Flying Qualities
Grades 9-12

Flying Qualities is a particular discipline within the field of Aeronautics. It addresses piloted aircraft stability and controllability to ensure acceptable aircraft response, mission performance, and flight safety.

A Flying Qualities engineer is responsible for the analysis and evaluation of the aircraft’s behavior to confirm acceptable response characteristics in compliance with certain specifications and criteria. Such criteria include the Department of Defense, Military Standards, which identify satisfactory, acceptable, and unacceptable levels of response characteristics. The Flying Qualities engineer uses many tools and methods, both analytical and experimental, including simulation tests and flight tests, where pilot rating scales are often used. Such a scale that is common within the Flying Qualities community is the Cooper-Harper Rating Scale, shown below, where a rating of 1 is most desirable and a rating of 10 is most objectionable.

The term Handling Qualities sometimes refers to the short-term aircraft response irrespective of pilot comfort or workload. The term Flying Qualities sometimes refers to long-term aircraft response that takes into account pilot comfort and workload. However, the two terms are often used interchangeably to describe the general aircraft response characteristics following pilot inputs and the ease with which a task or mission can be flown.

When one considers precise flight maneuvers and tasks, such as aerial refueling, formation flying, carrier approach and landing, and cross-wind landings and takeoffs, the importance of Flying Qualities becomes more apparent. Flying Qualities have a critical bearing on the safety of flight and on the ease of controlling an aircraft in both steady and maneuvering flights. An aircraft with poor flying qualities can result in undesirable response characteristics potentially leading to catastrophic loss of vehicle and life. With the advent of sophisticated and complex flight control systems in efficient and unstable flight vehicles, the concept of Flying Qualities takes on yet additional importance.
Adequacy for Selected Task or Required Operation

- Is it satisfactory without improvement?
  - Yes
  - No
    - Deficiencies warrant improvement

- Is adequate performance attainable with a tolerable pilot workload?
  - Yes
  - No
    - Deficiencies warrant improvement

- Is it controllable?
  - Yes
  - No
    - Improvement mandatory

Aircraft Characteristics

- Excellent
- Highly desirable
- Good
- Negligible deficiencies
- Fair
- Some mildly unpleasant deficiencies
- Minor but annoying deficiencies
- Moderately objectionable deficiencies
- Very objectionable but tolerable deficiencies
- Major deficiencies

Demands on the Pilot in Selected Task or Required Operation

- Pilot compensation not a factor for desired performance
- Minimal pilot compensation required for desired performance
- Desired performance requires moderate pilot compensation
- Adequate performance requires considerable pilot compensation
- Adequate performance requires extensive pilot compensation
- Adequate performance not attainable with maximum tolerable pilot compensation
- Considerable pilot compensation is required for control
- Intense pilot compensation is required to retain control
- Control will be lost during some portion of required operation

Pilot Rating

1, 2, 3, 4, 5, 6, 7, 8, 9, 10

* Definition of required operation involves designation of flight phase and/or subphases with accompanying conditions.