

[4910-13]

**Department of Transportation  
Federal Aviation Administration  
Finding of No Significant Impact**

**AGENCY:** Federal Aviation Administration (FAA), Department of Transportation (DOT)

**ACTION:** Finding of No Significant Impact

**SUMMARY:** The Federal Aviation Administration (FAA) prepared an Environmental Assessment (EA) to evaluate the East Kern Airport District (EKAD) proposal to operate a commercial launch facility at the Mojave Airport in Mojave, California. The EA also evaluated the potential environmental impacts of launches of two types of horizontally launched suborbital vehicles (Concept A and Concept B) proposed to be launched from the Mojave Airport. The EKAD owns and operates the Mojave Airport and must comply with the California Environmental Quality Act (CEQA) to operate a launch facility at the Mojave Airport. The EKAD was responsible for complying with the responsibilities of CEQA. In addition to the launch site operator license application from EKAD, Scaled Composites, LLC, is requesting a launch specific license and proposes to conduct up to six licensed launches in 2004 of the SpaceShipOne launch vehicle. This launch vehicle is similar to the Concept A vehicle described and analyzed in the EA. After reviewing and analyzing currently available data and information on existing conditions, project impacts, and measures to mitigate those impacts, the FAA, Office of the Associate Administrator for Commercial Space Transportation (AST) has determined that licensing the operation of the proposed launch site and issuing a launch specific license for up to six launches of the SpaceShipOne launch vehicle would not significantly affect the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA). Therefore the preparation of an Environmental Impact Statement (EIS) is not required and AST is issuing a Finding of No Significant Impact (FONSI). The FAA made this determination in accordance with all applicable environmental laws.

**FOR A COPY OF THE FINDING OF NO SIGNIFICANT IMPACT REGARDING EKAD LAUNCH OPERATIONS AND SCALED COMPOSITES LAUNCH SPECIFIC LICENSE CONTACT:** Ms. Michon Washington, FAA Environmental Specialist, Mojave Airport EA, c/o ICF Consulting, 9300 Lee Highway, Fairfax, VA 22031 or refer to the following internet address: <http://ast.faa.gov>

**DATES:** The Draft EA was released for public comment on October 31, 2003. In addition, the FAA held a public hearing on December 10, 2003 in Mojave, California to collect comments from the public. All comments received before December 12, 2003 were considered in the preparation of the Final EA.

**PROPOSED ACTIONS:** Operation of a non-Federal launch site in the United States, such as EKAD's proposed operation of a launch site at the Mojave Airport, in Mojave, California, and launches of launch vehicles, such as Scaled Composites' proposed launches of the SpaceShipOne vehicle from the Mojave Airport must be licensed by the FAA pursuant to 49 U.S.C. Sections 70101-70119, formerly the Commercial Space Launch Act. Licensing the operation of a launch site and a launch vehicle are Federal actions requiring environmental analyses by the FAA in accordance with NEPA, 1969, 42 U.S.C. Sec. 4321 et seq. Upon receipt of complete license applications, AST must determine whether to issue a license to EKAD to operate a launch site at the Mojave Airport and whether to issue a launch specific license to Scaled Composites for up to six launches of the SpaceShipOne launch vehicle from the Mojave Airport. An environmental determination is required for the evaluation of license applications.

The launch site would be located at the Mojave Airport. No construction activities are proposed as part of this action. Existing infrastructure including hangars and runways would be used to support launch and landing operations at the proposed launch site. Existing rocket test stands may also be used for static testing of rocket engines.

The proposed EKAD launch site operator license would be for the purpose of operating a facility to launch horizontally launched, suborbital rockets. Under the proposed action, the FAA would issue a launch site operator license to the EKAD for the Mojave Airport for the purpose of operating a facility to launch horizontally launched, suborbital rockets. In addition, the EKAD may offer other services for commercial launch vehicle manufacturing, and other testing and manufacturing activities. These services and other testing and manufacturing activities are unrelated to, and are not authorized by the Launch Site Operator License. Launch providers would be responsible for obtaining launch licenses from the FAA to conduct launches at the Mojave Airport. The FAA may use the analyses in the Final EA as the basis for environmental determinations of the impacts of these launches to support licensing decisions for the launch of specific launch vehicles from the Mojave Airport.

Proposed launch operations currently include launches of two types of launch vehicles. The first type referred to in the EA as Concept A includes air-drop designs where two vehicles, an airplane and launch vehicle are mated together and the airplane carries the launch vehicle to a predetermined altitude where the launch vehicle is dropped and its rocket engines ignite. The SpaceShipOne vehicle is similar to the Concept A vehicle described and analyzed in the EA. The second type of launch vehicle, referred to in the EA as Concept B, includes horizontally launched vehicles, which use rocket power to take off from a standard aviation runway. The EA addresses the overall impacts to the environment of the proposed operations anticipated for a five-year launch site license term to include the launch and landing of Concept A and B launch vehicles at the Mojave Airport and testing rocket engines that would be incorporated into Concept A and B launch vehicles.

