# Article information:

Beyond the Solid Core Nuclear Thermal Rocket: A Computational Investigation into Criticality and Neutronics Performance of Advanced Liquid and Gas Core Reactor Approaches for Next Generation Performance
<https://deepblue.lib.umich.edu/handle/2027.42/174288>

# Article summary:

1. The gas core nuclear rocket concept offers advantages over conventional propulsion systems, such as high thrust and fuel efficiency.

2. Challenges to the realization of this technology include stably confining the fissioning gas core, preventing plasma erosion due to mixing, optimizing heat transfer from uranium plasma to hydrogen propellant, protecting nozzle from high-temperature exhaust, and obtaining a self-sustaining critical nuclear rocket engine.

3. Criticality analysis and heat transfer analyses were carried out in order to optimize the geometry and heat transfer of the engine, resulting in a specific impulse ranging from 1000 s to 6200 s and a thrust ranging from 50,000 N to 300,000 N with a mass of approximately 100,000 kg.

# Article rating:

Appears moderately imbalanced: The article provides some useful information, but is missing several important points or pieces of evidence that would be required to present the discussed topics in a balanced and reliable way. You are encouraged to seek a more balanced perspective on the presented issues by exploring the provided research topics and looking at different information sources.

# Article analysis:

The article “Beyond the Solid Core Nuclear Thermal Rocket: A Computational Investigation into Criticality and Neutronics Performance of Advanced Liquid and Gas Core Reactor Approaches for Next Generation Performance” is an informative piece that provides an overview of the potential benefits of using gas core nuclear rockets for space exploration beyond low Earth orbit. The article does provide some evidence for its claims by citing research studies that have been conducted on this topic. However, there are some areas where more information could be provided in order to make the article more reliable. For example, while the article mentions some challenges associated with using gas core nuclear rockets (e.g., stably confining the fissioning gas core), it does not provide any details about how these challenges can be addressed or what solutions have been proposed by researchers in this field. Additionally, while the article mentions that criticality is possible if certain technical challenges are addressed, it does not provide any evidence or data to support this claim. Furthermore, while the article mentions that hydrogen propellant temperatures can vary depending on uranium core temperature, it does not provide any information about how these temperatures are determined or what factors influence them. Finally, while the article mentions that an optimized nozzle was designed for this type of rocket engine commensurate with its high chamber pressure requirements, it does not provide any details about how this nozzle was designed or what materials were used in its construction. In conclusion, while this article provides an interesting overview of gas core nuclear rockets and their potential benefits for space exploration beyond low Earth orbit, it could benefit from providing more detailed information about how these challenges can be addressed and what solutions have been proposed by researchers in this field in order to make it more reliable and trustworthy.

# Topics for further research:

* Gas core nuclear rocket criticality
* Gas core nuclear rocket neutronics performance
* Gas core nuclear rocket stably confining fissioning gas core
* Hydrogen propellant temperature uranium core temperature
* Optimized nozzle design gas core nuclear rocket
* High chamber pressure requirements gas core nuclear rocket

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