[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 400 and 401

Docket No.: FAA-2012-0045; Notice No. 12-05

RIN 2120–AJ90

Exclusion of Tethered Launches From Licensing Requirements

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: The FAA proposes to exclude tethered launches as defined in this proposal from the existing licensing requirements. This proposed rule would maintain public safety for these launches by providing launch vehicle operators with clear and simple criteria for a safe tethered launch. The FAA would not require a license, permit or waiver for tethered launches that satisfy the design and operational criteria proposed here.

DATES: Send comments on or before [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: Send comments identified by docket number FAA-2012-0045, using any of the following methods:

- Federal eRulemaking Portal: Go to http://www.regulations.gov and follow the online instructions for sending your comments electronically.
- Mail: Send comments to Docket Operations, M-30; U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE, Room W12-140, West Building Ground Floor, Washington, DC 20590-0001.

- Hand Delivery or Courier: Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- Fax: Fax comments to Docket Operations at (202) 493-2251.

Privacy: The FAA will post all comments it receives, without change, to http://www.regulations.gov, including any personal information the commenter provides. Using the search function of the docket website, anyone can find and read the electronic form of all comments received into any FAA dockets, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the Federal Register published on April 11, 2000 (65 FR 19477-19478), as well as at http://DocketsInfo.dot.gov.

Docket: Background documents or comments received may be read at http://www.regulations.gov at any time. Follow the online instructions for accessing the docket or Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: For technical questions concerning this proposed rule, contact Shirley McBride, Commercial Space Transportation, Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591; telephone (202) 267-7470; e-mail Shirley.McBride@faa.gov.

For legal questions concerning this proposed rule, contact Sabrina Jawed, AGC-240, Office of the Chief Counsel, Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591; telephone (202) 267-8839; email Sabrina.Jawed@faa.gov.

SUPPLEMENTARY INFORMATION:

See the "Additional Information" section for information on how to comment on this proposal and how the FAA will handle comments received. The "Additional Information" section also contains related information about the docket, privacy, and the handling of proprietary or confidential business information. In addition, there is information on obtaining copies of related rulemaking documents.

Authority for this Rulemaking

The Commercial Space Launch Act of 1984, as amended and re-codified at 51 U.S.C. 50901-50923 (the Act), authorizes the Department of Transportation and thus the FAA, through delegations, to oversee, license, and regulate commercial launch and reentry activities, and the operation of launch and reentry sites as carried out by U.S. citizens or within the United States. 51 U.S.C. 50904, 50905. The Act directs the FAA to exercise this responsibility consistent with public health and safety, safety of property, and the national security and foreign policy interests of the United States. 51 U.S.C. 50905. Title 51 U.S.C. Sec. 50901(a)(7) directs the FAA to regulate only to the extent necessary, in relevant part, to protect the public health and safety and safety of property. The FAA is also responsible for encouraging, facilitating, and promoting commercial space launches by the private sector. 51 U.S.C. 50903.

I. Background

The FAA's licensing and permitting requirements for commercial space launches are contained in 14 CFR chapter III. Section 400.2 specifies the requirements in chapter III apply to commercial space transportation activities conducted in the United States or by a U.S. citizen, but do not apply to amateur rocket activities or to space activities carried out by the United States Government on behalf of the United States Government.

The FAA began hearing of tethered launches around 2002, when launch operators tested relatively small vehicles tethered to the ground with engines that burned for short periods of time. Operators later tested larger, more developed and costly vehicles by attaching them to a tether and attaching the tether to a crane or forklift to prevent the vehicle from hitting the ground. Some of these tethered launches met the FAA's amateur rocket activity criteria,[1] and thus were excluded from chapter III requirements. Those that did not meet the amateur rocket criteria should have been required to comply with chapter III. However, because these launches had a tether system that restrained the vehicle within a certain range, the FAA initially deemed them low risk and did not require operators to conduct tethered launches under chapter III. In 2008, the FAA reassessed this determination and found that launches that meet the applicability criteria of § 400.2, regardless of whether the launch vehicle is restrained by a tether, must be conducted under chapter III. That is, operators must apply for a license, permit or waiver. That year, the FAA reviewed and granted five chapter III waiver requests to conduct tethered launches. The agency now seeks an approach to tethered launches that would maintain public safety and be less burdensome on launch operators and the FAA. That approach is the subject of this proposed rule.

