

§417.125 Launch of an unguided sub-orbital launch vehicle.

(a) *Applicability.* This section applies only to a launch operator conducting a launch of an unguided suborbital launch vehicle.

(b) *Need for flight safety system.* A launch operator must launch an unguided suborbital launch vehicle with a flight safety system in accordance with §417.107 (a) and subpart D of this part unless one of the following exceptions applies:

(1) The unguided suborbital launch vehicle, including any component or payload, does not have sufficient energy to reach any populated area in any direction from the launch point; or

(2) A launch operator demonstrates through the licensing process that the launch will be conducted using a wind weighting safety system that meets the requirements of paragraph (c) of this section.

(c) *Wind weighting safety system.* A launch operator's wind weighting safety system must consist of equipment, procedures, analysis and personnel functions used to determine the launcher elevation and azimuth settings that correct for the windcocking and wind drift that an unguided suborbital launch vehicle will experience during flight due to wind effects. The launch of an unguided suborbital launch vehicle that uses a wind weighting safety system must meet the following requirements:

(1) The unguided suborbital launch vehicle must not contain a guidance or directional control system.

(2) The launcher azimuth and elevation settings must be wind weighted to correct for the effects of wind conditions at the time of flight to provide a safe impact location. A launch operator must conduct the launch in accordance with the wind weighting analysis requirements and methods of §417.233 and appendix C of this part.

(3) A launch operator must use a launcher elevation angle setting that ensures the rocket will not fly uprange. A launch operator must set the launcher elevation angle in accordance with the following:

(i) The nominal launcher elevation angle must not exceed 85°. The wind

corrected launcher elevation setting must not exceed 86°.

(ii) For an unproven unguided suborbital launch vehicle, the nominal launcher elevation angle must not exceed 80°. The wind corrected launcher elevation setting must not exceed 84°. A proven unguided suborbital launch vehicle is one that has demonstrated, by two or more launches, that flight performance errors are within all the three-sigma dispersion parameters modeled in the wind weighting safety system.

(d) *Public risk criteria.* A launch operator must conduct the launch of an unguided suborbital launch vehicle in accordance with the public risk criteria of §417.107(b). The risk to the public determined prior to the day of flight must satisfy the public risk criteria for the area defined by the range of nominal launch azimuths. A launch operator must not initiate flight until a launch operator has verified that the wind drifted impacts of all planned impacts and their five-sigma dispersion areas satisfy the public risk criteria after wind weighting on the day of flight.

(e) *Stability.* An unguided suborbital launch vehicle, in all configurations, must be stable in flexible body to 1.5 calibers and rigid body to 2.0 calibers throughout each stage of powered flight. A caliber, for a rocket configuration, is defined as the distance between the center of pressure and the center of gravity divided by the largest frontal diameter of the rocket configuration.

(f) *Tracking.* A launch operator must track the flight of an unguided suborbital launch vehicle. The tracking system must provide data to determine the actual impact locations of all stages and components, to verify the effectiveness of a launch operator's wind weighting safety system, and to obtain rocket performance data for comparison with the preflight performance predictions.

(g) *Post-launch review.* A launch operator must ensure that the post-launch report required by §417.25 includes:

(1) Actual impact location of all impacting stages and each impacting component.

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(2) A comparison of actual and predicted nominal performance.

(3) Investigation results of any launch anomaly. If flight performance deviates by more than a three-sigma dispersion from the nominal trajectory, a launch operator must conduct an investigation to determine the cause of the rocket's deviation from normal flight and take corrective action before the next launch. A launch operator must file any corrective actions with the FAA as a request for license modification before the next launch in accordance with § 417.11.

§ 417.127 Unique safety policies, requirements and practices.

For each launch, a launch operator must review operations, system designs, analysis, and testing, and identify any unique hazards not otherwise addressed by this part. A launch operator must implement any unique safety policy, requirement, or practice needed to protect the public from the unique hazard. A launch operator must demonstrate through the licensing process that any unique safety policy, requirement, or practice ensures the safety of the public. For any change to a unique safety policy, requirement, or practice, with the exception of a launch specific update, the launch operator must file a request for license modification as required by § 417.11. The FAA may identify and impose a unique safety policy, requirement, or practice as needed to protect the public.

§ 417.129 Safety at end of launch.

A launch operator must ensure for any proposed launch that for all launch vehicle stages or components that reach Earth orbit—

(a) There is no unplanned physical contact between the vehicle or any of its components and the payload after payload separation;

(b) Debris generation does not result from the conversion of energy sources into energy that fragments the vehicle or its components. Energy sources include chemical, pressure, and kinetic energy; and

(c) Stored energy is removed by depleting residual fuel and leaving all fuel line valves open, venting any pres-

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surized system, leaving all batteries in a permanent discharge state, and removing any remaining source of stored energy.

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Subpart C—Flight Safety Analysis

§ 417.201 Scope and applicability.

(a) This subpart contains requirements for performing the flight safety analysis required by § 417.107(f).

(b) The flight safety analysis requirements of this subpart apply to the flight of any launch vehicle that must use a flight safety system as required by § 417.107(a), except as permitted by paragraph (d) of this section.

(c) The flight safety analysis requirements of §§ 417.203, 417.205, 417.207, 417.211, 417.223, 417.224, 417.225, 417.227, 417.229, 417.231, and 417.233 apply to the flight of any unguided suborbital launch vehicle that uses a wind-weighting safety system. Appendices B, C, and I of this part also apply.

(d) For any alternative flight safety system approved by the FAA under § 417.301(b), the FAA will determine during the licensing process which of the analyses required by this subpart apply.

§ 417.203 Compliance.

(a) *General.* A launch operator's flight safety analysis must satisfy the performance requirements of this subpart. The flight safety analysis must also meet the requirements for methods of analysis contained in appendices A and B of this part for a launch vehicle flown with a flight safety system and appendices B and C of this part for an unguided suborbital launch vehicle that uses a wind-weighting safety system except as otherwise permitted by this section. A flight safety analysis for a launch may rely on an earlier analysis from an identical or similar launch if the analysis still applies to the later launch.

(b) *Method of analysis.* (1) For each launch, a launch operator's flight safety analysis must use—

(i) A method approved by the FAA during the licensing process;

(ii) A method approved as a license modification by the FAA; or,