4. 학사논문 지도교수: 김 윤 호

4-1. Development of hypervelocity launcher

4-2. High or hypervelocity impact simulation with meta-materials

4-3. Development of sabot separator under high vacuum condition

4-4. Non-structural hypervelocity impact shielding system

4-5. Feasibility study on cost-effective space travel

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Extreme Environments and Impact Lab. (EI Lab) https://sites.google.com/view/eilab/

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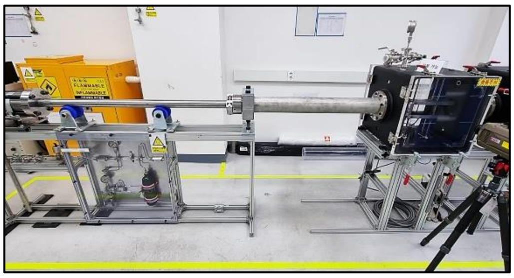
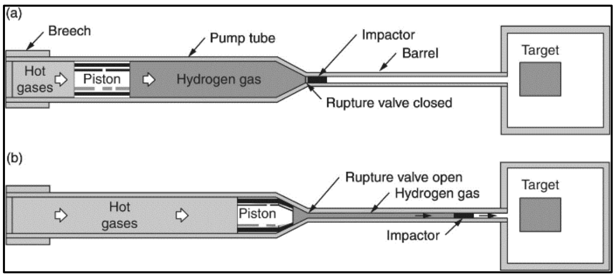
4-1. Development of hypervelocity launcher

YeonSu Kim





■ Introduction:

This proposal aims to develop a hypervelocity (typically over 3km/s) gas gun for material science research, with improved accuracy, repeatability, and versatility.

■ Objectives:

1. Design and simulate a hypervelocity gas gun.
2. Prototype and test the gun.
3. Validate the gun's accuracy, repeatability, and versatility.

■ Expected Outcomes:

1. Advanced hypervelocity gas gun for material science.
2. Safety strategies for hypervelocity launch system
3. Improved understanding of material properties under high-speed impacts.
4. Advancements in hypervelocity gas gun technology.

■ Conclusion:

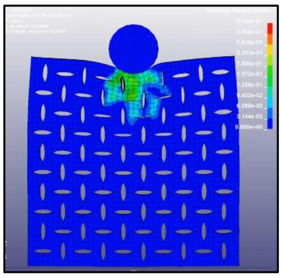
The development of a better hypervelocity gas gun will have significant impact on material science research. This proposal outlines the steps for creating such a gun.

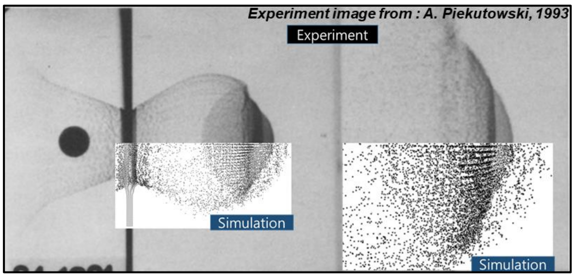
■ References:

https://www.youtube.com/watch?v=B4QGtVyIRHc&ab_channel=NASAVideo
https://hemi.jhu.edu/home/facilities-and-equipment/hyfire/high-speed-imaging/

4-2. Metamaterials Under High Velocity Impact: A Simulation Study

YeonSu Kim





■ Introduction:

A simulation method is needed to understand metamaterials' behavior under high-velocity impacts, as current methods lack accuracy.

■ Objectives:

1. Develop a simulation framework that accurately represents metamaterial properties.
2. Validate the simulation with experimental tests and comparisons.
3. Conduct high-velocity impact simulations with metamaterials.

■ Expected Outcomes:

1. Simulation method for high-velocity impact with metamaterials.
2. Improved understanding of metamaterial behavior under extreme conditions.
3. Advancements in simulation methods for high-velocity impact.

■ Conclusion:

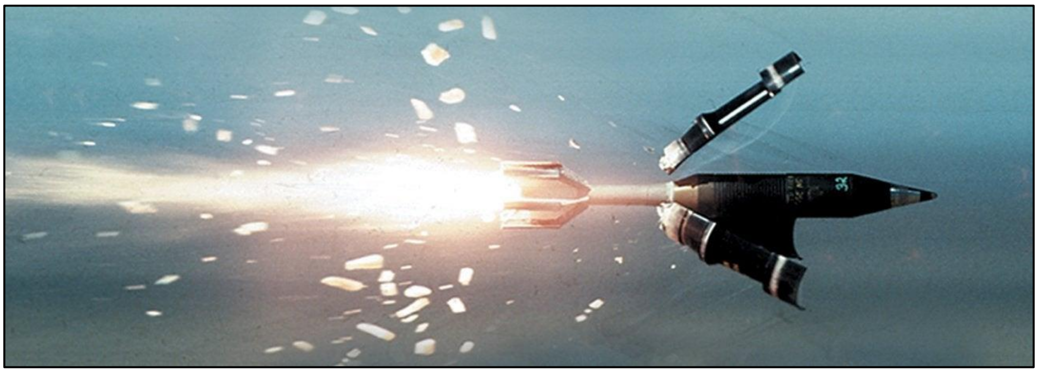
This proposal aims to develop a simulation method for high-velocity impact with metamaterials to better understand their behavior and advance simulation methods.

