

Before the
U.S. DEPARTMENT OF COMMERCE
NATIONAL TELECOMMUNICATIONS AND INFORMATION
ADMINISTRATION
Washington, DC 20230

In the Matter of)
)
Developing a Sustainable Spectrum Strategy for) Docket No. 181130999-8999-01
America's Future)
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COMMENTS OF COALITION OF AVIATION, SATCOM,
AND WEATHER INFORMATION USERS

January 22, 2019

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The undersigned coalition of satellite, aviation, and weather data industry leaders (“Coalition”) hereby respond to the National Telecommunications and Information Administration’s (“NTIA”) call for comments (“Call for Comments”) on developing a sustainable spectrum strategy for America’s future.¹ NTIA is requesting comments in response to the October 2018 Presidential Memorandum, *Developing a Sustainable Spectrum Strategy for America’s Future* (“Spectrum PM”).² In particular, NTIA issued its Call for Comments in response to Section 4 of the Spectrum PM which instructs the Secretary of Commerce to “generate a long-term spectrum strategy that includes legislative, regulator, or other policy recommendations.”³ NTIA seeks input on developing recommendations that include expanding spectrum access, improving spectrum sharing, enhancing spectrum management, utilizing

¹ Department of Commerce, National Telecommunications and Information Administration, *Developing a Sustainable Strategy for America’s Future*, 83 FR 65640 (Dec. 21, 2018) (“Call for Comments”).

² Memorandum for the Heads of Executive Departments and Agencies, *Developing a Sustainable Spectrum Strategy for America’s Future*, 83 FR 54513 (Oct. 30, 2018) (“Spectrum PM”).

³ Spectrum PM, Section 4.

ongoing research and development activities, fostering global competitiveness, protecting U.S. space assets from radio frequency interference, and augmenting the mission capability of Federal entities.⁴ NTIA draws parallels between goals delineated in the Spectrum PM and the Space Policy Directive-3, National Space Traffic Management Policy (“SPD-3”), released by the administration in June 2018, which establishes and guidelines and principles for an updated National Space Traffic Management Policy.⁵ In particular, NTIA emphasizes SPD-3’s goals of preventing unintentional radio frequency interference; ensuring appropriate spectrum use for current and future operations; verify[ing] “consistency between policy and existing national and international regulations and goals regarding global access to, and operation in, the RF spectrum for space services.”⁶

As long-time satellite operators and users of satellite communications (“SATCOM”) services in the L-band spectrum,⁷ the undersigned are particularly interested in NTIA’s focus on improving the predictability of spectrum access, and providing satellite operators with consistent spectrum allocations.⁸ Below we detail a number of spectrum policy principles that are conditions precedent to maintaining and improving American space competitiveness. To be specific, America’s continued space leadership depends on (1) a stable spectrum foundation for the satellite industry; (2) consistent protection from harmful interference; and (3) robust international engagement to preserve spectrum allocations in L-band spectrum for space services.

⁴ Call for Comments, 83 FR at 65640-41.

⁵ Memorandum for Heads for the Vice President, Heads of the Executive Departments and Agencies, *Space Policy Directive-3, National Space Traffic Management Policy*, 83 FR 38969 (Jun. 21, 2018), <https://www.gpo.gov/fdsys/pkg/FR-2018-06-21/pdf/2018-13521.pdf> (“SPD-3”).

⁶ Call for Comments, 83 FR at 65640; citing SPD-3, sec. 4(g).

⁷ The L-Band generally denotes the spectrum from 1 to 2 GHz. For purposes of this filing, references to “L-Band” refer to frequencies between 1525 MHz and 1695 MHz.

⁸ *Id.* at 65640-41.

Domestic or international policy initiatives inconsistent with these principles, such as the most recent Ligado (formerly LightSquared) proposal, should be rejected as detrimental to America's space leadership and the Administration's goals. We urge NTIA to consider these views as it prepares the National Spectrum Strategy.

I. INTRODUCTION

We submit these comments to inform your consideration as you move forward with the report and evaluate spectrum policy more broadly. More specifically, we underscore the importance of spectrum policies centered on a stable spectrum environment, adequate interference protection and global vigilance in achieving U.S. goals. The satellite industry today is dramatically improving lives and enhancing our nation's global competitiveness. In 2016, the U.S. satellite industry generated over \$110 billion in revenues and supported over 210,000 American jobs.⁹ In 2017, the global satellite industry earned \$269 billion, which translates to 79 percent of the total space economy (\$348 billion).¹⁰ More recently, Secretary Ross revealed that "the global space economy is roughly \$400 billion" of which "80 percent is commercial activity."¹¹ And these trends are on the rise. Morgan Stanley estimates that by 2040, global space revenue will grow to \$1.1 trillion.¹²

Recognizing the growth potential of this robust sector and largest segment of the space economy, the Administration has seized the opportunity to nurture the commercial and

⁹ Satellite Industry Association, 2017 State of the Satellite Industry Report, at 6 (June 2017), <https://www.sia.org/wp-content/uploads/2017/07/SIA-SSIR-2017.pdf>.

¹⁰ Satellite Industry Association, 2018 State of the Satellite Industry, <https://www.sia.org/wp-content/uploads/2018/06/2018-SSIR-2-Page-1.pdf>.

¹¹ See Wilbur Ross, Secretary of Commerce, Remarks at the U.S. Chamber of Commerce Space Summit: Industry Taking Off (Dec. 6, 2018), <https://www.commerce.gov/news/speeches/2018/12/remarks-us-commerce-secretary-wilbur-l-ross-us-chamber-commerce-space-summit>.

¹² *Space: Investing in the Final Frontier*, Morgan Stanley (Nov. 13, 2017), <https://www.morganstanley.com/ideas/-investing-in-space>.

government satellite industry. In 2017, President Donald Trump acted to restore America’s space leadership by reviving the long-dormant National Space Council to review government policies and develop recommendations to empower the commercial space industry.¹³ The Council has already made progress, sending three sets of recommendations to the President’s desk in its first year.¹⁴ These and other policy initiatives make clear the Administration’s welcomed commitment to U.S. space and spectrum leadership.