The FAA and the U.S. Air Force (USAF) are involved in the proposed action. The FAA is the lead Federal agency for the NEPA process and is responsible for licensing and regulating EKAD's launch operations under 49 U.S.C. Subtitle IX-Commercial Space Transportation, ch. 701, *Commercial Space Launch Activities*. The Air Force Flight Test Center (AFFTC) is the host organization at Edwards Air Force Base, which is located 48 kilometers (30 miles) east of the Mojave Airport. The AFFTC manages the special use airspace designated as Restricted Area R-2515 (contained within the R-2508 Complex), which would be the primary operating area for the vehicles launched from the Mojave Airport. Commercial and private agencies that operate aircraft in the R-2508 Complex maintain appropriate Letters of Agreement (LOA) with both the R-2508 Complex Control Board and the AFFTC for operation in their respective areas. In addition, USAF aircraft may use Mojave Airport for some missions. The AFFTC also operates the airfield, which would serve as the primary emergency landing site for the launch vehicles. These entities also have a responsibility for the environment and assets on the ground, which have the potential to be affected by launches. Therefore, the FAA requested and the USAF agreed to participate as a cooperating agency in the preparation of NEPA analysis for this proposed action. The EKAD is the lead agency for CEQA. On December 16, 2003 the EKAD adopted a Negative Declaration for the proposed action pursuant to the CEQA.

**ALTERNATIVES CONSIDERED:** Alternatives analyzed in the EA included (1) the proposed action, issuing a launch site operator license to the EKAD for the operation of a launch site at Mojave Airport for Concept A and Concept B launch vehicles, (2) issuing

a launch site operator license to the EKAD for the Mojave Airport for Concept A launch vehicles only, (3) issuing a launch site operator license to EKAD for the Mojave Airport for Concept B launch vehicles only, and (4) the no action alternative. Under the No Action Alternative, the FAA would not issue a launch site operator license to EKAD for launches of Concept A and Concept B launch vehicles from the Mojave Airport. No launches of Concept A or Concept B launch vehicles would take place from the Mojave Airport. The Airport would continue to operate as a general aviation airport and predicted environmental impacts from the proposed action would not occur.

## **ENVIRONMENTAL IMPACTS**

### **Safety and Health**

A hazard analysis is a necessary part of the Mission and Safety Review for the FAA licensing determination to assess the possible hazards associated with proposed ground, flight, and landing operations. Launches of Concept A and B vehicles (including SpaceShipOne) from the Mojave Airport would require launch specific licenses from the FAA and each launch applicant (including Scaled Composites) would be required to conduct risk analyses based on the proposed mission profiles. The Mission and Safety Review will consider these analyses, and, therefore, they were not discussed in detail in this EA. However, analysis of the safety and health implications of launch related operations and activities that have the potential for environmental impact were considered in this EA.

Ground operations involved in servicing and preparing launch vehicles typically involve industrial activities, which were evaluated for potential impact on the environment. There are various hazards associated with these activities including

- Spill/fire/explosion of propellant/fuel storage, transport, handling, and loading;
- Traffic accidents due to increased activity on and off site; and
- Occupational mechanical accidents.

There would be some vapors of various propellants released from propellant storage/transfer operations through evaporative losses. However, such vapors would be vented outside and at a height that would provide adequate protection for personnel, buildings and the environment. Also, the total quantity of emissions would not occur as a large acute (short-term)

exposure, but would occur as a slow vapor release over a long period of time. There is also the concern of spills of propellants during handling and loading operations and subsequent fire or explosion. However, the Mojave Airport has established practices and procedures to handle the spills and releases of propellants.

Increased road traffic that would result from conducting the proposed launch operations at the Mojave Airport would only add a few cars/trucks above existing traffic loads. However, the increase in the number of shipments of hazardous materials should not significantly increase the number of traffic accidents on the roadways around the Mojave Airport.

On-site work associated with the conduct of launch operations would be similar to that associated with industrial chemical operations. Exposure to mechanical accidents should not differ significantly from current levels for the Mojave Airport because the number of operations associated with the conduct of launch operations would be relatively small given the number of operations airport wide.

In a catastrophic accident, it would be likely that the crew would be seriously injured or killed. At the Airport, the on-site fire department would respond and secure the site, but would stay clear of the immediate area until the danger of explosions diminishes. It is expected that any fires resulting from a failure could be fought by the fire department. Additional off-site emergency response capability could also be used if necessary.

### **Air Quality**

Air emissions may be generated during launch/landing operations, pre- and post-launch ground operations, and accidents. The proposed action does not include any changes to the physical structure of the airport (e.g., runway) or any construction activities; therefore there are no construction vehicles or associated emissions and no construction-related dust or airborne particles. The air quality at the Mojave Airport in Eastern Kern County is in Federal non-attainment (serious) and State non-attainment (moderate) for ozone, and non-attainment for PM<sub>10</sub> (California standards only). A Federal agency cannot support an action (e.g., fund, license) unless the activity will conform to the Environmental Protection Agency-approved State Implementation Plan for the region. This is called a conformity determination or analysis. A conformity analysis may involve

performing air quality modeling and implementing measures to mitigate the air quality impacts. The Federal government is exempt from the requirement to perform a conformity analysis if two conditions are met.

