### 1AC: Plan

#### Plan - Private entities ought not appropriate lunar heritage sites

Harrington 19, Andrea J. "Preserving Humanity's Heritage in Space: Fifty Years after Apollo 11 and beyond." J. Air L. & Com. 84 (2019): 299. (Associate Professor and Director of the Schriever Space Scholars at USAF Air Command and Staff College)//Elmer

The issue of humanity’s cultural heritage in space has arisen as one of many unanswered questions in space law, with no international agreements specifically addressing it. With the beginning of the space age fifty-six years ago and a series of remarkable achievements in space exploration behind us, it is necessary to determine what should be done regarding the “artifacts” of this exploration. NASA has promulgated their recommendations for spacefaring entities with the goal of protecting the lunar artifacts left behind by the Apollo missions.8 These recommendations establish “keep-out zones” of up to a four kilometer diameter with the aim of protecting the artifacts, particularly from dangerous, fastmoving particles that arise as a result of craft landings.9 Experience has shown that even artifacts that are sheltered by craters can be significantly sandblasted and pitted as a result of the moving particles.10 These recommendations, supposedly drafted in conformity with the Outer Space Treaty, however, are completely nonbinding.11 Legislation that has passed the U.S. Senate and is under consideration by the House of Representatives as of July 2019 would make these recommendations binding on U.S. entities seeking to land on the Moon.12 Accidental damage from unrelated missions, however, is only one of many threats to space artifacts. With the impending return to the Moon, it is likely that individuals and corporations will be looking to turn a profit from space heritage, without concern for the protection of such heritage. Tourists may disrupt sites with careless expeditions and landing sites may be desecrated so that the items can be sold. A Russian Lunakhod lunar rover has already been sold at auction to a private party, though it has not yet been moved from its original position on the Moon.13 While national heritage legislation can protect space artifacts from citizens of their own countries, there is currently no effective means in the present space law regime by which a country can protect its heritage from other countries.14 Both California and New Mexico have added Tranquility Base to their list of protected heritage sites.15 However, this solution, and those proposed in the bill put forth to the U.S. House of Representatives, only serve to restrict the activities of a small subset of the potential visitors to the Moon. Though the Senate bill calls for the President to initiate negotiations for a binding international agreement, there is still a long road from this bill to a potential agreement.16 A solution is needed to prevent the damage, destruction, loss, or private appropriation of our cultural heritage in space.

### 1AC: Lunar Heritage

#### The Advantage is Lunar Heritage:

#### Global Moon Rush by private actors is coming now.

Sample 19 Ian Sample 7-19-2019 “Apollo 11 site should be granted heritage status, says space agency boss” <https://www.theguardian.com/science/2019/jul/19/apollo-11-site-heritage-status-space-agency-moon> (PhD at Queens Mary College)//Elmer

But protecting lunar heritage may not be straightforward. On Earth, the United Nations Educational, Scientific and Cultural Organisation (Unesco) decides what deserves world heritage status from nominations sent by countries that claim ownership of the sites. Different rules apply in space. The UN’s outer space treaty, a keystone of space law, states that all countries are free to explore and use space, but warns it “is not subject to national appropriation by claim of sovereignty”. In other words, space is for all and owned by none. Wörner is not put off and sees no need for troublesome regulations. “My hope is that humanity is smart enough not to go back to this type of earthly protection. Just protect it. That’s enough. Just protect it and have everybody agree,” he said. A no-go zone of 50 metres around Tranquility base should do the job, he added. Martin Rees, the Cambridge cosmologist and astronomer royal, said there was a case for designating the sites so future generations and explorers were aware of their importance. “If there are any artefacts there, they shouldn’t be purloined,” he said. “Probably orbiting spacecraft will provide routine CCTV-style coverage which would prevent this from being done clandestinely.” Beyond the dust-covered hardware that stands motionless on the moon, Lord Rees suspects future activity could drive calls for broader lunar protection. The Apollo 17 astronaut and geologist Harrison Schmidt has advocated strip mining the moon for helium-3, a potential source of energy. The proposal, which Rees suggests has raised eyebrows in the community, could potentially provoke a backlash. “There might be pressure to preserve the more attractive moonscapes against such despoilation, and to try to enforce regulations as in the Antarctic,” he said. Fifty years on from Apollo 11, the moon is still a place to make statements. In January, the Chinese space agency became the first to land a probe on the far side. On Monday, India hopes to launch a robotic probe, the delayed Chandrayaan-2 lander that is bound for the unchartered lunar south pole. Far more is on the cards. Major space agencies, including ESA and Nasa, plan a “lunar gateway”, described by Wörner as a “bus stop to the moon and beyond”. His vision is for a “moon village”, but rather than a sprawl of domes, shops and a cosy pub, it is more an agreement between nations and industry to cooperate on lunar projects. The private sector is eager to be involved. Between now and 2024, at least five companies aim to launch lunar landers. In May, Nasa selected three companies to design, build and operate spacecraft that will ferry scientific experiments and technology packages to the moon. The coming flurry of activity may make protection more urgent. Michelle Hanlon, a space lawyer at the University of Mississippi, co-founded the non-profit organisation For all Moonkind to protect, preserve and memorialise human heritage on the moon. While she conceded that not all of the sites that bear evidence of human activity needed protection, she said many held invaluable scientific and archaeological data that we could not afford to lose. “These sites need to be protected from disruption if only for that reason,” she added. The protection should be far wider, and more formal, than Wörner calls for, Hanlon argues. “It is astounding to me that we wouldn’t protect the site of Luna 2, the very first object humans crashed on to another celestial body, and Luna 9, the very first object humans soft-landed on another celestial body,” she said. The Soviet Luna programme sent robotic craft to the moon between 1959 and 1976. “The director general has a much more optimistic view of human nature than I do,” Hanlon said. “I completely agree that the entities and nations headed back to the moon in the near future will take a commonsense approach and give due regard to the sites and artefacts. However, that is the near future. We have to be prepared for the company or nation that doesn’t care. Or worse, that seeks to return to the moon primarily to pillage for artefacts that will undoubtedly sell for tremendous amounts of money here on Earth.”

#### Corporate development, tourism, and looting will destroy scientifically rich Tranquility base artifacts.

Fessl 19 Sophie Fessl 7-10-2019 “Should the Moon Landing Site Be a National Historic Landmark?” <https://daily.jstor.org/should-the-moon-landing-site-be-a-national-historic-landmark/> (PhD King’s College London, BA Oxford)//Elmer

When Neil Armstrong set foot on the moon on July 20, 1969, the pictures sent to Earth captured a historical moment: It was the first time that any human set foot on another body in our solar system. Fifty years later, experts are debating how to preserve humankind’s first steps beyond Earth. Could a National Park on the moon be the solution to saving Armstrong’s bootprints for future archaeologists? Flags, rovers, laser-reflecting mirrors, footprint—these are just a few of the dozens of artifacts and features that bear witness to our exploration of the moon. Archaeologists argue that these objects are a record to trace the development of humans in space. “Surely, those footprints are as important as those left by hominids at Laetoli, Tanzania, in the story of human development,” the anthropologist P.J. Capelotti wrote in Archaeology. While the oldest then known examples of hominins walking on two feet were cemented in ash 3.6 million years ago, “those at Tranquility Base could be swept away with a casual brush of a space tourist’s hand.” Fragile Traces Just how fragile humankind’s lunar traces are was seen already during Apollo 12. On November 19, 1969, Charles “Pete” Conrad and Alan Bean manually landed their lunar module in the moon’s Ocean of Storms, 200 meters from the unmanned probe Surveyor 3, which was left sitting on the moon’s surface two years earlier, in 1967. The next day, Conrad and Bean hopped to Surveyor 3. As they approached the spacecraft, they were surprised: The spacecraft, originally bright white, had turned light brown. It was covered in a fine layer of moon dust, likely kicked up by their landing. Harsh ultraviolet light has likely bleached the U.S. flag bright white. Without Apollo 12 upsetting the moon dust, Surveyor 3 would likely have remained stark white. Unlike Earth, the moon has no wind that carries away the dust, no rain to corrode materials, and no plate tectonic activity to pull sites on the surface back into the moon. But the moon’s thin atmosphere also means that solar wind particles bombard the lunar surface, and harsh ultraviolet light has likely bleached the U.S. flag bright white. The astronauts’ first bootprints will likely be on the moon for a long time, and will almost certainly still be there when humans next visit—unless, by tragic coincidence, a meteorite hits them first. Had LunaCorp not abandoned the idea in the early 2000s, the company’s plan to send a robot to visit the most famous sites of moon exploration could have done a lot of damage. And with Jeff Bezos’ recent unveiling of a mock-up of the lunar lander Blue Moon, it is only a matter of time before corporate adventurers and space tourists reach the moon. Historians and archaeologists are keen to avoid lunar looting. Roger Launius, senior curator of space history at the National Air and Space Museum in Washington, D.C., warned: “What we don’t want to happen is what happened in Antarctica at Scott’s hut. People took souvenirs, and nothing was done to try to preserve those until fairly late in the game.” On the other hand, there is a legitimate scientific interest in investigating how the equipment that’s on the moon was affected by a decades-long stay there.

#### Private entities are a unique threat to lunar heritage – national governments have active incentives to avoid heritage destruction.

* Private Key Card – AT: Alt Causes
* AT: Unilat CP
* AT: Adv CP
* AT: Generic DA
* AT: OST DA
* Solvency Advocate

Hertzfeld and Pace 13 (, H. and Pace, S., 2013. International Cooperation on Human Lunar Heritage. [online] Cpb-us-e1.wpmucdn.com. Available at: <https://cpb-us-e1.wpmucdn.com/blogs.gwu.edu/dist/7/314/files/2018/10/Hertzfeld-and-Pace-International-Cooperation-on-Human-Lunar-Heritage-t984sx.pdf> [Accessed 18 January 2022] Dr. Hertzfeld is an expert in the economic, legal, and policy issues of space and advanced technological development. Dr. Hertzfeld holds a B.A. from the University of Pennsylvania, an M.A. from Washington University, and a Ph.D. degree in economics from Temple University. He also holds a J.D. degree from the George Washington University and is a member of the Bar in Pennsylvania and the District of Columbia. Dr. Hertzfeld joined the Space Policy Institute in 1992. His research projects have included studies on the privatization of the Space Shuttle, the economic benefits of NASA R&D expenditures, and the socioeconomic impacts of earth observation technologies. He teaches a course in Space Law and a course in microeconomics through the Economics Department at G.W. Dr. Hertzfeld has served as a Senior Economist and Policy Analyst at both NASA and the National Science Foundation, and has been a consultant to many U.S. and international organizations, including a recent project on space applications with the OECD. He is the co-editor of Space Economics (AIAA 1992). Selected other publications include a study of the issues for privatizing the Space Shuttle (2000), an analysis of the value of information from better weather forecasts, an analysis of sovereignty and property rights published in the Journal of International Law (University of Chicago, 2005), and an economic analysis of the space launch vehicle industry (2005). Dr. Hertzfeld has also edited and prepared a new edition of the Study Guide and Case Book for Managerial Economics (Sixth Edition, W.W. Norton & Co.). Dr. Scott N. Pace is the Deputy Assistant to the President and Executive Secretary of the National Space Council (NSpC). He joined the NSpC in August 2017. From 2008-2017, he was the Director of the Space Policy Institute and a Professor of the Practice of International Affairs at George Washington University’s Elliott School of International Affairs. From 2005-2008, he served as the Associate Administrator for Program Analysis and Evaluation at NASA. Prior to NASA, he was the Assistant Director for Space and Aeronautics in the White House Office of Science and Technology Policy. From 1993-2000, he worked for the RAND Corporation’s Science and Technology Policy Institute, and from 1990-1993, he served as the Deputy Director and Acting Director of the Office of Space Commerce, in the Office of the Deputy Secretary of the Department of Commerce. In 1980, he received a Bachelor of Science degree in Physics from Harvey Mudd College; in 1982, Masters degrees in Aeronautics & Astronautics and Technology & Policy from the Massachusetts Institute of Technology; and in 1989, a Doctorate in Policy Analysis from the RAND Graduate School.)-rahulpenu

