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Before The
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In the Matter of: SpaceX Boca Chica Launch and Manufacturing Site: Public Scoping of Issues for Analysis in Environmental Assessment.	

Comment of Bruce Perens

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1 Overview

In this comment, I introduce the Rocket Launch, Operations, and Recovery Observer (“Launch Observer”) as a stakeholder, a beneficial public influence, an environmental impactor and (when managed appropriately) an environmental impact mitigator.

I request a Supplemental Environmental Analysis dealing with the issues of the Launch Observer near the Boca Chica site, which would be applied programmatically regarding all further environmental assessments of the facility.

I discuss issues of the Launch Observer and their environmental impact at and around SpaceX Boca Chica. As applicable examples of future activity at Boca Chica, I discuss Launch Observers at Kennedy Space Center and Cape Canaveral Space Force Station, and the Vandenberg Air Force Base.

I present a suggested policy and process framework for appropriately managing and accommodating the Launch Observer and their environmental impact in planning rocket manufacture, ground support, launch, and recovery operations. I present suggested requirements concerning Launch Observers to be used in future Environmental Impact Assessments.

1 Request for Supplemental Environmental Analysis

The 2014 Environmental Impact Statement for the SpaceX Boca Chica facility and all subsequent written re-evaluations through December, 2020 have not sufficiently taken into account the environmental impact of the Launch Observer and their issues. The locations where observers are likely to congregate, their numbers, their potential environmental impact and processes for mitigation are not mentioned in those documents.

Recent operations by SpaceX at Boca Chica *have* involved a significant number of Launch Observers, and they have had an environmental impact. Fortunately the impact appears to have been favorable this time, due to a cleanup operation organized by the Launch Observers themselves. Further operations are expected to have greater environmental impact. Thus, the 2014 EIS is no longer current nor substantially valid without the addition of a supplemental EIS regarding Launch Observers.

2 The Launch Observer

People have been entranced by rocket viewing for the two millenia that fireworks have existed, a trait that evolved into us as primitive humans sat around a community fire. The modern Rocket Launch, Operations, and Recovery Observer ("Launch Observer") includes the same motivations, as well as an appreciation of science, of astronauts as heroes, and of the hope for an interplanetary, and even interstellar, human race as passenger space vehicles become a reality.

2.1 The Launch Observer Has Standing In Space-Related Environmental Proceedings

This is a proceeding under the National Environmental Protection Act. That act establishes the purpose of encouraging *productive and* ***enjoyable*** *harmony between man and his environment.*

Obvious in the idea of *managing* the environment is the fact that it is *not* simply the natural space and resources around us, but the impingement upon that space and those resources of human beings and all of their works.

Thus, **the Launch Observer has standing** under this proceeding as someone who simply wishes to view a launch *for their own enjoyment. However,* the Launch Observer is not *merely* someone out for a good time:

2.2 The Launch Observer is a Stakeholder

Both private and government rocketry are taxpayer-funded, the private ones through various research and development programs and the support of many and various facilities, including the FAA itself, the launch sites, the International Space Station, and the *Eastern and Western Ranges,* launch telemetry ranges managed by the 30th and 45th Space Wings of the United States Space Force and NASA.

The Federal Aviation Act of 1958 establishes the FAA as an entity operating *in the public interest.* The 1st amendment of the Constitution guarantees the right of citizens to peacefully assemble, observe, and (when necessary) seek redress to the operation of their government. More generally, the citizen has a right to *know what their government is doing,* and of course this is necessary if they are to be informed voters.

Voluminous case law interpreting the 1st amendment (to a great extent concerning the observation of police officers, but applying equally to other government departments and their functionaries) supports the right of the public to be present to observe, and to photograph and make video recordings and other records.

The Launch Observer, as taxpayer, voter, and citizen; thus has a *constitutional right* to observe the operation of FAA regulated and/or government funded rocketry and space operations, within sensible limits of safety, privacy, and national security. **Launch Observers are thus stakeholders whose rights must be considered by the FAA and other authorities.** But their rights are often ignored, even thwarted, by poorly-informed authorities where many space operations take place, since of all such facilities *only* Kennedy Space Center has any reasonable plan and accommodation for Launch Observers.

2.3 The Launch Observer Performs a Public Benefit

FAA is fundamentally a science-based organization: Aircraft aren't held aloft by politics or the power of crystals. This is evident as FAA acts upon the results of scientific investigations such as those carried out by NTSB.

Increase in the scientifically-educated portion of the electorate is in the interest and mission of FAA: these are the people who will operate, advance, and patronize aviation and space travel; and operate the FAA itself. More generally, science is critical to the Federal Government and all citizens: It is only through science that we will solve public issues such as COVID-19 and the effects of pollution and global warming upon our nation and people.