- The ongoing activities do not produce emissions above the de minimis levels specified in the rule.
- The Federal action must not be considered a regionally significant action. A Federal action is considered regionally significant when the total emissions from the action equal or exceed 10 percent of the air quality control area's emissions inventory for any criteria pollutant.

Air analyses indicated that nitrogen oxides (NO<sub>x</sub>) and volatile organic compound (VOC) emissions are 0.01 metric tons (0.01 tons) per year and 2.2 metric tons (2.4 tons) per year, respectively. These would not be above the de minimis level of 45.4 metric tons (50 tons) per year. In addition, the total emissions from the proposed action represent 0.0001 percent of the area's emissions inventory for NO<sub>x</sub> and 0.05 percent of the area's emissions inventory for VOC, and therefore, are not regionally significant. Based on these data, there is no need for a Federal conformity analysis and no significant impacts to air quality are anticipated.

The National Ambient Air Quality Standard (NAAQS) for NO<sub>x</sub> and VOC for areas in severe non-attainment is 25 tons per year. Therefore, for emissions resulting from the proposed action, there would be no exceedances of the NAAQS from the proposed action and a NAAQS assessment would not be required to evaluate the potential for significant air quality impacts under NEPA.

For Concept A vehicles (including SpaceShipOne), the EA addressed the impacts to air quality from both the carrier aircraft and the mated suborbital launch vehicle. The aircraft would have turbojet engines using Jet A-1 fuel. The Concept A launch vehicle would use a hybrid rocket engine with nitrous oxide (N<sub>2</sub>O) and hydroxyl-terminated polybutadiene (HTPB) as propellants. There would be emissions from both the carrier aircraft and the launch vehicle components. To make emissions calculations for the carrier aircraft, it is assumed the aircraft would most closely resemble the T-38 Tiger aircraft which uses two J85-GE-5F engines. To estimate aircraft emissions, emission factors (e.g., pounds released per takeoff/landing cycle) found in the EPA document *Compilation of Air Pollutant Emission Factors* for the T-38 aircraft were used. The takeoff/landing cycle includes idle, takeoff, climb out to

914 meters (3,000 feet), descent starting at 914 meters (3,000 feet), approach, and landing.

The analysis considered emissions in two categories, above 914 meters (3,000 feet) and below 914 meters (3,000 feet). The 914 meter (3,000 feet) altitude is an appropriate cutoff because the Federal government uses 914 meters (3,000 feet) and below for contributions of emissions to the ambient air quality and for de minimis calculations. Annual emissions from the carrier aircraft for a maximum of six flights would be 225.1 kilograms (496.3 pounds) of CO, 3.3 kilograms (7.3 pounds) of nitrogen oxides (NO<sub>x</sub>), 28.3 kilograms (62.5 pounds) of volatile organic compounds (VOCs), and 1.7 kilograms (3.7 pounds) of sulfur dioxide (SO<sub>x</sub>). Because NO<sub>x</sub> and VOC emissions from the carrier aircraft are not above the de minimis level of 45.4 metric tons (50 tons) per year, there is no need for a Federal conformity analysis.

Emissions from the launch vehicle would occur from the combustion of N<sub>2</sub>O and HTPB. For each flight, there would be an estimated 1,295 kilograms (2,855 pounds) of N<sub>2</sub>O and 228 kilograms (503 pounds) of HTPB. The emissions would begin at an altitude of between 16 to 20 kilometers (10 to 12 miles) (troposphere and beginning of stratosphere). The emissions are based on propellant emission factors similar to those used in the Navy FA-18E/F EA. These emission factors are refined because the launch vehicle proposes to use N<sub>2</sub>O and HTPB rather than perchlorate and HTPB as in the Navy EA. Thus, it was assumed that

- N<sub>2</sub>O fully decomposes to oxygen and nitrogen,
- The oxygen fully reacts with the hydrogen in the HTPB to form water,
- The oxygen reacts with the carbon in HTPB to produce roughly ten times as much carbon monoxide (CO) as carbon dioxide (CO<sub>2</sub>) (similar to FA-18E/F EA), and
- The nitrogen is released as nitrogen gas (N<sub>2</sub>).

To estimate the total emissions, the emissions fractions were multiplied by the total amount of propellant used (1,523 kilograms [3,358 pounds]) and the number of flights expected per year. In a year with a maximum of six flights the emissions would be 274 kilograms (604 pounds) of CO<sub>2</sub>, 1,828 kilograms (4,030 pounds) of CO, 2,011 kilograms (4,433 pounds) of water, and 4,935 kilograms (10,880 pounds) of N<sub>2</sub>. The propellant is fully expended above 914 meters (3,000 feet); therefore, there

are no propellant combustion emissions for the proposed vehicle during landing.

There are also emissions from the carrier aircraft above 914 meters. Although these emissions were considered, it was generally assumed that aircraft emissions from the six proposed flights per year would be relatively small compared to a total of 18,301 aircraft flights occurring annually from the Mojave Airport.