International Cooperation on Human Lunar Heritage The U.S. Apollo Space Program was a premier technological accomplishment of the 20th century. Preserving the six historic landing sites of the manned Apollo missions, as well as the mementos and equipment still on the Moon from those and other U.S. (e.g., Ranger and Surveyor) and Soviet Union (e.g., Luna) missions is important. Some of the instruments on the lunar surface are still active, monitored, and provide valuable scientifi c information. But recent government and **private**-**sector** **plans** to explore and potentially use lunar resources for commercial activity raise questions about the use of the Moon and potential accidental or purposeful threats to the historic sites and scientific equipment there. Although some steps to protect these sites have been proposed, we suggest a better way, drawing on international, not U.S. unilateral, recognition for the sites. Less than 2 years before the fi rst footsteps on the lunar surface on 20 July 1969 (see the image) , the United Nations Outer Space Treaty (OST) was drafted, ratifi ed, and came into force ( 1). Article II of the OST reinforced and formalized the international standard that outer space, the Moon, and other celestial bodies would not be subject to claims of sovereignty from any nation by any means, including appropriation. The OST prohibits ownership of territory or its appropriation by any state party to the treaty, which includes the United States, Russia, and 126 other nations. It does not prohibit the use of the Moon and its resources. In fact, the treaty emphasizes the importance of freedom of access to space for any nation and the importance of international cooperation in space exploration. These principles of the space treaties have enabled gains in science and technology and have contributed to international stability in space. New attention is being focused on the lunar surface. China has an active Moon exploration program and is considering sending astronauts (taikonauts) to the Moon. **Private** **firms** are contemplating robotic **missions** that could land in the vicinity of the historical sites of Apollo and other missions. Although we might assume the best of intentions for such missions, they could **irreparably** **disturb** the **traces** **of** the first **human** **visits** to another world. NASA has taken **steps** **to** **protect** the lunar landing **sites** and equipment and to initiate a process to create recognized norms of behavior. In July 2011, guidelines were issued for private companies competing in the Google Lunar X Prize that established detailed requirements for avoiding damage to U.S. government property on the Moon ( 2). H.R. 2617, The Apollo Lunar Landing Legacy Act, was introduced into the U.S. Congress on 8 July 2013 ( 3). In essence, it proposes to designate the Apollo landing sites and U.S. equipment on the Moon as a U.S. National Park with jurisdiction under the auspices of the U.S. Department of the Interior. Although the bill acknowledges treaty obligations of the United States, it would create, in effect, a unilateral U.S. action to control parts of the Moon. This would **create** a **direct** **conflict** **with** **i**nternational **law** and could be viewed as a **violation** **of** U.S. commitments under the **OST**. It would be an ineffective way of protecting historical U.S. sites, and it fails to address interests of other states that have visited and will likely visit the Moon. It is **legally** **flawed**, **unenforceable**, and **contradictory** **to** our national **space** **policy** and our international relations in space ( 4). There is a better way for the United States to protect its historic artifacts and equipment on the Moon. The fi rst step is to clearly distinguish between U.S. artifacts left on the Moon, such as fl ags and scientifi c equipment, and the territory they occupy. The second is to gain international, not unilateral, recognition for the sites upon which they rest. Aside from debris from crash landings (by Japan, India, China, and the European Space Agency), there are only two nations with “soft-landed” equipment on the lunar surface: the United States and Russia. China has plans to soft-land Chang’e 3 on the Moon in December 2013. All three nations (and any others wishing to participate) have much to gain and little or **nothing** **to** **lose** **from** a **multinational** **agreement** based on mutual respect and mutual protection of each other’s historical sites and equipment. Legal Issues Although ownership of planets, the Moon, and celestial bodies is prohibited, ownership of equipment launched into space remains with the nation or entity that launched the equipment, wherever that equipment is in the solar system. Under the OST, that nation is both responsible and liable for any harmful acts that equipment may create in space. There are no prescribed limits on time or the amount of damage a nation may have to pay. The U.S. government therefore still owns equipment it placed on the Moon. Ownership has the associated right of protecting the equipment, subject to using necessary and proportional means for protection. But, because no nation can claim ownership of the territory on which equipment rests, there is an open issue of how to control the spots on the Moon underneath that equipment, because the site is **integral** **to** the **historical** **signifi** **-** **cance**. In H.R. 2617, establishment of Apollo sites as a unit of the U.S. National Park System could be interpreted as a declaration of territorial sovereignty on the Moon, even though ensuing paragraphs specify the Park’s components as the “artifacts on the surface of the Moon” at those sites. This problem needs international legal clarifi cation, achievable via a formal agreement among those nations that have the technological ability to directly access the Moon ( 5). Section 6(a) raises another legal issue. The bill proposes that the Secretary of the Interior shall administer the park in accordance with laws generally applicable to U.S. National Parks. It also requires the Secretary to act in accordance with applicable international law and treaties. The U.S. National Park System Act states that the Parks are “managed for the benefi t and inspiration of all the people of the United States” ( 6). The OST clearly emphasizes that the exploration and use of space by nations is to benefi t all peoples. The laws and space policies of the United States have always emphasized peaceful uses of space and the benefi ts of space for humankind. It may not be possible to implement and execute provisions of this Bill without raising important and fundamental questions about these contradictions between the language of the treaty and the mandates of our National Park Service. A third legal issue is raised in section (6) (c)(2) that allows private donations and cooperative agreements to “provide visitors centers and administrative facilities within reasonable proximity to the Historical Park.” This **implies** **future** **private** **use** of the Moon **under** **rights** **granted** **by** the **U.S.** government. **Unilateral** **granting** **of** lunar territorial **rights** to private individuals and implicit sovereign protection of that territory **violates** the **OST**. Finally, section 8 of the bill requires the Secretary of the Interior to submit the Apollo 11 lunar landing site to the United Nations Educational, Scientifi c, and Cultural Organization (UNESCO) for designation as a World Heritage Site. This violates Article II of the OST. All current World Heritage Sites are located on sovereign territory of nations. The only exception is a separate treaty that allows UNESCO to designate underwater sites (such as sunken ships) as protected cultural sites ( 7). These designations are very limited, and although the convention has been ratifi ed by 43 nations, the United States, Russia, and China are not among them. Thus, any new treaty of this type specifi cally for outer space would have little chance of being ratifi ed by the major space-faring nations. A Proposal to Protect Lunar Sites Although a new U.N. treaty for space artifacts of signifi cant cultural and historic importance may be reasonable someday, this would start a very long process with unknown outcomes. Such a treaty could be delayed to a point beyond the time when nations and/or companies may be active on the Moon ( 8). Our suggested alternative is to create a bilateral agreement between the United States and Russia, offered as a multilateral agreement to other nations with artifacts on the Moon. This would be more legally expedient, politically sustainable, and would more likely meet and exceed the stated goals of the bill. It would also emphasize the important role of national laws to implement and enforce these international space agreements. **Any** **nation** **with** **assets** on the lunar surface will **endeavor** **to** **protect** those assets. This creates a situation where those nations have a **timely**, **current**, and **common** **interest** incorporating important implications for peaceful uses of outer space; **scientific** **research** and the advancement of **knowledge**; and **cultural** **and** **heritage** **value**, either presently or in the foreseeable future. The United States, Russia, and China all engage in multilateral cooperative space programs. They share many economic and trade dependencies adding to the international importance of promoting cooperation in space and commerce. In spite of today’s charged political environment, an **agreement** of the type we propose may still be possible to negotiate because it **focuses** **on** the **culture** **of** **space**, the use of space to benefit humankind, and the **archaeological** **record** of our civilization. It specifi cally would not touch sensitive issues of real property rights, export controls, human rights, or the weaponization of outer space. **Cooperation** on recognizing and protecting each other’s interests in historical sites and on equipment and artifacts also has no signifi cant security, prestige, or technological impediments. It reinforces the basic principles of the existing space treaties, avoids declarations of sovereignity on the Moon, and encourages multilateral cooperation resulting in a more stable and predictable environment for private activities on the Moon. The best mechanism for implementing a new agreement would be direct negotiations at highest levels of government in the United States, Russia, and China, with priority to include Russian sites in a proposal that protects U.S. sites. It could be included in meetings of heads of state of those nations, either jointly or sequentially among the three nations. Such an agreement could be executed in a relatively short period of time, setting precedents for peaceful and coordinated research, exploration, and exploitation of the Moon ( 9). An international agreement on lunar artifacts among the United States, Russia, and China would be a far superior and long-lasting solution than the unilateral U.S. proclamation in H.R. 2617. Enforcement of the agreement would be through each nation’s national laws, applying to those entities subject to the jurisdiction or control of the agreement members. Each nation’s property would be protected and preserved. Other nations should be free to join the agreement, and particularly encouraged to do so if they have the ability to access the Moon. An important result would be to develop a new level of trust among nations that could then lead to more **comprehensive** **future** cooperative agreements on **space**, **science**, **exploration**, **commerce**, **and** the use of the Moon and **other** **celestial** **bodies**.

#### Tranquility base research key to moon dust research.

Dovey 19 Ceridwen Dovey “Moondust Could Cloud Our Lunar Ambitions” <https://www.wired.com/story/moondust-nasa-lunar-ambitions/> (PhD Candidate, Anthropology at NYU, B.A. Anthropology and Environmental Science at Harvard, National Book Foundation Nominee, Contributor to Wired and The New Yorker)//Elmer

It's superfine. It's sharp. It sticks to everything. Before we return to the moon, we'll have to conquer one of the weirdest substances in the solar system. In the public imagination, the American astronauts who landed on the moon five decades ago were square-jawed superhumans, not the types to worry about something as banal as housekeeping. But they did, obsessively. Each time they got back to the Apollo Lunar Module after a moonwalk, they were shocked at how much dust they'd tracked in and how hard it was to banish. This was no earthly grime; it was preternaturally sticky and abrasive, scratching the visors on the astronauts' helmets, weakening the seals on their pressure suits, irritating their eyes, and giving some of them sinus trouble. “It just sort of inhabits every nook and cranny in the spacecraft and every pore in your skin,” Apollo 17's Gene Cernan said during his post-mission debriefing. Over the course of six moon landings, the so-called Dusty Dozen fought valiantly with their foe. They stomped their boots outside, then cinched garbage bags around their legs to stop the dust from spreading. They attacked it with wet rags, bristle brushes, and a low-suction vacuum cleaner, which Pete Conrad of Apollo 12 called “a complete farce.” (He finally stripped naked and stuffed his blackened suit into a pouch.) Cernan, upon returning from his last moonwalk, vowed, “I ain't going to do much more dusting after I leave here. Ever.” In the end, NASA couldn't find a foolproof solution. Years after John Young commanded Apollo 16, he still believed that “dust is the number one concern in returning to the moon.” Now, with national space agencies and private corporations poised to do just that, the Apollo dust diaries are relevant once more. In January, China landed its Chang'e-4 probe on the far side of the moon, the latest step toward its stated aim of building a lunar research station. Two months later, the Japanese Aerospace Exploration Agency said it was partnering with Toyota to design a six-wheeled moon rover by 2029. Around the same time, Vice President Mike Pence announced plans to put American boots on the moon by 2024. According to NASA administrator Jim Bridenstine, the goal is “to go sustainably. To stay. With landers and robots and rovers—and humans.” India and Russia have missions planned too. Then there are the private ventures like Moon Express, whose Harvest Moon expedition will prospect for water, minerals, and other resources to mine. All of which raises a crucial question: What to do about that troublesome dust? An Australian physicist named Brian O'Brien may have the answer. O'Brien became Earth's foremost authority on moondust almost by accident. In 1964, five years before Apollo 11 touched down in the Sea of Tranquility, he was a skinny, precocious young professor of space science at Rice University in Houston, specializing in the study of radiation. This was during the early phase of Apollo training, when the astronauts were taking crash courses in all manner of subjects—vector calculus, antenna theory, the physiology of the human nose. O'Brien's task was to teach them about the Van Allen belts, two regions of intense radiation that encircle the planet like a pair of inflatable pool tubes. He remembers the Apollo class of 1964, which included Gene Cernan and Buzz Aldrin, as the most “disciplined and alert” cohort of students he ever had. In the lead-up to the Apollo 11 launch, O'Brien persuaded NASA to include a little something extra in the payload. It was a small box, about the size of a thick bar of soap, whose main function was to measure the accumulation of dust on the moon's surface. O'Brien describes it as “a hitchhiking, delightfully minimalist” device. He sketched it on the back of his drinks coaster on a flight from Los Angeles to Houston, and refined the design on a cocktail napkin. Named the Dust Detector Experiment, or DDE, it was perhaps the least impressive component of the Apollo 11 science package; NASA didn't even bother to mention it in press releases. But it worked well enough that the agency included modified versions of the original DDE on all subsequent Apollo flights. Four of them are still up there, and to this day they hold the record for longest continually operating experiments on the moon. For many years, the data that the early DDEs sent back to Earth was thought to be missing or lost. Since its surprise rediscovery in 2006, those in the inner circle of outer space activities have slowly begun to realize that O'Brien's unassuming detectors have a lot more to tell us about moondust than anyone could have imagined—except, of course, for O'Brien himself. Now 85, still sprightly and living in Perth, he's been waiting half a century for the chance to share with the world what he knows about one of the solar system's most baffling substances.

#### Moon Dust Research key to Moon Basing.

Smith 19 Belinda Smith 7-18-2019 “Who protects Apollo sites when no-one owns the Moon?” <https://www.abc.net.au/news/science/2019-07-19/apollo-11-moon-landing-heritage-preservation-outer-space-treaty/11055458> (Strategic Communications Advisor at Department of Education and Training at University of Victoria)//Elmer

It's not just about history Alongside heritage value, the bits and pieces left on the Moon have enormous scientific significance. Take moon dust. It's a real problem for moon-bound equipment because it's made of fine, super sticky and highly abrasive grains, which have a habit of clogging instruments and spacesuits. But as Armstrong and Aldrin trotted across the surface, the footprints they left behind gave us valuable information into the properties of moon dust, Flinders University space archaeologist Alice Gorman said. "The ridges on the boots were meant to measure how far they sank into the dust. "Then they used the light contrast between the ridges to measure the reflectance properties of the dust." A boot print in grey dust. This iconic photo of Buzz Aldrin's footprint is also a science experiment. (Supplied: NASA) It's data like this that will help if we want a long-term base on the Moon — we need to know how our gear will stand up to lunar conditions. Apart from the sticky, gritty dust, the lunar surface is also peppered with meteorites and cosmic rays. So, Dr Gorman said, one of the very few reasons to revisit a moon site is to collect some of the equipment left behind and see how it fared. "What has happened to this material in 50 years of sitting on the lunar surface? "This is going to be really interesting scientific information because it will help planning for future missions and get an understanding of long-term conditions." And NASA has already done this. The Apollo 12 mission, which landed on the Moon four months after Apollo 11, collected parts from the 1967 Surveyor probe and brought them back to Earth. An astronaut standing next to a piece of equipment on the lunar surface Along with rocks and soil samples, Apollo 12 astronauts collected pieces of the Surveyor 3 probe for analysis back on Earth. (Supplied: NASA) Another reason to preserve the equipment left on the Moon is to prove we really went there, Professor Capelotti said. "There's a lot of people out there who still don't believe it happened. "The stuff on the Moon is a testament to what we did and when we did it."

#### Lunar Basing solves Earth Observatory – specifically Super-Volcanoes and Arctic Aviation.

Hamill 16, Patrick. "Atmospheric observations from the moon: A lunar earth-observatory." 2016 Ieee International Geoscience and Remote Sensing Symposium (Igarss). IEEE, 2016. (Department of Physics and Astronomy at San Jose State University)//Elmer

There are many reasons for placing an Earth atmospheric observatory on the Moon. Perhaps the most obvious reason is that from the Moon one can observe a single location on Earth for a relatively long period of time (hours, rather than seconds for a satellite in LEO). During a 24 hour period, nearly every point on the surface of Earth can be monitored, and during one month, both the sunlit and night sides of the Earth will have been observed. Further, there will have been excellent views of the polar regions. The visible images of the entire illuminated surface of Earth will allow one to evaluate in an unambiguous manner the total cloud fraction of Earth’s atmosphere. The scans will allow one to determine the composition of the Earth’s atmosphere in terms of the major trace gases and aerosols. The polarization of the scattered light will also yield information on the aerosol type. Stellar occultation allows one to determine profiles of extinction from aerosol particles, and the altitude dependence of concentrations of gas species such as O3, CO2, etc. Profiles of stratospheric particle extinctions are of particular interest following energetic volcanic eruptions that inject large amounts of SO2 into the stratosphere. Profiles of O3 allow one to determine the vertical structure of the Antarctic ozone hole and “mini ozone holes” in the Arctic. Stellar occultation is a valuable technique for studying the formation and structure of polar stratospheric clouds. The GOMOS instrument on ENVISAT was operational from 2002 to 2012 and during that time it observed well over 10,000 stellar occultations. Perot et al. [6] present a polar mesospheric climatology based on these measurements. The formation of dust clouds, particularly from regions such as the deserts in Northern Africa and Central Asia, and their atmospheric dispersion is an important scientific and environmental problem. The lunar observations could shed light on the relationship between the presence of dust and the formation of hurricanes in the Atlantic Ocean. The fact that the entire disk of the Earth is visible from the Moon make it an excellent location to measure the radiation balance of the Earth. Consequently, a component of the observatory would be an ERBE/CERES type of radiometer to measure short and longwave radiation [7]. The goal would be to monitor, on a continuous basis, the global energy balance, planetary brightness, regional forcings and the net radiative effect of clouds [8]. The fact that during the course of a month Earth presents both day and night faces to the Moon allows one to determine emitted and reflected radiation under a variety of solar illuminations. Volcanic plumes are a well-known danger to aircraft. Some regions of Earth that are not well monitored, such as the Arctic regions between North America and Asia, are locations of frequently occurring volcanic eruptions. Monitoring of the Earth from the Moon would offer an early warning system for volcanic plumes reaching aircraft altitudes. The atmosphere above a low earth orbit satellite is tenuous but not entirely negligible. The fact that the Moon has essentially no atmosphere, means there is no interference of measurements of the radiation emitted from the surface of Earth.

