

the launch vehicle, any jettisoned components, and its payload do not pass closer than 200 kilometers to a manned or mannable orbiting object during ascent to initial orbital insertion through at least one complete orbit.

(c) *Suborbital launch.* For a suborbital launch, the analysis must establish any launch waits needed to ensure that the launch vehicle, any jettisoned components, and any payload do not pass closer than 200 kilometers to a manned or mannable orbiting object throughout the flight.

(d) *Analysis not required.* A collision avoidance analysis is not required if the maximum altitude attainable by a launch operator's unguided suborbital launch vehicle is less than the altitude of the lowest manned or mannable orbiting object. The maximum altitude attainable must be obtained using an optimized trajectory, assuming 3-sigma maximum performance.

§417.233 Analysis for an unguided suborbital launch vehicle flown with a wind weighting safety system.

For each launch of an unguided suborbital launch vehicle flown with a wind weighting safety system, in addition to the other requirements in this subpart outlined in §417.201(c), the flight safety analysis must:

(a) Establish flight commit criteria and other launch safety rules that a launch operator must implement to control the risk to the public from potential adverse effects resulting from normal and malfunctioning flight;

(b) Establish any wind constraints under which launch may occur; and

(c) Include a wind weighting analysis that establishes the launcher azimuth and elevation settings that correct for the windcocking and wind-drift effects on the unguided suborbital launch vehicle.

Subpart D—Flight Safety System

§417.301 General.

(a) *Applicability.* This subpart applies to any flight safety system that a launch operator uses. The requirements of §417.107(a) define when a launch operator must use a flight safety system. A launch operator must en-

sure that its flight safety system satisfies all the requirements of this subpart, including the referenced appendices. Paragraph (b) of this section provides an exception to this.

(b) *Alternate flight safety system.* A flight safety system need not satisfy one or more of the requirements of this subpart for a launch if a launch operator demonstrates, in accordance with §406.3(b), that the launch achieves an equivalent level of safety as a launch that satisfies all the requirements of this part. The flight safety system must undergo analysis and testing that is comparable to that required by this part to demonstrate that the system's reliability to perform each intended function is comparable to that required by this subpart.

(c) *Functions, subsystems, and components.* When initiated in the event of a launch vehicle failure, a flight safety system must prevent any launch vehicle hazard, including any payload hazard, from reaching a populated or other protected area. A flight safety system must consist of all of the following:

(1) A flight termination system that satisfies appendices D, E, and F of this part;

(2) A command control system that satisfies §§417.303 and 417.305;

(3) Each support system required by §417.307; and

(4) The functions of any personnel who operate flight safety system hardware or software including a flight safety crew that satisfies §417.311.

(d) *Compliance—(1)Non-Federal launch site.* For launch from a non-Federal launch site, any flight safety system, including all components, must:

(1) *Non-Federal launch site.* For launch from a non-Federal launch site, any flight safety system, including all components, must:

(i) Comply with a launch operator's flight safety system compliance matrix of §415.127(g) that accounts for all the design, installation, and monitoring requirements of this subpart, including the referenced appendices; and

(ii) Comply with a launch operator's testing compliance matrix of §415.129(b) that accounts for all the test requirements of this subpart, including the referenced appendices.

(2) *Federal launch range.* This provision applies to all sections of this subpart. The FAA will accept a flight safety system used or approved on a Federal launch range without need for further demonstration of compliance to the FAA if:

(i) A launch operator has contracted with a Federal launch range for the provision of flight safety system property and services; and

(ii) The FAA has assessed the Federal launch range, through its launch site safety assessment, and found that the Federal launch range's flight safety system property and services satisfy the requirements of this subpart. In this case, the FAA will treat the Federal launch range's flight safety system property and services as that of a launch operator.

§ 417.303 Command control system requirements.

(a) *General.* When initiated by a flight safety official, a command control system must transmit a command signal that has the radio frequency characteristics and power needed for receipt of the signal by the onboard vehicle flight termination system. A command control system must include all of the following:

- (1) All flight termination system activation switches;
- (2) All intermediate equipment, linkages, and software;
- (3) Any auxiliary stations;
- (4) Each command transmitter and transmitting antenna; and
- (5) All support equipment that is critical for reliable operation, such as power, communications, and air conditioning systems.

(b) *Performance specifications.* A command control system and each subsystem, component, and part that can affect the reliability of a component must have written performance specifications that demonstrate, and contain the details of, how each satisfies the requirements of this section.

(c) *Reliability prediction.* A command control system must have a predicted reliability of 0.999 at the 95 percent confidence level when operating, starting with completion of the preflight testing and system verification of § 417.305(c) through initiation of flight

and until the planned safe flight state for each launch. Any demonstration of the system's predicted reliability must satisfy § 417.309(b).

(d) *Fault tolerance.* A command control system must not contain any single-failure-point that, upon failure, would inhibit the required functioning of the system or cause the transmission of an undesired flight termination message. A command control system's design must ensure that the probability of transmitting an undesired or inadvertent command during flight is less than 1×10^{-7} .

(e) *Configuration control.* A command control system must undergo configuration control to ensure its reliability and compatibility with the flight termination system used for each launch.

(f) *Electromagnetic interference.* Each command control system component must function within the electromagnetic environment to which it is exposed. A command control system must include protection to prevent interference from inhibiting the required functioning of the system or causing the transmission of an undesired or inadvertent flight termination command. Any susceptible remote control data processing or transmitting system that is part of the command control system must prevent electromagnetic interference.

(g) *Command transmitter failover.* A command control system must include independent, redundant transmitter systems that automatically switch, or "fail-over," from a primary transmitter to a secondary transmitter when a condition exists that indicates potential failure of the primary transmitter. The switch must be automatic and provide all the same command control system capabilities through the secondary transmitter system. The secondary transmitter system must respond to any transmitter system configuration and radio message orders established for the launch. The fail-over criteria that trigger automatic switching from the primary transmitter to the secondary transmitter must account for each of the following transmitter performance parameters and failure indicators:

- (1) Low transmitter power;
- (2) Center frequency shift;