Emissions can also occur from support equipment used during ground operations. This could include various trucks and equipment, although there would be relatively few used and therefore few emissions would be expected to result from their use. There would also be air emissions from fueling the carrier aircraft and storage of additional fuels. Each flight of the carrier aircraft would consume 2,903 kilograms (6,400 pounds) of Jet-A fuel. This would equal 21,804 liters (5,760 gallons) per year based on 1.25 liters per kilogram (0.15 gallons per pound) and six flights per year. Fuel use at the Mojave Airport during the 12-month period from July 2002 to June 2003 was 7,933,837 liters (2,095,898 gallons). An additional 21,804 liters (5,760 gallons) of fuel per year represents a small increase in annual Jet-A usage at the airport and, therefore, the emissions from storage and dispensing as a result of activities related to proposed launch operations would not be significant.

Because the emissions from the launch vehicle would originate far above the applicable altitude (914 meters [3,000 feet]) for the Federal or California ambient air quality standards, these emissions are not evaluated using these air ambient quality standards. Under Federal law, it would be necessary to conduct a conformity analysis for criteria pollutants that do not meet Federal attainment standards. Eastern Kern County is in serious non-attainment for ozone under Federal attainment standards. Therefore, if annual emissions of ozone precursors (VOC or NO<sub>x</sub>) were above certain de minimis levels, it would be necessary to conduct a conformity analysis. Emissions analysis showed that NO<sub>x</sub> and VOC emissions would not exceed de minimis levels of 45.4 metric tons (50 tons) per year. Based on emissions originating below 914 meters (3,000 feet) there is no need for a Federal conformity analysis. None of the emissions are expected to expose the nearby population or sensitive receptors to substantial pollutant concentrations. Also, the emission products should not expose the population to objectionable odors of types that do not already exist from airport operations (e.g., fuel and exhaust odors).

## **Airspace**

No significant impacts to Mojave Airport airspace would occur as a result of the proposed action. Conducting a maximum of six launches of the SpaceShipOne vehicle over a 12-month period would have no significant impacts on airspace. Conducting six launches per year would result in a 0.03 percent increase in activity at the Mojave Airport. Increased operations including all Concept A and B launches (up to 56 flights per year by 2008) for the proposed activity would represent an increase of 0.3 percent over the current annual flight rate at the Airport. This increase would not exceed the capabilities of the Mojave Airport facilities and control tower and would not result in a significantly higher probability of in-flight mishaps. No significant impacts to off-site airspace would occur as a result of the proposed action. The proposed action would occur almost exclusively in the R-2508 Complex. The Mojave Airport and several of its tenants have LOAs with the R-2508 Complex Control Board and the managers of individual restricted areas within the R-2508 Complex to operate within the various individual restricted areas (including R-2515). Any flights into the R-2508 Complex that are part of the proposed action that would create a significant impact to military activities would be prohibited by the scheduling and controlling agencies. Thus, the proposed action would not result in long-term changes to military operations or training within restricted airspace.

## **Biological Resources**

### *Vegetation*

The proposed action would use a designated runway at Mojave Airport for launches and landings of Concept A and B launch vehicles. The runways are routinely used for take-offs and landings by other aircraft, and no construction activities would be required to support launch operations. Because no development activities are planned, adverse effects to vegetation, including Joshua trees and creosote scrub, would not be anticipated.

In the unlikely event of an emergency landing, the pilot would attempt to reach the primary abort site at the main runway at Edwards Air Force Base. However, any airport within gliding range with a runway of at least 1,219 meters (4,000 feet) would be a candidate for an emergency landing location. Although the designated abort sites include areas where sensitive habitat and species may be present, it is unlikely that an emergency landing

would occur at these sites, and therefore significant impacts to vegetation found at these sites would not be anticipated.

### *Wildlife*

The proposed action would use a designated runway at Mojave Airport for launches and landings of Concept A and B launch vehicles. The runways are routinely used for take-offs and landings of other aircraft, and no construction activities would be required to support launch operations. As a result, no loss of habitat would be anticipated.

Because no construction activities are planned, no significant adverse effects, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species would be anticipated. The desert tortoise which is a U.S. Fish and Wildlife Service federally-listed, threatened wildlife species, has historically occurred throughout the region of influence and has limited potential to occur almost anywhere within the Mojave Specific Plan area. Critical habitat for the desert tortoise has been designated in the region of influence and the FAA initiated informal consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act. After review of potential impacts, the FAA determined and the U.S. Fish and Wildlife concurred, that the proposed action, including the launch of Concept A vehicles (such as SpaceShipOne) or Concept B vehicles is not likely to adversely affect federally listed threatened or endangered species or critical habitat. As a protective measure for desert tortoise that may be within the Mojave Airport fence, the U.S. Fish and Wildlife Service requested that the FAA survey the runway prior to take-off and landing of suborbital vehicles. If a desert tortoise were discovered at the airport, personnel would follow appropriate U.S. Fish and Wildlife Service and California Department of Fish and Game protocols.

The breakup of the launch vehicles during a crash and subsequent recovery activities could directly impact biological resources in the Region of Influence through ground disturbance. Also, if falling debris hit specific species on the ground, those resources would likely be destroyed. However, because it is unlikely that a crash would occur, impacts to biological resources as a result of vehicle crash would not be anticipated.

