

§ 417.221

flight safety system would not significantly increase the accumulated risk from debris impacts and maintains positive flight safety system control to the maximum extent feasible.

§ 417.221 Time delay analysis.

(a) *General.* A flight safety analysis must include a time delay analysis that establishes the mean elapsed time between the violation of a flight termination rule and the time when the flight safety system is capable of terminating flight for use in establishing flight safety limits as required by § 417.213.

(b) *Analysis constraints.* A time delay analyses must determine a time delay distribution that accounts for the following:

(1) The variance of all time delays for each potential failure scenario, including but not limited to, the range of malfunction turn characteristics and the time of flight when the malfunction occurs;

(2) A flight safety official's decision and reaction time, including variation in human response time; and

(3) Flight termination hardware and software delays including all delays inherent in:

- (i) Tracking systems;
- (ii) Data processing systems, including all filter delays;
- (iii) Display systems;
- (iv) Command control systems; and
- (v) Flight termination systems.

§ 417.223 Flight hazard area analysis.

(a) *General.* A flight safety analysis must include a flight hazard area analysis that identifies any regions of land, sea, or air that must be surveyed, publicized, controlled, or evacuated in order to control the risk to the public from debris impact hazards. The risk management requirements of § 417.205(a) apply. The analysis must account for, at a minimum:

(1) All trajectory times from liftoff to the planned safe flight state of § 417.219(c), including each planned impact, for an orbital launch, and through final impact for a suborbital launch;

(2) Regions of land potentially exposed to debris resulting from normal

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flight events and events resulting from any potential malfunction;

(3) Regions of sea and air potentially exposed to debris from normal flight events, including planned impacts;

(4) In the vicinity of the launch site, any waterborne vessels, populated off-shore structures, or aircraft exposed to debris from events resulting from any potential abnormal flight events, including launch vehicle malfunction;

(5) Any operational controls implemented to control risk to the public from debris hazards;

(6) Debris identified by the debris analysis of § 417.211; and

(7) All launch vehicle trajectory dispersion effects in the surface impact domain.

(b) *Public notices.* A flight hazard areas analysis must establish the ship hazard areas for notices to mariners that encompass the three-sigma impact dispersion area for each planned debris impact. A flight hazard areas analysis must establish the aircraft hazard areas for notices to airmen that encompass the 3-sigma impact dispersion volume for each planned debris impact. Section 417.121(e) contains procedural requirements for issuing notices to mariners and airmen.

§ 417.224 Probability of failure analysis.

(a) *General.* All flight safety analyses for a launch, regardless of hazard or phase of flight, must account for launch vehicle failure probability in a consistent manner. A launch vehicle failure probability estimate must use accurate data, scientific principles, and a method that is statistically or probabilistically valid. For a launch vehicle with fewer than two flights, the failure probability estimate must account for the outcome of all previous launches of vehicles developed and launched in similar circumstances. For a launch vehicle with two or more flights, launch vehicle failure probability estimates must account for the outcomes of all previous flights of the vehicle in a statistically valid manner.

(b) *Failure.* For flight safety analysis purposes, a failure occurs when a launch vehicle does not complete any phase of normal flight or when any