#### Natural Disasters are an Existential Event – outweighs Nuclear War.

Wright 18 Pam Wright 1-19-2018 "Extreme Weather Events Have Greatest Likelihood of Threatening Human Existence, Experts Say" <https://weather.com/science/environment/news/2018-01-19-extreme-weather-threatens-human-existence> (M.S. in Meteorology, editor for The Weather Channel)//Elmer

Extreme weather events are the most likely threat to humanity in the next 10 years, experts say. Each year, nearly 1,000 scientists and decision-makers from around the world take a survey to identify and analyze the most pressing risks facing the planet. This year and for the second year in a row, the results of the 2018 Global Risks Report, released Wednesday at the World Economic Forms, revealed extreme weather as the most likely threat to the world over a 10-year period, topping weapons of mass destruction. These were followed by cyber attacks, data fraud or theft and failure of climate change mitigation and adaptation. “Extreme weather events were ranked again as a top global risk by likelihood and impact. Environmental risks, together with a growing vulnerability to other risks, are now seriously threatening the foundation of most of our commons," Alison Martin, group chief risk officer for the Zurich Insurance Group, said in a press release. The survey looked at five environmental risk categories this year: extreme weather events and temperatures; accelerating biodiversity loss; pollution of air, soil and water; failures of climate change mitigation and adaptation; and risks linked to the transition to low carbon. All ranked high in terms of impact and likelihood. "This follows a year characterized by high-impact hurricanes, extreme temperatures and the first rise in CO2 emissions for four years," the authors wrote in the report. "We have been pushing our planet to the brink and the damage is becoming increasingly clear." The report noted that the 2017 hurricane season, which included hurricanes Harvey, Irma and Maria, was the most expensive hurricane season on record. The authors noted that extreme rainfall "can be particularly damaging." "Of the 10 natural disasters that caused the most deaths in the first half of 2017, eight involved floods or landslides," the authors added. "Storms and other weather-related hazards are also a leading cause of displacement, with the latest data showing that 76 percent of the 31.1 million people displaced during 2016 were forced from their homes as a result of weather-related events." The report said extreme heat in California, Chile and Portugal resulted in some of the most extensive wildfires ever recorded in those areas. More than 100 deaths were attributed to wildfires in Portugal, according to the report. Extreme weather will also affect agriculture around the world, which may lead to a food crisis, the report said, adding that the Food and Agriculture Organization of the United Nations says more than 75 percent of the world’s food comes from just 12 plants and five animal species. "It is estimated that there is now a one-in-twenty chance per decade that heat, drought, and flood events will cause a simultaneous failure of maize production in the world’s two main growers, China and the United States," the authors wrote. In addition, fears of “ecological Armageddon” are "being raised by a collapse in populations of insects that are critical to food systems." In terms of the potential in having the greatest impact on humanity over the next 10 years, weapons of mass destruction ranked just above extreme weather, followed by natural disasters, failure of climate change mitigation and adaptation and water crisis. The authors noted that the use of weapons of mass destruction would have catastrophic effects but is a relatively unlikely scenario. Martin said in a World Economic Forum release that she fears the world "may squander the opportunity to move towards a more sustainable, equitable and inclusive future." "Unfortunately we currently observe a 'too-little-too-late' response by governments and organizations to key trends such as climate change," she added. "It’s not yet too late to shape a more resilient tomorrow, but we need to act with a stronger sense of urgency in order to avoid potential system collapse."

#### Arctic aviation through Alaska solves nuclear wars.

Cooper 12 – Kathleen Cooper, Master’s Degrees in Business Administration from the University of Phoenix and Military Operational Art and Science from Air Command and Staff College, ““North To Alaska”: The Geostrategic Importance of the Last Frontier”, SAASS Thesis, June, https://apps.dtic.mil/dtic/tr/fulltext/u2/1019442.pdf