Noise impacts generated by launch vehicles at the Mojave Airport, including sonic booms, could elicit a short-term

startle response in wildlife but no long-term adverse impacts would be expected. In general, noise levels would be significantly less than those produced by existing aircraft vehicles in the region, and launches would occur infrequently over the course of a year. Therefore, these short-term noise impacts would be less than significant.

### **Cultural Resources**

No airport modifications or construction activities are currently planned to support the proposed action. Concept A and B vehicles (including SpaceShipOne) would use a designated runway at the Mojave Airport for launches and landings. The runways are routinely used for takeoffs and landings of other aircraft and no construction activities would be required. Potential impacts to cultural resources would be associated generally with the noise produced during flights and could include physical damage to buildings, structures or rock features through accident or vibration, visual or audible impacts to the setting of cultural resources, and disturbance of traditional activities, such as religious ceremonies or subsistence hunting. Impacts to cultural resources from airspace use would most likely be related to alterations in setting from visual or aural disturbance, and the extremely remote possibility of debris falling. The probability of damage to National Historic Register listed or eligible sites is small. No construction activities would occur as part of the proposed action, and no adverse effects on National Register sites would be anticipated. The FAA consulted with the California State Historic Preservation Officer to initiate informal consultation under Section 106 of the National Historic Preservation Act. The FAA determined that the proposed project would have no adverse effect on cultural resources. The California State Historic Preservation Officer concurred with the FAA's determination and consultation under Section 106 was concluded.

### **Geology and Soils**

The breakup of the launch vehicles during a crash and subsequent recovery activities could directly impact geology. The force associated with falling debris might create craters. The specific impact to geology would depend on the force at which the debris impacts the ground. However, because the probability of a crash is extremely low, it is unlikely that debris or residual propellant would significantly impact geology. The proposed action would have less than significant or no impact on soils. In terms of ground clouds from the combustion

of propellants, Concept A vehicles (including SpaceShipOne) would have no impacts because the only emission source at the ground level would be from the carrier aircraft. However, Concept B vehicles use liquid propellants, which would create a ground cloud consisting of carbon monoxide, carbon dioxide, hydrogen, and water. The ground cloud would disperse as the vehicle moves along the runway. Additionally, Concept B launch vehicles would use a liquid propellant, which creates a ground cloud with fewer impacts to soils than caused by the burning of solid rocket propellants.

The breakup of Concept A or B vehicles (including SpaceShipOne) during a crash and subsequent recovery activities could directly impact soils. Residual propellant in the damaged or destroyed launch vehicle could be absorbed by the soils affecting soil quality in the impact area. Because the probability of a crash is extremely low, and cleanup of reportable quantities is required under the Comprehensive Environmental Response Compensation and Liability Act, it is not expected that debris or residual propellant would significantly impact soils.

#### **Hazardous Materials and Hazardous Waste Management**

For both Concept A and B vehicles (including SpaceShipOne), the primary hazardous materials used would be propellants. Propellants used for Concept A launch vehicles (including SpaceShipOne) are relatively inert and they would be stored at the Airport. For Concept B, the kerosene and/or alcohol would have similar hazardous characteristics to the jet fuel currently used at Mojave Airport. All fuels and other hazardous materials would be stored and used in compliance with the regulations applicable to their storage and use, and already in place at Mojave Airport. No adverse impacts would be anticipated from these additional hazardous materials or subsequent hazardous waste disposal.

The SpaceShipOne vehicle would be fueled by a hybrid rocket motor using liquid  $N_2O$  and solid HTPB. Jet-A fuel would be used to fuel the carrier aircraft from takeoff on the ground until reaching 15,240 meters (50,000 feet) where the rocket motor would be ignited.

To compress gaseous  $N_2O$  to liquid form, a combination of elevated pressure and reduced temperature is needed. Specially designed storage tanks would be used for storing  $N_2O$ . Scaled Composites would use a Mobile Nitrous Oxide Delivery System (MONODS). MONODS was designed and built as a portable  $N_2O$  storage unit that

could be used to fill the launch vehicle. MONODS includes a 6,435-liter (1,700-gallon) tank, generator and heating/cooling unit. The storage vessel is constructed of materials that meet the American Society of Testing and Materials specification SA-240-304 for stainless steel. It meets the American Society of Mechanical Engineers Code and is registered with the National Board of Pressure Vessels.

HTPB is a solid propellant that is manufactured and placed in a Case, Throat and Nozzle (CTN) motor offsite. The CTN would therefore arrive at the Mojave Airport fully fueled. The solid propellant is stable and non-reactive until ignited. Overall, there would be no significant Hazardous Materials and Hazardous Waste Management impacts anticipated from the launch of SpaceShipOne launch vehicles from the Mojave Airport.

