



# Standard Specification for Design and Performance of Pneumatic-Hydraulic Unmanned Aircraft System (UAS) Launch System<sup>1</sup>

This standard is issued under the fixed designation F2585; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers the design and performance of unmanned aircraft system (UAS) launch system operating via a closed-loop pressurized hydraulic or pneumatic system with a hydraulic recovery, or both.

1.2 In instances where the launcher and UAS manufacturer are the same entity, compliance with this specification is the responsibility of the UAS manufacturer where applicable.

1.3 *This standard does not purport to address all of the safety concerns associated with the UAS launch system and its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *Military Standard:*<sup>2</sup>

MIL-STD-882 Standard Practice for System Safety

## 3. Terminology

3.1 *Definitions:*

3.1.1 *acceleration envelope*—range of launch accelerations (that is, acceleration curves) that the UAS launcher is capable of generating.

3.1.2 *deployed configuration*—UAS launcher's physical geometry in which it is in neutral position and ready for launch operations. Any manufacturer-prescribed check-out tests have been completed when the UAS launcher is in deployed configuration.

3.1.3 *gaseous charging agent*—compressible fluid that is pressurized to store the energy required for launch.

3.1.4 *jerk*—first derivative of the acceleration curve with respect to time; also referred to as acceleration growth rate.

3.1.5 *launch actuator*—cylinder that accepts the gaseous charging agent or liquid charging agent during expansion of the gaseous charging agent to move a piston; transfers gas or fluid pressure into an accelerating force on the shuttle assembly.

3.1.6 *launch, or exit, velocity*—velocity of the UA upon release from the launcher; UAS take-off velocity.

3.1.7 *launch lock*—mechanism that secures the shuttle assembly into the launch position to counter the force from fully pressurized pre-launch accumulator(s).

3.1.8 *launch rail*—track upon which the shuttle assembly can be accelerated prior to UA take-off.

3.1.9 *launch system*—self-contained system capable of launching a UA at prescribed take-off conditions; also referred to as a launcher or catapult.

3.1.10 *launch weight*—maximum allowable UA take-off weight not including the weight of the shuttle assembly.

3.1.11 *liquid charging agent*—incompressible fluid that can be used to fill the pre-launch accumulators to move the piston.

3.1.12 *neutral position*—UAS launcher system state in which (1) any fluids inside the pre-launch accumulators and pre-charge accumulators (if available) are at equal pressures, or (2) the system does not apply a force on the launch lock mechanism.

3.1.13 *power transmission mechanism*—used to transfer the accelerating force from launch actuator to shuttle assembly (for example, a shuttle assembly ram, cable and pulley system, etc.); power transmission mechanism may not be necessary in designs in which the launch actuators moves the shuttle assembly directly.

3.1.14 *pre-charge accumulator(s)*—similar in design to the pre-launch accumulator; allows extra space for storing gaseous charging agent between launches at a pressure lower than operating pressure; also used to achieve desired pre-launch accumulator pressures despite fluctuations in ambient temperatures.

3.1.15 *pre-launch accumulator(s)*—stores the energy required for launch; typically consists of either (1) a cylinder with a piston separating fluids (gaseous charging agent and liquid charging agent) within which a compressible fluid (usually a gas) is pressurized by pumping an incompressible

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F38 on Unmanned Aircraft Systems and is the direct responsibility of Subcommittee F38.01 on Airworthiness.

Current edition approved Aug. 1, 2008. Published August 2008. Originally approved in 2006. Last previous edition approved in 2006 as F2585 – 06. DOI: 10.1520/F2585-08.

<sup>2</sup> Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.