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[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Waiver of Acceptable Risk Restriction for Launch

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of waiver.

SUMMARY: This notice concerns two petitions for waiver submitted to the FAA by Space Exploration Technologies Corp. (SpaceX): (1) a petition to waive the requirement that a waiver request be submitted at least 60 days before the effective date of the waiver unless good cause for later submission is shown in the petition; and (2) a petition to waive the restriction that the risk to the public from the launch of an expendable launch vehicle not exceed an expected average number of 0.00003 casualties ($E_c \leq 30 \times 10^{-6}$) from debris.

DATES: This notice is effective [Insert date of publication in Federal Register] and is applicable beginning December 18, 2015.

FOR FURTHER INFORMATION CONTACT: For technical questions concerning this waiver, contact Charles P. Brinkman, Licensing Program Lead, Commercial Space Transportation - Licensing and Evaluation Division, 800 Independence Avenue, S.W., Washington, DC 20591; telephone: (202) 267-7715; e-mail: Phil.Brinkman@faa.gov. For legal questions concerning this waiver, contact Laura Montgomery, Manager, Space Law Branch, AGC-210, Office of the Chief Counsel, Regulations Division, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591; telephone (202) 267-3150; e-mail: Laura.Montgomery@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

On November 19, 2015, SpaceX submitted a petition, which it revised on November 24, 2015, to the Federal Aviation Administration's (FAA's) Office of Commercial Space Transportation (AST) requesting a waiver with respect to a launch license for flight of a Falcon 9 launch vehicle carrying ORBCOMM-2 satellites. SpaceX requested a waiver of 14 CFR 417.107(b)(1), which prohibits the launch of an expendable launch vehicle if the total expected average number of casualties (E_c) for the launch exceeds 0.00003 for risk from debris. Because the scheduled launch was planned to occur in less than sixty days, SpaceX also requested a waiver to section 404.3(b)(5), which requires that a petition for waiver be submitted at least sixty days before the proposed effective date of the waiver, which in this case would be the date of the planned launch.

The FAA licenses the launch of a launch vehicle and reentry of a reentry vehicle under authority granted to the Secretary of Transportation in the Commercial Space Launch Act of 1984, as amended and re-codified by 51 U.S.C. Subtitle V, chapter 509 (Chapter 509), and delegated to the FAA Administrator and the Associate Administrator for Commercial Space Transportation, who exercises licensing authority under Chapter 509.

SpaceX is a private commercial space flight company. The petition addresses an upcoming flight that SpaceX plans to undertake to deliver the ORBCOMM-2 satellites. SpaceX's Falcon 9 launch vehicle will launch from Cape Canaveral Air Force Station (CCAFS) and its first stage will fly back to CCAFS for landing.

The U.S. Air Force advised SpaceX that the preliminary calculation of E_c for the launch, including the planned first stage fly back, shows the launch would exceed the 0.00003 limit imposed by section 417.107(b)(1). The 45th Space Wing Range Safety calculated the total

unmitigated E_c for the mission to be 0.000118 based on daytime populations on CCAFS, the worst-case December weather within the 45th Space Wing Range Safety data files, and 0.9665 reliability assigned to the flight computer with autonomous engine shutdown algorithms. The reliability of the human-activated flight termination system is 0.999. With mitigation, namely, the evacuation of all non-essential personnel including visitors and press from CCAFS, risk drops to as low as 86×10^{-6} expected casualties, which is within the Air Force's criteria of 100×10^{-6} expected casualties for the sum of risks due to impacting inert and impacting explosive debris, toxic release, and far field blast overpressure. Analysis indicates that almost all the risk is due to debris, with the risk associated with the latter two hazards not contributing to the overall risk. The risk for debris is comprised of 76×10^{-6} for ascent and fly back, with almost all of that risk coming from the fly back of the Falcon 9 first stage to CCAFS. Downrange overflight of Europe contributes 7×10^{-6}, and the planned disposal of the Falcon 9 upper stage in the southern Pacific Ocean contributes less than 3×10^{-6}. The FAA recognizes that any estimate of the E_c for any launch includes substantial uncertainties, and presenting these risk results as precise numbers implies better accuracy than actually exists. However, this type of presentation does allow showing the relative contributions of each of the risk components. Further, the risk computed on the day of launch may be different from the current estimate above.

Waiver Criteria:

Chapter 509 allows the FAA to waive a license requirement if the waiver (1) will not jeopardize public health and safety, safety of property; (2) will not jeopardize national security and foreign policy interests of the United States; and (3) will be in the public interest. 51 U.S.C. 50905(b)(3) (2011); 14 CFR 404.5(b) (2011).

Section 404.3(b)(5) Waiver Petition

Section 404.3(b)(5) requires that a petition for waiver be submitted at least sixty days before the proposed effective date of the waiver, which in this case would be the date of the planned launch, currently scheduled for December 19, 2015. This section also provides that a petition may be submitted late for good cause. Here, SpaceX initially submitted its waiver on November 19, 2015, which it revised on November 24, 2015, less than sixty days before the intended launch date. SpaceX needed the results of the initial analysis by the 45th Space Wing Range Safety before it was evident that a waiver of the E_c requirement would be required. Accordingly, the FAA is able to find good cause.