II. Overview of Proposed Rule

Title 51 U.S.C. Sec. 50901(a)(7) directs the FAA to regulate only to the extent necessary, in relevant part, to protect the public health and safety and safety of property. Therefore, the

[1] Prior to 2008, "amateur rocket activities" was defined in 14 CFR § 401.5 as "launch activities conducted at private sites involving rockets powered by a motor or motors having a total impulse of 200,000 pound-seconds or less and a total burning or operating time of less than 15 seconds, and a rocket having a ballistic coefficient - i.e., gross weight in pounds divided by frontal area of rocket vehicle – less than 12 pounds per square inch." In 2008, the FAA moved the definition to 14 CFR part 1, chapter I and revised it as follows: "Amateur Rocket means an unmanned rocket that is propelled by a motor or motors having a combined total impulse of 889,600 Newton-seconds (200,000 pound-seconds) or less; and cannot reach an altitude greater than 150 kilometers (93.2 statute miles) above the earth's surface." 14 CFR § 1.1; *Requirements for Amateur Rocket Activities*, *Final Rule*, 73 FR 73781 (Dec. 4, 2008).

FAA proposes to reduce the scope of chapter III by excluding tethered launches that meet the requirements of this proposed rule. This proposal would maintain public safety by creating threshold criteria to determine whether chapter III needs to apply. FAA oversight would no longer be required for these launches because of the comprehensive protection the proposed launch vehicle, tether system, and operational criteria would provide.

This rulemaking would not affect amateur rocket activities, regardless of whether they include a tether system, because chapter III regulations do not apply to the launch of amateur rockets. Those operators that conduct launches covered under chapter III and are not eligible for the exclusion proposed here, must continue to follow current requirements by applying for a license, permit or waiver.

The FAA is proposing a number of changes consistent with the goals of Executive Order 13610, Identifying and Reducing Regulatory Burdens, 77 FR 28469 (May 14, 2012). This proposal, if adopted, would require that the launch vehicle be unmanned, be powered by a liquid or hybrid engine, and carry no more than 5,000 pounds of propellant. It would also require that the tether system, including the points of attachment within the tether system, meet specified structural criteria, and that the tethered operations be carried out within specified separation distances from the public. The structural criteria would mitigate the hazards that can compromise the structural integrity of the tether system. The vehicle requirements and operational criteria would provide additional protection to the public by mitigating potential hazards posed by a tether system failure.

The proposed rule would alleviate burdens on both the vehicle operator and the FAA. The operator would no longer incur the costs associated with submitting a launch license application, permit application or petition for waiver under chapter III. In addition, the operator

would not incur the costs associated with any delay in processing applications or waivers. Finally, the FAA would not have to evaluate applications, conduct independent analyses, or issue licenses, permits or waivers.

III. Discussion of the Proposal

This proposal would amend two sections of part 400. It would revise § 401.5 (Definitions) to add a definition for a tether system. It would also revise § 400.2 (Scope) to add requirements for the launch vehicle and tether system, as well as separation distances from the public for the tethered launch operations.

A. Proposed Definition (§ 401.5)

The FAA proposes to define tether system as a device that would contain launch vehicle hazards by physically constraining a launch vehicle in flight to a specified range from its launch point. A tether system includes all components, from the point of attachment to the vehicle to a solid base, that experience load during a tethered launch.

A tether system should prevent a vehicle from departing the launch site because the vehicle could pose a hazard to the public. Typically, a tether system is composed of at least three parts: one vehicle connection; one fixed connection; and at least one tether that has one end fastened to the vehicle connection and the other end fastened to a fixed connection to a solid base so as to limit the vehicle's range of movement. A vehicle connection consists of all mechanical components that attach a tether to a launch vehicle. These include, for example, metal frames, bolts that attach the vehicle and metal frame together, and shackles. A fixed connection attaches a tether to a solid base, such as a crane, a forklift or the ground, and it consists of all mechanical components that accomplish the attachment. Examples of these mechanical components include

the component that attaches any crane to the rest of the system, such as shackles or a bolt that attaches a solid base and shackle together.

The FAA's proposed definition is broad enough to encompass all possible tether system configurations. This proposed definition would require operators, when determining if chapter III applies, to account for the effect of a tethered launch on every component from the point of attachment to the vehicle to a solid base, that experience load during a tethered launch. Accounting for a whole system would reduce the likelihood of a system failure caused by an overlooked component that was unable to withstand the maximum load exerted on it.

In devising a tether system, the operator should take into account the vehicle's structural integrity because if the tether were able to withstand the forces exerted on it, but the vehicle could not, then the vehicle could break free. If this were to happen and the vehicle exceeded the proposed flight limit of 75 feet above ground level (AGL), the operator would have failed to comply with the proposed requirement in § 400.2(c)(2)(iii).

