

# Slosh Damping Using Magneto-Active Propellant Management Device

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## Issues



Figure 1. Tanker Accidents due to uncontrolled moment



Figure 2. A trajectory deviation of the rocket (Falcon, 2007)



Figure 3. Internal cracks in the Volvo bus fuel tank

## Liquid Slosh

Movement of free surface of a liquid within a container or a propellant tank.

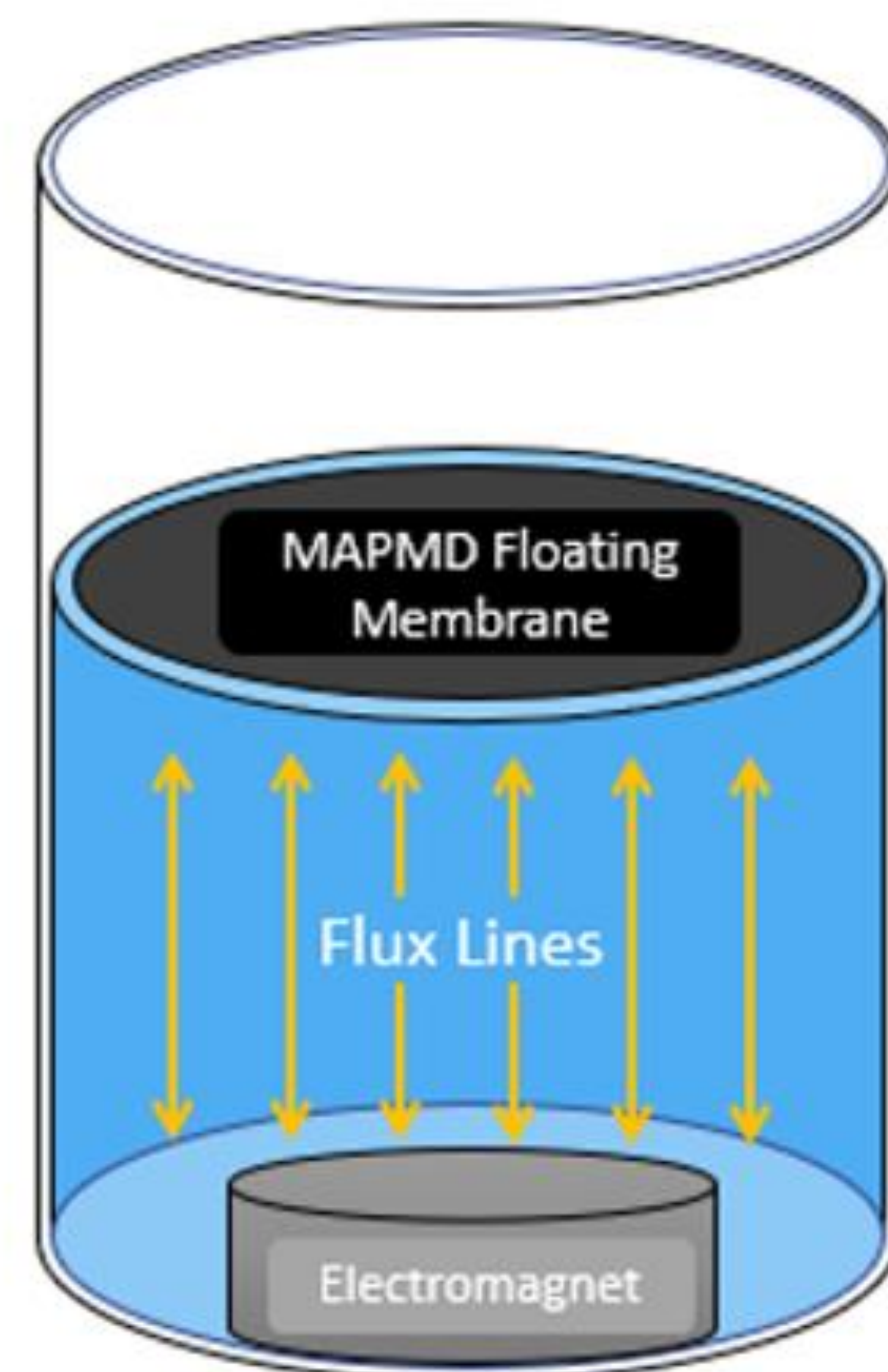
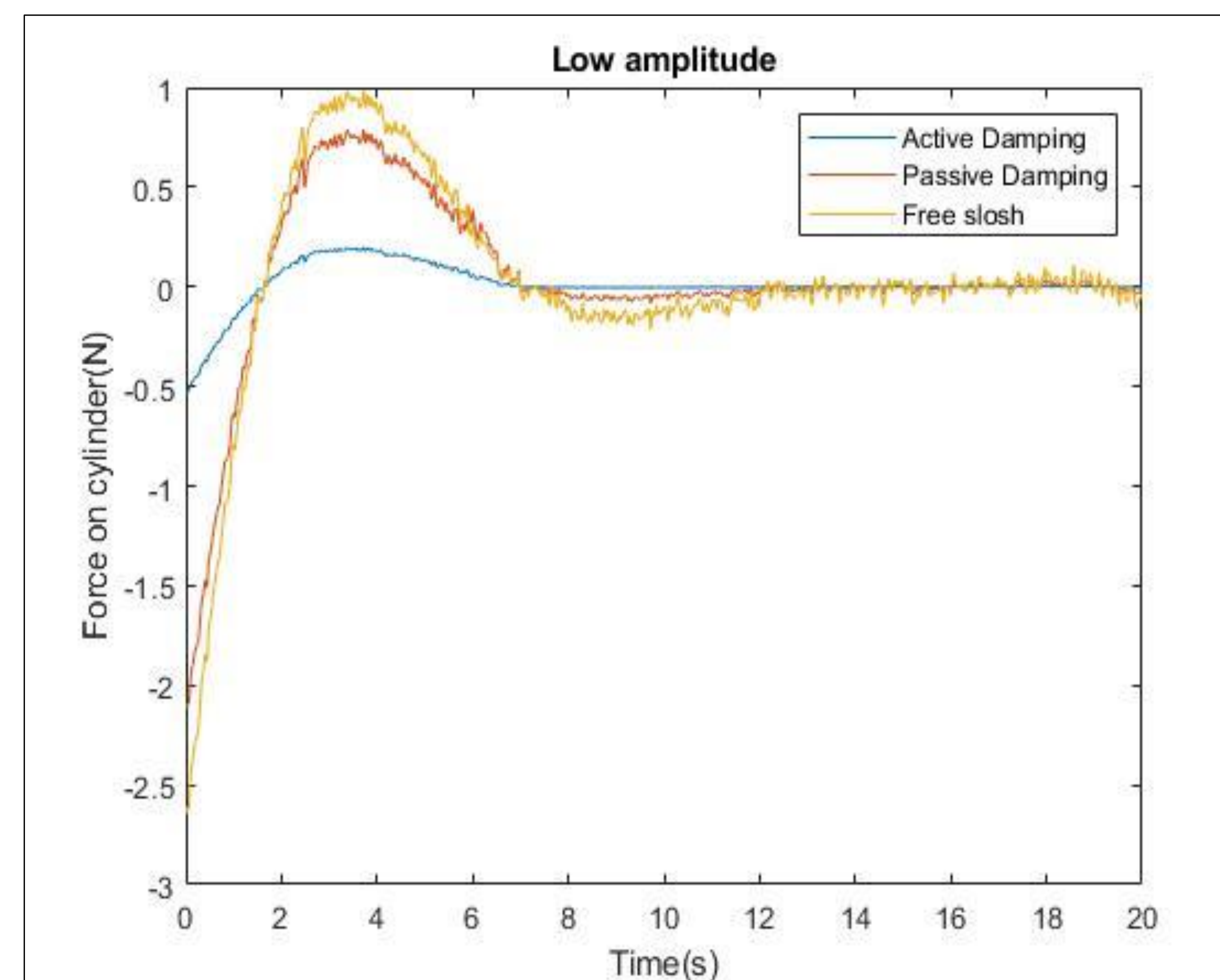
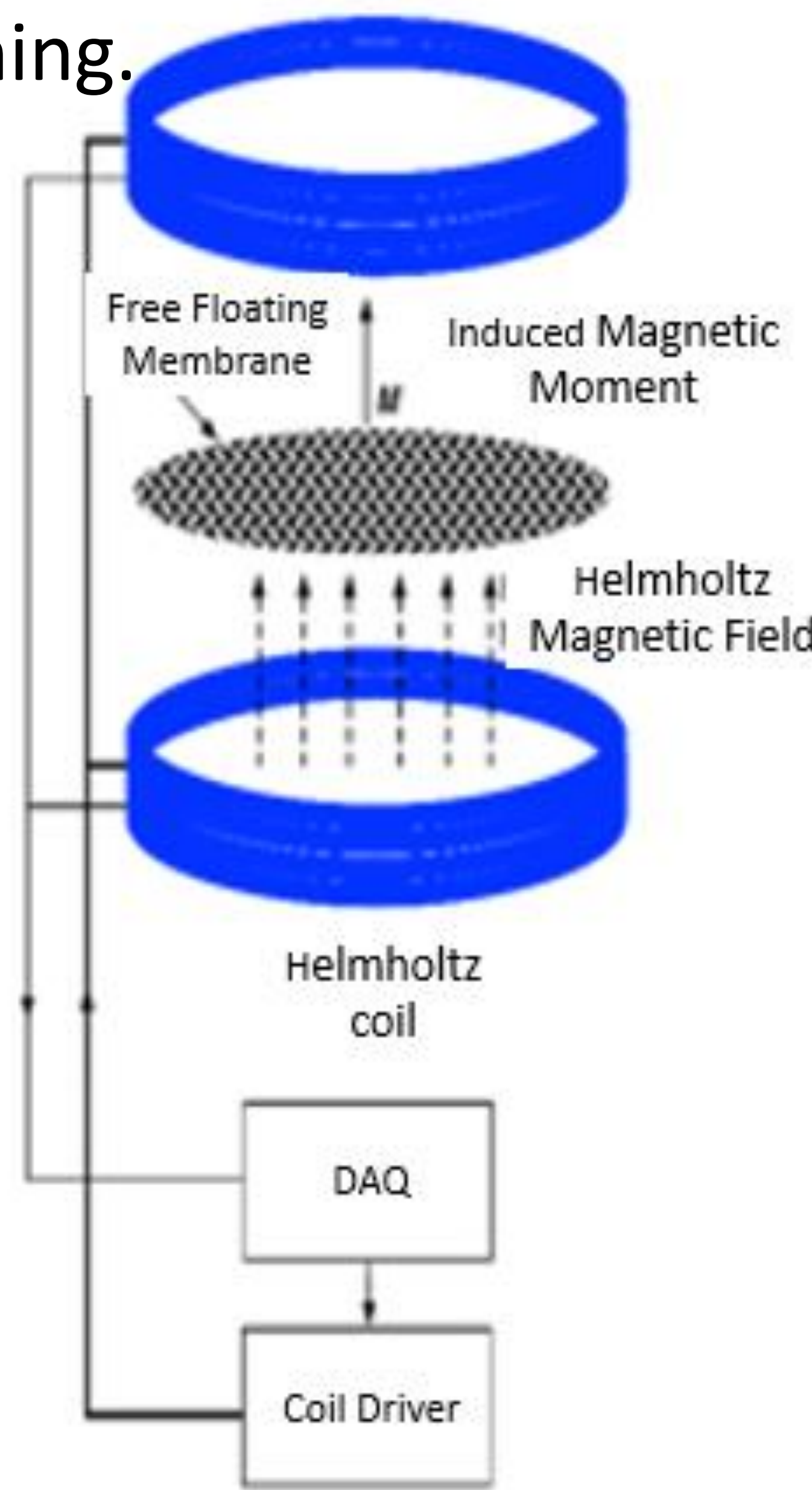