Indeed, from the White House to Congress, key policymakers have demonstrated a thoughtful commitment to space policy. For example, the President recently issued the Spectrum PM that tasked Secretary Ross with, among other things, developing recommendations on how “to improve the global competitiveness of United States terrestrial and space-related industries.”¹⁵ As Vice President Mike Pence noted in a 2018 speech, “a stable and orderly space environment is critical to the strength of our economy and resilience of our national security systems.”¹⁶ The Vice President reiterated those views in an August 2018 speech, stating that “space is essential to our nation’s security, prosperity, and our very way of life” and offering the Administration’s promise to “unleash America’s burgeoning commercial space companies.”¹⁷

Secretary Ross has also made space industry initiatives a high priority, proposing to

¹³ Exec. Order No. 13803, 82 Fed. Reg. 31,429 (July 7, 2017).

¹⁴ See SPD-3; Memorandum for Heads for the Vice President, Heads of the Executive Departments and Agencies, *Space Policy Directive-2, Streamlining Regulations on Commercial Use of Space*, 83 FR 24901 (May 30, 2018), <https://www.gpo.gov/fdsys/pkg/FR-2018-06-21/pdf/2018-13521.pdf> (“SPD-2”); Presidential Memorandum on Reinvigorating America’s Human Space Exploration Program (Dec. 11, 2017), <https://www.whitehouse.gov/presidential-actions/presidential-memorandum-reinvigorating-americas-human-space-exploration-program>.

¹⁵ See Spectrum PM, Section 4(e) (Oct. 25, 2018).

¹⁶ See Michael Pence, Vice President, Remarks at 34th Space Symposium (Apr. 16, 2018), <https://www.whitehouse.gov/briefings-statements/remarks-vice-president-pence-34th-space-symposium-colorado-springs-co>.

¹⁷ See Michael Pence, Vice President, Remarks on the Future of the U.S. Military in Space (Aug. 9, 2018), <https://www.whitehouse.gov/briefings-statements/remarks-vice-president-pence-future-u-s-military-space>.

elevate and amplify the role of the Office of Space Commerce (currently housed in the National Oceanic and Atmospheric Administration or “NOAA”) to coordinate all space-related activities at the Department under his direct oversight,¹⁸ and submitting to Congress a legislative proposal that would promote the Office to “Bureau of Space Commerce” and would consolidate the Department’s space commerce functions.¹⁹ The legislative proposal also noted how “[s]pace commerce is important to the Nation’s continued economic growth, job creation, technological innovation, human development, and national security” and that “the United States endeavors to create an economic environment favorable to commercial space activities and seeks to ensure United States leadership in space commerce.”²⁰ Secretary Ross also announced that the Department of Commerce was in the process of creating a “one-stop-shop” for the space industry’s advocacy and regulatory needs, and has formed a “Space Team” that leverages expertise from across the Department and offices, such as the International Trade Administration, Bureau of Industry and Security, NTIA, NOAA, NIST, and the Patent and Trademark Office.²¹ Finally, Secretary Ross hosted a Space Investment Summit where he moderated a panel that discussed space investment challenges and stated his hope that the meeting would “help provide links between the financial community and space companies that

¹⁸ See Wilbur Ross, Secretary of Commerce, Remarks at the National Space Council Second Meeting: A Bright Future for U.S. Leadership of Space Commerce (Feb. 21, 2018), <https://www.commerce.gov/news/secretary-speeches/2018/02/secretary-ross-bright-future-us-leadership-space-commerce>.

¹⁹ See Office of Space Commerce, Legislative Proposal to Establish Bureau of Space Commerce (Oct. 15, 2018), <https://www.space.commerce.gov/legislative-proposal-to-establish-bureau-of-space-commerce>.

²⁰ Space Policy Advancing Commerce (“SPACE”) Act, <https://www.space.commerce.gov/wp-content/uploads/SPACE-Act-Legislative-Proposal.pdf>.

²¹ See Wilbur Ross, Secretary of Commerce, Remarks at the U.S. Chamber of Commerce Space Summit: Industry Taking Off (Dec. 6, 2018), <https://www.commerce.gov/news/speeches/2018/12/remarks-us-commerce-secretary-wilbur-l-ross-us-chamber-commerce-space-summit>.

are truly changing the course of American industry.”²²

Throughout 2018, NTIA Administrator David Redl extolled the impact of the satellite industry on the U.S. economy and the importance of satellite communications, noting that “the world as we know it today literally would not exist without these satellites.”²³ At the 2018 Mobile World Congress Americas, Administrator Redl stated that the “Administration is putting policies in place to ensure America’s continued leadership in technology and telecommunications,” and that Secretary Ross is “taking steps to help ensure the United States is at the forefront of space technologies, with a revamped Office of Space Commerce.”²⁴ Administrator Redl further noted that the “administration-wide focus on space commerce shows that we are forward looking and focused on addressing not just the problems of today but the spectrum needs of the future” and that there is a “consensus around maintaining U.S. leadership in wireless technology” including “satellite and space systems.”²⁵ Separately, he described “promoting the kind of leadership in space-based commerce and space-based assets that the United States traditionally has had in 4G wireless.”²⁶

Similarly, Federal Communications Commission (“FCC”) Chairman Ajit Pai correctly observed that “we now stand at a moment of tremendous promise for [the satellite] industry –

²² See Wilbur Ross, Secretary of Commerce, Remarks at the Department of Commerce Space Investment Summit (Dec. 12, 2018), <https://www.commerce.gov/news/speeches/2018/12/remarks-commerce-secretary-wilbur-l-ross-department-commerce-space-investment>.