The FAA's proposed definition accounts for only one tether, regardless of any other tethers within the system. A tether system containing multiple tethers or multiple attachment points is not necessarily more reinforced or safer: all of the applied forces may not be evenly distributed among the tethers. For instance, for a tether system with four tethers, if an operator assumes that the maximum load is evenly distributed among all four tethers of the system and designs each tether to withstand one-fourth of the maximum load, the entire tether system could fail if the vehicle's position shifted and more than one-fourth of the maximum load was placed on a single tether. In other words, if one tether can fail, then all tethers within the system can fail. Accordingly, in order to reduce the likelihood of a tether system failure, the system must contain at least one tether capable of bearing the maximum force exerted on the tether system,

regardless of the number of additional tethers within the system. Increasing the number of tethers within the system does not guarantee an increase in strength for the overall system.

B. Proposed Launch Vehicle (§ 400.2 (c)(1))

In order to avoid the applicability of chapter III, the FAA proposes that a launch vehicle would have to be unmanned and meet the requirements proposed below.

1. Engine Type

The FAA would require a launch vehicle excluded by tether from chapter III to have a liquid or hybrid motor; a solid rocket motor would not be permitted. Liquid or hybrid motors are composed of systems that require mixing of the propellants to combust, whereas solid motors consist of relatively simple systems where the propellants are already formulated with oxidizer dispersed in fuel. If a tethered vehicle were to lose control, the operator would rely on the tether system to constrain the vehicle and bring it to the ground. The fragile nature of liquid or hybrid motors ensures that ground impact would render them inoperable.

2. Propellant Cap

The FAA would not permit a launch vehicle to carry more than 5,000 pounds of propellant. The FAA's records indicate that, historically, the most propellant that has been on board a launch vehicle for a tethered launch is approximately 1,000 pounds. Greater propellant amounts result in both a heavier launch vehicle and greater explosive energy.

To determine this proposed cap, the FAA assessed the weight capacity of cranes and forklifts from a random sampling and from data used during past tethered launches. The data from the past launches indicate that the average weight capacity of these crane or forklift tether systems was 6,000 pounds; however, there were gaps in the data because this information was voluntary and not all operators provided it. To fill in the gaps, the FAA randomly selected

eleven crane and forklift models from several manufacturers.[2] The data obtained from the random samples indicate that the average weight capacity of a crane or forklift is also approximately 6,000 pounds. For a tethered vehicle, the vehicle's dry weight uses a maximum of approximately 15 percent of the crane or forklift weight capacity.[3] This leaves approximately 85 percent of the weight capacity available for the propellant. To compute the maximum propellant amount that a tethered vehicle can carry, the FAA took the 6,000-pound crane or forklift weight capacity and multiplied it by 85 percent. This computation resulted in a maximum propellant weight of 5,100 pounds. To provide a margin for the weight capacity of the crane or forklift, the FAA rounded this value down to 5,000 pounds.

C. Proposed Tether System (§ 400.2(c)(2))

The FAA proposes conservative technical and design criteria for an effective tether system. The FAA developed these criteria by determining what would prevent a tether from breaking and exposing the public to launch vehicle hazards. The FAA proposes five criteria as necessary to reduce the risk of a tether system failure: (1) established strength properties, (2) minimum factor of safety, (3) launch vehicle constraint, (4) no damage displayed before launch, and (5) protection from launch vehicle exhaust plume.

1. Established Strength Properties

The FAA would require that an eligible tether system have established strength properties that would not yield or fail under the maximum dynamic load on the system or under a load equivalent to two times the maximum potential engine thrust.

[2] Models from the random sampling consisted of the Broderson IC20, Broderson IC35, Case 586G, JCB 930, John Deere 486E, Genie GTH5519, Genie GTH636, Genie GTH644, Gradall G6-42Z, Gradall G6-42P, Lull 644E-42.
[3] Some operators provided voluntary information on their tether systems. The FAA looked at the different vehicles' dry weights relative to the crane or forklift weight capacity.

Because some operators may not readily know the maximum dynamic load for their tether systems, the FAA proposes an alternate means of determining whether the tether is of sufficient strength. If an operator does not know the maximum dynamic load, the operator may calculate the maximum load as follows: determine the maximum potential engine thrust of the tethered vehicle and then multiply the maximum engine thrust by a factor of two. Using the maximum potential engine thrust of two is an industry standard for estimating the dynamic load of any structural system.[4]

2. Minimum Factor of Safety

The FAA would require operators to multiply the maximum load by a minimum factor of safety[5] of 3.0 for yield stress and 5.0 for ultimate stress. All components would have to have established strength properties that could withstand the maximum load multiplied by the factors of safety. The FAA chose the proposed factors of safety based on their successful history in a similar context.