Section 417.107(b)(1) Waiver Petition

Section 417.107(b)(1) prohibits the launch of a launch vehicle if the total E_c for the launch exceeds 0.00003 for debris. For reasons described below and in order to account for the potential variation in the E_c computed on the day of launch, the FAA will allow SpaceX to conduct a mission where the expected casualty risk due to impacting inert and impacting explosive debris exceeds 30×10^{-6} casualties, provided the sum of the expected casualty risk due to debris, toxics, and far field blast overpressure remains less than or equal to 100×10^{-6}, which is the Air Force's criterion. The expected casualty risks due to toxics and far field blast overpressure shall each remain less than or equal to 30×10^{-6} in accordance with 14 CFR 417.107(b)(1).

Launch of the Falcon 9 Vehicle

The FAA waives the debris risk requirement of section 417.107(b)(1) because the Falcon 9 launch will not jeopardize public health and safety or safety of property, a national security or foreign policy interest of the United States, and is in the public interest.

i. Public Health and Safety and Safety of Property

The Falcon 9 ORBCOMM-2 launch is the first launch of an orbital expendable launch vehicle with a planned fly back of one of its stages to the launch site. SpaceX has attempted two landings of its Falcon 9 first stage on a barge on the ocean off CCAFS. The stages reached their intended landing spot, but did not survive the landings. In neither case was public health or safety or safety of third party property jeopardized. The damage to SpaceX's barge was minimal. The USAF conducted an assessment of the risk to property on CCAFS and has determined that the risks are acceptable.

The total risk that will be permitted will not exceed the expected casualty criterion proposed by the FAA in Changing the Collective Risk Limits for Launches and Reentries and Clarifying the Risk Limit Use to Establish Hazard Areas for Ships and Aircraft, Notice of Proposed Rulemaking, 79 FR 42241 (Jul. 21, 2014) (Risk NPRM), and used by NASA, the United States Air Force, and other U.S. National Test Ranges. See U.S. Air Force Instruction 91-217, Space Safety and Mishap Prevention Program (2010); NASA Procedural Requirements 8715.5 Rev A, Range Flight Safety Program (2010); Range Commanders Council (RCC) Standard 321-10, Common Risk Criteria Standards for National Test Ranges (2010). The major contribution to E_c for this launch of the Falcon 9 is attributable to the fly back of its first stage to CCAFS. As part of this mission, SpaceX intends to demonstrate the feasibility of returning the first stage to the launch site for its eventual reuse instead of disposing it in the ocean.

The current E_c requirement for government launches from U.S. National Test Ranges is that risk from launch may not exceed 100×10^{-6}, which, because it is comprised of the sum of the risks from the three principal hazards of debris, toxics, and overpressure, means that the federal launch ranges can permit the risk attributable to debris to exceed the FAA's risk threshold. See Air Force Instruction 91-217, Space Safety and Mishap Prevention Program (2010). The FAA

recently proposed a rule similar to that of U.S. National Test Ranges that would permit launch to occur so long as the total risk did not exceed 0.0001. The FAA has previously waived section 417.107(b)(1) to allow SpaceX to conduct a launch whose total E_c was calculated to be between approximately 98 x 10^{-6} and 121 x 10^{-6}, and, accounting for potential variation on the day of launch, allowed SpaceX to conduct the mission as long as E_c did not exceed 0.00013. 77 FR 24556-01, 2012 WL 1387813. For the reasons provided in the Risk NPRM and previous waivers, the FAA considers the estimated risk of 86 x 10^{-6} will not jeopardize public safety.

ii. National Security and Foreign Policy Implications

The FAA has identified no national security or foreign policy implications associated with granting this waiver.

iii. Public Interest

The waiver is consistent with the public interest goals of Chapter 509 and the National Space Transportation Policy. Three of the public policy goals of Chapter 509 are: (1) to promote economic growth and entrepreneurial activity through use of the space environment; (2) to encourage the United States private sector to provide launch and reentry vehicles and associated services; and (3) to facilitate the strengthening and expansion of the United States space transportation infrastructure to support the full range of United States space-related activities. See 51 U.S.C. 50901(b)(1), (2), (4). Commercial Space Transportation Licensing Regulations, Notice of Proposed Rulemaking, 62 FR 13230 (Mar. 19, 1997). A successful demonstration of a stage returning to a launch site has the potential for reducing launch costs. As it is a major procurer of launch services, reduced launch costs will be of direct benefit to the U.S. Government. It will also help to make the U.S. launch industry more competitive internationally. The National Space Transportation Policy clearly identifies how strengthening US

competitiveness in the international launch market and improving the cost effectiveness of US space transportation services are in the public interests: "Maintaining an assured capability to meet United States Government needs, while also taking the necessary steps to strengthen U.S. competitiveness in the international commercial launch market, is important to ensuring that U.S. space transportation capabilities will be reliable, robust, safe, and affordable in the future. Among other steps, improving the cost effectiveness of U.S. space transportation services could help achieve this goal by allowing the United States Government to invest a greater share of its resources in other needs such as facilities modernization, technology advancement, scientific discovery, and national security. Further, a healthier, more competitive U.S. space transportation industry would facilitate new markets, encourage new industries, create high technology jobs, lead to greater economic growth and security, and would further the Nation's leadership role in space." SpaceX's proposed demonstration is in the public interest.

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