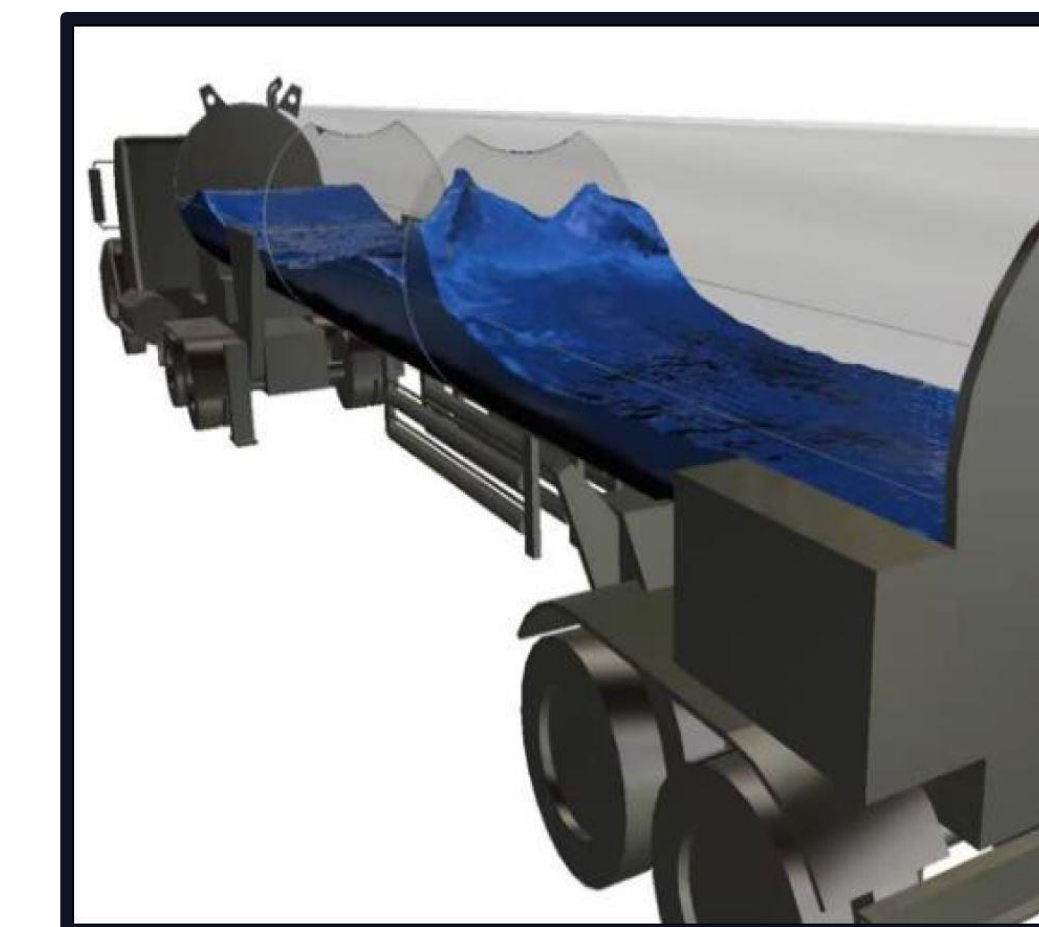
Figure 4. For MAPMD active condition, no visible deviation and synchronous peaks in the plot is seen. This can be attributed to the fact that slosh wave amplitudes are low in this condition and damping can be attained at 6s. For inactive and free slosh condition, deviations in the curve can be seen even after 20s.

