WILLIAM E. BOEING DEPARTMENT OF
AERONAUTICS & ASTRONAUTICS
College of Engineering

Motion Damping System Test Procedure (at atm)

Version 1.0, <Date 2024-04-03>

Date: _____ / _____ / _____
yyyy mm dd

Part Number: _____

Serial Number: _____

Initials: _____, _____, _____, _____

Test Objective

Verify through testing that the motion damping system is able to generate a damping factor of 0.476 by collecting velocity measurements captured on a video camera using results from a hanging pendulum setup of the magnet/magnet housing and the conducting aluminum plate. The magnet/magnet housing will be fixed to the moving pendulum arm, while the conducting aluminum plate will be fixed 0.2 inches away from the point of maximum velocity in the motion of the arm.

Equipment Required

Qty	Description	Specs/Calibration	Check
1	*Magnet*	*1/8" diameter, 1/4" thickness cylinder magnet*	
1	*Magnet housing*	*Custom printed*	
1	*Set-screw*	*Size #4*	

1	*Conducting aluminum plate*	*6061 aluminum, 0.04” thick, 1” square*	
1	*String*	*Nylon, 10”*	
1	*Duct tape*		
1	*Slow motion camera*	*Function on iPhone XR*	

Test Procedure

1 Setup & Safety Checks

Slot magnet into magnet housing hole. OK? _____

Fix the magnet in place using the set screw. OK? _____

RECORD weight of system Measured: _____

Using the bolt holes in the magnet housing, tie the string to the magnet housing apparatus. OK? _____

CHECK that when the system is held up on the string side, the magnet face hangs straight down toward the ground. IF NOT, retie string. OK? _____

Using duct tape, tape the string side of the system to a rigid surface such that the magnet housing hangs toward a work surface with the ability to swing freely. OK? _____

Ensure the clearance distance between the exposed magnet face and the work surface is approximately 0.2 inches at the lowest point in the pendulum motion. OK? _____

RECORD the actual clearance distance between the exposed magnet face and the work surface. Measured: _____

Measure taut string length OK? _____

RECORD taut string length. Measured: _____

Mark center point of the hanging magnet on the work surface. OK? _____

Using the marking from the previous step, tape the conducting aluminum plate down such that the centers of the free-hanging magnet and the plate are concentric. OK? _____

Set up the video camera such that its recording direction is orthogonal to the intended plane of motion of the pendulum. OK? _____

2 Power Up

Using the camera, start recording in slow motion. OK? _____

Raise the height of the magnet system while keeping the string taut. OK? _____

Measure the raised height of the magnet system OK? _____

RECORD the raised height of the magnet system. Measured: _____

3 Motion Damping Tests

Release the magnet system, allowing it to swing freely. OK? _____

Visually confirm the system is passing through the conducting plate. OK? _____

STOP recording. OK? _____

4 Shut down

Disassemble the pendulum system. OK? _____

Store the magnet, set screw, housing. OK? _____

Discard the string. OK? _____

Disassemble the system on the work surface. OK? _____

Store the conducting aluminum plate. OK? _____

Discard the tape. OK? _____

Change Log

Ver	Date	By	E-mail	Change
1.0	4/3/2024	Nathan Cheng Ben Fetters	nkcheng@uw.edu bfetters@uw.edu	Initial release.