■ References:

https://www.sciencedirect.com/science/article/abs/pii/S0734743X18300939

4-3. Development of sabot separator under high vacuum condition

Dr. Sarath Kumar Sathish Kumar



- Introduction:

High-vacuum conditions are often used in high-speed material testing to reduce the effects of air resistance. Sabot separators are essential components in these tests, but their performance can be negatively impacted by high vacuum conditions.

- Objectives:
  1. Investigate the impact of high vacuum on sabot separator performance.
  2. Design an optimized sabot separator for high vacuum.
  3. Validate the optimized sabot separator with experiments and comparisons.

- Expected Outcomes:
  1. Optimized sabot separator for high vacuum.
  2. Improved understanding of high vacuum impact on sabot separator performance.
  3. Advancements in sabot separator technology for high-speed material testing.

- Conclusion:

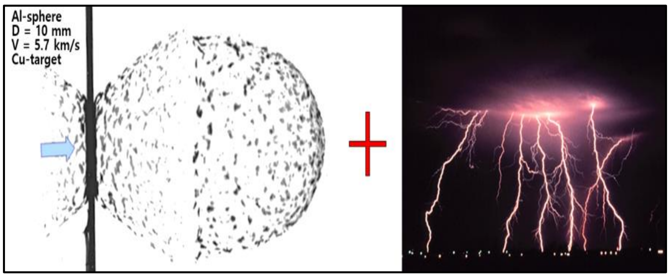
The development of a sabot separator that is optimized for use in high-vacuum conditions will greatly improve the accuracy of high-speed material testing. This proposal outlines a comprehensive approach to developing such a component, and has the potential to significantly advance the field of high-speed material testing.

- References:

https://www.youtube.com/watch?v=0giK-zqrAKI&ab_channel=hw97karbine

4-4.   Non-structural hypervelocity impact shielding system

JinHyeok Seok



■ Introduction:

Hypervelocity impacts pose a risk to spacecraft. To reduce weight and improve efficiency, we propose a non-structural impact shielding system that incorporates electric discharge.

■ Objectives:

1. Investigate electric discharge for impact protection.
2. Design a non-structural system incorporating electric discharge.
3. Validate performance through experiments and comparison with existing solutions.

■ Expected Outcomes:

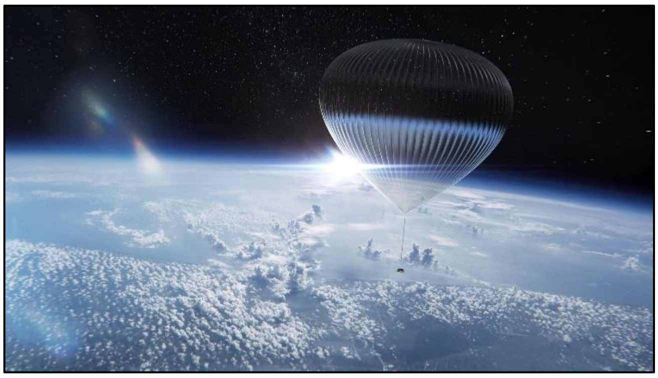
1. Non-structural impact shielding system with electric discharge.
2. Improved understanding of electric discharge for impact protection.
3. Advancements in impact protection technology for space exploration.

■ Conclusion:

This proposal outlines a comprehensive approach to developing a non-structural hypervelocity impact shielding system. The resulting system will provide improved hypervelocity impact protection while reducing the weight and increasing the efficiency of the overall system. This has the potential to greatly benefit the field of space exploration and protection.

4-5. Feasibility study on cost-effective space travel

JinHyeok Seok



- Introduction:

This study aims to evaluate the feasibility of cost-effective space travel. High cost remains a significant barrier to progress in space missions.

- Objectives:
  1. Analyze costs associated with space travel methods.
  2. Evaluate potential for cost savings in launch vehicles, spacecraft design, and mission operations.
  3. Assess feasibility of new technologies for reducing cost.
  4. Provide cost-effective recommendations for future space missions.

- Expected Outcomes:
  1. Assessment on different space travel methods
  2. Recommendations for cost-saving strategies in space travel.
  3. Basis for future research and development in the field.

- Conclusion:

The study will provide important insights into the feasibility of cost-effective space travel and contribute to the future of space exploration and commerce.

- References:

https://www.youtube.com/watch?v=QKq4sLERZ4M&ab_channel=CNET