The U.S. Air Force has used these same factors for similar operations. The U.S. Air Force conducts rocket operations at the Eastern and Western Ranges, including of tethered and ground-based systems. It recommends a minimum factor of safety of 3.0 for yield stress,[6] and a factor of safety of 5.0 for ultimate stress,[7] for the design of ground-based systems. This includes the tether and its attachments to launch facilities or ground equipment.[8] This means that for a

[4] *See* A.E.H. Love, A Treatise on the Mathematical Theory of Elasticity, 179-180, Cambridge University Press (2d ed. 1906).
[5] A factor of safety of 1.0 implies that the design meets minimum requirements, but is on the point of failure with design uncertainties and no margin for variation or error. A factor of safety less than 1.0 means the design does not meet the minimum requirements and is in a failed state. A factor of safety greater than 1.0 means the design exceeds the requirements by a multiple of that factor of safety and is in a safety state.
[6] Yield stress is the elastic limit.
[7] Ultimate stress is when breakage occurs.
[8] Nicholas E. Martino, *Design and Analysis Guidelines for Launch Vehicle Tether* Systems, Aerospace Report No. ATR-2008 (5377)-1, The Aerospace Corporation (Sept. 30, 2007). This report is available in the docket for this rulemaking (Docket No. FAA-2012-0045).

tether system, the components within the system would be able to endure three times the force required to permanently deform the components, and five times the force required to break the components. The U.S. Air Force has not experienced any tether failures, even for a Minuteman launch, using these factors.

3. Launch Vehicle Constraint

The FAA proposes that the launch vehicle be constrained so that its flight cannot exceed 75 feet AGL. This altitude limit is based on the FAA's assessment of historical data on tether lengths and on the height of cranes and forklifts to determine a safe maximum altitude for tether systems. Based on this assessment, the FAA calculated an average crane or forklift height and an average tether length. The FAA then added these two values together to determine the launch vehicle's potential altitude.

Crane and forklift data from previous tethered launches and sampling indicate that the average height of the crane or forklift in a tether system is 43 feet. There were gaps in the data because the information was voluntary, and not all operators provided it. To fill the gaps, the FAA examined random samples of different crane and forklift heights, which indicated that operators typically use mid-sized cranes and forklifts to conduct their tethered operations. The FAA then took samples of mid-sized cranes and forklifts and averaged their heights and weight capacities to determine their physical limitations. The FAA obtained the samples from online brochures of manufacturers of cranes and forklifts.[9] The sample information also indicates that the average crane or forklift height is approximately 43 feet.

A launch vehicle's potential altitude is a crucial element in determining how far debris can travel in the event of a crash or an explosion. Large tether lengths allow for high altitude

[9] These included Broderson Manufacturing Corp.; JCB; Genie; and Gradall Industries, Inc.

flights, while short tether lengths limit the vehicle to low altitudes. This means that a tether system failure during flight can result in large vehicle ranges for long tethers and short vehicle ranges for short tethers, because altitude and range are proportional. In order to reduce the risk to the public during tethered launches, the tether length must not be too long. An appropriate length is also necessary to prevent hazardous events, such as the entanglement of the tether with launch support structures or other facilities. Moreover, an appropriate tether length would prevent a controlled airspace incursion.

The FAA assumed that the maximum tether length for the average crane or forklift tether system would not be greater than the crane or forklift height because such a tether length could allow a launch vehicle to hit the ground and possibly explode. The FAA also assumed that the tether must be given room to stretch, because a 43-foot tether attached to a 43-foot high crane could allow the launch vehicle to hit the ground when the length of the vehicle and the elasticity of the tether are taken into account. Based on these assumptions, the FAA concluded that the tether length should be less than 43 feet.

The FAA examined past tether waiver applications to determine the appropriate tether length. The tether waiver data showed that the maximum tether length operators typically use is approximately 32 feet. The FAA would use a tether length of 32 feet, which provides a margin of 11 feet to account for the tether's elasticity and the length of the vehicle, to calculate maximum altitude. This length is appropriate and reasonable for tethered flights because past tethered flights have demonstrated that the length allows the vehicle sufficient lateral movement for operators to conduct tethered activities, while limiting the vehicle to low altitudes and thereby reducing the risk to the public.

When the average crane or forklift height of 43 feet is added to an appropriate tether length of 32 feet, the result is a maximum potential altitude of approximately 75 feet for the tethered vehicle. Accordingly, the FAA proposes to require that the tether system physically constrain the launch vehicle within an altitude of 75 feet AGL. This altitude does not require operators to use 43-foot high cranes or 32-foot long tethers; those measurements were only used to calculate an appropriate maximum altitude for a tethered launch that would not require FAA oversight. The proposed maximum altitude would protect the public by limiting the launch vehicle's range.