²³ See David J. Redl, Assistant Secretary of Commerce for Communications and Information, Remarks at Satellite 2018: Affirming Our Partnership for Growth and Innovation in Space, Washington, DC (Mar. 14, 2018), <https://www.ntia.doc.gov/speechtestimony/2018/remarks-assistant-secretary-redl-satellite-2018>.

²⁴ See David J. Redl, Assistant Secretary of Commerce for Communications and Information, Remarks at Mobile World Congress Americas, Los Angeles, CA (Sept. 12, 2018), <https://www.ntia.doc.gov/speechtestimony/2018/remarks-assistant-secretary-redl-mobile-world-congress-americas>.

²⁵ See David J. Redl, Assistant Secretary of Commerce for Communications and Information, Remarks at Silicon Flatiron’s “Spectrum Hall of Shame: The Worst (and Best) Radio Policy Decisions”, Boulder, CO (Sept. 6, 2018), <https://www.ntia.doc.gov/speechtestimony/2018/remarks-assistant-secretary-redl-silicon-flatirons>.

²⁶ See Conversation on Digital Privacy at the Brookings Institution, C-SPAN, (Oct. 12, 2018), <https://www.c-span.org/video/?452887-1/digital-privacy&start=398>.

and ultimately for American consumers, who stand to benefit from [industry] efforts,” and committed to help satellite companies seize these opportunities.²⁷ Underscoring this point, the FCC declared November 2018 to be “Space Month” and devoted the majority of the November 15, 2018 Commission Open Meeting to space-related agenda items.²⁸ During the Open Meeting, Chairman Pai stated that the items were “intended to ensure the U.S. remains the most desirable country in the world for licensing, operating, and developing new satellite technologies” and acknowledged that “satellites are critically important to delivering communication services to millions of Americans.”²⁹

Below, as an illustrative example of the importance of such policies, we provide background on critical L-Band satellite services that are operating today and have successfully been in use for the past four decades thanks to the consistent application of these policies that have guided U.S. spectrum policy. The L-Band story, specifically operations in the frequencies between 1525 MHz and 1695 MHz, is typical for the space industry – which requires long lead times for research and development, investment and economic impact.

II. SPECTRUM PREDICTABILITY, RELIABILITY, AND GLOBAL HARMONIZATION ARE THE KEY FOUNDATIONS FOR CONTINUED SUCCESS OF L-BAND SATELLITE SERVICES

Over the course of many decades, the U.S. Government has built the foundation for the success of the L-Band by providing stable spectrum allocations, protecting allocated spectrum

²⁷ See Ajit Pai, Chairman, FCC, Remarks at the Satellite Industry Association’s 21st Annual Leadership Dinner, Washington, DC (Mar. 12, 2018), <https://docs.fcc.gov/public/attachments/DOC-349676A1.pdf>.

²⁸ See Ajit Pai, *Space Month at the FCC* (Oct. 24, 2018), <https://www.fcc.gov/news-events/blog/2018/10/24/space-month-fcc>.

²⁹ See FCC, *November 2018 Open Commission Meeting*, <https://www.fcc.gov/news-events/events/2018/11/november-2018-open-commission-meeting> (last visited Dec. 28, 2018).

from harmful interference, and defending L-band interests around the globe.³⁰ The L-Band has evolved over the years to include three key services we highlight below: Global Positioning System (“GPS”), the NOAA Geostationary Operational Environmental Satellites (“GOES”), which provide positional, timing, and weather data directly to users all across the U.S. and satellite communications (“SATCOM”) services provided by companies like Iridium Communications, Inc. (“Iridium”).³¹ The GOES weather satellites were first launched in 1975 after nearly a decade of successful meteorological experiments aboard other satellites. The first GPS satellites were launched in 1978. In 1987, the government first carved out this spectrum neighborhood for mobile satellite service (“MSS”) use and SATCOM.³² Thus the seeds of these successful services were sown more than thirty years ago.

All of these services have operated in their current spectrum bands for decades with considerable amounts of capital being invested into the satellite systems in reliance on the ability for continued operations free from harmful interference – and the corresponding benefits to consumers and the country have flowed from these careful decisions. GPS signals impact the lives of virtually every American and industry, providing safety and security at all times and providing the navigational foundation for countless services used millions of times daily. Recent estimates of GPS’s economic benefits to the U.S. economy are as high as \$2.9 trillion per year.³³

³⁰ See generally, Lon C. Levin & Dennis C. Nash, American Mobile Satellite Corp., *U.S. Domestic and International Regulatory Issues* (Jan. 1, 1993), <https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19940018275.pdf>.

³¹ Other SATCOM providers are also present in the band.

³² See Amendment of Parts 2, 22, and 25 of the Commission’s Rules to Allocate Spectrum for, and to Establish Other Rules and Policies Pertaining to the Use of Radio Frequencies in a Land Mobile Satellite Service for the Provision of Various Common Carrier Services, *Second Report and Order*, 2 FCC Rcd 485 (1987).

³³ See Positioning, Navigation, and Timing Advisory Board, Protect, Toughen, and Augment, Global Positioning System for Users, National Space-Based Positioning, Navigation, and Timing (PNT) Advisory Board Topic Papers, at 3, (Sept. 2018), <https://www.gps.gov/governance/advisory/recommendations/2018-09-topic-papers.pdf>. In 2015, the benefits of GPS in the U.S. were measured at \$68.7 billion dollars per year. Irv Leveson, *The Economic Value*

GOES satellites transmit vital data for weather and flood prediction, including imagery of major hurricanes such as Hurricanes Harvey, Irma, and Maria.³⁴ For weather and climate data, government researchers found that “the overwhelming majority of people” used weather forecasts on an average of 3.8 times per day, or 301 billion forecasts consumed per year. The benefits of daily weather forecast information from GOES has been estimated to provide an average value of around \$286 per household or an aggregate value of \$31.5 billion per year.³⁵ Operating in the L-Band are also commercial SATCOM services, which enable ultra-reliable service for the most critical of communications for public safety agencies, government agencies, and the aviation and maritime industries, including areas that are out of the reach of terrestrial networks.