This thesis examines whether Alaska is as strategically important today as when Mitchell made his proclamation in 1935. He stated to the House Military Affairs Committee, “I believe in the future he who holds Alaska will hold the world, and I think it’s the most strategic place in the world.”6 Mitchell was referring to the importance of basing aircraft in Alaska and its decisive proximity to Europe and Asia. Mitchell’s opinion was shaped by his assignment to Alaska as a lieutenant, which exposed him to the wealth of abundant natural resources and the centrality of Alaska to America’s interests in the Pacific theater. This paper will test Mitchell’s claim by analyzing the evolution of Alaskan airpower and the roles of military and civilian aviation from 1913 to 1945. The first chapter shows how airpower transformed Alaska. It also reveals how the colder Alaskan climate shaped the development of the air service’s aircraft and operations. Highlighted is the critical geostrategic location of Alaska during World War II. The Aleutian Campaign against the Japanese and support of the Russians during the Lend Lease program, two operations centered on Alaska, were pivotal in securing an Allied victory in the war. The establishment of air routes and the Alaska-Canada Highway opened access to the Last Frontier and increased US global reach to other nations. Next, an examination of Alaska and the importance of airpower post-World War II, through the Cold War years, provides additional insight to evaluating Mitchell’s claim of Alaska’s strategic importance. The strife between former allies Russia and the US altered the global balance of power for over 40 years. Alaska, next door to the Soviet Union, was in a prime strategic location to support the air and missile defense mission to protect the US homeland. The installation of the Distant Early Warning Line, White Alice Communications System, and the Ballistic Missile Early Warning Site at Clear Air Force Station signaled US resolve to deter Soviet threats. Additional investments in Alaska resulted in much of the infrastructure that remains today, which continues to support US military and commercial interests. Finally, an assessment of contemporary Alaska and Alaskan-based military missions determines if the state’s strategic importance has endured since 1935. With the end of the Cold War, new challenges have emerged such as climate change and rogue nations pursuing possession of nuclear missiles that may potentially threaten the US homeland. The melting of the Arctic polar ice cap may cause increased competition for scarce natural resources and territory. The result of this competition will affect who gets controls of the Northern sea routes. Because of Alaska’s strategic location, the US has a vital interest in the Arctic and a role in resolving these issues. Further, Alaska’s proximity has enabled US air and missile defense missions to adapt to the rogue nation threat by integrating key locations with the US Ballistic Missile Defense System. The conclusion contains a summary of the historic periods and provides recommendations for the future, based on historical analysis and findings contained in the contemporary Alaska chapter. Extensive research and the evidence provided reveal that Mitchell’s claim that Alaska is the “most strategic place in the world” remains true today. The development of this thesis resulted from the review of over 100 primary and secondary sources. Records obtained from the Historical Research Agency at Maxwell Air Force Base, Alabama were the foundation of this research. A review of scholarly journals, monographs, online databases, and professional opinions also informed this analysis. Experience at Elmendorf Air Force Base, Alaska on the Eleventh Air Force staff from 2003 to 2005 gave the author a truly unique perspective to the issue and awareness of the strategic importance of Alaska. Additionally, a remote assignment to Clear Air Force Station, Alaska, conducting Missile Warning and Space Surveillance from 2005 to 2006, helped to shape the author’s operational Alaskan perspective. Chapter 1 Alaskan Air Power: 1913-1945 Alaska is the most central place in the world for aircraft and that is true of Europe, Asia or North America. I believe, in the future, he who holds Alaska will hold the world, and I think it is the most strategic place in the world. Brigadier William L. “Billy” Mitchell General William “Billy” Mitchell’s assignment in Alaska from 1901 to 1903 as a young lieutenant was fortuitous. His team established the Washington-Alaska Military Cable and Telegraph System, which “opened up the territory to civilization.”1 His experiences convinced him of the geostrategic importance of Alaska. He would later publicly advocate, in speeches and articles, about the importance of basing aircraft and establishing air routes throughout Alaska. Mitchell was convinced “with the coming of air power, Alaska [had] become the key point, strategically, of the Pacific.”2 The first introduction of aircraft to Alaskan territory was on 4 July 1913 by Mitchell’s friend James V. Martin.3 He conducted a flight over Fairbanks, Alaska in a Martin Tractor airplane to generate public interest.4 At that time, the people of Alaska relied on sled dogs, wagons, boats and limited automobiles for transportation. A remote and vast territory, Alaska is over 570,640 square miles.5 As Martin demonstrated, air transportation could and eventually would transform Alaska. In 1919, Mitchell wrote a personal letter to Colonel Henry H. Arnold stating “he was very anxious to push through a flight to Alaska with land planes.”6 Mitchell oversaw the Alaska Flying Expedition in 1920.7 Captain St. Clair Streett of the Black Wolf squadron led the round-trip journey from Mitchel Field, New York to Nome, Alaska.8 The official purpose of this flight was establishing an air route, testing the bimotored aircraft (“evolved from modifications in the DH-4 airplane”), and photographing unmapped remote areas of Alaska.9 Captain Streett and the other pilots also had a purpose captured by the saying: “Yesterday a month was required to reach the Yukon; if our expedition exceeds, it will prove that the Yukon is but three days distant—by airplane!”10 Along the air route, the crews experienced flight mishaps, inadequate landing fields, and bad weather. One time en route North, one aircraft landed in a former dump in Portal Field, North Dakota.11 Tires on one plane were cut-up by glass, and another plane’s tail skid broke.12 Fortunately, the innovative crews quickly made the repairs. Part of a Ford axle fixed the tail skid.13 Later in the journey, Captain Streett had an in-flight emergency resulting in him leaving his seat to apply a fire extinguisher, while his mechanic took control of the plane.14 Fog, rain, and hail also made flying difficult and dangerous in the Northwest Territory. The rain combined with darkness made navigation treacherous. On one stormy night, Captain Streett’s “first glimpse of terra firma was a cliff, not below [him], but ahead of [him]!”15 This expedition provided the opportunity for the inhabitants of remote territories to see an airplane for the first time. The people of Jasper County in Canada had their first experience without incident.16 While in Seward, Alaska, one woman, a Mrs. Kemp, was greatly frightened when four planes flew overhead.17 She hid her children in the cellar, covered the trapdoor with a China hutch, and then armed herself with a six-gun and a 30-40 rifle.18 She remained convinced that these were “monsters,” until a US Judge later informed her about the Alaska Flying Expedition.19 The people of Fairbanks were pleasantly surprised at the speed and distance covered by the expedition. During the days of the Gold Rush, the trip normally took over 1 1/2 years through the Yukon River compared to 50 hours by plane.20 The Alaskan Flying Expedition crews flew 4,500 miles in 53 hours and 30 minutes at a maximum speed of 115 miles per hour in DeHavilands (DH-4Bs).21 These were modified vintage World War I airplanes.22 The four airplanes safely arrived in Nome, Alaska on 24 August.23 The crew successfully accomplished the round trip flight, landing at Mitchel Field on 20 October.24 They traveled “9,000 miles in just 112 hours of flying, with the same airplanes, the same motors, and the same spark-plugs.”25 The crews took aerial photographs in only ten hours for $1,500 dollars, saving the US Geological Survey $10,000 dollars and about three years.26 Lieutenant Clifford Nutt, one of the four pilots, stated the mission’s “success would establish a precedent for future military and commercial operations.”27 Airplanes inspired economic dreams in Carl “Ben” Eielson, a former Air Service pilot. He began an air service business in 1922 in Fairbanks based on the former military Curtiss JN-4D airplane, commonly referred to as the “Jenny.”28 His business included transporting, guiding, and mail delivery. He made the first airmail delivery in Alaska on 21 February 1924.29 A delivery that averaged 18 days by sled dog was only three hours by air.30 Eielson encouraged aviation developments and accomplished many firsts leading the way for commercial investments. Eielson and George Hubert Wilkins, an Australian Arctic explorer, achieved much recognition for their Arctic flight from Point Bar 9 the Distinguished Flying Cross.33 Eielson and Wilkins’ achievements demonstrate how military and commercial airpower shaped Alaska. Mitchell’s prediction to Arnold in his letter in 1919 came true. The 1920 flight did “develop into a round-the world flight.”34 In 1924, Mitchell organized the Douglas World Cruisers 4-ship flight.35 “Again, Alaska, because of its strategic location on the air map of the world, would figure prominently in his plans.”36 This around-the-world flight, conducted by the US Army Air Service, began on 6 April 1924 and officially ended almost six months later on 28 September.37 The planes were named the Seattle, Chicago, New Orleans, and Boston.38 The route began in Seattle and then went through Prince Rupert, Sitka, Seward, Chignik, Dutch Harbor, Nazan Bay, Atka, Chichagof Harbor, Attu, across the Kurile Islands to Japan, through southern Asia, Europe, North Atlantic and ended back in Seattle.39 The flight covered 26,345 miles in 363 flight hours and 7 minutes, averaging 72.5 miles per hour.40 Building on the Alaska Flying Expedition lessons and utilizing three of the previous pilots from that expedition as advance crews, Mitchell proved that airpower could extend America’s global reach.41 The Alaska portion of the trip caused numerous difficulties for Major Frederick L. Martin, the mission lead. He experienced engine trouble and an unfortunate meeting with an Alaskan mountain.42 He and his mechanic survived, but that was the end of the Seattle’s journey.43 The Coast Guard cutters USCGC Haida and USCGC Algonquin provided invaluable support recovering Major Martin and aiding the other three crews through the Alaska portion of their trip.44 Mitchell remarked, “These airplanes flew through Alaska and again it was demonstrated to anyone with an eye to the future and conversant with world conditions that it was of the utmost importance for us to establish our airways there at the earliest possible moment. However, conservatism, ignorance, and lack of foresight have prevented it up to this time.”45 Mitchell later wrote, “Since the World Fliers went through the Aleutian Islands and down the Kuriles, the Japanese have paid special attention to the northern route.”46 He stated “they are deathly afraid of an air attack through Alaska,” not an attack through Hawaii or the Philippines.47 Mitchell advocated for a permanent air presence in Alaska and noted that the neither the US Army nor Navy had taken any actions to defend Alaska.48 In one of Mitchell’s reports, he “predicted that Japan would strike the US without warning and the Aleutian Islands would become a major theater of operations.”49 War Plan Orange, originally conceived in 1890, was a Pacific defense plan in case of war with Japan.50 Plan Orange updates included Alaska in a strategic triangle with Panama and Hawaii in 1928, 1938, but then the focus shifted away from Alaska in 1942.51 “American strategy in the Pacific, [Brigadier General Stanley D. Embick] insisted, should concentrate on holding the strategic triangle, Alaska-HawaiiPanama. Such a course would place the United States in an invulnerable position and permit its military and naval forces to conduct operations in such a manner that will promise success instead of national disaster."52 However, Alaska would remain a low economic priority of the strategic triangle, until a crisis ensued.53 An Alaska tragedy captured the Air Service’s attention and was the impetus for change. In 1929, Eielson and his partner Joe Crosson established Alaska Airways.54 The company provided recovery services for Swenson Fur and Trading Corporation on the Siberian Coast.55 On 9 November 1929, Eielson and his mechanic, Earl Borland died in a plane crash on one of the personnel and fur recovery missions.56 Harsh weather conditions made search and rescue operations difficult. On 27 January 1930 because of the efforts of Alaskan, Canadian, and Russian pilots, the bodies of Eielson and Borland were recovered.57 Despite not being recognized by the US, the Soviet Union still provided assistance.58 Unfortunately, the U.S. Army Air Corps was unable to participate in the recovery efforts.59 The Air Corps had no pilots trained in Arctic operations nor did they have the necessary equipment for cold weather operations.60 On 5 March 1934, Alaskan Delegate Anthony J. Dimond testified before Congress, introducing the “Dimond Bill” highlighting the inability of the Air Service to aid in the recovery of Eielson’s body, the need for cold weather testing and training, and a requirement for equipping Alaska with defenses.61 Dimond’s argument was further strengthened by the Air Corps’ misfortune in delivering mail in 1934, which prompted the War Department to direct the Baker Board.62 Twelve pilots died and fifty-seven aircraft accidents occurred in a four-month period while delivering mail.63 House Speaker Henry Rainy stated, “If the Air Corps was not equal to carrying the mail…how would it carry bombs?”64 The Baker Board “studied and reported on the adequacy and efficiency of the Air Corps in performing its mission in peace and war.”65 Lieutenant Colonel Henry “Hap” Arnold renewed faith in the Air Corps and diverted attention away from the mail tragedy. On 19 July 1934, Colonel Arnold led “The Alaska Flight,” consisting of fourteen officers and sixteen enlisted men in ten Martin B-10 bombers.66 The flight was a round-trip from Bolling Field, Washington D.C. to Fairbanks, Alaska. The mission included surveying and photographing Alaska for future military defenses.67 Alastair McBain asserted that Colonel Arnold “made the flight to prove, it was said, that the maligned Billy Mitchell knew what he was talking about when he said Alaska would be important in the defense of this hemisphere.”68 The 950-mile return flight from Juneau to Seattle along the coastline “demonstrated that a tactical unit could be deployed to Alaska without having to fly over neutral territory” and the first time “Alaska had been linked with the continental United States by a mass non-stop flight of American airplanes.”69 The Alaska Flight traveled 18,000 miles with only one recoverable mishap, at Cook Inlet in Alaska, returning on 20 August.70 Upon his return, Colonel Arnold stated, “We have proved that it is possible to take tactical units of the Air Corps to Alaska quickly and bring them back successfully.”71 In his post-trip report, he recommended the creation of an Air Corps base in Alaska and that a “fair share of public funds” be provided to improve Alaskan air navigation.72 The combination of the harsh climate and inadequate navigation aids was dangerous for pilots.73 Colonel Arnold received the Distinguished Flying Cross and his second Mackay Trophy, an award given for the “year’s most outstanding flight” the Alaskan Flight.74 He personally briefed his findings from the trip and emphasized Alaska’s strategic importance to President Roosevelt.75 The Air Corps Tactical School (ACTS) also investigated the strategic importance of Alaska and provided the classified study Strategic Possibilities of Alaska: 1934-1935. Captain Arthur W. Vanaman, Captain Muir S. Fairchild, Lieutenant Hoyt S. Vandenberg, and Lieutenant Laurence S. Kuter were the Air Corps committee members who prepared the report. The committee concluded that Alaska was “vital to the continued existence of the United States as a first-class power that air bases be established in Alaska with absolutely no delay.”76 Three main considerations shaped the survey recommendations. First, air base establishment in Alaska would protect the US and deny adversaries the ability to expand their air bases into the remote US territory.77 Second, the ACTS committee believed air power was critical and the most effective method to defend the Alaskan Territory and the US.78 Air power would overcome the need for excessive ground troop requirements.79 Finally, air power would be necessary because “naval power [would] fail in the event of an Atlantic threat.”80 ACTS concluded maintaining US sovereignty of Alaska was important to protect against “hostile seizure” and that the strategic Alaskan territory could serve US homeland defense interests.81 Diplomacy and military power were two methods considered to maintain the economic status quo.82 The ACTS committee reasoned that diplomacy was not a viable option, because of the reduction in the US presence in the Philippines and Guam and Japan’s withdrawl from the League of Nations.83 ACTS stated that the solution to enforcing national policy would then be “achieved by elimination [of diplomacy] and [that] air power must be employed.”84 To defend against potential Japanese aggression, ACTS considered the establishment of air bases at Guam and Fairbanks, Alaska.85 However, Guam was not a workable option for either air or naval bases because of the “complacent agreement to leave Guam undefended.”86 The ACTS report indicated that establishing air and naval bases in Guam would be a provocative move and result in a war with Japan.87 Establishing an air base in Fairbanks, they believed, would not trigger Japanese aggression.88 ACTS offered, “Various points in Alaska might be prepared to service this force under the guise of supplementing the restricted means of communication throughout that country.”89 ACTS emphasized the strategic location of Alaska, especially the Aleutian Island of Attu in close proximity to Japan (see Figure 1).90 “The radius of action of an air force based near Attu Island, includes the entire Island Empire of the dominant Asiatic power in the Pacific. Her cities, her industry, her transportation, her royal family, her political center, her military and naval headquarters, her major naval bases and, perhaps, the main portion of her navy, her army, and her air force are within that range.”91 Reinforcing Attu as an airbase would protect the US from a Japanese attack.92 On 17 January 1935, the introduction of the Wilcox Bill advocated for airfield construction in Alaska and five other strategic locations.93 In support of the Wilcox Bill, General Mitchell made his now famous testimony in support of Alaska on 11 February 1935. He stated, “Alaska is the most central place in the world for aircraft and that is true of Europe, Asia or North America. I believe, in the future, he who holds Alaska will hold the world, and I think it is the most strategic place in the world.”94 According to John Cloe, military historian of Alaska, this was one of the last public appearances of General Mitchell prior to his passing on 19 February 1936.95 The Wilcox committee took into account the Dimond Bill, Colonel Arnold’s report, and the Baker Board findings.96 On 12 August 1935, the Wilcox National Air Defense Act became law. Despite not providing funding for construction, this became the “most important piece of legislation […] almost all base construction from 1935 through World War II was done under the umbrella of the Wilcox Act.97 As part of the act’s funding for the development of Arctic bases, Congress finally funded a cold weather testing facility near Fairbanks in 1939.98 US international concerns and growing instability reinforced Alaska’s strategic importance. On 1 September 1939, World War II began when Germany invaded Poland. “Japan’s expansionist goals” were also becoming increasingly alarming.99 Then on 17 June 1940, France surrendered to Germany. As a result, military presence and construction of airfields and bases throughout Alaska rapidly increased.100 By February 1941, B-18s and P-36s began arriving at Elmendorf Air Force Base.101 President Roosevelt sought to improve US-USSR relations and support the Allied war effort. In January 1941, President Roosevelt reversed the 1939 embargo, which removed restrictions on aviation related supplies and deliveries to the USSR.102 This embargo was based on the Export Control Act of 1940 created in response to Japanese aggression.103 He made this decision, despite the non-aggression pact between Germany and the USSR.104 “Continued isolation of the USSR seemed increasingly less desirable, and tentative steps were taken to improve relations.”105 To support the Allies, Roosevelt approved the US Lend-Lease Act on 11 March 1941.106 The Soviets complicated matters for the US by entering into a neutrality treaty with Japan on 13 April 1941.107 Japan’s proximity to undefended Alaska threatened US interests. However, one-and-one-half months later the German-Soviet pact dissolved on 22 June 1941, when Germany launched Operation Barbarossa and attacked the Soviet Union.108 Alaskan defenses received another boost after 7 December 1941, when Japan attacked Pearl Harbor in Oahu, Hawaii.109 General Arnold agreed to send two more squadrons and provide new P-40s and B-26s.110 However, by the end of January 1942, just 13 of 24 P-40s and 7 of 13 B26s completed the journey to Alaska.111 Outdated navigation aids and harsh weather conditions made flying the aircraft from the US mainland to Alaska difficult and dangerous.112 Colonel William O. “Bruce” Butler, the Fourth Air Force Chief of Staff, devised a successful plan to ship planes by boat from Spokane to Alaska, instead of subjecting pilots to the treacherous air route in the winter.113 The Alaska Communication System (formerly called the Washington-Alaska Military Cable and Telegraph System) proved inadequate for wartime.114 “Alaska’s early warning air defense depended on the visual observation made by ground observers, the majority of whom were Indian agents located in remote villages.” 