Launch Observers in general encourage science and particularly science education. They are, to a great extent, there because they are excited by the science of rocketry and its potential for the human race. They transmit this to their children, who grow up to be excited by science.

Launch Observers perform a public benefit: they promote science, technology, engineering, and mathematics; and education in those fields, supporting our national security and competitiveness. They should be supported and encouraged.

2.4 The Launch Observer Has an Environmental Impact

Launch Observers, by their presence at a launch, space operation, or recovery, can have a significant environmental impact. This impact can be easily mitigated *if planned for,* but at facilities other than Kennedy Space Center, *no entity takes responsibility* for Launch Observers, and *there is no budget* for their accommodation.

This means that Launch Observers are handled as a general policing problem, staffed by small-town police or soldiers, neither of whom have much training or experience in crowd management. With no good policies or processes in place, and no financial responsibility for the accommodation of Launch Observers, the sole extent of the policing effort is to block them, move them on, and to in general harass them.

Just outside of Vandenberg Air Force Base in the City of Lompoc, I witnessed a significant environmental impact due to the unacceptable lack of preparation for the thousands of Launch Observers for the October 8, 2018 launch and landing of the Falcon 9 at the base. This was the first landing of a Falcon first stage there, and a dramatic just-past-sunset launch (see Section 4.1.5: *The Twilight Phenomenon*).

The base operates an inadequate facility called “Hawk’s Nest”, 10.5 miles from the launch pad, as their only official observation site. This site did not have a view of the launch or landing pad and was much too far away. The first 300 vehicles through the gate to Hawks Nest were admitted, and then the gates were closed, leaving many thousands of people to find an unofficial observing location.

I observed from Ocean Avenue in the City of Lompoc, at a site approximately 5 miles from the launch pad, an appropriate distance considering both safety and what could be observed. There is no nice way to say this: thousands of people were there for as long as 10 hours, with not one potty. The few City of Lompoc police present, restricting their activity to traffic-management, were quick to render their only response to complaints: “We didn’t invite you to come here”. Human waste was inappropriately deposited around the site. After the launch and landing, there was an hours-long traffic jam during which many people left their cars, in panic, to run into farmers fields in pursuit of the few potties left out for the harvesters. They trampled revenue crops and in general created a mess for the farmers.

This ugly and even dangerous situation could have been avoided with a score of potties placed in likely locations and appropriately serviced. It wasn't, because no appropriate policies and processes were in place, and nobody was told to foot the relatively small bill.

The SpaceX Boca Chica launch facility is in an ecologically sensitive area including South Padre Island, Texas, and its surrounding wetlands, Boca Chica State Park and Brazos Island State Park, the Las Palomas Wildlife Management Area; Playa Bagdad and the adjacent wetlands of Matamoros, Mexico. **There must be a plan to properly manage and accommodate tens of thousands of Launch Observers who are likely to come to such events as the first orbital flight attempt of the Starship / Super Heavy combination.** Similarly, management and accommodation of Launch Observers at sites like Vandenberg Air Force Base and the surrounding City of Lompoc must be improved.

2.5 The Launch Observer Is An Environmental Impact Mitigator, When Properly Managed

At the December 9, 2020 first 12.5 kilometer flight test of the SpaceX Starship, Emmett Osborne, a 19-year-old engineering student, was disquieted by the condition of Isla Blanka park, which was to be the - entirely unofficial - site of hundreds or thousands of observers for the Starship flight. It was a mess. With the help of internet influencers, Osborne organized a park cleanup before the launch, leaving the park in much better shape than before the Launch Observers arrived.

This event received news coverage at https://www.mysanantonio.com/sa-inc/article/SpaceX-Starship-chasers-converge-in-South-Texas-15813022.php

When properly managed, Launch Observers are an effective cleanup crew for the areas they visit.

2.6 The Launch Observer is a Safety and Security Issue To Be Managed

The SpaceX Boca Chica launch site, though private, will inevitably be the site of government missions, and is presently the home of much information restricted under the International Traffic in Arms Regulations and the Export Administration Regulations, and subject to industrial and national espionage. Like any launch or construction site, it's a dangerous place for the staff, and worse for uninvited interlopers.

Vandenberg Air Force Base ("VAFB") is no amusement park. There are nuclear-weapon-related facilities and much more of a National Security nature that is not disclosed. Rockets and satellites kept there carry

hypergolic fuels that are intensely toxic. A brush fire at the huge base shut down our nation’s polar launch capability for months.