A. HISTORY OF GPS ALLOCATIONS, SERVICES PROVIDED, CUSTOMERS SERVED, ECONOMIC IMPACT

GPS is a satellite constellation system consisting of over two dozen satellites that was originally used for U.S. military purposes, but was later opened up for civilian use.³⁶ In the early 1970s, the U.S. Department of Defense (“DoD”) started work on a navigation system that used the time differences in radio signal frequency from moving satellites to pinpoint a receiver’s geolocation. The DoD launched the first satellite in the system in 1978, and by 1993, the

of GPS: Preliminary Assessment, at 15 (June 11, 2015) (“Leveson Report”), <https://www.gps.gov/governance/advisory/meetings/2015-06/leveson.pdf>. This was a conservative estimate that did not take into account that 84% of Americans regularly use navigation apps dependent on GPS. RJ Reinhart, *Most Americans Already Using Artificial Intelligence Products* (Mar. 6, 2018), <https://news.gallup.com/poll/228497/americans-already-using-artificial-intelligence-products.aspx>.

³⁴ Thomas Powell, David Lubar & Karen Jones, *America’s critical dependence on satellite-based services – and the regulatory threats they face* (Jan. 25, 2018), <https://spacenews.com/op-ed-americas-critical-dependence-on-satellite-based-services-and-the-regulatory-threats-they-face>.

³⁵ Economics and Statistics Administration, Department of Commerce, *The Value of Government Weather and Climate Data* (Sept. 2, 2014), <http://www.esa.doc.gov/economic-briefings/value-government-weather-and-climate-data>.

³⁶ FAA, *GNSS Frequently Asked Questions – GPS*, https://www.faa.gov/about/office_org/headquarters_offices/-ato/service_units/techops/navservices/gnss/faq/gps (last visited Aug. 20, 2018).

satellite system became fully operational.³⁷ Today, the GPS constellation system provides positioning, navigation, and timing services worldwide, regardless of weather conditions, mostly in the 1559-1610 MHz band.³⁸ These services are used for public safety, commercial, consumer, and scientific operations in aeronautical, maritime, and ground-based navigation, surveying, construction, precision agriculture, timing synchronization, emergency medical response and disaster management, and search and rescue.³⁹ The GPS constellation is in the midst of an upgrade with the launch of next-generation satellites that will offer security, longer satellite life, and greater accuracy. The first of these satellites, known as GPS III, was launched aboard a SpaceX rocket on December 23, 2018.⁴⁰

The economic value of these GPS services in the U.S. was estimated by the U.S. Positioning Navigation and Timing Advisory Board in September 2018. The PNT Advisory Board noted that, while calculating the economic benefits of GPS to the U.S. economy is difficult due to the technology's ubiquity and impact on the economy and national security, estimates of GPS's economic benefits are as high as \$2.9 trillion.⁴¹ Furthermore, 3.2 million U.S. jobs directly rely on GPS technology.⁴²

³⁷ NASA, *Global Positioning System History* (Thuy Mai ed., 2017) (Oct. 27, 2012), https://www.nasa.gov/directorates/heo/scan/communications/policy/GPS_History.html.

³⁸ NTIA, *1559-1610 MHz*, at 5 (Mar. 1, 2014), https://www.ntia.doc.gov/files/ntia/publications/compendium/-1559.00-1610.00_01MAR14.pdf.

³⁹ *Id.*

⁴⁰ SMC Public Affairs, *First GPS III satellite successfully launched* (Dec. 23, 2018) <https://www.afspc.af.mil/News/Article-Display/Article/1721703/first-gps-iii-satellite-successfully-launched/> Additional GPS III satellites are planned with another expected to launch in 2019. *Id.*

⁴¹ See Positioning, Navigation, and Timing Advisory Board, Protect, Toughen, and Augment, Global Positioning System for Users, National Space-Based Positioning, Navigation, and Timing (PNT) Advisory Board Topic Papers, at 3, (Sept. 2018), <https://www.gps.gov/governance/advisory/recommendations/2018-09-topic-papers.pdf>.

⁴² Press Release, J. David Grossman, GPS Innovation Alliance, *Driving America's Future through GPS* (May 15, 2018), http://www.gpsalliance.org/news/Driving_Americas_Future_through_GPS.aspx.

B. HISTORY OF NOAA ALLOCATIONS, SERVICES PROVIDED, CUSTOMERS SERVED, ECONOMIC IMPACT

The U.S. government's interest in geostationary weather satellites dates back to the 1960s with the launch of a series of observational satellites that experimented with capturing images of the earth and transmitting data to and from ground stations.⁴³ From 1966 to 1974, six satellites in the Applications Technology Satellite series were launched, and after meteorological experiments performed aboard proved to be a success, the U.S. government officially started development of geosynchronous weather satellites.⁴⁴ In 1974, the U.S. government launched the Synchronous Meteorological Satellite that continuously monitored weather conditions night and day and "collected and relayed data from over 10,000 central ground stations."⁴⁵ The government's experiments with the monitoring satellites continued until the GOES program officially launched in 1975 as a joint effort by NOAA and NASA.⁴⁶ Today, GOES provides weather services in the 1675-1695 MHz band, such as natural and environmental disaster warnings, global water resource forecasts, river gauge data regarding water levels and flow rates, meteorological and oceanographic data, and navigation safety services. GOES also provides weather data to consumer-facing companies such as AccuWeather and the Weather Channel, the weather insurance industry, and the weather technology-driven high-precision agricultural industry.⁴⁷

Since the early 1900s following the tragic "Big Burn" of 1910 that charred 4,700 square

⁴³ NASA, *GOES Overview and History*, <https://www.nasa.gov/content/goes-overview/index.html>.