115 Funding enabled an upgrade to the current system, providing a tactical network by activating existing sea cables permitting secure communications.116 Additional air support services were finally provided.117 The surge in Alaskan forces and increased infrastructure justified a flag rank presence in Alaska.118 As such, Colonel Butler transferred to Anchorage, Alaska and pinned on Brigadier General after assuming command of Eleventh Air Force on 8 March 1942.119 He contended with a lack of pilots and an aircraft shortfall.120 Rear Admiral Robert A. Theobald assumed command of Task Force 8, which Admiral Chester Nimitz, Commander in Chief, Pacific Fleet directed to prepare for the Japanese threat projected in the Aleutians.121 He had operational control over Eleventh Air Force.122 By 21 May 1942, the US became aware of the “objectives of Midway, the approximate strength of the Japanese Northern Area Force and that it [would] strike on 1 June or shortly after.”123 Admiral Nimitz ordered Theobald “not to his risk his forces unless he was certain of victory.”124 Theobald, Butler, and General Simon Bolivar Buckner, the Alaskan Defense Command chief, met on 27 May 1942 to plan the Aleutian defense.125 The Japanese attacked Dutch Harbor, Alaska on 3 June, followed by their attack at Midway on 4 June 1942.126 There are two reasons for the Japanese strategy. First, the Japanese objective at Dutch Harbor was directing US attention away from the planned main event, the attack at Midway Atoll.127 The Japanese assumed the US would divert their forces away from Midway to protect US territory.128 Secondly, the aftermath of the Doolittle Raid on Tokyo on 18 August 1942 left some Japanese convinced the attack was launched from a “secret base in the western Aleutian Islands,” not the USS Hornet.129 Japanese assumptions proved out to be wrong on both counts. Radar alerted the US in the Aleutians of an impending Japanese attack.130 Despite the fact that the Imperial Japanese Navy lost the Battle of Midway, the Japanese Special Navy Landing Force occupied the Aleutian Islands of Kiska on 6 June and Attu on 7 June.131 This event marked the first time since the War of 1812 that foreign invaders had occupied US North American territory.132 According to Chandonnet, “Because of the Aleutian operation, the Japanese at the crucial Battle of Midway did not have the superiority in air carriers they might have had.”133 Additionally, “If [Admiral] Yamamoto’s plan had succeeded, Japan would have gained undisputed control of the central and western Pacific.”134 Major Neil Rice prepared a memorandum regarding the situation in the Aleutians dated 11 June 1942.135 The Office of the Chief of Staff at the War Department forwarded Rice’s memorandum to Lieutenant General Arnold. Major Rice stated that the occupation of the islands gave the Japanese control of the western Bering Sea, and insisted the US must maintain Umnak and Dutch Harbor.136 He noted the potential loss of these two islands would provide the Japanese unfettered access to the entire Bering Sea.137 Major Rice recommended Alaska be a separate theater with a designated Commanding General.138 Additionally, he provided a survey of existing airfields and suggested that Army personnel maintain and construct additional Alaskan airfields.139 As the conflict progressed in the Aleutians, the US military recovered a Mitsubishi Zero, the top fighter of the Imperial Japanese Navy Air Service, on the Aleutian island of Akutan.140 The salvaged plane was sent to San Diego in July 1942.141 This was the “first complete Zero to fall into US hands.”142 The US repaired the plane and subsequently used it to train Allied pilots and improve flight tactics against the Japanese.143 Progress in the Aleutian Islands and Alaska was overshadowed by higher priority theater requirements.144 By July 1942, General Arnold did not want to send more air assets to Alaska as it “would be a wasteful diversion from other theaters of which are air theaters.”145 However, supporting the Russians through the Lend Lease program gained momentum in American strategy, which provided Alaska another important wartime mission. The Alaska-Siberia (ALSIB) route proposed by the US on 23 April 1942 concerned Stalin.146 He stated, “I’m afraid our friends, the Japanese, won’t like the Alaska-Siberia route.”147 Stalin preferred other Lend Lease route options. The Russians’ first preference was the cumbersome 13,000-mile South Atlantic route requiring shipping and flying the planes.148 The second undesirable Russian preferred route went through the North Atlantic sea-lane to Arctic Russian ports.149 President Roosevelt and Churchill voiced their concerns to Stalin regarding this passage.150 Hitler’s forces reportedly destroyed 30-40% of the North-Russian convoys supporting Lend Lease, “in effect, shut[ting] down the route.”151 German submarines forcefully patrolled the routes suggested by the Russians.152 Despite these German threats, Stalin was not concerned for Allied safety stating, “No major task can be carried out in wartime without risk of loss.”153 On 3 July 1942, Stalin approved the ALSIB air route to transfer planes from the US to Russia.154 The Lend Lease planes moved along the Northwest Staging Route, beginning in Great Falls, Montana and ending in Fairbanks.155 The Soviet pilots trained and received the planes at Ladd Field in Fairbanks and then flew the planes to Krasnoyarsk, Russia. Figure 2 highlights the ALSIB route.156 The military constructed the Alaska-Canada (ALCAN) highway, which enabled ground support of the pilots.157 This vital logistical lifeline began in Dawson Creek, Canada and ended at Delta Junction, Alaska.158 Contract commercial airliners returned the US pilots from Ladd Field to Great Falls, speeding up Lend Lease operations.159 From 11-29 May 1943, US forces successfully fought the Japanese at Attu and took back control of the island.160 15,000 US soldiers mobilized and attacked the 2,500 Japanese soldiers holding the island.161 General Landrum ordered air-dropped requests for the Japanese surrender on 28 May.162 There were 28 Japanese prisoners of war- the rest of the garrison was killed in action or committed suicide.163 The battle resulted in 550 US casualties, 1,150 wounded, and 1,800 that suffered from non-battle related injuries.164 While the battle at Attu progressed, the Japanese troops at Kiska began evacuating the island and returning to the Kurile Islands.165 Once Attu was secured and an operational airfield in place, the US began launching air assaults on Paramushiro, Japan in the Kurile Islands on 10 July 1943.166 The 77th Bomber Squadron sent 8 B-25s equipped with 32 500-pound general-purpose bombs.167 The bombs successfully dropped but cloud cover obstructed targeting.168 This was the “first [air attack] from an American land base.”169 These attacks continued, while the Japanese quietly vacated Kiska. On 28 July, approximately 5,183 Japanese completely cleared Kiska in 55 minutes.170 Chandonnet stated it was a “brilliant escape under cover of fog.”171 However, the US continued airdropping bombs on Kiska, noting the island appeared deserted and falsely assumed the Japanese were in hiding.172 On 15 August 1943, “nearly 35,000 US and Canadian troops made unopposed landings to reoccupy Kiska. They were astonished as they were relieved to find the Japanese gone.”173 Unfortunately, there were still 31 casualties and 51 wounded, as a result of friendly fire and Japanese booby traps during the unchallenged attack.174 With the departure of the Japanese troops, the US and Canadian troops had accomplished their mission.175 Soon, “Assignments to the Aleutians were looked upon with dread as they often meant enduring foul weather, long periods of darkness, grinding boredom, food shortages, no one-year rotational policy, the feeling of uselessness, and worst of all, very few women.”176 Troops continued aerial reconnaissance missions and occasional bombing of the Kurile Islands.177 The Aleutian Campaign turned into a “Theater of Frustration.”178 On September 11, 1943, Eleventh Air Force launched 7 B-24s and 12 B-25s from Attu to conduct a raid on the Kuriles.179 The Japanese fighters encountered the US bombers.180 This catastrophic air attack resulted in the loss of the majority of Eleventh Air Force bombers due to damage or destruction.181 However, the US crews claimed 13 air victories and 2 possible victories.182 Some bombers did not make it back to Attu and sought sanctuary in Petropavlovsk, Russia.183 US pilots flying from the Aleutians to conduct missions in the Kuriles faced additional hardships, facing internment when forced to divert to Russia.184 The Soviet-Japanese neutrality treaty remained in effect until 8 August 1945.185 In the meantime, the Russians made a secret agreement with the US to return their troops.186 However, of the 80 US aircrews that landed in Russia some claimed they were “treated little better than prisoners of war.”187 By December 1944, “seven B-24s, eleven B-25s, and nine Venturas were diverted to Russia. Nearly 200 American were interned and later released. The Russians kept the bombers.”188 Nevertheless, the US continued to support the Russians through Lend Lease operations based in Alaska. The Russians received approximately 7,926 airplanes on the Alaskan-Siberian Route (see Table 1).189 Heavy bombers were not provided, because the Russians did not want to provoke the Japanese.190 Because of Lend Lease, “the Soviet Air Force was able to quickly expand its obsolete bomber force and transform it into a credible offensive asset against the Luftwaffe.”191 General Arnold stated US troops “worked overtime to get the airplanes in first-class condition so that all the Russians had to do was fly them from Fairbanks to Russia. They never gave us any thanks; they never showed in any way that they were grateful for what we had done to make their stay in Fairbanks happy and pleasant, or regretted the inconvenience to our people.”192 Post-war, the Soviets dismissed these US contributions.193 Source: Bravo 369 Flight Foundation and Top Cover for America Germany surrendered on 7 May 1945 and the Japanese followed on 2 September. “Alaska contributed to the Allied victory, not only against Japan in the Pacific, but also against Germany in Europe.”194 The great global conflict concluded, but almost immediately, US and Soviet tensions increased. Some analysts speculated the Soviets hoarded Lend Lease aircraft and supplies for later use and during the war had used the ALSIB route for spying.195 The Korean War confirmed some of these suspicions, when US troops seized former American Lend Lease equipment, supplied by the Russians and Chinese from surplus war stock.196 The “wartime marriage of the capitalist and communist countries was ending” while a Cold War began.197 Chapter 2 Alaska and the Cold War: 1945-1990 As airpower develops, Alaska will develop as the air crossroads of the Pacific. Brigadier William L. “Billy” Mitchell With the conclusion of World War II in 1945, the growing hostilities between the US and the Soviet Union developed into a Cold War. The divisions of the bipolar world, between the liberal capitalist US and the communist Soviet Union, fueled the Cold War for over four decades. Premier Joseph Stalin in February 1946 stated, “there could be no collaboration between communist countries and ‘the dying, corrupt’ capitalist democracies.”1 Views on the stability of this period vary. Some argued the “near equal distribution of nuclear military power between the USSR and the United States created a bipolar world in which the two superpowers successfully managed stability in order to survive.”2 Others contended the competition between the two superpowers resulted in instability, leading to “arms races and proxy wars in order to keep one or the other from gaining hegemony.”3 Regardless of these arguments, Alaska had a major role in protecting the US from Soviet aggression and would continue to play a key geostrategic role throughout the Cold War. According to Lieutenant General Atkinson, CINCAL, 1953-1956, “since there was no more Japanese Empire -- they had been defeated -- it was obvious that the main threat at that time to us was the Soviet Union.”4 Because of Alaska’s geostrategic location, it again contributed significantly to securing national security objectives during the Cold War. A polar projection map (Figure 3), as opposed to the more commonly used Mercator projection map, signifies Alaska’s strategic location in proximity to Russia.5 At the closest point, just over two miles separate Little Diomede Island, Alaska from Big Diomede Island, USSR. Lieutenant General Breitweiser, CINCAL, 1967-1969, asserted that Mercator projection maps “distort the public mind on distances between key points on the globe.”6 From an Airman’s perspective, a Mercator map provides accurate distance but does not accurately portray the size of the North and South Poles and detracts from the strategic location of Alaska. “Cold Warriors” also favored the polar projection map because it accentuated the size of the USSR, portraying it as a looming giant threatening the US. In 1947, the Joint Chiefs gave control of Alaska to the newly independent Air Force, because “Alaska is a battleground for Airmen.”7 A new post-World War II defensive strategy, which focused on deterring the Soviet Union, resulted in a force restructure in Alaska. Most notably, the Aleutians lost significance and the sector was disestablished in 1946.8 Interviews of former Alaskan Commanders-in-Chief from 1947 to 1969 provide some insight into the change in strategy. In the article “Alaska: Airman’s Theater” in 1950, it was stated the appearance of the Aleutians as “stepping stones from Asia up to the North American continent’s front door, lands to be defended one by one” was deceiving.9 “No map could hint the subzero temperatures that could cripple an army, taunt it with frostbite, hold it to a mile-a-day advance through roadless mountains and plains.”10 Air officers commented the Aleutians were “islands of tundra” where an adversary such as Russia could be isolated and bombed “with no place to march to” if they chose to invade.11 Additionally, these officers did not support the dispersion of aircraft in the formidable Aleutians and wanted them based in the “heartland” of Alaska at Elmendorf Air Force Base, Ladd Field, and Eielson.12 However, concentration of the aircraft at these three bases provided adversaries a concentrated target set, one easier to plan against.13 Lieutenant General Kepner, CINCAL 1950-1953, a deterrence advocate, believed the build-up of the Alaskan military infrastructure would deter adversaries, thus preventing future battles.14 He compared the cost of B-36 bombers that “never dropped a bomb on the enemy” to the costs of investing in Alaskan bases.15 “Their very existence prevents the enemy from deciding to attack at times.”16 General Twining, CINCAL, 47-50, stated in 1950 that “Alaska is a one-shot deal […] we have to be prepared to meet a surprise attack the first time or not at all. We don’t have a second chance.”17 General Twining reiterated the need for continued planning to counter “our enemies to the west” 23 years later in 1973.18 Air Defense Alaska became the “eyes for the nation in order to warn the rest of the country if an attack was coming.”19 The establishment of Alaskan Command in 1947 included the missions of defending Alaska and “protect[ing] the North American continent from attacks across the polar regions.”20 Air defense enhancements and force restructuring were necessary. “A new Heartland concept of air defense dominated war planning and eventually redefined the physical locations for units assigned to Alaskan Air Command” (AAC).21 This Heartland contained the bases in Anchorage and Fairbanks.22 “Under the armed forces’ new strategy for defending Alaska, the U.S. was coiling its strength -- its winterized jet fighters, its cadres of weather-wise pilots and its supporting Army troops -- into one tight defense set in the Alaskan heart.”23 Planners at AAC, the Army-Navy Hoge Board, and HQ Air Force conducted separate studies and concluded radar sites for air defense were necessary in Alaska.24 As a result, Congress approved the initial construction of ten radar sites and two control centers.25 On 27 June 1950, an provisional air defense system became operational improving coverage and lessening fears of a Soviet invasion.26 The 10th Air Division at Elmendorf Air Force Base and the 11th Air Division at Ladd Field had responsibility for the air defense system.27 The two divisions oversaw the radar sites operated by the aircraft control and warning (AC&W) squadrons.28 The AC&W system achieved full operational capability status in 1954.29 Figure 4 highlights the division sectors, the AC&W sites, and the Alaskan portion of the Distant Early Warning (DEW) Line system.30 The establishment of the DEW Line system in 1957 was in response to a 1951 Air Force sponsored study regarding Soviet nucleararmed manned bombers.31 The report indicated the air defense network needed improvement to counter this potential threat.32 The consensus was that the polar region was vulnerable to Soviet exploitation. A 1952 Summer Study group, hosted at the Massachusetts Institute of Technology, recommended the DEW Line as a potential “critical component of defense against manned bombers attacking across the arctic circle, by providing early detection and warning to a central point in the United States.”33 The group surmised the Air Force “needed three to six hours advanced warning of an attack so that (1) Strategic Air Command bombers could more easily be dispersed to numerous airfields or be airborne to survive an initial onslaught, (2) air defense interceptors could be deployed to maximize the defense, (3) civil aircraft could be better diverted from the more likely target areas, and (4) civil defense measures could be more effectively implemented.”34 Figure 4: Alaskan AC&W and DEW Line System, 1959 Source: John Haile Cloe, Top Cover for America The DEW Line system, codenamed Project 572, consisted of over 50 radar and communication stations spanning 3,000 miles.35 The location of some of the sites had historical significance and illustrated both man’s long presence in the region as well as the dangers of Arctic operations. “One site is within walking distance of the spot where Sir John Franklin perished in 1847 during his ill-fated expedition to find the Northwest Passage; another looks down on the remains of a ship abandoned by Roald Amundsen in the early 1900’s. And more recently, it was near Point Barrow that Wiley Post and Will Rogers died in an airplane crash in 1935.”36 When the DEW Line system detected an aircraft, it was “radioed by high-wave scatter broadcast to be picked up by receivers at Colorado Springs.”37 The “radars reported the location, track direction, and time of bomber detection to NORAD.”38 Aircraft from either Alaska or Canada were then dispatched to intercept the unidentified aircraft. The fighter interceptor squadrons assigned to the 10th and 11th Air Divisions patrolled and protected Alaskan airspace from the Soviet Union.39 In 1950, fighters could be “scrambled” within three minutes of notification, “no easy feat in the heavy cold of Alaskan winter.”40 From 1945 to 1955, AAC was “initially equipped with P-51s, which were replaced in succession by F-80s, F-94s, F-89s, and F-102s.”41 In 1970, the F-102s were exchanged for F-4Es.42 The Soviet threat was real. Prior to the DEW Line system installation, US aircraft experienced one confirmed and one probable attack by Soviet MiG-15s in 1953 and 1955.43 “By 1957, AAC had reached the peak of its air defense strength” with over 150 F-89s assigned to Alaska.”44 The addition of the operational DEW Line system enhanced air defense capability. The DEW Line provided a “radar fix […that] fasten[ed] the electronic brains of the [fighter] interceptors” enabling engagement of the unidentified aircraft.45 The Alaskan radar “detected known Soviet bomber tracks as early as 1958, the first intercept wasn’t until 5 December 1961 when two Soviet TU-16 Badgers System in 1958.52 According to Lieutenant General Atkinson, prior to White Alice, the radar sites had the intelligence on incoming aircraft but lacked a continuous capability to notify Elmendorf headquarters.53 Due to the inadequate telephone line system in Alaska, radio was the primary but unreliable means of communication.54 “White Alice” system was an indispensable link in the Air Defense of the United States. It enabled combat centers to receive warnings from remote radar outpost[s]; it made possible effective coordination between various branches of the military establishment which guarded against the approach of hostile aircraft; it gave both the military and civilian organizations a chance to prepare for such an attack; and it provided reliable communications between Americans within Alaska and those within the continental United States.55 This network tied in the DEW Line and the Ballistic Missile Early Warning Station (BMEWS) at Clear, Alaska. Figure 5 highlights the White Alice network distribution throughout Alaska.56 During the late 1950s, “emphasis was switched from defending against not only a bomber attack but also an intercontinental ballistic missile, or ICBM, attack.”57 The current air defense system was insufficient to counter the new ICBM threat.58 Because of Soviet advancements in ICBMs, Clear, Alaska was one of three locations throughout the world selected for a BMEWS.59 In 1961, the completed BMEWS in Alaska was connected to the NORAD Command Operations Center at Ent Air Force Base, Colorado and Strategic Air Command (SAC) Strategic