#### **Land Use**

No significant impacts to land use would occur as a result of the proposed action. The Mojave Airport is a highly developed, urbanized, non-sensitive area, and habitat and nature conservation plans are not applicable to the airport. The proposed action would be to conduct horizontal launches and landings on established runways of vehicles similar in size, power, and noise level to aircraft already using the airport. Therefore, no significant change would occur in airport activities. The proposed action does not include any construction, additions, or modifications to the airport facilities that would physically divide an established community. Therefore, the proposed action would not result in a conflict with an applicable land use, habitat conservation, or natural community conservation plan.

No significant impacts to land use in the off-site Region of Influence would occur as a result of the proposed action. The Concept A and B launch vehicles (including SpaceShipOne) would use Runway 12-30, which serves large airline carrier jet aircraft and high performance military and non-military jet aircraft. This runway has a northwest-southeast orientation that routes aircraft over commercial, industrial, and resource management land uses and away from sensitive land uses in the Mojave community such as residential areas and school areas. Because the proposed vehicles are similar in size, power, and noise level to the aircraft currently using the airport, any impacts on land uses in the Mojave community due to the proposed action would be equal to or less than the impacts of the existing activities. Noise impacts on sensitive land uses are

discussed in the Noise analysis. The proposed action would not include any off-site construction or modification of existing buildings or facilities, and therefore would not physically divide any established communities. No conflicts with any applicable land use plans or habitat or nature conservation plans for the Mojave community would occur as a result of the proposed action.

## Noise

Approximately 1,226 jet aircraft takeoff and land at the Mojave Airport annually. The jet engines of the Concept A carrier vehicle are similar in size and power to jet aircraft that operate at the Mojave Airport. Noise levels at the airport from the Concept A carrier vehicle would be less than or equal to noise levels produced by afterburning jet aircraft currently using the Mojave Airport. The launch vehicles would land unpowered, therefore noise levels for landing would be insignificant and were not considered further in the noise analysis. Because the Mojave Airport currently experiences high intensity noise levels of 90 dB due to military jet flights and stationary rocket testing, and because the additional high intensity noise level would be insignificant, impacts to noise levels during launches at the Mojave Airport would be insignificant.

The Mojave community currently experiences high noise levels from military jet takeoffs and landings and stationary rocket tests. Sensitive receptors in the Mojave community such as schools and residential areas already experience high intensity noise levels above 90 dBA. An additional 4.4 minutes per week of high intensity noise levels would not cause significant impacts to sensitive receptors and would not elevate the average noise level above the acceptable levels of 65 CNEL or 65 L<sub>dn</sub>. (Kern County, 2003c)

The predicted overpressure for sonic booms produced by Concept A and B vehicles (including SpaceShipOne) flying at approximately 21,341 to 24,390 meters (70,000 to 80,000 feet) above mean sea level would be approximately 5.86 kilograms per square meter (1.2 pounds per square foot). Launches from the Mojave Airport would only occur during daytime hours. As a previous DoD study has shown, the noise effects of 10 daytime sonic booms at an overpressure of 4.88 kilograms per square meter (1 pound per square foot) everyday for a year would yield an outdoor accumulated noise level equal to an L<sub>dn</sub> of 65 dBA. This result aids in defining the maximum daily allowance for the number of daytime sonic boom events (10 events per day) to reach the L<sub>dn</sub> 65

dba noise standard limit. This assumes the estimated sonic boom overpressure is within the same order of magnitude, 4.88 kilograms per square meters (1 pounds per square foot), as those to be generated by the proposed Concept A and B vehicles.

The  $L_{dn}$  of 65 dBA is the accepted outdoor noise level related to transportation that has been adopted by the State of California and Kern County. In addition, a Community Noise Equivalent Level (CNEL) noise standard of 65 dB, applied for sensitive land uses such as residential and school areas, is also a required noise standard by the local authorities. Note the  $L_{dn}$  is similar to CNEL. Both measures are the average noise level over a 24-hour period, yet each applies a separate variation on penalties for nighttime noise levels.  $L_{dn}$  adds a 10 dB penalty for noises occurring between 10 pm and 7 am the following morning. CNEL adds a 5 dB penalty to noises occurring between 7 pm and 10 pm, and adds a 10 dB penalty to noises occurring between 10 pm and 7 am the following morning. (Kern County, 2003d)

However, the current proposed action would occur only during daytime hours. With no nighttime decibel penalties applicable, the  $L_{dn}$  and the CNEL would be equivalent measurements. As a result, an  $L_{dn}$  of 65 dBA for 10 daytime sonic booms per day for a year would be equivalent to a CNEL of 65 dBA for the proposed conditions.

Under the proposed action, it is expected the maximum overpressures would be on the order of 4.88 kilograms per square meter (1 pound per square foot), yet operations would occur at a lower frequency number of events (but only 1.1 sonic booms per week). Therefore, the sonic boom noise impact of the proposed action is estimated to be below the accepted  $L_{dn}$  and CNEL 65 dBA noise limits given the approximate factor of sixty-four times fewer expected number of sonic boom events estimated. At present, the Mojave Airport currently experiences sonic boom noise exposure from supersonic military jets and supersonic Space Shuttle testing at Edwards AFB.