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ Economics and Statistics Administration, Department of Commerce, *Fostering Innovation, Creating Jobs, Driving Better Decisions: The Value of Government Data* at 15 (July 2014), <http://www.esa.doc.gov/sites/default/files/revisedfosteringinnovationcreatingjobsdrivingbetterdecisions-thevalueofgovernmentdata.pdf>.

miles of Washington, Idaho, and Montana, the fire management community led by the National Forest Service has relied on the weather community to provide crucial information to support the safety and effectiveness of fire fighters on the ground. This relationship has been critically important in recent years as several major fires have impacted the lives of U.S. citizens and their livelihoods, including the North Bay Fire in October 2017 in northern California and the southern California fires in December 2017. These fires led to 46 deaths and thousands of homes destroyed with costs exceeding \$10 billion, though weather forecasts were deemed effective at predicting these vast conflagrations and they could have yielded much worse damage without such forecasts.⁴⁸ Fire fighters facing wildfires on the ground rely on incident meteorologists who provide crucial information to characterize fires on a real-time basis, relying on “mini weather forecast offices” with satellite dishes and other technologies to get real time ground and satellite information from wherever they are in the field.⁴⁹ Unfettered access to real-time information relayed via GOES satellites operating within or adjoining the 1675-1680 MHz band is crucial to keeping firefighters and infrastructure safe, especially as wildfire seasons are consistently worsening each decade.

The benefit today to private industry of reducing weather uncertainty has been roughly estimated to be around \$13 billion,⁵⁰ and is projected to substantially grow due to the increased cost and frequency of billion-dollar natural disasters, the increased sophistication of business models that account for more nuanced weather trends, and the utilization of big data analytics to

⁴⁸ Nicholas J. Nauslar, John T. Abatzoglou and Patrick T. Marsh, *The 2017 North Bay and Southern California Fires: A Case Study*, Fire 2018, 1, 18, <https://www.spc.noaa.gov/publications/nauslar/2017cali.pdf>.

⁴⁹ Jack Williams, *Weather Forecasters Help Keep Wildfire Fighters Safe*, Weatherwise, 71:4, 20-27 (July/August 2018).

⁵⁰ The National Weather Service, *National Weather Service Enterprise Analysis Report; Findings on changes in the private weather industry*, at 8 (June 8, 2017), https://www.weather.gov/media/about/Final_NWS%20Enterprise%20Analysis%20Report_June%202017.pdf.

better respond to extreme high-impact events.⁵¹ In a recently issued report, NOAA noted that between 1980 and 2017, there were 219 weather and climate-related events in the U.S. where damages exceeded \$1 billion, totaling more than \$1.5 trillion, and that “a mere 1% reduction in these losses could save up to \$400 million annually.”⁵² The report also noted that a nationwide study of U.S. households’ willingness to pay for accurate National Weather Service forecasts is \$31 billion.⁵³

C. HISTORY OF IRIDIUM ALLOCATIONS, SERVICES PROVIDED, CUSTOMERS SERVED, ECONOMIC IMPACT

The FCC first designated the Big LEO band plan in 1994.⁵⁴ At the time, the band was intended to support sharing between five MSS operators, two of which remain today, including Iridium. Iridium was originally provided with an exclusive spectrum allocation of 1621.35-1626.6 MHz to accommodate the other operators. Over the last ten plus years, Iridium has operated in the 1618.725-1626.5 MHz on an exclusive basis and shared the 1617.775-1618.725 MHz operations with Globalstar.⁵⁵ Originally envisioned in the late 1980s and fully deployed in 1998, Iridium is a truly innovative satellite system, with 66 cross-linked low earth orbit satellites. Iridium’s success as a U.S. company has depended on its FCC spectrum allocation and support from federal government partners, as well as efforts to ensure international spectrum harmonization. It was, and remains, the only commercial satellite system with complete global

⁵¹ *Id.* at 10.

⁵² NOAA, NOAA's Contribution to the Economy; Powering America's Economy and Protecting Americans, at 10 (Sept. 2018), <https://www.performance.noaa.gov/wp-content/uploads/NOAA-Contribution-to-the-Economy-Final.pdf>.

⁵³ *Id.*

⁵⁴ The Big LEO band consists of portions of spectrum in the L-band (1610-1626.5 MHz and the S-band 2483.5-2500 MHz).

⁵⁵ Spectrum and Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands, *Second Order on Reconsideration, Second Report and Order, and Notice of Proposed Rulemaking*, 22 FCC Rcd 19733, 19737 ¶ 8 (2007).

coverage.

Iridium has grown a highly successful business operating in its 8.725 MHz of spectrum. Today, Iridium has over one million subscribers⁵⁶ – including over 100,000 federal government customers primarily through its two-decade partnership with the Department of Defense – more than double the 427,000 subscribers it had in 2010 while relying on its first-generation MSS constellation, primarily in mobile voice and data services.⁵⁷ Iridium invested \$3 billion in the development of Iridium NEXT, a complete upgrade and replacement of its 66-satellite non-geostationary orbit (“NGSO”) constellation with nine on-orbit spares and six ground spares.⁵⁸ As Iridium’s satellite capabilities have advanced with this upgrade, it is expanding its service offerings with the new higher capacity Iridium CertusSM service.⁵⁹

Iridium’s use of its spectrum has evolved and grown significantly since the system was launched as a voice and paging system. Iridium has created jobs, saved lives, and continued to innovate to improve the system’s capabilities for government and commercial users alike. Many Iridium subscribers use Iridium data messaging services which are leveraged by machine-to-machine (“M2M”) markets, control and data acquisition (“SCADA”) applications, and personal,

⁵⁶ Iridium Communications Inc., 2018 Quarterly Report (Form 10-Q), at 20 (Oct. 25, 2018), <https://www.sec.gov/Archives/edgar/data/1418819/000141881918000017/irdm10-q093018.htm>.