Air Command and Alaska In response to US national policy that “prohibited a first strike philosophy,” SAC continued to “build the sinews of the preventative strike force.”63 The logic at the time was that since “national policy precluded the nation’s taking the offensive, it was suggested the weight of evidence indicate[d] that a posture that can win a general war is by its very nature the kind of posture that can deter both it and lesser conflicts.”64 As such, SAC aircraft forward deployed to Alaska, and other areas outside of the continental United States, under Operation Reflex Action.65 Fifteenth Air Force, assigned to Strategic Air Command, placed tenant units at Eielson and Elmendorf Air Force Bases during the Cold War.66 Strategic Air Command deployed bombers to Eielson Air Force Base on a rotational basis from 1947 to 1963.67 Elmendorf Air Force Base hosted SAC bombers from 1960 to 1966.68 “This ended an era in which Alaska had played an important role by maintaining the strategic retaliatory capabilities of the United States.”69 Most notably, Alaskan Air Command increased support of the SAC Chrome Dome mission during the Cuban Missile Crisis, beginning on 20 October 1962.70 Eielson Air Force Base ensured they could supply additional JP-4 and petroleum, oil, and lubricants for intensified Chrome Dome requirements and made daily reports to SAC from 22 October to 21 November.71 In response to the crisis, Alaskan NORAD region combat forces assumed the highest level of readiness.72 By 27 November, the Alaskan NORAD Region reverted to normal readiness levels.73 In the years leading up to World War II and beyond, it was not just the military that saw the importance of Alaska as an air route to the rest of the word. As commercial aviation began to boom, the airline business looked North to Alaska, too. Commercial Air in Alaska Commercial air in Alaska grew from the early military and bush pilot flights highlighted in Chapter One. The 1929 establishment of Aviation Field, later renamed Merrill Field in 1930, resulted in Anchorage “becom[ing] the leader in air traffic operations and passengers carried within Alaska.”74 Additionally, Charles Lindbergh and his co-pilot wife Anne Morrow Lindbergh, generated attention for Alaskan commercial air with their flight to the Orient in 1931 along the Great Circle Route. In Anne Morrow Lindbergh’s book, North to the Orient, she emphasized that the route to the Far East would show the “indisputable importance of future air-routes between America and Japan, China and Siberia.”75 Their historic flight surveyed unchartered commercial air routes through Canada, Alaska, and the Soviet Union on their way to and from the Orient.76 From 1932 to 1938, commercial aircraft rapidly expanded in number from 31 to 155 air frames, resulting in the establishment of the Civil Aeronautics Authority in Alaska.77 The expansion of commercial aviation into Alaska provided humanitarian and economic benefits. Alaska Airlines in the 1940s was the “largest charter operator in the world.”78 Demonstrating its capability, Alaska Airlines delivered food during the Berlin Airlift and transported refugees resettling in Israel.79 By 1946, Anchorage was advertised as the “shortcut between Europe and the Orient via the Arctic route mak[ing] the journey from New York to Tokyo two thousand miles shorter than the Central Pacific route through San Francisco.”80 The marketing worked, and in 1947 Anchorage and Shemya became stops for Northwest Orient Airlines on their routes to the Far East.81 Lieutenant General Atkinson noted the increased “commercial activity” and reliance on Elmendorf Air Force Base during this time, since it was the only facility equipped to handle major commercial air operations.82 Merrill Field, located in Anchorage, could not support large commercial operations because city encroachment prevented further airfield expansion.83 In 1948, Congress authorized funds for the construction of “international type” airports in Anchorage and Fairbanks.84 Continued federal and state investments ensured modernization of Alaskan airports and the capacity to support the demands of the jet age.85 By the 1960s, “Anchorage established itself as the ‘Air Crossroads of the World’ [hosting] seven international carriers [that] used the [Anchorage International] Airport as a regular stop-over on routes between Europe, Asia, and the Eastern U.S.”86 However, even with all the air defenses in Alaska, commercial airlines in the region were not immune to the threats of the Cold War. Two Korean Air Line flights unintentionally violated Soviet air space on this northern route and were engaged by interceptors. On 20 April 1978, Flight 902 departed Paris, France en route to Anchorage and was fired on by an SU-15 when failing to respond to commands.87 The plane was initially identified by Soviet air defenses as a reconnaissance Boeing RC-135, but was later confirmed to be a civilian airliner prior to engagement.88 Two passengers died during the incident from “rapid decompression,” while the remaining 107 occupants survived.89 On 1 September 1983, Flight 007 departed Anchorage en route to Seoul and unintentionally got off course twice.90 The first time off course, six Soviet MIG-23s were sent to engage the aircraft, but the airliner had departed their designated air defense sector.91 Upon reentering Soviet airspace, two SU-15s intercepted and fired missiles into the airliner, resulting in the loss of 269 passengers and crew.92 The Soviets assumed that the aircraft was a US RC-135 intelligence aircraft, since one was reported in the area of Kamchatka that same day.93 This type of aircraft routinely flew missions off the Soviet coast.94 Prior to takeoff the pilots inadvertently set the autopilot incorrectly and were unaware they were off course during routine flight communications with air traffic controllers.95 The US RC-135 flight returned to Shemya without Russian knowledge and the Korean airliner was misidentified as the US plane.96 The unfortunate incident was a mistake and the victims were senseless casualties of the Cold War.97 Despite the instability of the Cold War, “Alaska had become one of the ‘flyingest’ places in the world […] nearly as many airplanes were registered to private owners as were automobiles” in the 1980s.98 However, improved jets with extended range in the 1990s reduced the number of international passengers stopping in Alaska.99 Fortunately, the cargo and domestic air market thrived.100 “After the Cold War ended, commercial aviation through the Arctic became the reality as Russian government opened the air space over Siberia for international aviation.”101 During the Cold War, US investments in Alaska ensured North America was safe from Soviet air and ICBM threats. The military units and forces assigned to Alaska adapted to the constant Soviet threat. Chapter 3 Contemporary Alaska Alaska’s strategic value increases constantly […] the future will prove that its acquisition was one of our greatest investments. General William L. “Billy” Mitchell Airpower and aviation contributed to opening up the Last Frontier. This chapter focuses on highlighting other areas that define Alaska’s strategic importance today. Valuable natural resources located within Alaska and contested areas in the Arctic have gained increased significance. Because of Alaska’s geostrategic location, the US can make sovereignty claims in the Arctic and profit from potential Arctic trade routes. Alaska’s geostrategic location is also ideal for intercepting rogue ballistic missiles from North Korea and the Middle East. Alaskan based airpower and associated forces continue to conduct critical air defense missions that protect the US homeland. Climate Change and Geopolitical Concerns In 2010, President Obama declared the US an “Arctic Nation” in his National Security Strategy.1 Recognition of Alaska’s access to the Arctic, since the US purchase in 1867, has continually increased in significance for nearly a century and a half, furthering US interests. Climate change has captivated international attention, and this environmental phenomenon is melting the polar icecaps and freeing up access to scarce and in-demand natural resources, as well as opening new sea routes across the Arctic Ocean. Figure 6 depicts the impact of climate change on the Arctic ice from 1979 to 2011.2 Figure 6: Average Monthly Arctic Sea Ice Extent Source: National Snow and Ice Data Center Once formidable Arctic passages, ice-bound during the long winters, are now open longer, presenting opportunities for maritime trade and commercial travel. Alaska also contains critical air and missile defense assets vital to US national security. This section focuses on how climate change is enhancing Alaska’s geostrategic importance today and continues to offer opportunities for military operations based in Alaska against threats to the homeland. Alaska’s position in the Arctic enables the US to make territorial and economic claims. Canada, Denmark (Greenland), Finland, Iceland, Norway, Russia, and Sweden are the other Arctic states (see map in Chapter 2, Figure 3). “All eight countries are positioning themselves to protect their sovereignty, defend their competing territorial claims, and develop significant natural resources. Future disputes could involve shipping routes, potential environmental degradation, and local resident’s concerns, as well as how best to combat to combat terrorism and transnational crimes.”3 Climate change has increased competition for resources among the five primary Arctic states centered on the North Pole. Canada and the United States dispute how to divide the Beaufort Sea and the status of the Northwest Passage but continue to work cooperatively to survey the Arctic continental shelf; Denmark (Greenland) and Norway have made submissions to the Commission on the Limits of the Continental shelf (CLCS) and Russia is collecting additional data to augment its 2001 CLCS submission; record summer melting of sea ice in the Arctic has renewed interest in maritime shipping lanes and sea floor exploration; Norway and Russia signed a comprehensive maritime boundary agreement in 2010.4 The 1982 United Nations Convention Law of the Sea (UNCLOS) is the primary source for resolving international disputes and determining rights. UNCLOS also provides Arctic states exclusive rights to natural resources within their established economic exclusion zones (EEZs).5 Arctic states are actively seeking claims beyond the mandated 200-mile EEZ and must apply to extend claims up to 350 miles from their continental shelf.6 The Lomonosov Ridge, an underwater mountain range, is a point of contention between Canada, Denmark and Russia.7 These states each claim that the Lomonosov Ridge extends from their respective continental shelf, and so is within their larger zones.8 Approval of this claim would expand their EEZ and increase their share of the natural resources.9 Figure 7 illustrates Arctic claims, borders, and highlights the Lomonosov Ridge.10 Figure 7: Arctic Claims Source: BBC News Europe The UN requires costly scientific evidence to support territorial claims, which involves mapping of the underwater continental shelf in areas of dispute.11 Russia filed a claim that “extends from the undersea Lomonosov Ridge and Mendeleev Ridge to the North Pole.”12 In 2001, the UN disapproved the claim.13 However, Russia is gathering evidence to support another claim in the 2012-2013 timeframe.14 In the meantime, Russia has remained assertive in the Arctic. In 2007, Russia boldly placed its flag on the seabed of the North Pole, which is located in the Lomonosov Ridge area.15 Canada and Denmark plan to submit claims to the Lomonosov Ridge as well.16 Canada announced in September 2010 that it had collected sufficient proof to claim the Lomonosov Ridge.17 Part of the Northwest Passage claimed by Canada and Denmark is also located within this contested strategic ridge.18 The outcome of this claim will redefine Arctic rights and affect international maritime traffic. The US does not recognize these claims to extend EEZs.19 “When other nations assert claims contrary to customary international law as reflected in the convention, the United States actively contests such claims through the FON [Freedom of Navigation Program]. In this manner, the United States has preserved its navigational rights and continue[s] to shape the international law of the sea.”20 Nevertheless, beginning this spring through 2014, the Arctic-5 will bid on territory under the provisions of UNCLOS.21 The US is not among the 162 nations that have ratified the treaty since 1982.22 President Obama stated in May 2010 that the US would “pursue ratification of the United Nations Convention of the Law of the Sea.”23 By ratifying the treaty, the US would have a voice in resolving 50 issues and determining Arctic rights.24 The US remains the “odd man out, legally, because it's the only country with Arctic interests that hasn't signed onto the Law of the Sea.”25 General Jacoby, Commander, US Northern Command, asserted that “as the commander responsible for the Arctic […] it would be very helpful to have a seat at the table as we begin the lengthy process of determining [the boundaries of the] Continental Shelf and all the attributes of the Arctic that competing nations will be interested in.”26 Ratification of UNCLOS has been contentious in the US. President Reagan was the first to oppose ratification due to concerns over deep-sea bed mining provisions.27 President Clinton endorsed the revisions and forwarded them for Senate approval. Since then some argue that the UNCLOS does not support US interests, but places excessive restrictions. Under UNCLOS, the US would be required to provide a portion of gas and oil revenues obtained from the US continental shelf to the International Seabed Authority for redistribution to “developing countries.”28 The US could also be at the mercy of unfavorable determinations made under UNCLOS. Opponents assert the US does not require “UNCLOS membership either to enjoy the freedom of the high seas or to exercise the right of innocent passage through the territorial waters of foreign nations. These rights and freedoms are among the oldest and most widely accepted principles of the law of the sea. They have been codified 51 twice, first in the Convention on the Territorial Sea and Contiguous Zone in 1958 and then in UNCLOS in 1982.”29 The Arctic-5 in 2008 agreed to the Ilulissat Declaration, which committed these states to resolving Arctic territory disputes peacefully.30 However, the Ilulissat Declaration does not account for military alliances and is not applicable to NATO pledges.31 In September 2010, Russian Foreign Minister Sergei Lavrov “warned that NATO, of which Canada and the three other Arctic powers are members, should not become involved in settling territorial disputes in the Arctic.”32 He stated that negotiation among the Arctic states and established principles were sufficient for conflict resolution.33 The Chiefs of Defense from the eight Arctic states met in a forum for the first time in April 2012 to discuss Arctic challenges.34 The US has not built up forces in the Arctic to contend with the rising Russian Arctic power. According to the Heritage Foundation, the Russian Arctic doctrine released in March 2009 indicates the primary goal is “transform[ing] the Arctic into Russia’s strategic resource base and make Russia a leading Arctic power by 2020.”35 Russia seeks to secure its Arctic interests and protect its borders by increasing its military presence with Arctic brigades.36 The US military has a significant role in the Arctic, because of Alaska’s long coastline on the Arctic Ocean. A realignment of Geographic Combatant Commands territorial boundaries recently took effect. Under the Unified Command Plan for 2011, USNORTHCOM assumed geographical responsibility for Alaska and no longer shares territorial responsibility with US Pacific Command (USPACOM).37 There was no change in Alaskan force alignment as they remain under USPACOM control. Additionally, USNORTHCOM and US European Command both have oversight of designated areas in the Arctic region.38 However, USNORTHCOM is the appointed advocate for securing Arctic capabilities for both Combatant Commands.39 General Jacoby stated in 2012 that one of his priorities is “monitoring the unique and fast-changing domain of the Arctic.”40 The reassignment of priorities must still be determined after the US determines what its Arctic strategy is. Vice Admiral Brian M. Salerno, US Coast Guard (USCG), stated, "We are in many ways an Arctic nation without an Arctic strategy."41 US military forces in Alaska are not equipped to meet the challenges of the Arctic. The end of the Cold War resulted in reduced Department of Defense investments in the Arctic region.42 The Arctic Capabilities Assessment Working Group (ACAWG) stated, “Facilities located below the Arctic Circle, even those in Alaska, provide limited capability to support Arctic missions due to long transits required to reach the operating area.”43 More airpower in the region is needed to support the gradual opening of the Arctic. The ACAWG white paper cited the potential for increased search and requirements and the risk of not having air stations in the Arctic to support these missions.44 The paper recommended the development of air infrastructure, basing of aircraft, and assigning military personnel in North Slope, Alaska.45 Additionally, the US lacks sufficient icebreakers to support and protect interests in the Arctic Ocean. Icebreaking capability enables the government, military, and commercial access to Arctic waters. Additionally, “US-flagged ice-capable ships provide visible US sovereign maritime presence throughout the Arctic region.”46 The US only has three icebreakers, of which only one is operational compared to 34 Russian icebreakers and 16 Canadian icebreakers.47 The USCGC Healy is the sole operational US icebreaker and is based in Seattle, Washington with the other two docked vessels. The USCG told Congress that it requires at least six icebreakers, three medium and three heavy.48 The DoD has chosen to rely on foreign icebreakers for additional support.49 “This situation draws a parallel to the country's lack of space shuttles, which has caused it to rely on Russian Soyuz rockets to reach the International Space Station.”50 A 2011 Department of Defense report to Congress recommended, “Further evaluation of the future operating environment is required before entertaining significant investments in infrastructure or capabilities” and that “existing defense infrastructure (e.g., bases, ports, and airfields) is adequate to meet near- to mid-term US national security interests.”51 As Chapter 1 and 2 illustrated, a crisis is generally required before investments are committed to Alaska. A harsh winter in Nome, Alaska prevented the last fuel shipment of the year in November 2011. As a result, the Russian tanker Renda supplied Nome with 1.5 million gallons of fuel, with the aid of the icebreaker USCGC Healy in January 2012. The two ships departed Dutch Harbor, Alaska on 3 January and arrived in Nome ten days later traveling over 300 miles in ice-packed water. This historic event was the “first time that petroleum products have been delivered by sea to a Western Alaskan community through ice covered waters.”52 US Alaskan Senator Mark Begich commented that Nome's fuel-delivery problem "drives home the nation's need for a strengthened presence in the Arctic. It underscores the reality that despite seasonal reductions in the Arctic ice pack, we still need more icebreaking capacity."53 The Nome crisis brought attention to the dismal state of US icebreaking capacity in the Arctic. The USCGC Healy, a mediumcapacity icebreaker, is more suited to support scientific exploration than heavy-duty commercial or military Arctic operations. Just prior to supporting the Nome mission, the USCGC Healy completed a tour lasting seven months in the Bering Strait and the Arctic, supporting NASA and the National Science Foundation, and also worked with Canada on mapping the Arctic Ocean.54 One icebreaker is insufficient to meet current and expanding future needs. The outcome of the Nome crisis resulted in $8 million allocated in the 2013 budget proposal to begin the process of obtaining a new USCG polar icebreaker.55 Without the proper equipment, the US may encounter difficulties in securing its Arctic interests. One of these key American interests is access to natural resources. Natural Resources The Arctic Ocean is the smallest of the five oceans but is still almost one-and-one-half times the size of the US.56 The Arctic polar region is the second largest desert in the world.57 The Arctic area contains untapped natural resources such as “sand and gravel aggregates, placer deposits, poly-metallic nodules, oil and gas fields, fish, and marine mammals.”58 Figure 8 details the Arctic natural resources from a Russian perspective.59 Because of Alaska’s location in the Arctic, the US also stands to gain more natural resources from the region. Alaska’s economy is dependent on natural resources. As such, the state is positioning itself to promote interest by uncovering additional mineral and energy resources, by conducting geophysical surveys, and by mapping.60 Investors and federal government partnership is required for further exploration. The Alaskan Division of Geological and Geophysical Surveys (DGGS) has 12 mineral and seven energy projects planned or ongoing for Fiscal Year 2012.61 Figure 8: Natural Resources in the Arctic Source: RIA Novosti Minerals According to Mr. Dan Sullivan, the Alaskan Commissioner for the Department of Natural Resources, “Alaska has much to offer the nation in the effort to secure a stable domestic supply of minerals.”62 For 2010, Alaskan mineral exports to China, Japan, Korea, and Spain were valued at $1.3 billion.63 In 2010, the total value of Alaska’s mineral industry was $3.685 billion compared to $2.966 billion in 2009.64 Alaskan minerals may aid in reinvigorating the economy and counterbalance the decline of petroleum production at Prudhoe Bay.65 Currently, there are six large lode mines in Alaska. Teck Resources Ltd.