The additional noise level associated with the launches of Concept A and B vehicles would be an insignificant increase to the community. The noise levels in the Mojave community associated with sonic booms would be less than 65 dBA  $L_{dn}$  and less than 65 dBA CNEL. The entire Mojave community including sensitive receptors currently experiences sonic boom noise exposure from air- and spacecraft landing at Edwards AFB. The proposed action would not constitute a significant increase in noise level to the community.

Annoyance created by sonic booms is a function of boom intensity, number of booms per time period, attitude of the population, and the activity in which people were engaged in at the time of the boom. There is no precise relationship between the parameters. A noise study found that 10 percent of subjects exposed to 10 to 15 booms per day were annoyed at an overpressure of one pound per square foot and that this reached nearly 100 percent at three pounds per square foot. However, people may be more sensitive when exposed to numerous booms per day, while prior experience with sonic booms (such as people who live on an Air Force Base) seems to lower sensitivity. Other studies indicate that there is a wide range in estimating percent annoyed ranging from 10 percent to 70 percent at one pound per square foot and 55 percent to approximately 100 percent at three pounds per square foot.

### **Socioeconomic Impacts and Environmental Justice**

Since no new development would be required to support the proposed action, and only existing personnel would be used to conduct launch activities, the proposed action would not induce substantial population growth in the community of Mojave. The proposed action would not be expected to displace people or decrease the population in the community of Mojave and therefore no impacts to population would be expected from the proposed action.

The proposed action would not require new construction or create new employment positions at the Mojave Airport. The proposed action would not result in any jobs being eliminated at the Mojave Airport and therefore no impacts to employment are expected from the proposed action. Any increase in the number of people accessing Mojave as a result of the proposed action would be limited to launch participants and launch spectators. These visitors would most likely spend only one day in Mojave to watch or participate in launches. It was assumed that each launch of Concept A and B launch vehicles would add three passenger vehicles to the area and each vehicle would contain one to two people. The maximum number of flights for Concept A would be six launches per year, which would add 18 passenger vehicles to the area per year. The maximum number of flights for Concept B would be 50 flights a year, which would add 150 passenger vehicles to the area per year. Existing roads could easily handle this level of passenger traffic and therefore additional transportation infrastructure would not be required. In addition, because these visitors would only be spending a short amount of time in Mojave, they are not expected to

significantly impact the local service industry. Therefore, there would be no significant socioeconomic impact to the community of Mojave from the proposed action.

Since no construction activities would be required to issue a launch site operator license to EKAD for the Mojave Airport and only existing personnel would be used to conduct launch activities, the proposed action would not have an impact on the health or environment of minority or low-income populations located at or near the airport. Noise levels from the proposed launch vehicles would be significantly less than those experienced from existing vehicles in the region, would occur infrequently over the course of a year, and already occur as part of existing activities in the region. Therefore, no impacts to environmental justice communities are expected from the proposed action.

### **Transportation**

Under the proposed action no additional employees would be hired by the Mojave Airport or potential launch participants at the airport. Any increase in the number of automobiles accessing Mojave Airport would be limited to launch participants and launch spectators. Existing access roads could easily handle an increase in passenger traffic without a change in level of service designation of a significant change in the volume to capacity ratio. The proposed action would not result in inadequate emergency access or parking capacity at the Mojave Airport or within the Mojave community. The proposed action would not conflict with adopted plans, policies, or programs supporting alternative transportation.

Under the proposed action, additional propellants would be delivered to the Mojave Airport to support the flights of the proposed launch vehicles.

Propellants to be delivered for the SpaceShipOne vehicle would include  $N_2O$  and HTPB for the launch vehicle and Jet-A fuel for the carrier vehicle. Approximately 1,295 kilograms (2,855 pounds) of  $N_2O$  are required per launch. Each delivery truck would transport 11,340 kilograms (25,000 pounds) of  $N_2O$  to the Mojave Airport. Under the proposed flight schedule, the maximum number of launches would be six per year; therefore, one delivery truck per year would supply the required  $N_2O$ . Approximately 2,903 kilograms (6,400 pounds) of Jet-A fuel are required per launch. Each delivery truck would transport 28,122 kilograms (62,000 pounds) of Jet-A fuel to the Mojave Airport; therefore one truck a year would be needed to supply the

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required Jet-A fuel. One truck per flight would be needed to bring the motor containing the solid propellant, HTPB, to the Mojave Airport; therefore six trucks per year would be needed to deliver the required HTPB. A maximum of eight delivery trucks would be required to supply propellants for the SpaceShipOne launch vehicles per year. The Mojave Airport estimates that there are currently 264 propellant truck deliveries annually. The Mojave Airport is located at the crossroads of major north-south and east-west roadways. The small number of additional passenger vehicles and delivery trucks anticipated as part of the proposed action would not increase traffic congestion or cause a decline in the level of service.

### **Visual Resources**

The design of the proposed launch vehicles would resemble traditional airplanes in flight, and the visual landscape already includes aircraft in flight. The proposed action would not create a new source of substantial light or glare to adversely affect day or nighttime views in the area, so the visual dominance would be "Not Noticeable." Both proposed launch vehicle concepts would leave visual contrails, but they would be similar in visual impact to contrails from existing operations. Because this area is already used for aircraft takeoffs and landings, the visual sensitivity is low. The proposed action would not substantially degrade the existing visual character or quality of the site and its surroundings and would have no adverse effect on a scenic vista or scenic resources, as there are none in the area.