⁵⁷ Iridium Communications Inc., 2011 Annual Report (Form 10-K), at 38 (Mar. 6, 2012), <https://www.sec.gov/Archives/edgar/data/1418819/000119312512097807/d262216d10k.htm>.

⁵⁸ As of January 11, 2019, Iridium has launched all 75 Iridium NEXT satellites. Press Release, Iridium, *Iridium Completes Historic Satellite Launch Campaign; Financial and technological transformation nears, with 75 new satellites successfully deployed by SpaceX over the past two years* (Jan. 11, 2019) <http://investor.iridium.com/2019-01-11-Iridium-Completes-Historic-Satellite-Launch-Campaign>; Caleb Henry, *SpaceX Completes Iridium Next Constellation* (Jan. 11, 2019), <https://spacenews.com/spacex-completes-iridium-next-constellation/>

⁵⁹ See Press Release, Iridium, *Iridium CertusSM Goes Live; World’s First Truly Global Broadband Service* (Jan. 16, 2019) <http://investor.iridium.com/2019-01-16-Iridium-Certus-SM-Goes-Live-Worlds-First-Truly-Global-Broadband-Service>; Iridium, *Services*, <https://www.iridium.com/services/iridium-certus> (last visited Aug. 20, 2018); Press Release, Iridium, *Iridium Announces Third-Quarter 2018 Results; Company Raises 2018 Outlook* (Oct. 25, 2018), <http://investor.iridium.com/2018-10-25-Iridium-Announces-Third-Quarter-2018-Results-Company-Raises-2018-Outlook>.

asset, and vehicle/aircraft tracking applications. The Iridium network currently supports millions of these transactions on a daily basis, resulting in Iridium devices being deployed virtually everywhere throughout the United States. In the past decade, Iridium has seen increased profits, and doubled the number of employees in the United States. In 2017, backed by more than 300 technology partners, this growth translated to nearly \$450 million in revenues.⁶⁰ These services and user growth trends will continue to expand with the completion of the Iridium NEXT upgrade, which will support all legacy services and user equipment while also providing new services.

III. SPACE POLICY SUCCESS REQUIRES STABILITY IN SPECTRUM ALLOCATIONS, CONSISTENT PROTECTION FROM HARMFUL INTERFERENCE, AND INTERNATIONAL VIGILANCE

Satellite systems in the L-band have longstanding and critical uses that require a stable spectrum environment. Satellite networks take many years and substantial sums of money to develop and launch. In addition, once satellites are in orbit and operational, they must be protected from harmful interference. The investment and reliance interests are far too great for a satellite network to be launched only for its operations to be subsequently compromised by subsequent government policies that result in harmful interference. Finally, to promote the international nature of satellite operations, the L-Band spectrum allocations must be protected in the United States and harmonized with international allocations to promote global markets and American competitiveness. These conditions have been present in the L-Band for decades resulting in the successful launch and preservation of the services described above. Such

⁶⁰ Iridium Communications Inc., 2017 Annual Report (Form 10-K), at 2 (Feb. 22, 2018), https://www.sec.gov/Archives/edgar/data/1418819/000141881918000005/irdm_12312017x10k.htm;

conditions will also be essential for the success of new satellite services.⁶¹ Domestic or international policy initiatives inconsistent with these principles must be rejected.

A. IT IS IMPERATIVE TO PROVIDE SATELLITE OPERATORS WITH CERTAINTY WITH RESPECT TO THEIR SPECTRUM ENVIRONMENT

To ensure that commercial and government satellite operators are partners with the U.S. Government in promoting economic growth and leading the world in space,⁶² America’s regulatory environment must provide satellite operators with predictability in spectrum allocations in the frequency bands in which they operate. As National Space Council Policy Advisor Michael Beavin stated in a recent speech, “[r]egulatory instability is bad for business and can be especially lethal to satellites.”⁶³ Once launched, the ability of satellite providers to alter the way in which their satellites operate or fundamentally change the way they offer services is extremely difficult, if not impossible. As demonstrated above for the L-Band, the process of allocating spectrum, achieving global harmonization, licensing systems, launching satellites, and building a customer base are inherently long-term exercises that yield substantial public interest benefits. When regulators shift direction repeatedly, or threaten to take steps that would substantially alter the operating environment for existing allocations, investment withers

⁶¹ See e.g., WorldVu Satellites Limited, Petition for a Declaratory Ruling Granting Access to the U.S. Market for the OneWeb NGSO FSS System, *Order and Declaratory Ruling*, 32 FCC Rcd 5366 (2017) (“OneWeb Grant”); Space Exploration Holdings, LLC, Application For Approval for Orbital Deployment and Operating Authority for the SpaceX NGSO Satellite System, *Memorandum Opinion, Order and Authorization*, FCC 18-38 (rel. Mar. 29, 2018) (“SpaceX Grant”); Space Norway AS, Petition for a Declaratory Ruling Granting Access to the U.S. Market for the Arctic Satellite Broadband Mission, *Order and Declaratory Ruling*, 32 FCC Rcd 9649 (2017); Telesat Canada, Petition for Declaratory Ruling to Grant Access to the U.S. Market for Telesat’s NGSO Constellation, *Order and Declaratory Ruling*, 32 FCC Rcd 9663 (2017); Audacy Corporation, Application for Authority to Launch and Operate a Non-Geostationary Medium Earth Orbit Satellite System in the Fixed- and Inter-Satellite Services, *Order and Authorization*, FCC 18-72 (rel. June 6, 2018); O3b Limited, Request for Modification of U.S. Market Access for O3b Limited’s Non-Geostationary Satellite Orbit System in the Fixed-Satellite Service and in the Mobile-Satellite Service, *Order and Declaratory Ruling*, FCC 18-70 (rel. June 6, 2018).

⁶² Call for Comments, Section 1(e). See also SPD-2, at Section 1.