–NANA’s Red Dog Mine, one of the world’s largest zinc producers, received all permits and began mining the Aqqaluk deposit adjacent to the main Red Dog deposit, extending the mine’s life to 2031. Red Dog produced 593,043 tons of zinc, 121,144 tons of lead, and more than 6.7 million ounces of silver. Coeur’s Kensington underground gold mine complex near Juneau began mining on July 3 and produced 43,143 ounces of gold in 2010. Hecla Mining Co.’s Greens Creek Mine near Juneau produced more than 7.2 million ounces of silver in 2010, along with 68,838 ounces of gold, 74,496 tons of zinc, and 25,336 tons of lead. Kinross Gold’s Fort Knox Mine near Fairbanks produced 349,729 ounces of gold, and Sumitomo’s Pogo Mine produced 383,434 ounces of gold. Usibelli Coal Mine produced 2.06 million tons of coal. Placer gold production, from more than 225 operators, was 69,318 ounces.66 These Alaskan resources represent a large portion of the earth’s minerals. • Coal: 17% of the world’s coal, 2nd most in the world • Copper: 6% of the world’s copper, 3rd most in the world • Lead: 2% of the world’s lead, 6th most in the world • Gold: 3% of the world’s gold; 7th most in the world • Zinc: 3% of the world’s zinc; 8th most in the world • Silver: 2% of the world’s silver; 8th most in the world • Rare Earth Minerals: over 150 occurrences67 Alaska contains in-demand rare earth elements (REE), which are valuable strategic minerals. REEs are “indispensable for military and high-technology applications, as well as clean/renewable-energy technologies (such as wind turbines, solar panels, batteries for electric vehicles).”68 REEs transform crude oil into gasoline and create permanent magnets, which supports the miniaturization of electronics.69 The US relies primarily on REE imports from China, placing the nation at a disadvantage.70 China is the leader in the REE market, owns almost half of the world’s REEs, and produces 97% of the global supply.71 “Recent curtailment of REE exports from China and reliance on the Chinese industry for processing and manufacturing critical REE-reliant products has heightened awareness of the fragility of the supply-demand chain for REEs worldwide.”72 China has enacted trade quotas, increased charges on REEs, and announced that it is considerably limiting access to these precious REEs.73 Alaska could be a potential domestic and international supplier of REEs. There are 70 identified areas in Alaska containing REEs (see Figure 9).74 In addition, there are 40 million acres of “high mineral potential” lands in need of assessment.75 The Bokan Mountain/Dotson Ridge property is an area in Alaska that contains a massive supply of rare earth metal oxides.76 Measured in tonnage, this property is the 15th largest mineral supply of these metals in North America.77 Bokan Mountain is unique compared to other US deposits, because it is “enriched with yttrium, dysprosium, and critical Heavy REEs, which are essential for the production of permanent magnets.”78 Alaska is encouraging REE development. The DGGS launched the Rare-Earth Elements and Strategic Minerals Assessment project in 2011. “The goals of this 3-year project are (1) to compile historic and industrydonated data in digital format; (2) to obtain new field and analytical data critical for assessing Alaska’s REE potential; (3) to evaluate the historic and new data to identify areas of Alaska with the highest REE potential, as well as those needing additional geologic evaluation; (4) to communicate the results of our work to the public; and (5) to publish the data and results of our studies on the DGGS website.”79 Securing a share in the market requires investment in locating more REEs and the infrastructure to process these strategic minerals.80 If not, the US will have to rely on China for processing, which, given the criticality of these resources, is strategically unwise.81 Energy Northern Alaska is a “world class petroleum province” and contains valuable gas reserves.82 However, oil and gas production is declining in Alaska. Figure 10 shows oil/gas fields and the exploration wells in the National Petroleum Reserve-Alaska (NPRA) area.83 The North Slope region includes the NPRA and extends to the border of the Arctic National Wildlife Refuge (ANWR). Like minerals, further exploration, mapping, and infrastructure are required to make the NPRA more accessible to potential developers.84 The investment costs are high, but the return can be rewarding. Figure 10: National Petroleum Reserve-Alaska Source: State of Alaska: Division of Geological & Geophysical Surveys The discovery of oil in Prudhoe Bay, Alaska along the Arctic Ocean in 1968 transformed the Alaskan economy.85 The Trans-Alaska Pipeline (TAP), completed in 1977, transfers this oil through an 800-mile long pipeline.86 The TAP system (TAPS) begins in the North Slope region in Prudhoe Bay and ends at the marine terminal in Valdez.87 Crude oil is stowed there and has been loaded onto more than 19,000 tankers at Valdez since 1 August 1977.88 As of 2011, more than 16 billion barrels of oil have passed through TAPS. This system provides about 15 percent of the oil produced in the US.89 The flow of oil through TAPS is slowing down. In 1989, it took only 4-days compared to 14-days today for oil to reach Valdez.90 The Alyeska President testified to the House Finance Committee in May 2011 stating the slow oil problems would worsen over time and expects an annual 5- to- 6 percent decline.91 Figure 11 illustrates the historical oil production and the projected decline.92 Cooler oil temperatures combined with decreased throughput is a major concern.93 Additionally, the original warm oil design of TAP did not account for decreased oil temperatures.94 TAPS provides the Alaskan economy 90 percent of its revenues.95 Figure 11: Alaskan Oil Production in Decline Source: Alyeska Pipeline Service Company Natural gas estimates of 35 trillion cubic feet are contained in the North Slope region.96 On 30 March 2012, ExxonMobil, ConocoPhillips, BP and TransCanada announced a partnership to begin preparing for commercialization of the natural gas located in Point Thomson, an area within North Slope.97 This settlement has been highly anticipated by Alaskans. According to Alaskan Governor Sean Parnell, there are 8 trillion cubic feet of natural gas and millions of barrels of oil and gas liquids located in Point Thomson.98 The development of the Alaska Pipeline Project will be similar to the TAPS concept. The future pipeline will enable the gas to reach and compete in the international market. The major components of the settlement include: • Increasing liquids production into the Trans Alaska Pipeline System (TAPS). • Opening the Eastern North Slope to new development opportunities by adding infrastructure and a 70,000 barrels per day common carrier pipeline connecting to TAPS. • Incentivizing and laying out a clear path and alternatives for fullfield development, each of which will require billions of dollars in investment if pursued. • Positioning North Slope gas for a large-scale gas pipeline project. • Providing potential for significant gas volumes for in-state use no later than 2019. • Requiring a commitment to develop a separate oil reservoir within Point Thomson.99 This settlement opens a future Alaskan natural gas market and supports the productivity of TAPS. Trade Routes The Northwest Passage and the Northern Sea Route are the two primary waterways in the Arctic and both pass through the 53-mile long Bering Strait in the proximity of Alaska and Russia.100 Figure 12 captures the northern Arctic water passages and location of the Arctic Bridge.101 This figure also illustrates the receding of the ice in the Arctic region due to climate change. As a result, this strait is accommodating increased maritime traffic with the use of icebreakers. According to Alaskan Lieutenant Governor Mead Treadwell, “$1 billion worth of goods passed through the Bering Strait” in 2010 […] “The ships,” he said, “are coming.”102 Figure 12: Polar Shipping Routes Source: J-P Rodrigue, The Geography of Transport Systems These two legendary Arctic routes have a potential to change global shipping patterns. In September 2008, a glimpse of the potential future occurred when for the first time both the Northwest Passage and the Northeast Passage, called the Northern Sea Route today, were simultaneously open.103 The shortcut across the Arctic decreases travel time and translates to significant savings for maritime commercial traffic. Figure 13 contrasts the current trade routes with Arctic routes.104 Figure 13: Sea Trade Routes Source: Hugo Ahlenius, UNEP/GRID-Arendal The Northwest Passage has challenged Arctic explorers for centuries. Roald Amundsen, a Norwegian, was the first Arctic explorer who successfully sailed the Northwest Passage. According to Amundsen’s autobiography, he abruptly departed for this journey when a particularly generous creditor demanded payment within 24 hours and threatened him with charges of fraud.105 As such, Amundsen quickly departed Oslo, Norway in June 1903 with a crew of six and reached Nome, Alaska in September 1906.106 His inspiration for the journey was the writings of Arctic explorer Sir John Franklin.107 Franklin and his crew attempted to navigate the Northwest Passage from 1845-1848.108 However, his two ships froze into the ice, preventing further travels. Eventually every man on the expedition perished.109 In contrast, the success of Amundsen’s journey through the Northwest Passage is an inspiring historic event. The Northwest Passage remains accessible longer each season. According to Steve MacLean, President of the Canadian Space Agency, the route has been open every year for at least six weeks for the past 15 years and expected to remain open for longer periods in the future.110 This passage provides an alternative to the Panama Canal route and easier access to India and China.111 The Northwest Passage route from East Asia and Western Europe is only 13,600 kilometers as compared to 24,000 kilometers using the Panama Canal.112 The Chinese recently sent their icebreaker “Xue Long” through the Northwest Passage. They conducted research in the coastal areas of Alaska and Canada.113 The Chinese are planning a trip along the Northern Sea Route in 2012. Alaskan lawmakers are concerned about “threats posed by an increasingly Arctic-oriented China and an apparent lack of concern by U.S. leaders about the country's obligations as an Arctic nation.”114 An Alaskan news source reported, “The Chinese want to see the Arctic Ocean's energy riches divided up among all nations -- according to their population.”115 Non-Arctic states want a share of the Arctic resources, and China is able to access the Arctic and represent their interests. As noted earlier, some of Canada’s claims do not have the support of the US. Canada claims that portions of the Northwest Passage are internal to its territory and stands to gain the most from the opening of this route.116 However, the US continues to operate as if the passage is an international waterway.117 Because of a few ice-free weeks per year, the Northwest Passage is generating international debate regarding ownership, rights, and access. The Northern Sea Route is receiving the same kind of attention. The Russian government has maintained the Northern Sea Route since 1978, with its growing fleet of ice-breaking ships.118 The route opened in 1991 to international marine traffic.119 The Northern Sea Route from Rotterdam to Yokohama is 8,500 kilometers versus 20,600 kilometers via the Suez Canal.120 According to Alaskan Lieutenant Governor Mead Treadwell, “Russia intends to make the Northern Sea Route, which passes Alaska’s front door, as important to global shipping and commerce as the Suez Canal. Major tanker loads of oil products, gas condensate, and mineral ores have come [Alaska’s] way already.”121 There are concerns that the Arctic routes may not be as profitable as desired. •First, it is highly uncertain to what extent the receding perennial ice cover is a confirmed trend or simply part of a long term climatic cycle. •Second, there is very limited economic activity around the Arctic Circle, implying that shipping services crossing the Arctic have almost no opportunity to drop and pick-up cargo as they pass through. Thus, unlike other long distance commercial shipping routes there is limited revenue generation potential for shipping lines along the Arctic route, which forbids the emergence of transshipment hubs. This value proposition could improve if resources (oil and mining) around the Arctic are extracted in greater quantities. •The Arctic remains a frontier in terms of charting and building a navigation system, implying uncertainties and unreliability for navigation. This implies that substantial efforts have to be made to insure that navigation can take in place in a safe manner.122 Substantial investments are necessary to make these routes viable for commercial traffic. Additionally, obtaining insurance for trips through the Arctic may not be affordable due to the nature of the environment. This scenario is similar to building the infrastructure and establishing air routes to and through Alaska described in Chapter 1. Air and Missile Defense One of the primary military missions for forces based in Alaska today is Air and Missile Defense. The threats to US national security have changed, while Alaska has remained a key location to protect US interests against potential aggressors. This section details the importance of having US forces in Alaska and the value of investing Federal resources in this state. Air Alaskan-based air defenses continue to respond to potential violators of US airspace, ensuring protection of the homeland. Many of the intercepts of Russian aircraft have occurred in the Alaskan Air Defense Identification Zone, which is a buffer to US airspace.123 Since 1992, there have been more than 66 Russian intercepts, a significant decrease from the Cold War period.124 However, according to NORAD, “its fighters made 45 intercepts of Russian military flights between 2007 and 2010, compared with eight between 1999 and 2006.”125 General Chandler, Commander, Pacific Air Forces, reported that for a 10-month period beginning in June 2007 there were 16 intercepts of Russian bombers off the Alaskan coast.126 This increase in Russian activity was not sustained, but does indicate the need for Alaskan forces to remain flexible and vigilant. Alaskan Command (ALCOM) is the focal point for the modernization of the Joint Pacific Alaska Range Complex (JPARC). Proposed updates to this complex will provide the ideal location for air, land and sea forces to train together and refine their skills. JPARC “will bring together the services’ existing training ranges: the Air Force’s 66,000-square-mile Pacific Alaska Range Complex, home to the Red Flag Alaska exercise; the Army’s new $80 million Battle Area Complex and Combined Arms Combat Training Facility near Fort Greely, Fort Wainwright and Fairbanks, Alaska; and 58,000 square miles of ocean and air space in the Gulf of Alaska.”127 Public support is critical for JPARC modernization approval. As of 30 March 2012, the JPARC environmental impact statement is available for public input until 7 June 2012. According to ALCOM Public Affairs, a record of decision is expected in the 2013-2014 timeframe.128 The proposed JPARC enhancements and expansions would do the following: • Enable realistic joint training and testing to support emerging technologies, • Respond to recent battlefield experiences, and • Enable the Services to train with tactics and new weapons systems to meet combat and national security needs so military personnel can succeed in their mutually supportive combat roles.129 Missile Defense President Ronald Reagan’s “Star Wars” vision has become a different type of Missile Defense reality. Modifications to existing older Alaskan infrastructure supports the ongoing US Missile Defense initiative. Additional investments in Alaska support the robust Ballistic Missile Defense System (BMDS). “Missile defense plays an important role in the broader U.S. international security strategy, supporting both deterrence and diplomacy.”131 Figure 15 illustrates the Ground-based Midcourse Defense (GMD) elements in Alaska that are part of the BMDS.132 Continuing developments by Iran and North Korea to improve longrange missiles could potentially hold the US homeland at risk.133 “As the threat of missiles launched from Iran, North Korea, or coalitions of hostile parties grows, so does the need for more robust defenses— particularly when no matter where on earth a missile is launched from, it would take 33 minutes or less to hit the U.S. target it was programmed to destroy.”134 BMDS enables the US to respond to ballistic missile threats and defend against limited ICBM assaults. “USNORTHCOM is responsible for directing missile defense operations to protect the homeland from hostile acts while assisting the Missile Defense Agency in developing improved capability.”135 The following section summarizes the critical GMD infrastructure in Alaska. The history of the post at what is now Fort Greely, Alaska began in 1942.136 Fort Greely was a stop along the Lend Lease route during World War II (discussed in Chapter 2). Since then the mission of Fort Greely continues to evolve from supporting cold weather testing and training to becoming an integral part of the BMDS. According to Colonel George Bond, a Missile Defense officer, the location of Fort Greely is ideal to “intercept a missile out of North Korea, [and] block an ICBM fired out of the Middle East.”137 Currently there are 26 ground-based interceptors (GBIs) at Fort Greely. Vandenberg Air Force Base, California contains another four GBIs. The intent of the GBIs is to “destroy enemy missiles mid-way through flight, essentially at the edge of space.”138 The Alaskan National Guard launch crews at Fort Greely are a Fire Control Node and have the ability to launch the interceptors at Vandenberg Air Force base, too. The back-up Fire Control Node site is located in Colorado Springs. Fort Greely is the “focal point for Ground Based Midcourse Defense” (GMD).139 On 6 August 1955, the post was named after Arctic explorer General Adolphus Washington Greely, because of his contributions to the establishment of the Alaska Communication System in the early 1900s.140 General Mitchell worked for General Greely, ensuring the installation of this system as a young lieutenant. General Mitchell stated, “In new countries the first effort is to get means of communication. In Alaska the telegraph was the wedge which cleft open the country to communications.”141 As such, General Greely’s early influence continues to be felt. Cobra Dane is a radar site located at Eareckson Air Station on the island of Shemya, Alaska along the Aleutian chain. The radar began operating at Shemya in 1977.142 Improvements to Cobra Dane since then enable support of the missile defense mission. “The upgrade improves midcourse BMDS sensor coverage by providing acquisition, tracking, object classification, and data that can be used for cueing, launch of interceptor missiles [at Fort Greely and Vandenberg], and course updates of interceptors while retaining the sites legacy intelligence and space track missions.”143 Cobra Dane has the capability to detect objects up to 3000 miles out.144 Eareckson Air Station first supported troops in 1943 during World War II. During the Cold War, this island stop along the Great Circle Route supported commercial and military air refueling.145 The base originally called Shemya Air Force Base was renamed after Colonel William Olmstead Eareckson on 6 April 1993. Colonel Eareckson commanded and flew bombing missions from Shemya during the Aleutian Campaign in WWII. “He introduced low-level skip bombing and forward air control procedures long before they became common practices in other war theaters.”146 The original mechanical radar at Clear Air Force Station, Alaska was replaced with a dual-faced, steady-state, phased-array radar in 2001.147 The radar continues to support the missile warning and space surveillance missions. Ongoing upgrades to the radar will result in the additional missile defense mission and inclusion into the BMDS by Fiscal Year 2017.148 These upgrades will enable the radar at Clear Air Force Base to provide real-time “threat ballistic missile tracking data to commit launch interceptors and to update the target tracks to the interceptor while the interceptor is in flight.”149 Adak, Alaska is the initial designated homeport of the Sea-Based X-Band Radar (SBX).150 The SBX is mobile manned radar that “provides an advanced capability to the overall Ballistic Missile Defense System, greatly increasing the Missile Defense Agency’s ability to conduct operational and realistic testing of the BMDS, while providing an operational capability to the Combatant Commands.”151 SBX provides information and aids in the guiding of the GBIs at Fort Greely and Vandenberg, regardless of from where it is operating.152 Adak is another island in the Aleutians that was critical during World War II. This island was a staging area for the retake of Attu and Kiska islands from the Japanese. Military presence on Adak has not been continuous. Adak’s position was also advantageous during the Cold War, supporting fleet communications, listening posts, and antisubmarine patrol aircraft.153 The GMD element in Alaska is a critical contributor to the BMDS. Figure 16 illustrates how the overall BMDS should operate.154 According to the 2010 Ballistic Missile Defense Review, “the ballistic missile threat is increasing both quantitatively and qualitatively, and is likely to continue to do so over the next decade.”155 Alaska’s natural resources and geostrategic location define the Last Frontier’s importance. As climate change progresses the Arctic will become an additional front that requires a robust US air and sea force presence. Alaskan natural resources are vital to the US economy. Accessing additional resources reduces reliance on foreign suppliers. Airpower projected from Alaska enables the US to protect its territory. Additionally, Alaskan based Missile Defense shields the US from hostile ballistic missiles. Alaska’s significance continues to endure the test of time.