### **Water Resources**

Because no construction or expansion to the existing facilities would occur, the proposed action would not cause impacts to existing drainage patterns that would result in increased erosion, siltation, or on-site or off-site flooding. The proposed action would not involve the generation of additional storm water or of additional sources of pollutants that could be washed away during storm events. The existing storm water system and permit would be adequate for the proposed action. The proposed action would not make any changes to the amount of impermeable surface area and would therefore have no impact on the existing off-site storm water system. Therefore, the capacity of the current storm water system would be adequate to accommodate the proposed action. Because no construction or expansion to the existing facilities would occur, the proposed action would not substantially deplete ground water supplies

either on- or off-site or interfere with ground water recharge such that there would be a net deficit in aquifer volume or a lowering of the local ground water table. In the event of a catastrophic accident unburned propellant could impact ground water. However, the small size of the proposed vehicles and the low probability of a catastrophic event would make the impacts insignificant.

In the event of a catastrophic accident, debris and wreckage could impact drainage patterns or storm water flows. But, the small size of the proposed vehicles and the low probability of a catastrophic event would make the impacts insignificant. Extensive emergency response and clean-up procedures would further reduce the magnitude and duration of any impacts.

### **Cumulative Impacts**

The proposed action would not exceed de minimis levels for criteria pollutants and the percent of the air quality control area's emissions inventory for any criteria pollutant. Total CO<sub>2</sub> emissions from all sources in the U.S. were 5,159 million metric tons (5,687 million tons) in 1994. The proposed action would account for an increase of only a fraction (less than 0.000002%) of these CO<sub>2</sub> emissions. Consequently, the total expected CO<sub>2</sub> emissions from the proposed action would be insignificant. There would be no emissions that directly affect ozone depletion. No significant cumulative impacts to air quality are expected.

Because of the volume of air traffic that uses this area already and the structured scheduling procedures in place for joint-use of the R-2508 Complex, the proposed action would have no significant cumulative effects on airspace.

In the EA for the Orbital Reentry Corridor for Generic Unmanned Lifting Entry Vehicle Landing at Edwards AFB, the USAF considered up to 12 flights per year. Currently an average of two military jet aircraft take off and/or land at the Mojave Airport per day. These military aircraft can produce sonic booms. Even in the worst case scenario, i.e., one launch from the Mojave Airport, one launch of the proposed Unmanned Lifting Entry Vehicle from Edwards AFB, and two jet aircraft take offs or landings from the Mojave Airport, there would not be more than 10 sonic booms generated per day in the Region of Influence. Therefore, there would be no significant cumulative impacts to noise from the proposed action.

No significant cumulative impacts to biological, cultural, geologic, mineral, visual and aesthetic, or water resources would occur as a result of the proposed action. No significant cumulative impacts would result from hazardous materials or hazardous waste used or produced as a result of the proposed action. No significant cumulative impacts to land use, socioeconomic, environmental justice, or transportation would occur as a result of the proposed action.

Detailed analyses of safety and related issues would be addressed in the FAA's Mission and Safety Review prior to issuing a launch license. However, safety and health analyses of operations that have the potential for environmental impact were considered in the EA and were determined to have no significant cumulative impacts on the environment.

Although the proposed action would support and facilitate limited growth, it would not induce growth. Additionally, there would be no specific future development activities currently known that would be dependent on the proposed action. Therefore no significant cumulative secondary impacts are expected to result from the proposed action.

#### **No Action Alternative**

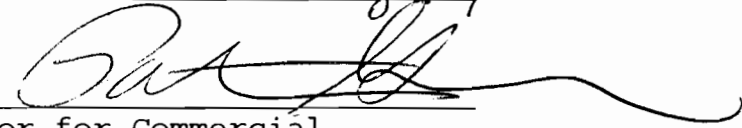
Under the No Action Alternative, the FAA would not issue a launch site operator license to the EKAD for the operation of a launch site at the Mojave Airport or issue a launch license to Scaled Composites for up to six launches of SpaceShipOne from the Mojave Airport. Scaled Composites could continue to conduct aviation-related activities that do not require a launch license.

The predicted environmental effects of the Proposed Action would not occur. The existing on- and off-site conditions at the Mojave Airport would remain unchanged.

## DETERMINATION

An analysis of the proposed action has concluded that there are no significant short-term or long-term effects to the environment or surrounding populations. After careful and thorough consideration of the facts herein, the undersigned finds that the proposed Federal action is consistent with existing national environmental policies and objectives set forth in Section 101(a) of the National Environmental Policy Act of 1969 (NEPA) and that it will not significantly affect the quality of the human environment or otherwise include any condition requiring consultation pursuant to Section 102 (2) (c) of NEPA. Therefore, an EIS for the proposed action is not required.

Issued in Washington, DC on: February 18, 2004

Patricia Grace Smith   
Associate Administrator for Commercial  
Space Transportation

