee cannot produce the chemical reactions under extreme conditions such as would have occurred in the ROKS Cheonan incident.

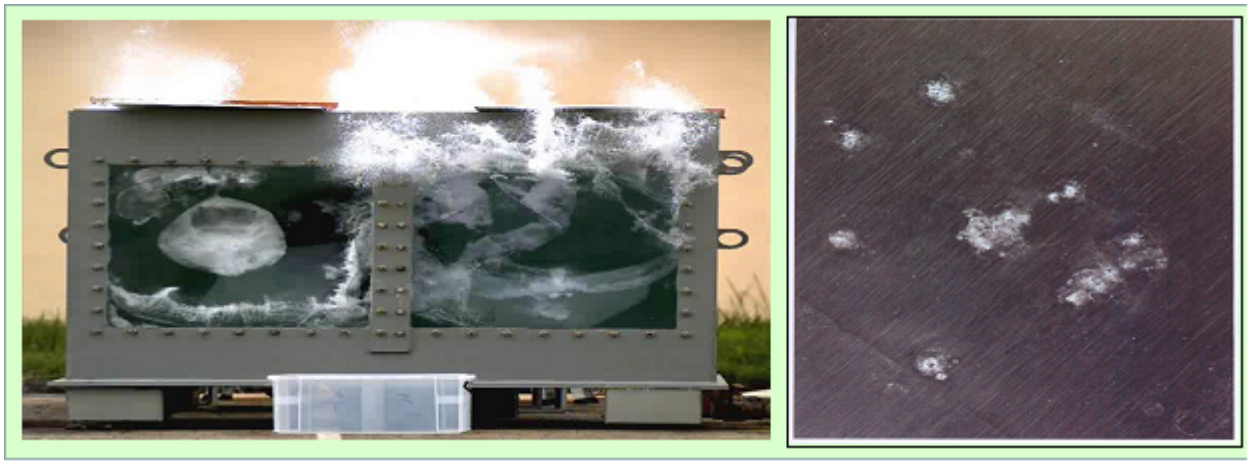
Analysis of Adhered Substances:

Collection of the adhered substances: Bow, stern, stack, and torpedo propulsion motor (10 locations)