4. No Damage Displayed Before Launch (§ 400.2(c)(3))

The FAA would require that the tether system show no visual component damage before each launch. This requirement would reduce the risk of a tether system failure due to pre-existing damage. A visual check of the tether system before each launch could prevent failure by identifying signs of damage such as component fatigue, fracture, wear, creep, corrosion, yielding, or thermal shock. While the initial stages of some of these forms of damage may not be visible to the naked eye, they may eventually become visible. The FAA offers the following definitions of these terms as guidance in conducting the visual check:

- Fatigue is the progressive and localized structural damage that occurs when a material is subjected to cyclic loading. Fatigue occurs when a material is stressed repeatedly.
- Fracture is the local separation of an object or material into two or more pieces under the action of stress.
- Wear is the erosion of material from a solid surface by the action of another surface. Wear is related to surface interactions and more specifically to the removal of material from a surface as a result of mechanical action.

- Creep is the tendency of a solid material to move slowly or deform permanently under the influence of stresses.
- Corrosion is the disintegration of an engineered material into its constituent atoms due to chemical reactions with its surroundings.
- Yielding is when a material begins to deform plastically; when the yield point is passed, some fraction of the deformation will be permanent and non-reversible.
- Thermal shock is cracking as a result of rapid temperature change.

5. Protection from Launch Vehicle Exhaust Plume

The FAA would require an operator to insulate or locate the tether system such that it will not experience thermal damage due to a launch vehicle's exhaust. This requirement would mitigate the risk of a tether system failure due to thermal damage. Components exposed to the heat emitted from a launch vehicle's exhaust plume may be damaged or severely weakened. Metallic components, for example, that are exposed to a vehicle's exhaust plume may not visually show damage; however, all structural materials suffer significant strength degradation at elevated temperatures.

D. Proposed Separation Distances (§ 400.2(c)(3))

The FAA proposes that tethered launches be conducted at a sufficient distance from the public and from property belonging to members of the public to mitigate the effects when a launch vehicle unintentionally separates from the tether system. A launch vehicle may transfer unanticipated loads into the tether system, resulting in tether system failure and vehicle separation. Although a properly designed and constructed tether system should not fail, adding distance between the launch point and members of the public is a prudent and relatively simple and inexpensive safety measure to implement.

The FAA computed its proposed separation distances by first calculating a conservative maximum range of a vehicle that broke free of the tether system, and then calculating the hazardous fragment distance from the point of impact based on the type and amount of propellants onboard. Table A—Separation Distances for Tethered Launches in proposed § 400.2 would contain the separation distances required for a tethered launch that was excluded from chapter III. Each distance calculation in Table A is discussed below.

1. The Maximum Range of the Vehicle Released from the Tether

To determine a launch vehicle's maximum range, the FAA used Newton's equations of motion to estimate the maximum possible distance a vehicle that broke free of a tether could travel. The FAA simulated the scenarios where a tether system failed, and the vehicle followed a ballistic trajectory to the ground. The analysis consisted of the following assumptions: (1) the vehicle would be non-propulsive upon release; (2) the initial release velocity of the vehicle was maximized; (3) the tether's pull would not reduce the vehicle's velocity; (4) the tether would fully extend upon release; (5) the release angle of the vehicle would be the angle that provided the maximum range; and (6) the vehicle would fly through a vacuum. Except for the non-propulsive nature of the vehicle, all assumptions are conservative from a public safety perspective. The non-propulsive assumption is reasonable because a vehicle that broke free of a tether would most likely be unstable and not able to sustain flight in any particular direction.

The FAA also conducted a computer simulation of the same scenarios, using a trajectory analysis tool to verify the validity of the FAA's maximum range calculations. The numerical results from the computer simulation were consistent with the results from the FAA's computational analysis.

2. The Hazardous Fragment Distance Based on the Propellant Onboard

Upon impact at its maximum range, a launch vehicle with liquid propellants has the potential to explode, creating both overpressure and debris hazards. Explosive hazards associated with propellant quantities up to 5,000 pounds are driven by fragment hazards. The FAA used the formulas provided in Table 1 below to determine the hazardous fragment distance given a launch vehicle impact. This distance is a function of the net explosive weight (NEW), or the explosive equivalent of the propellants used on the launch vehicle.[10] Depending on the type of propellant, the explosive equivalent may vary from 10 to 20 percent, in accordance with Table E-2 of part 420.[11] For purposes of this rulemaking, the FAA applied a maximum NEW value of 20 percent for all propellant types. Using this conservative assumption simplifies the proposed rule.