## Working Principle

Sloshing in the propellant tank is controlled by electromagnetic membrane which creates a downward force to reduce sloshing.



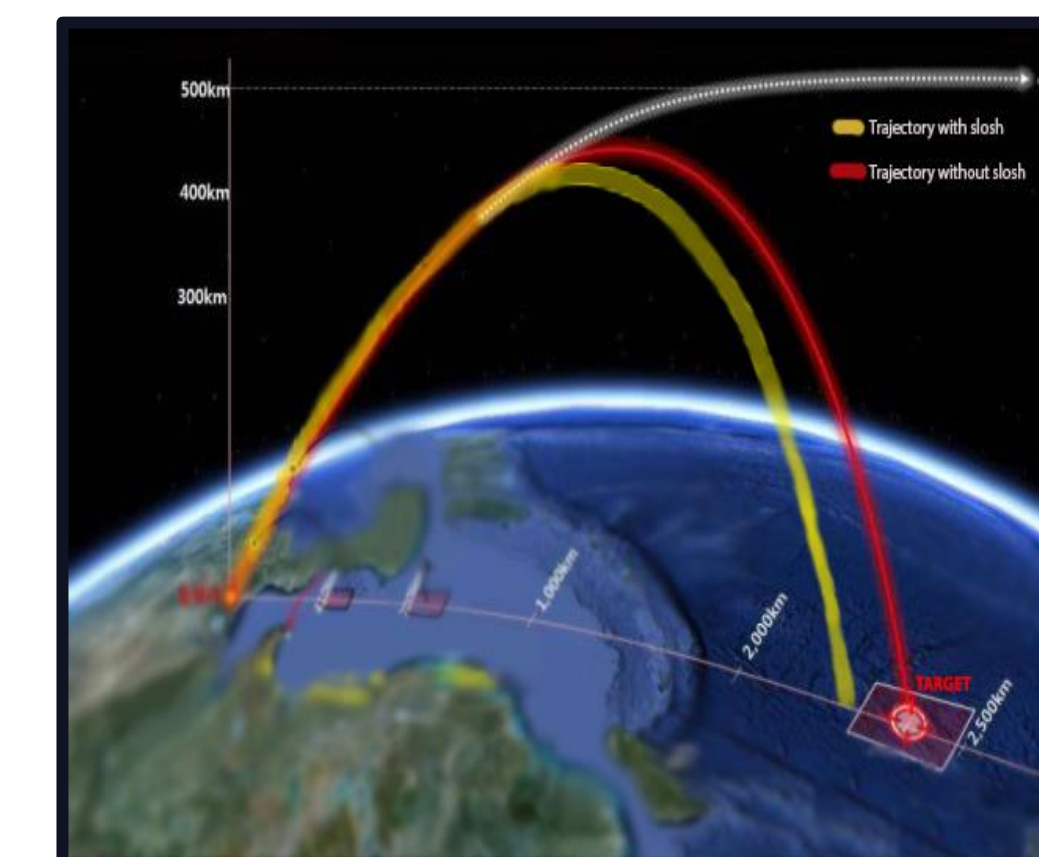
## Applications



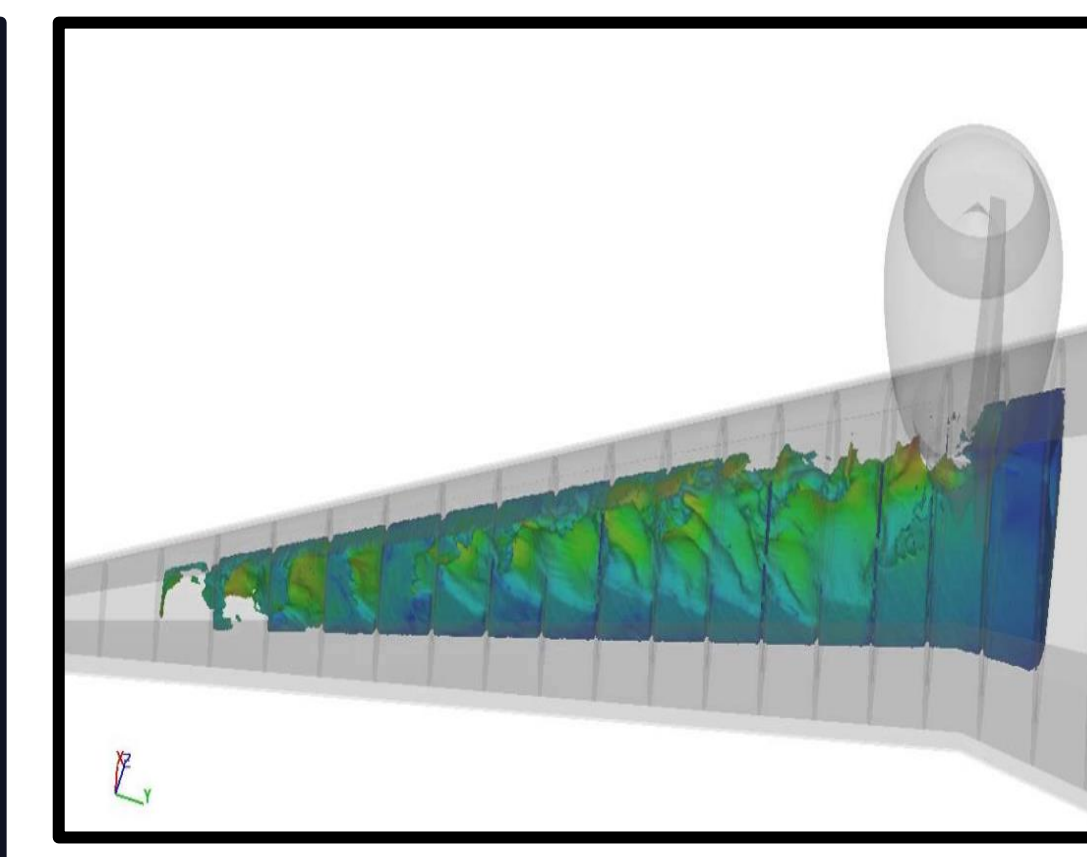
Tanker



Oil train



Missile Trajectory



Aircraft Fuel tank



Space Mission



Marine

## Patented Technology

US 2016/0203901 A1 US 2016/0318708 A1

(19) United States (19) United States  
 (22) Patent Application Publication (43) Pub. No.: US 2016/0203901 A1  
 Sivasubramanian et al. (43) Pub. Date: Jul. 14, 2016  
 (22) Patent Application Publication (43) Pub. No.: US 2016/0318708 A1  
 Kim et al. (43) Pub. Date: Nov. 3, 2016

(54) HYBRID MAGNETO-ACTIVE PROPellant MANAGEMENT DEVICE FOR ACTIVE SLOSH DAMPING IN SPACECRAFT (51) Int. Cl. B60G 2300 (2006.01) (52) U.S. Cl. 2016/0203901 A1 (57) ABSTRACT

(54) FLOATING ACTIVE BARRIERS SYSTEM AND METHOD OF SLOSH DAMPING COMPRISING THE SAME (51) Int. Cl. B60G 2300 (2006.01) (52) U.S. Cl. 2016/0318708 A1 (57) ABSTRACT

This disclosure provides a system for damping slosh of a liquid within a tank, a baffle for use in the system, and a method of damping slosh using the system. The system includes a plurality of baffles. Each baffle has a body configured to substantially float upon the liquid. Each baffle also has an activation material received along at least a portion of the body. The activation material is magnetically responsive in the presence of a magnetic field. The system further includes an actuator configured to provide the magnetic field.