⁶³ Michael Beavin, Senior Policy Advisor, National Space Council, Remarks at the Federalist Society: Modernizing American Space Policy (July 26, 2018) (“July Beavin Speech”), <https://fedsoc.org/events/modernizing-american-space-policy>.

and space-based business cannot succeed. To date, L-Band operators have generally been able to depend on a stable regulatory environment.⁶⁴ To ensure the continued success in the L-Band, the National Spectrum Strategy must emphasize the ability of satellite operators to continue to rely on the predictability and stability of spectrum allocations.⁶⁵

B. SATELLITE PROVIDERS MUST BE PROVIDED WITH CONSISTENT PROTECTION FROM HARMFUL INTERFERENCE

As NTIA considers the future needs of spectrum users,⁶⁶ including those of space-based applications like the satellite industry, specifically the GPS industry, users of NOAA GOES satellites, and SATCOM providers like Iridium, it is imperative to recognize the significant and longstanding impact these L-band space-players have had on the U.S. economy. To allow the industry to continue to flourish for the next 15 years and beyond, the government must ensure that harmful interference is effectively prevented, regardless of its source. As a National Space Council representative recently stated, “[i]nterference prevention and management is a crucial challenge for long term sustainability of space based systems. Powerful terrestrial systems in close proximity to bands used by incumbent satellite systems and their ground facilities are problematic.”⁶⁷ Allowing the deployment of interfering services in bands adjacent to critical satellite operations without adequately protecting incumbent services would significantly reduce regulatory certainty for American corporations, chill innovation and investment in existing technology, and threaten American jobs. In contrast, given that the Coalition L-band operators have flourished with their existing L-band spectrum allocations, providing additional spectrum

⁶⁴ While generally true, we note that multiple weather technologies in the L-band have had their allocation moved and altered at considerable cost to federal agencies and industry, such as radiosondes (or “weather balloons”) and the GOES-R series of satellites that had its spectrum allocation consolidated shortly before launch.

⁶⁵ Call for Comments, Section II, 1.

⁶⁶ FR Summary, Section II, 7.

⁶⁷ See July Beavin Speech.

for these critical uses would enable these operations the ability to further innovate and grow.⁶⁸

The Coalition encourages NTIA to evaluate those satellite spectrum licensees that have failed to invest in satellite assets and assess whether making spectrum available to other satellite operators or similar uses would promote US space leadership.⁶⁹

C. SATELLITE SPECTRUM MUST BE PROTECTED IN THE UNITED STATES AND HARMONIZED INTERNATIONALLY

It is equally critical for L Band satellite operators to have certainty for its radio frequency spectrum and interference protection internationally as it is in the United States. Satellite operations are inherently global, which requires satellite spectrum to be protected both in the United States and before international organizations. For example, the World Meteorological Organization, and some of its member countries, like Canada and its provinces, expressed their concerns to the FCC about the likely interference to GOES satellites if the 1675-1680 MHz band is allowed to be shared by terrestrial users, largely due to longstanding international policy surrounding the optimal transmission of satellite weather data in real-time in that band.⁷⁰ As policymakers are well aware, transmissions from satellites do not stop at a border. In particular, Iridium and GPS operations are provided through NGSO constellations which uniquely cover and serve the entire globe. International consistency on L-band allocations and interference protection is necessary to provide satellite companies regulatory certainty that save costs and encourage innovation. Commercial and government satellite operators depend on the U.S.

⁶⁸ See *e.g. supra II.C.* describing how Iridium has successfully built its MSS business in 8.725 MHz of spectrum.

⁶⁹ See *infra IV* for discussion of the continued underuse of the L-band spectrum that Ligado has proposed to use.

⁷⁰ Comments of World Meteorological Organization, RM-11681 (June 21, 2016); Comments of Meteorological Service of Canada, RM-11681 (June 27, 2016); Comments of the Government of Yukon, RM-11681 (June 21, 2016). While GOES satellites operate in the 1675-1695 MHz band, Ligado Networks Subsidiary LLC's predecessor filed a Petition for Rulemaking asking the FCC to initiate a rulemaking to allocate the 1675-1680 MHz band for terrestrial mobile use shared with federal use. LightSquared Subsidiary LLC, Petition for Rulemaking to Allocate the 1675-1680 MHz Band for Terrestrial Mobile Use, RM-11681 (Nov. 2, 2012).

government for a predictable regulatory environment. It is equally important for satellite operators to be able to rely on the U.S. government to defend domestic allocations and interference protections internationally. Failure to do so not only affects the ability to operate abroad but harms the ability of satellite companies to continue to succeed in the United States.

IV. THE ADMINISTRATION SHOULD REJECT DOMESTIC AND INTERNATIONAL SPECTRUM POLICIES CONTRARY TO THESE PRINCIPLES, INCLUDING LIGADO

NTIA has focused on ensuring a stable regulatory environment for satellites while at the same time identifying more spectrum for terrestrial 5G users.⁷¹ Importantly, a U.S. official recently said that while they are seeking spectrum for terrestrial 5G users, “we’ll be working to ensure a stable, harmonized, international regulatory environment for satellite services meeting government and private sector needs.”⁷² The attempt to leverage the race to 5G cannot come at the expense of billions of direct investment by the L Band satellite industry and hundreds of millions annually in economic growth. Satellite services are an important element of providing 5G solutions and have the unique benefit of being able to deliver worldwide coverage to areas that are hard to reach by terrestrial systems. There is a need to identify additional spectrum for 5G and the FCC has done an impressive job in that task already. However, such efforts cannot be permitted to cause irreparable harm to the U.S. space industry and or to the many government and commercial interests that depend on robust and reliable satellite offerings and harmonized spectrum available for satellite use to deliver services worldwide. Further, while the prompt deployment of 5G could no doubt benefit the weather industry, which has some of the most frequently used apps in the world, the weather community is concerned about the potential

⁷¹ Call for Comments, Section II, 7.