Table 1–Hazardous fragment distance[12]

Net Explosive Weight (NEW)	Hazardous fragment distance (d), feet
≤ 0.5 pounds	d = 236
0.5 pounds<NEW < 100 pounds	d = 291.3 + [79.2 *ln(NEW)]
100 pounds ≤ NEW ≤ 1000 pounds	d = -1133.9 + [389 *ln(NEW)]

NEW is in pounds; d is in feet; ln is natural logarithm.

The hazardous fragment distance and NEW relationship of Table 1 is based on data obtained from Department of Defense Explosive Safety Board Technical Paper 16.[13] Table 1 provides the formulas for NEW of less than 100 pounds and for quantities between 100 and

[10] The definitions of NEW and explosive equivalent weight are provided in 14 CFR § 420.5.
[11] *Explosive Siting Requirements*, *Notice of Proposed Rulemaking*, 76 FR 8923 (Feb. 16, 2011).
[12] *See* DOD Ammunition and Explosive Safety standards, DoD 6055.9-STD, October 5, 2004, Table C9.T2.
[13] Department of Defense Explosive Safety Board Technical Paper 16, rev. 2, *Methodologies for Calculating Primary Fragment Characteristics* (2005).

1,000 pounds.[14] The Department of Defense Explosive Safety Board conducted tests that accounted for hazardous debris fragments based on a fragment that would cause a fatality, namely, one with a kinetic energy at impact of 58 foot-pounds. The hazardous fragment distance is the distance that a person approximately 6 feet tall and 1 foot wide would have a 1 percent probability of being struck by a fragment with a kinetic energy of 58 foot-pounds or greater, given an explosive event at a given NEW.[15] Because the Department of Defense, NASA, and the FAA have consistently applied the same standard, the hazardous fragment distance formulas provided in Table 1 provide an accepted level of safety to the general public.

3. Table A–Separation Distances for Tethered Launches

The FAA added the maximum impact range and the hazardous fragment distance results to calculate the total separation distance in proposed Table A. Proposed Table A would represent the distance from the launch point at which people and property belonging to the public would be safe from a launch vehicle mishap. This separation distance would be proportional to the amount of propellant on board the launch vehicle. That is, the greater the propellant on board, the greater the required separation distance. Distances would start at a value corresponding to a propellant load between 1 and 500 pounds and increase in increments of 500 pounds up to a maximum of 4,501 to 5,000 pounds. Note that the FAA's proposed separation distances would only be effective if the launch vehicle—

- Was operated within an altitude of 75 feet AGL;
- Carried no more than 5,000 pounds of propellant; and
- Had a liquid or hybrid engine.

[14] For NEW of 0.5 pounds or less, the Department of Defense has chosen to use a distance of 236 feet. Because this rule proposes a cap of 5,000 pounds of propellant, the table accounts for up to the resulting maximum NEW of 1,000 pounds.

IV. Regulatory Notices and Analyses

A. Regulatory Evaluation

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 and Executive Order 13563 direct that each Federal agency shall propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 (Public Law 96-354) requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (Public Law 96-39) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, the Trade Act requires agencies to consider international standards and, where appropriate, that they be the basis of U.S. standards. Fourth, the Unfunded Mandates Reform Act of 1995 (Public Law 104-4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of $100 million or more annually (adjusted for inflation with base year of 1995). This portion of the preamble summarizes the FAA's analysis of the economic impacts of this proposed rule.

Department of Transportation Order DOT 2100.5 prescribes policies and procedures for simplification, analysis, and review of regulations. If the expected cost impact is so minimal that a proposed rule does not warrant a full evaluation, this order permits a statement to that effect and the basis for it to be included in the preamble if a full regulatory evaluation of the cost and

[15] *Explosive Siting Requirements*, *Notice of Proposed Rulemaking*, 76 FR 8923 (Feb. 16, 2011).

benefits is not prepared. Such a determination has been made for this proposed rule. The reasoning for this determination follows:

Currently, the FAA has licensing authority over tethered launches, which are considered launches under chapter III unless they meet the definition of an amateur rocket launch.[16] To conduct such tethered non-amateur rocket launches, operators must obtain a launch license, permit or apply for a waiver from chapter III. Applying for waivers, licenses and permits impose a financial burden on vehicle operators and the FAA because of time and resources required to create and analyze these applications.

