

# Free-Play Testing

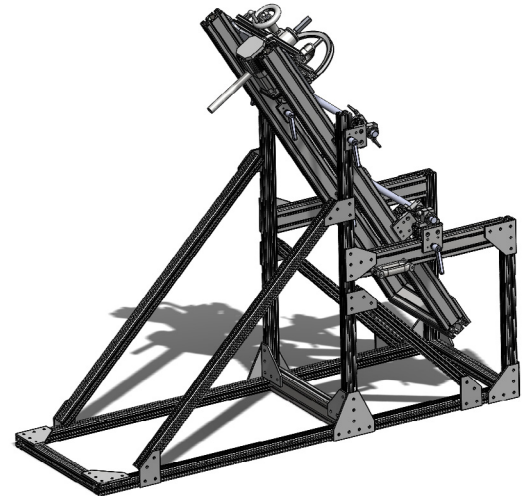
## Overview

Free-play testing is used to evaluate rotational variation in aircraft control surfaces. Excessive control surface free-play can result in flutter, vibration, fatigue, or other instabilities that may affect aircraft performance. ATA Engineering, Inc., (ATA) has developed free-play testing procedures that provide highly repeatable and precise test results with minimal aircraft downtime, and ATA has experience conducting free-play testing on aircraft ranging from large military aircraft to small commercial planes.

ATA's free-play testing procedures involve the continuous application of force on a given control surface while applied force and surface deflection are measured, providing precise and repeatable free-play measurements down to fractions of a degree as the entire load range is recorded, as opposed to measuring displacements at discrete force values. ATA's data processing software computes free-play values in accordance with the Department of Defense Joint Service Specification JSSG-2006. With ATA's automated MATLAB scripts, initial free-play estimates can also be made available to the customer within minutes after test conclusion for quick on-site data review.

ATA also designs and fabricates test-specific free-play frames based on individual aircraft parameters such as control surface height, angle, and maximum applied force. ATA's free-play frames are all tested in-house to ensure that they comply with customer requirements for safety and load capacity. Load application frames and displacement frames are designed to interact with the aircraft as non-invasively as possible, requiring no modification to the customer aircraft. All ATA free-play frames are designed to be deployable, enabling quick test setup and execution.

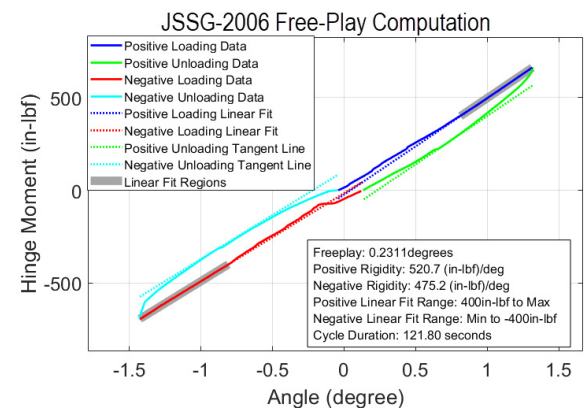
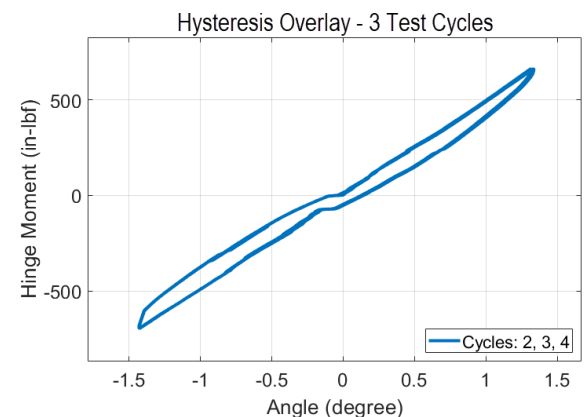
All ATA's free-play testing equipment is portable and can either be transported to the customer's facility or assembled at the customer's facility for on-site free-play tests. ATA free-play equipment includes data-acquisition systems, data analysis computers, load application frames, deflection measurement frames, displacement transducers, and force transducers.



ATA designs and manufactures custom free-play test frames to fit customer requirements.

## Why Use ATA for Your Free-Play Needs?

- ▶ ATA's free-play test results have been praised by our customers as some of the highest-quality free-play test data, and ATA has been recognized for our ability to meet demanding deadlines without sacrificing data quality.
- ▶ ATA's highly efficient free-play test procedure and real-time data processing accelerate test schedules and reduce aircraft downtime.
- ▶ Initial test results can be made available to the customer within minutes of test conclusion so that data quality can be confirmed immediately.
- ▶ ATA's ability to design and adapt test fixtures around the aircraft ensures that all test requirements are satisfied without sacrificing data quality or test scheduling
- ▶ ATA's highly experienced staff provide complete test and analysis services and bring extensive troubleshooting experience to the process, reducing risk, cost, and schedule.



ATA's free-play test procedures lead to precise and repeatable test results, with "quick look" test results available immediately after testing.