International Journal of Applied Science and Engineering Review

IJASER

ISSN: 2582-6271

Vol. 5, Issue.3, May-June 2024, page no. 18-20

To cite this article: Yeuncheol Jeong (2024). THE OPERATION DESERT STORM AND THE PATRIOT MISSILE DEFENSE SYSTEM [2] -THE SCUD AND THE PATRIOT MISSILES, International Journal of Applied Science and Engineering Review (IJASER) 5 (3): 18-20 Article No. 193 Sub Id 294

THE OPERATION DESERT STORM AND THE PATRIOT MISSILE DEFENSE SYSTEM [2] -THE SCUD AND THE PATRIOT MISSILES

Yeuncheol Jeong

Quality Assurance and Accreditation Department, Philippine School Doha, Doha, State of Qatar

DOI: https://doi.org/10.52267/IJASER.2024.5303

ABSTRACT

Postol questioned whether the Patriot is fully equipped to handle all the non-linear butterfly effects of the Scud in the air. To make the matter worse, once it re-enters the atmosphere toward a target, the breaking pieces of the Scud then act as some sort of multi-warheads of the more advanced modern ballistic missiles. The Patriot system may not be able to handle the incoming pieces of the Scud at its short range of defense.

KEYWORDS: projectile, trajectory, air friction; non-linear effects, butterfly effects, Patriot, Scud, ballistic missiles, multi-warheads, operation desert storm

INTRODUCTION

Some computer simulations for high speed trajectory of an object in the air have been attempted and claimed to be at least partially successful. In spite of these claims, simulating an actual high speed trajectory of an object in the air is quite difficult to achieve due to a various effects of air frictions. The realistic high speed trajectory motion shows vibrations, circular rotations and sideway swing motions. On top of these, a combination of these effects adds some additional non-linear “butterfly effects”, which further complicate an actual trajectory under air friction.

Engineers are constantly aware of these “butterfly effects” and they know that they may not be able to simulate the actual high speed trajectory even in the near future, regardless of some claims of successful simulations. This work presents a historical case study on a realistic fast moving object, in this case, a missile.

International Journal of Applied Science and Engineering Review

IJASER

ISSN: 2582-6271

Vol. 5, Issue.3, May-June 2024, page no. 18-20

The Scud and the Patriot Missiles

The US led allied forces including Saudi Arabia and Israel invaded Iraqi occupied Kuwait in January, 1991 after the Iraq armed forces annexed Kuwait in Aug 1990. This invasion of the allied forces was known as "the operation desert storm." Since the allied invasion, Iraq then launched a number of their Scud missiles toward Saudi Arabia and Israel. Against these Scud missiles, the US provided the Patriot surface to air missile defense system developed by Raytheon to Saudi Arabia and Israel to counteract the missile threats from Iraq.

Once launched, the Scud missile will be propelled by its rocket up to 35 miles from the ground (Collins, 2012). Then, above 35 miles after its rocket's burn out, due to its inertia, the Scud continues its ascending motion up to the maximum height of 100 miles from the ground. Afterwards, the Scud will be descending with an acceleration reaching a maximum speed of 4400 miles per hour toward a target on the ground. The Patriot system starts to trace the Scud by radar as high as 25 miles from the ground. The Patriot missile will then be launched against the Scud with a maximum speed 3800 miles per hour before the Patriot explodes into pieces with its debris speed of 1800 miles per hour. Thus, the maximum speed of the debris combined with the speed of the Patriot missile is 5600 miles per hour. This means that the relative speed of the Scud and the Patriot is up to 10000 miles per hour or, in other words, almost 5km per second.

Although the high relative speed of 5km per second is formidable, for every single Scud missile, the Patriot defense system was announced to be 100% successful by its manufacturer, Raytheon. This claim was well received at least by the general public and the mainstream mass media at that time. Almost all the people in the world had never raised a single question about the effectiveness of the Patriot system against the Scud. However, Theodore Postol, Professor of Science, Technology and National Security Policy in the Program in Science, Technology, and Society at MIT was probably the only person who raised the question about the effectiveness of the Patriot. In fact, he even suggests that the Patriot system may have a zero effectiveness against its enemy missile, meaning no single Scud missile was ever effectively counter measured by the Patriot system.

He reasoned that the Patriot is not fully equipped to handle all those non-linear butterfly effects of the Scud caused by air frictions (Shapiro, 1961). To make the matter worse, the Scud missile starts to break into pieces once it re-enters the atmosphere toward a target from its maximum altitude. The breaking pieces of the Scud then act as some sort of multi-warheads of the more advanced modern ballistic missiles. From the Patriot's point of view, the Scud not only behaves unexpectedly in the atmosphere due to the air frictions but also its breaking pieces show some features of multi warheads once they come closer toward a target. The Patriot missile defense system is only designed for a close-range interception from a target.

International Journal of Applied Science and Engineering Review

IJASER

ISSN: 2582-6271

Vol. 5, Issue.3, May-June 2024, page no. 18-20

According to Professor Postol, the patriot cannot possibly handle these incoming pieces of the Scud at this short range of coverage within the time given.

CONCLUSION

Professor Postol claimed that the Scud not only behaves unexpectedly in the atmosphere due to a various effects of air frictions, but also its breaking pieces show some features of multi warheads once they come closer toward a target. And, the Patriot cannot possibly handle the incoming pieces of the Scud at the short range of its defense.

REFERENCES

Collins, Harry M., *The Golem: What You Should Know About Science*, Cambridge University Press; 2nd edition, 2012

Shapiro, Ascher H., *Shape and Flow: the Fluid Dynamics of Drag*, Anchor Books/ Doubleday; 1st edition, 1961