⁷² See July Beavin Speech.

interference implications of some sharing proposals due to the negative impact on weather data quality and reliability.⁷³

As an example, Ligado’s proposal to convert 40 megahertz of prime satellite spectrum to a mobile broadband terrestrial service in the middle of the L-Band satellite spectrum neighborhood runs afoul of each of the principles described above. First, granting its request would turn upside down forty years of a predictable spectrum environment for satellite providers in the band. Satellite operators in the L-Band have depended on the knowledge that their neighbors would operate satellite systems at permitted power levels and with operational characteristics that will ensure their coexistence. After decades of successful satellite operations, permitting a terrestrial mobile broadband service to arbitrage its way into the middle of this satellite neighborhood would fundamentally change the nature of the band to the detriment of the incumbent operators and their customers. A recent letter noted that granting Ligado’s request would “undermine the investment-backed expectations of those who operate commercial satellite systems by fundamentally altering the interference environment decades after licensing” and “would convert 40 MHz of increasingly rare satellite spectrum away from satellite use, rewarding a company for underutilizing its satellite spectrum rather than investing in new satellite technologies.”⁷⁴

Second, allowing a nationwide mobile broadband service to operate directly adjacent to satellite services will cause harmful interference to the countless government and commercial entities that rely on GPS, SATCOM, and NOAA GOES satellite services. The FCC has

⁷³ Kelcee Griffis, *Inside The Ups And Downs Of Ligado's Satellite 5G Project*, Law360 (July 31, 2018).

⁷⁴ Letter from Coalition of Aviation, SATCOM, and Weather Information Users, to Chairman Ajit Pai, Federal Communications Commission, IB Dockets No. 11-109, 12-340; RM-11681; IBFS File Nos. SES-MOD-20151231-00981, SAT-MOD-20151231-00090, SAT-MOD-20151231-00091, SES-AMD-20180531-00856, SAT-AMD-20180531-00044, SAT-AMD-20180531-00045 at 2 (filed Jul. 18, 2018) (“July 18 Coalition Letter”).

consistently emphasized the importance of allowing incumbent operators to operate free from harmful interference.⁷⁵ For example, when the FCC adopted rules to allow MSS operators to offer terrestrial operations *ancillary to their satellite operations* (not as a complete replacement to satellite as Ligado has proposed), the agency adopted rules that were designed to prevent harmful interference from those terrestrial operations into the satellite services.⁷⁶ The Commission has explained that the rules impose an “absolute obligation on the [terrestrial] operator to resolve any harmful interference to other services.”⁷⁷ Contrary to these requirements, Ligado’s proposed terrestrial operations have been demonstrably proven to cause harmful interference. A July 18, 2018 Coalition letter summarized these concerns, noting that “the record, augmented by recent government reports, makes clear that the interference will be particularly impactful to the countless government and commercial entities that rely on GPS and SATCOM services for aviation safety and other critical services and the many groups that receive and depend upon real-time weather and related environmental information from [NOAA] satellites.”⁷⁸ More recently, in a letter to the PNT Executive Committee, the PNT Advisory Board – led by the nation’s foremost GPS experts – stated that Ligado’s proposal “will create

⁷⁵ In 2003, the Commission adopted rules allowing MSS satellite operators to provide *ancillary* terrestrial component (“ATC”) service. See Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands; Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands, *Report and Order and Notice of Proposed Rulemaking*, 18 FCC Rcd 1962 (2003) (“*ATC Order*”) (emphasis added). Noting the important role of satellite service, the Commission took steps to ensure that ATC would remain ancillary to the provision of MSS. Despite the best intentions of the Commission, ATC has never been successfully deployed due to persistent interference concerns.

⁷⁶ See, e.g., *id.* at 2017 ¶ 104 (“We adopt technical parameters for ATC operations in each of the bands at issue designed to protect adjacent and in-band operations from interference from ATC.”).

⁷⁷ *Spectrum & Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands; Globalstar Licensee LLC, Auth. to Implement an Ancillary Terrestrial Component*, Report & Order and Order Proposing Modification, 23 FCC Rcd 7210, 7223 ¶ 35 (2008).

⁷⁸ July 18 Coalition Letter at 1.

totally unacceptable interference for a great number of GPS users in the United States.”⁷⁹

Finally, granting the Ligado request will make it more difficult to protect U.S. satellite companies from ill-conceived international interference-causing proposals. Failure to protect U.S. commercial satellite interests from interference caused by U.S. operators will surely be used against the U.S. in international negotiations. Similarly, if Ligado is able to successfully arbitrage its satellite spectrum for terrestrial mobile broadband in the U.S., then they will surely seek to do the same internationally, replicating globally the interference they will cause in the U.S. and further undercutting American space leadership.

V. CONCLUSION

Today America’s space industry is at an inflection point. Our commercial and government space programs are the envy of the world – with substantial investment, innovation, employment and economic growth, and security derived from our leadership. World-leading operators and a new generation of space entrepreneurs stand ready to propel our space industry forward. The Administration has recognized this opportunity and already taken important steps to enhance our global competitiveness and security. Pursuant to the Spectrum PM, NTIA is creating a National Spectrum Strategy. As the Administration develops future spectrum plans, it is critical that U.S. policy continue to value and enhance the stability of L-band satellite spectrum allocations, protect those investments from harmful interference, and robustly advocate for these principles in international fora. These principles create the solid foundation America’s space industry needs to continue to succeed. Equally important, spectrum management decisions that undermine these core principles – such as the Ligado application – must be rejected if

⁷⁹ Letter from Bradford W. Parkinson, 1st Vice-Chair, on behalf of the PNT Advisory Board, to Patrick M. Shanahan, Deputy Secretary of Defense and Jeffrey A. Rosen, Deputy Secretary of Transportation, Co-Chairs, National Executive Committee for Space-based Positioning, Navigation and Timing, at 3 (Aug. 10, 2018), <https://www.gps.gov/governance/advisory/recommendations/2018-08-letter-to-excom.pdf>.