Adjacent to VAFB is a Federal prison with its own security issues, and a reserve for the endangered Snowy Plover that can not tolerate more than a handful of entrances by untrained people during the breeding season. The beach and wetlands within the base and around it are sites for marine mammal haul-out and breeding, waterbird nesting, and are in general animal habitat.

In contrast, the Kennedy Space Center Visitor Center *is* an amusement park (as well as a historical and educational center) and manages tourists and launch viewing events within controlled areas at Kennedy Space Center and the adjacent Canaveral Space Force Base. Visitor management and operations are contracted to Delaware North Corporation as a for-profit activity.

The more interesting events at Kennedy Space Center and Canaveral easily overflow the base, with viewers for 10 miles in every direction *and* in vessels within protected wetlands and navigable waterways, making them a management problem for many different agencies.

3 Who Should Pay?

The failure of Vandenberg Air Force Base and the City of Lompoc stated in Section 2.4, above, is due to several factors:

- No FAA, nor environmental, proceeding placed responsibility for managing Launch Observers and their impact upon any entity.
- The successive Commanders of Vandenberg Air Force Base have obviously not considered the management and accommodation of Launch Observers to be within their mission, or there would be more provided for the observers than a single, inappropriately-distant and too-small viewing site. It is probable that Launch Observers are considered to be a low-priority issue within the public-relations budget for the base, and no more.
- By default, management fell to mere traffic control and exclusion from areas by the base and the City of Lompoc.

The first step in preventing future failures is to determine who shall pay for management and accommodation of Launch Observers.

Obviously, there *is* money: The Kennedy Space Center Visitor Center is operated at no government expense, and produces 300 Million dollars a year in income. Launch is an *extremely* lucrative business, with SpaceX, the least-expensive vendor per kilogram to various orbits; charging around 66

Million dollars for commercial launches of the *Falcon 9,* and approximately 120 Million dollars for Government launches mainly operated on behalf of the National Reconnaissance Organization by the Space Force.

Somewhere in there, we can find money to pay for potties.

Of course, accommodating the Launch Observer also means operation and management of appropriate viewing sites and the visitors to them. But the first priority must be reducing their environmental impact, and not subjecting them to unnecessary indignity.

Managing and accommodating Launch Observers and their environmental impact should be billed to the launch customer by the launch facility, and should be an item for consideration in each Environmental Impact Assessment concerning the launch facility. No Environmental Impact Statement for a launch facility should be considered complete without an appropriate statement of the expected attendance by Launch Observers for various sorts of launch or recovery, the accommodation that will be provided for them, and how their environmental impact is to be be managed.

Accommodation of Launch Observers is potentially a profitable opportunity, as it is today for Delaware North Corporation at the Kennedy Space Center Visitor Center. I gladly paid $200 to be hosted at the Saturn V Center during the first Falcon Heavy launch and double-landing, and tickets for that venue quickly sold out. Delaware North also offered less expensive viewing venues which all sold out, and viewing overflowed onto roads, shorelines, and waterways for 10 miles in every direction and hotel rooms were full all up and down the Florida coast. Launch Observers provided significant income to the area.

It is an unfortunate fact that many military families live at the edge of poverty. This is coupled with social ills and suicide among them. Perhaps paid viewing opportunities at military launch sites like Vandenberg Air Force Base, Canaveral Space Force Station, and Patrick Air Force Base can be operated to benefit military families in need.

4 Process Framework

This section is a suggested process framework for launch facilities, which would help them to satisfy future Environmental Impact Assessments that include concerns regarding Launch Observers.

4.1 Identify The Interest and Potential Attendance

For each launch, it is necessary to identify the public interest in the mission and the potential attendance resulting from that interest. These factors should be considered:

4.1.1 Historical Attendance Data

Attendance data should be collected for each launch and other space operation, carefully noting the type of mission (as explained below), since that is the main factor influencing overall interest in the mission. Keeping this information at hand will help to forecast future attendance. Potential sources of this information are:

- Photos showing attendance at viewing sites. There are software applications and published methodologies for calculating attendance from photographic data.
- Ticket sales at paid viewing sites, local park ticket sales and admissions.
- Lodging occupancy reports generated from the payment of lodging taxes; from hotels, motels; Air B&B and VRBO for home-sharing; heavily-used travel agencies such as Travelocity, Orbitz, Hotels.com; the local Chamber of Commerce and Tourism Bureau.
- Flight occupancy reports from the airports, air carriers, and ticketing agencies.
- Rental car usage reports from the various car rental companies, ticketing agencies, and from taxes paid on car rentals.
- Parking lot or structure occupancy data.
- Traffic sensor data from the local agencies operating highways and roads, and from commercial traffic data reporting companies such as Idealspot.
- Cell phone location data sold by Google, Apple, etc.