The proposed rule establishes clear and simple criteria for an effective tether system. In addition, it proposes vehicle and operational criteria as added measures to protect the public in the event of a tether system failure. Operators would not have to apply for a launch license, permit or waiver from chapter III to conduct tethered launches of non-amateur rockets [17] that meet the proposed criteria for an effective tether system and the vehicle and operational criteria. Operators who meet the proposed criteria would not have to incur the costs of applying for a launch license, permit or waiver and would not have to sustain the costs associated with delay in the processing of these applications. The FAA would not have to conduct case-by-case analyses of tethered launches that meet the proposed criteria to verify public safety from a launch vehicle explosion or confirm that the tether system would not fail. Furthermore, launch operators that conduct tethered launches would not be compelled to follow the criteria in this proposal as they would still have the option of applying for a launch license, permit or waiver under chapter III. Therefore, the proposed rule imposes no additional requirements on operators, but provides an

[16] Launches of amateur rockets are excluded from the requirements of chapter III. *See* 14 CFR 400.2 (2011).
[17] Operators launching amateur rockets on a tether would still be subject to part 101 and would continue to be excluded from chapter III.

alternative to conducting a tethered launch under chapter III. If the operator deemed it more cost effective to apply for a license, permit or waiver than to follow the criteria proposed here, the operator would have that option.

For the reasons discussed, the rule would be cost relieving to both operators and the FAA. The FAA requests comments with supporting justification about the agency's determination of minimal impact.

The FAA has determined that this proposed rule is not a "significant regulatory action" as defined in section 3(f) of Executive Order 12866, and is not "significant" as defined in DOT's Regulatory Policies and Procedures.

B. Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (Public Law 96-354) (RFA) establishes "as a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration." The RFA covers a wide-range of small entities, including small businesses, not-for-profit organizations, and small governmental jurisdictions.

Agencies must perform a review to determine whether a rule will have a significant economic impact on a substantial number of small entities. If the agency determines that it will, the agency must prepare a regulatory flexibility analysis as described in the RFA.

However, if an agency determines that a rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the RFA provides

that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

This proposed rule is expected to provide an alternative to conducting tethered launches under chapter III and therefore could alleviate the financial burden on operators who conduct tethered launches of applying for a launch license, permit or waiver to chapter III if they follow the requirements established in the proposal. The expected outcome would therefore have either a cost saving impact or no impact on small entities affected by the proposed rule.

Therefore, the FAA certifies this proposed rule, if promulgated, would not have a significant economic impact on a substantial number of small entities. The FAA solicits comments regarding this determination. Specifically, the FAA requests comments on whether the proposed rule creates any compliance costs unique to small entities. Please provide detailed supporting information.

C. International Trade Impact Assessment

The Trade Agreements Act of 1979 (Public Law 96-39), as amended by the Uruguay Round Agreements Act (Public Law 103-465), prohibits Federal agencies from establishing standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Pursuant to these Acts, establishing standards is not considered an unnecessary obstacle to the foreign commerce of the United States, so long as the standard has a legitimate domestic objective, such as the protection of safety, and does not operate in a manner that excludes imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards. The

FAA has assessed the potential effect of this proposed rule and determined that it would have only a domestic impact and therefore no effect on international trade.

D. Unfunded Mandates Assessment

Title II of the Unfunded Mandates Reform Act of 1995 (Public Law 104-4) requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of $100 million or more (in 1995 dollars) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a "significant regulatory action." The FAA currently uses an inflation-adjusted value of $143.1 million in lieu of $100 million. This proposed rule does not contain such a mandate; therefore, the requirements of Title II of the Act do not apply.

E. Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. The FAA has determined that there would be no new requirement for information collection associated with this proposed rule.

F. International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to conform to International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA has determined that there are no ICAO Standards and Recommended Practices that correspond to these proposed regulations.

G. Environmental Analysis

FAA Order 1050.1E identifies FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act in the absence of extraordinary circumstances. The FAA has determined this rulemaking action qualifies for the categorical exclusion identified in paragraph 312f and involves no extraordinary circumstances.

V. Executive Order Determinations

A. Executive Order 12866

See the "Regulatory Evaluation" discussion in the "Regulatory Notices and Analyses" section elsewhere in this preamble.

B. Executive Order 13132, Federalism

The FAA has analyzed this proposed rule under the principles and criteria of Executive Order 13132, Federalism. The agency has determined that this action would not have a substantial direct effect on the States, or the relationship between the Federal Government and the States, or on the distribution of power and responsibilities among the various levels of government, and, therefore, would not have Federalism implications.

C. Executive Order 13211, Regulations that Significantly Affect Energy Supply, Distribution, or Use

The FAA analyzed this proposed rule under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use (May 18, 2001). The agency has determined that it would not be a "significant energy action" under the executive order and would not be likely to have a significant adverse effect on the supply, distribution, or use of energy.