#### Volcano explosions cause Civilizational Collapse – Extinction.

Pamlin and Armstrong 15, Dennis, and Stuart Armstrong. "Global challenges: 12 risks that threaten human civilization." Global Challenges Foundation, Stockholm (2015). (Entrepreneur and Founder of 21st Century Frontiers, Senior Associate at Chinese Academy of Social Sciences, Visiting Research Fellow at the Research Center of Journalism and Social Development at Renmin University)//Elmer

3.2.2.1 Expected impact disaggregation 3.2.2.2 Probability The eruption which formed the Siberian Traps was one of the largest in history. It was immediately followed by the most severe wave of extinction in the planet’s history, 374 the Permian– Triassic extinction event, 375 where 96% of all marine species and 70% of terrestrial vertebrate species died out. Recent research has provided evidence of a causal link: that the eruption caused the mass extinction.376 There have been many other super-volcanic eruptions throughout history.377 The return period for the largest supervolcanoes (those with a Volcanic Explosivity Index378 of 8 or above) has been estimated from 30,000 years379 at the low end, to 45,000 or even 700,000 years380 at the high end. Many aspects of super-volcanic activity are not well understood as there have been no historical precedents, and such eruptions must be reconstructed from their deposits.381 The danger from super-volcanoes is the amount of aerosols and dust projected into the upper atmosphere. This dust would absorb the Sun’s rays and cause a global volcanic winter. The Mt Pinatubo eruption of 1991 caused an average global cooling of surface temperatures by 0.5°C over three years, while the Toba eruption around 70,000 years ago is thought by some to have cooled global temperatures for over two centuries.382 The effect of these eruptions could be best compared with that of a nuclear war. The eruption would be more violent than the nuclear explosions,383 but would be less likely to ignite firestorms and other secondary effects. Unlike nuclear weapons, a super-volcano would not be targeted, leaving most of the world’s infrastructure intact. The extent of the impact would thus depend on the severity of the eruption - which might or might not be foreseen, depending on improvements in volcanic predictions384 - and the subsequent policy response. Another Siberian Trap-like eruption is extremely unlikely on human timescales, but the damage from even a smaller eruption could affect the climate, damage the biosphere, affect food supplies and create political instability. A report by a Geological Society of London working group notes: “Although at present there is no technical fix for averting supereruptions, improved monitoring, awareness-raising and research-based planning would reduce the suffering of many millions of people.” 385 Though humanity currently produces enough food to feed everyone,386 this supply is distributed extremely unevenly, and starvation still exists. Therefore a disruption that is small in an absolute sense could still cause mass starvation. Mass starvation, mass migration, political instability and wars could be triggered, possibly leading to a civilisation collapse. Unless the eruption is at the extreme end of the damage scale and makes the planet unviable, human extinction is possible only as a consequence of civilisation collapse and subsequent shocks.387

#### Lunar Basing key to Ageing Research – solves Ageing Crisis.

Green 10, David A. "How the UK can lead the terrestrial translation of biomedical advances arising from lunar exploration activities." Earth, Moon, and Planets 107.1 (2010): 127-146. (Programme Director, Space Physiology & Health MSc at Kings College London)//Elmer

Space-faring nations have accumulated much knowledge regarding the acute changes associated with microgravity in human and non-human organisms (Cle´ment and Slenzka 2006). Numerous methods and countermeasures have been devised to ameliorate such changes in an attempt to preserve astronaut and mission capability (Garshnek 1989; Williams 2003). Furthermore, research within the space environment has provided unique insights into areas as diverse as gene expression (e.g. Cogoli and Cogoli-Greuter 1997), immunology (Sonnenfeld and Shearer 2002; Borchers et al. 2002), wound healing (Davidson et al. 1999), bone physiology (e.g. Turner 2000; Vico et al. 2000), musculoskeletal (Narici and de Boer 2010) and cardiovascular regulation (reviews; Hargens and Richardson 2009; Hughson 2009), angiogenesis (Radek et al. 2008), circadian/sleep rhythm and performance (Mallis and DeRoshia 2005) in addition to sensory-motor function (e.g. Kalb and Solomon 2007; Souvestre et al. 2008). ISS studies have shown how fundamental gravity is for functional development (Temple et al. 2002), although most of the work refers to mammalian, or in a broader context, animal development, rather than that of humans, about which we know extremely little in a space environment. It has also provided insights into how we perceive the world around us, and ourselves within it (Lipshits et al. 2005). Intriguingly, whilst ‘normal’ earthbound physiology appears in the main to be negatively affected by a reduction in gravity, viral virulence of certain human pathogenic bacteria increases when compared to their ground based control groups (Wilson et al. 2007). Such findings are not only fascinating but provide a bridge between medicine and biomedical research, and also between space biomedicine and other areas of space biology, including astrobiology. Terrestrial applications of prolonged space environment exposure that the lunar surface offers insights for issues ranging from cardiovascular pathology, e.g. orthostatic intolerance, ageing/disuse/spinal cord (Edgerton et al. 2000; Pavy-Le Traon et al. 2007) pathology such as osteoporosis, falls risk (Cle´ment et al. 2005), radiation/cancer risk, psychology of the individual and the group, human factors and medical devices such as healthcare extension technologies. Space biomedicine has also helped and has the potential to further aid people living in developing countries, for example through telemedicine. Furthermore, space biomedicine has much to tell us about the major causes of mortality in the developed world (Mortimer et al. 2009), such as the metabolic syndrome and cardiovascular disease. It also provides useful models of individualised medicine (Kalow 2002), including pharmacogenetics and genetic-lifestyle interactions (Mattick 2003). In particular, the radiation environment of the Moon could provide unprecedented opportunities for fundamental research in the field of radiation biology (Gridley et al. 2009) and carcinogenesis (Rykova et al. 2008) not possible on Earth (ESA 1992). Whilst ISS has been an undoubted geopolitical success, significant biomedical insights have only recently started to accrue. Key factors include the limited number of astronauts and the high degree of control individual Agency’s maintain, which often results in differential countermeasure adoption. As a consequence, determination of both the true nature of space-related physiological insults, and thus the optimal countermeasures that should be adopted is far from complete (e.g. Cavanagh et al. 2005). Issues surrounding partial gravity are even more unclear and potentially more enlightening than microgravity in terms of biological mechanisms. As such Lunar exploration is emerging as a potential destination to learn about life beyond Earth and to further explore the solar system via a combination of collaboration and competition among space-faring nations (Space report 2009). The Moon of today appears far more viable as a location than it appeared during Apollo missions. For instance, evidence of ice deposits have been discovered within polar craters, which may provide liquid water for colonists and their hydroponic crops and those constituents may be converted into rocket fuel. Such a tightly controlled (and controllable) environment (if sustainable) could be particularly useful in the investigation of countermeasure interaction such as diet/nutritional supplementation and exercise (Convertino 2002). Although subject numbers would initially be low, high levels of motivation and extensive remote monitoring (telemedicine) would facilitate excellent long-term adherence. Space (and thus lunar) habitation has been suggested as a model of ‘accelerated’ ageing (Vernikos and Schneider 2010) and/or disuse pathology (Elmann-Larsen and Schmitt 2003) in view of the resultant similarities including loss of bone density, muscle volume/ strength and cardiorespiratory de-conditioning. As a society we have the moral, social and economic imperative to keep our citizens alive and functional. However, the number of over 60s is forecast to be 1.25 billion by 2025, of which most will suffer at least one chronic disease and 50% two or more, typically complex, challenging and resource intensive. For instance, the US expends 75% of its healthcare resources upon chronic, and 90% upon age-related conditions. Within Europe, 37% have at least one chronic condition, accounting for 77% of the total disease burden, 86% of all deaths, and 70% percent of total health expenditure, particularly expensive if poorly managed. Therefore, similarities to terrestrial medicine and their ‘accelerated’ nature renders lunar space biomedicine the opportunity to offer substantial terrestrial returns in terms of knowledge, health and wellbeing and economic development.