4.1.2 Crewed Missions

The presence of a crew on the space vehicle will always increase interest, due to the perception of astronauts as heroes who are risking their lives to advance science and the future prospects of the human race.

4.1.3 First-Time Missions

Firsts generate interest. The first crewed flight on the SpaceX Dragon, the first launch and landing of Falcon Heavy, the first landing of a Falcon 9 at Vandenberg Air Force Base, these all generated very large crowds. Future heavily-attended events will include the first orbital flight and stage

recoveries of the SpaceX Starship / Super Heavy combination, the first crewed flight and stage returns of that combination, the launches of various crewed missions

4.1.4 Space Company Identity

Today, SpaceX generates interest far exceeding other space companies. Their daring technical achievements, appearing to outpace NASA and every other aerospace company at a fraction of the cost; have captured the hearts of many, providing hope of an interplanetary future for humanity when good news was in short supply. There is also the interest in Elon Musk as an innovator, and as the most wealthy person in the world. Blue Origin could join SpaceX in generating this sort of interest, if their New Glenn vehicle succeeds and they are able to scale up flights. As new technical achievements are made, other companies may take a turn as the momentary darlings of space enthusiasts.

4.1.5 The Twilight Phenomenon

An article explaining the Twilight Phenomenon is on Wikipedia at https://en.wikipedia.org/wiki/Twilight_phenomenon. Twilight launches can exceed the beauty of any firework show. Thus, expect greater attendance at launches occurring just before dawn or after sunset.

4.1.6 Weather

Good weather and, especially, clear sky will increase attendance.

The presence of fog will cause Launch Observers to relocate to fog-free vantages. These will often be at higher altitudes or outside of prevailing breezes that bring fog ashore.

4.1.7 Other Ambient Influences

The amount of media coverage of the mission has a very strong influence on attendance. Launch Observers are probably more influenced by internet sources today than television and radio.

4.1.8 Offshore Launch and Recovery

The distance of offshore space operations from land will encourage Launch Observers to embark upon sea observation voyages, which will sail to viewing positions just outside of the range safety zone. These voyages must then be managed by the Coast Guard.

4.2 Identify The Viewing Areas

Once the potential attendance is estimated, the areas that will be used by Launch Observers should be identified, and the number of observers at each site must be estimated.

It is best to provide sufficient officially-sanctioned observing areas to accommodate all Launch Observers, but observers are likely to eschew inappropriate locations like Hawk's Nest at VAFB. An appropriate observing site should be as close as possible to the launch or recovery area while outside of the range safety zone, and should have an unobstructed line of sight to the launch or recovery area if that is possible. The better the view, the easier it will be to attract Launch Observers to your official location.

4.3 Provide Mitigation of Environmental Impact At The Viewing Areas

The first concern will be providing sufficient porta-potties at the viewing areas, to prevent the environmental impact of human waste. This will also reduce the impact of those who would otherwise be motivated to trample environmentally fragile areas in order to find a private place to relieve themselves. Secondarily, impacts such as parking and litter should be managed.

Communication channels to the Launch Observers should be established. These will in general take the form of press releases or internet media sites which regularly carry information about opportunities for launch or recovery observation. Short-range AM or FM radio broadcasts are sometimes used to inform crowds as they approach a facility. Where tickets are issued or admission fees are collected, a paper handout with instructions is appropriate.

Attendees should always be asked to bring a garbage bag, to pack out their own trash and to remove other trash that is evident, and to always take the garbage bag with them when they leave. Launch Observers *will* leave an area cleaner than when they arrived, if organized properly.

Launch Observers should be informed of the potential for environmental damage and how they can avoid it, for example by keeping to established trails, or by staying away from bird nesting areas.

4.4 Receive and Report Feedback

Launch and recovery sites that bear a responsibility to mitigate environmental concerns associated with Launch Observers should operate a means of receiving feedback regarding that impact. Such feedback might include reports of the intrusion of Launch Observers into ecologically sensitive land, the failure of facilities provided for Launch Observers

(perhaps within sufficient time to resolve them) and ideas and concerns of locals and the observers. Feedback should be acted upon, and should be a topic of all subsequent environmental assessments and re-evaluations.

5 Concerns Regarding Offshore Launch Observation

5.1 SpaceX Offshore Platforms

SpaceX has purchased two offshore oil platforms to be repurposed for offshore launch and recovery of the Starship / Super Heavy combination. Operations using these platforms are likely to be sited about 20 miles from populated land, due to noise and range safety concerns. I surmise that one or both platforms might eventually be sited in the Gulf of Mexico, offshore of Brownsville, Texas, as far South as practical within the 24-mile Contiguous Zone of the United States.