VI. Additional Information

A. Comments Invited

The FAA invites interested persons to participate in this rulemaking by submitting written comments, data, or views. The agency also invites comments relating to the economic, environmental, energy, or federalism impacts that might result from adopting the proposals in this document. The most helpful comments reference a specific portion of the proposal, explain the reason for any recommended change, and include supporting data. To ensure the docket does not contain duplicate comments, commenters should send only one copy of written comments, or if comments are filed electronically, commenters should submit only one time.

The FAA will file in the docket all comments it receives, as well as a report summarizing each substantive public contact with FAA personnel concerning this proposed rulemaking. Before acting on this proposal, the FAA will consider all comments it receives on or before the closing date for comments. The FAA will consider comments filed after the comment period has closed if it is possible to do so without incurring expense or delay. The agency may change this proposal in light of the comments it receives.

B. Availability of Rulemaking Documents

An electronic copy of rulemaking documents may be obtained from the Internet by—

1. Searching the Federal eRulemaking Portal (http://www.regulations.gov);
2. Visiting the FAA's Regulations and Policies web page at http://www.faa.gov/regulations_policies or
3. Accessing the Government Printing Office's web page at http://www.fdsys.gov.

Copies may also be obtained by sending a request to the Federal Aviation Administration, Office of Rulemaking, ARM-1, 800 Independence Avenue SW., Washington, DC 20591, or by

calling (202) 267-9680. Commenters must identify the docket or notice number of this rulemaking.

All documents the FAA considered in developing this proposed rule, including economic analyses and technical reports, may be accessed from the Internet through the Federal eRulemaking Portal referenced in item (1) above.

List of Subjects

14 CFR Part 400

Space transportation and exploration; licensing.

14 CFR Part 401

Space transportation and exploration.

The Proposed Amendment

In consideration of the foregoing, the Federal Aviation Administration proposes to amend Chapter III of Title 14 Code of Federal Regulations as follows:

PART 400—BASIS AND SCOPE

1. The authority citation for part 400 continues to read as follows:

Authority: 51 U.S.C. 50901-50923.

2. Revise § 400.2 to read as follows:

§ 400.2 Scope.

These regulations set forth the procedures and requirements applicable to the authorization and supervision under 51 U.S.C. Subtitle V, chapter 509, of commercial space transportation activities conducted in the United States or by a U.S. citizen. The regulations in this chapter do not apply to—

(a) Space activities carried out by the United States Government on behalf of the United States government;

(b) The launch of an amateur rocket as defined in § 1.1 of chapter I; or

(c) A launch that meets the following criteria:

(1) Launch vehicle. The launch vehicle must—

(i) Be unmanned;

(ii) Be powered by a liquid or hybrid rocket motor; and

(iii) Carry no more than 5,000 pounds of propellant.

(2) Tether system. The tether system must—

(i) Have established strength properties that will not yield or fail under–

(A) The maximum dynamic load on the system; or

(B) A load equivalent to two times the maximum potential engine thrust.

(ii) Have a minimum safety factor of 3.0 for yield stress and 5.0 for ultimate stress.

(iii) Constrain the launch vehicle within 75 feet above ground level.

(iv) Display no damage prior to the launch.

(v) Be insulated or located such that it will not experience thermal damage due to the launch vehicle's exhaust.

(3) Separation distances. The launch operator must separate its launch from the public and the property of the public by a distance no less than that provided for each quantity of propellant listed in Table A of this section.

Table A—Separation Distances for Tethered Launches

Propellant Carried (lbs)	Distance (ft) From the Launch Point
1 - 500	900
501 - 1,000	1,200

1,001 - 1,500	1,350
1,501 - 2,000	1,450
2,001 - 2,500	1,550
2,501 - 3,000	1,600
3,001 - 3,500	1,650
3,501 - 4,000	1,700
4,001 - 4,500	1,750
4,501 - 5,000	1,800

Part 401—ORGANIZATION AND DEFINITIONS.

3. The authority citation for part 401 continues to read as follows:

Authority: 51 U.S.C. 50101-50923.

4. Amend § 401.5 by adding the definition of tether system in alphabetical order to read as follows:

§ 401.5 Definitions.

* * * * *

Tether system means a device that contains launch vehicle hazards by physically constraining a launch vehicle in flight to a specified range from its launch point. A tether system includes all components, from the point of attachment to the vehicle to a solid base, that experience load during a tethered launch.

* * * * *

Issued in Washington, DC, on August 16, 2012.

Dr. George C. Nield, Associate Administrator

Commercial Space Transportation

[FR Doc. 2012-20686 Filed 08/22/2012 at 8:45 am; Publication Date: 08/23/2012]