Underwater explosion experiment

• Condition : Size of water tank: 2m?1.5m?1.5m / seawater 4.5ton

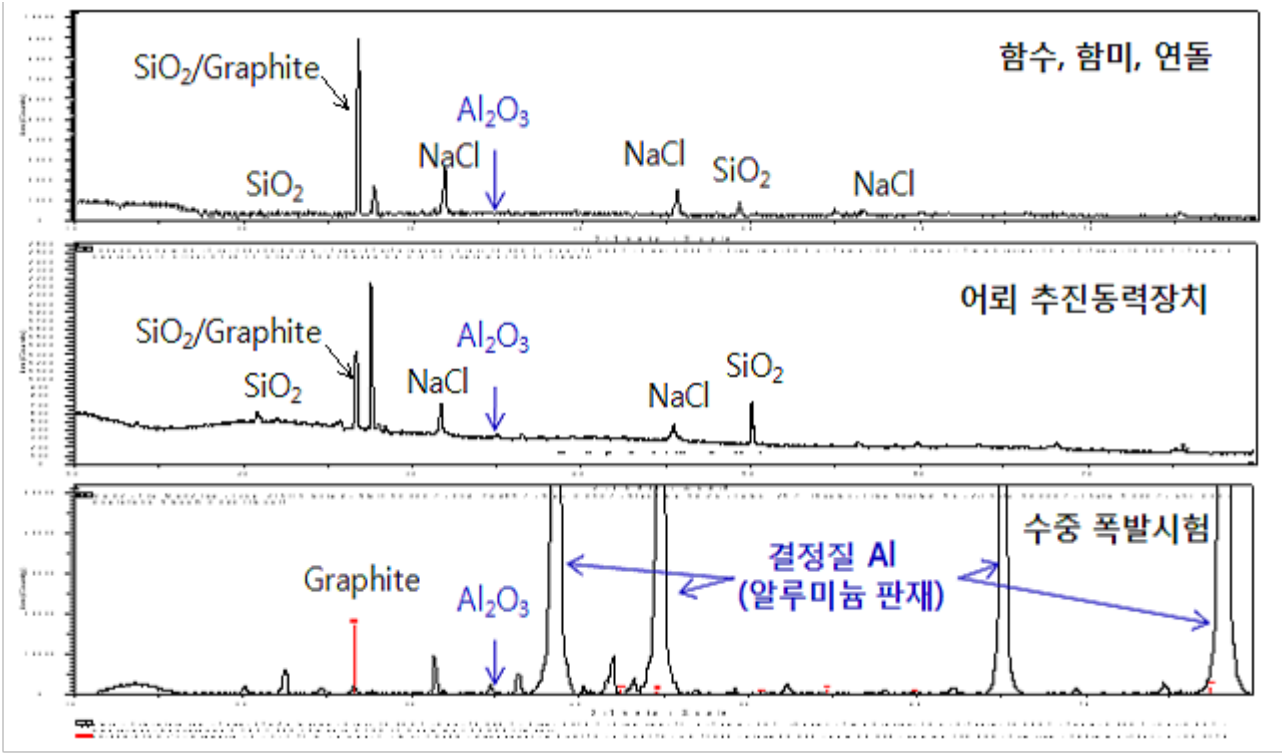


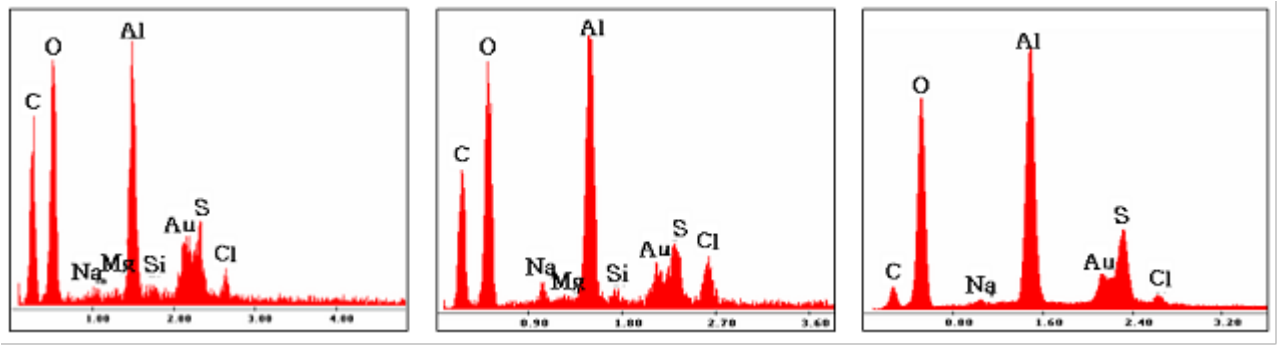
Explosive charge : 15g (RDX, TNT, AL powder, etc.)

○ **Composition analysis result**

Detected substances	Content(%)	Note	Detected substances	Content(%)	Note
Aluminum oxide	45~55	Amorphous	Sulfur	3.5(2.4)~4.5(8.6)	
Carbon	0.6~3.0	Partially graphite	Moisture, etc.	36~42	

EDS Result: Identical explosive elements were detected: (C, O, AL)





<Bow, Stern, Stack> <Torpedo propulsion motor> <Underwater explosion experiment>

X-ray diffraction result: Only a little amount of crystallized aluminum oxide was detected. Evidence that most products are amorphous aluminum oxide

"The fact that the inscription "1?(No.1 in English)" was perfectly preserved in the explosion is scientifically unexplainable and goes against a regular court of law."

The torpedo explosion was a non-contact underwater explosion under the condition of a water temperature of 3 Degrees C. The torpedo consists of a target detection section (70cm), warhead (72cm), battery (4.125m), and propulsion motor (1.805m). Therefore, even if an explosion took place at the warhead (72cm), the battery (4.125m) would absorb the explosive force. Also, the end part of the propulsion section where the "1?" inscription was found is protected by a maintenance cap. Furthermore, the inside of this section was already filled up with 3 Degrees C water upon the firing of the torpedo.

Simulation results found that the diameter of the gas bubble is approximately 6m when generated by the explosion of the explosive of 250kg charge size, and that the expansion of the gas bubble would push back the torpedo propulsion motor by 30~40m. Furthermore, the lubricant at the front of the

steering section (located at the end part of the propulsion section) and motor were not burnt, confirming that the high heat was not fully delivered to the rear propulsion section.

A detailed analysis of the "1?" inscription was conducted using a spectroscope. This analysis found that the inscription is marked on anti-corrosive paint (polyvinylbutyral), which was applied on the iron part of the propulsion motor and has a color similar to stainless steel. It was confirmed that the "1?" inscription remained intact due to the fact that the painted area was not damaged by heat. The conditions of the Cheonan should be emphasized again, where no traces of flame or heat damage were found inside the Cheonan or on the electric wire covers and other interior materials.

In conclusion, the assertions of Prof. Lee and Suh regarding the physical conditions of the survivors and deceased members, adhered substances, and "1?" inscription on the torpedo propulsion motor are different from the truth.

III. References

[1] XRD(X-Ray Diffraction) test : A test to confirm the crystallization of a chemical compound.
[2] EDS: (Energy Dispersive Spectroscopy) test : A test to discern the element composition of a substance.

IV. Nautilus Invites Your Responses

The Northeast Asia Peace and Security Network invites your responses to this essay. Please send responses to: napsnet@nautilus.org. Responses will be considered for redistribution to the network only if they include the author's name, affiliation, and explicit consent.

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