Such platforms would be close to Starship / Super Heavy manufacturing in Boca Chica and could be serviced from the Brownsville Ship Harbor. There will be an environmental impact from operation of these platforms and transport to and from them. The platforms may eventually offload launch and recovery of rockets from the Boca Chica site, reducing chemical and noise impact at that site, but perhaps requiring channelization of the South Bay and Boca Chica Bay to the Brownsville Ship Channel for SpaceX barge operations.

Once in operation, sea voyages for observation of launches from the platforms will be an issue for management by the Coast Guard.

5.2 DM-1 Toxic Incident

There was an intrusion of unauthorized boaters into the range safety zone of the SpaceX DM-1 recovery. This occurred offshore of Pensacola, Florida on August 3, 2020. Boaters were exposed, at an apparently sub-clinical level, to highly toxic hypergolic or pyrophoric fuel. This fuel was still evident in the atmosphere around the Dragon vehicle for another half hour, including after it was hoisted onto its recovery vessel. To protect themselves from the chemicals, the recovery crew were required to withdraw from around the Dragon, except for persons equipped with the proper personal protective equipment who continued to monitor the chemical presence. The astronauts were required to sequester themselves within the sealed Dragon vehicle and to make use of its independent air supply until the chemicals dissipated.

This exposure of unauthorized persons to toxic chemicals was a result of an inaccurate estimation of the interest in the mission and the resources necessary to establish an interdiction zone, probably by the Coast Guard.

The Coast Guard also appears to have inadequately informed its officers of their jurisdiction to carry out an interdiction effort within the United States 24-mile Contiguous Zone or international waters, even though the boats involved bore US registry and were thus subject to US law.

The intruding boaters were, of course, at fault. The Coast Guard appeared to bear most of the blame, although certainly NASA and SpaceX were also involved.

I suggest specific rules for Launch Observation voyages, most of which overlap rules already in place for larger vessels:

- The vessels must be documented with the National Vessel Documentation Center.
- The vessels must carry AIS Class A transceivers, and must configure them to continuously beacon their documented vessel name and port of call, and their location, and to respond to digital selective calling (“DSC”). The crew must respond to DSC hails appropriately.
- The vessels must carry a second radio transceiver which is set to continuously monitor marine channel 16. The crew must respond to channel 16 hails appropriately.
- The vessels must, before departure, download from an official source on the internet a map of the range safety zone (this would be a Local Notice to Mariners today), and use it in conjunction with a GPS moving map during the entire voyage to ensure that they do not inadvertently enter the range safety zone.
- There should be a second, larger range safety zone which would exclude all vessels that are not equipped to comply with the above rules. A vessel that enters this zone without beaconing the proper AIS information would be turned away.

6 Requirements for Environmental Assessments, Environmental Impact Statements, and Re-Evaluations

In the above, I have established the right of Launch Observers to be present under the applicable laws and the Constitution. I have laid out a process for managing their accommodation and mitigating their environmental impact.

Every Environmental Impact Statement of a rocket launch or recovery facility should include a plan to accommodate Launch Observers and to mitigate their environmental impact, in a similar manner to the process framework I have laid out in Section 4 of this comment. Thus, these issues must be examined as part of Environmental Assessments. The facility

should be required to report upon their continuing implementation of accommodation and mitigation of Launch Observers as part of each successive re-evaluation of the EIS.

I suggest that launch and recovery facilities use Section 4 of this comment as a template in creating their plan.

7 Service, Standing and Filing

There appears to be no requirement for service in this informal public scoping. But if requested, I will acknowledge service of replies via email to bruce@perens.com

This comment is timely filed, having been served via email to the address indicated in FAA's solicitation during the period that this issue was open for comment.

While FAA appears to use the Regulations.gov web site for NPRM comments, this scoping is confusingly being carried out using an email address at ICF, a for-profit consultancy that acts like an NGO. A more formal framework for submission of comments which would facilitate public viewing of comments, and replies to comments by the public, would be appreciated. I like the example of FCC's Electronic Comment Filing System, which provides a view of all proceedings, comments, and replies for the past 30 years.

Since the address given for comments is at ICF rather than FAA itself, I have also served this comment directly via email to relevant parties at FAA and commercial space vendors.

As a taxpayer, citizen, interested and impacted party: I claim standing under, but not limited to, the following laws:

- Federal Aviation Administration Act of 1958
- National Environmental Protection Act of 1969
- National Environmental Improvement Act of 1970