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**Opening remarks to UK Foundation for Science & Technology Roundtable**

“Growing international research and development partnerships in a post-Brexit world”

Good morning to all our distinguished guests and greetings on behalf of my colleagues at the National Aeronautics and Space Administration. It is an honor to participate in this important discussion on research and development partnerships, and I would like to sincerely thank the foundation for inviting me to participate.

I'd like to spend the next few minutes reflecting on the space program as an example of an incredibly successful international collaboration. One that has yielded so many technological advances that benefit all aspects of the global economy and quality of life. I also will project what I believe is an even more exciting future for collaboration and economic growth in space and across a wide range of emerging technologies.

For 60 years NASA has been driven to answer the most profound and fundamental human questions: How did the universe originate? How did we get here? And are we alone? The first 60 years of space exploration have yielded an unbroken line of scientific discoveries that are beginning to unlock the secrets of the universe.

Those discoveries were made possible only through collaboration with our valued international partners, none more significant than our partners in the European Space Agency and particularly the United Kingdom. What began as a “space race” has grown into a model of international collaboration that has yielded untold scientific knowledge, and improved our quality of life here on Earth. Space exploration is humanity's greatest adventure fueled by the combined genius of the world's best scientist, engineers and technicians including many right here in the United Kingdom.

In the first 60 years, we landed humans on the moon, flew 135 space shuttle missions and, through collaboration with our international partners, we built the International Space Station—a one million-pound, football-field-sized spacecraft orbiting the Earth at a speed of 17,500 mph. In addition, our robotic avatars have visited every planet in our solar system, and our great space-based observatories have explored space and time back to near the very beginning in the Big Bang.

At NASA we have an important tag line: “Technology drives exploration.” The incredibly challenging environment of spaceflight dictates the most stringent requirements on materials, power systems, propulsion, sensors, computers...and the human system. Our audacious missions succeed only if we create the advanced technologies necessary to make the impossible possible.

These same technologies drive economic progress and improve quality of life on Earth. The world's most advanced Solar Power systems were developed for the ISS. Space-based GPS navigation enables car services like Uber, search and rescue missions, and emerging urban air mobility.

Space-based imagery is used in agriculture, locating natural resources, environmental monitoring and weather forecasting. Miniaturized electronics developed for space enabled laptop computers and CMOS low power sensors developed for space imaging are found in virtually every iPhone camera.

And benefits extend to human health systems. In the United States, 90% of all infant formula contains a nutritional supplement developed to mitigate the health effects in astronauts living in a micro gravity environment. Our water purification systems on ISS have been applied to provide clean drinking water in remote areas on Earth. Miniaturized and remote medical technologies for astronauts have enabled higher levels of medical care in underdeveloped areas. And those are just a few examples. So what does the future look like for space exploration and technology, and what does it mean for collaboration opportunities? The next 60 years will be even more exciting than the past and promise to provide an exponential explosion of technology advances that will bring unbounded economic progress and partnering opportunities.

At NASA, we're creating the next era of space exploration with an emphasis on partnership. White House Space Policy Directive #1 calls for NASA to "lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and to bring back to Earth new knowledge and opportunities." This ambitious charge will be realized only through an exploration architecture that leverages public private and international collaboration.

Today we are successfully commercializing Low Earth Orbit. We have created a commercial cargo transportation infrastructure around the space station and will extend that next year to human transportation. Companies like Blue Origin, Space-X, Bigelow, and Sir Richard Branson's Virgin Galactic, will start independent commercial space operations in the very near future. New, affordable launch systems including Orbex are moving closer to reality, and new spaceports are being developed including the one right here in the UK.

Looking further from home: In partnership with our European partners, we are developing a new generation of spacecraft more powerful and capable than any in history. These vehicles will take humans back to the moon to develop a sustainable human presence and eventually on to Mars. The long-term objective is nothing short of expanding the economic sphere into lunar orbit and beyond.

A new generation of internationally developed robotic explorers, including the recently launched Mars Insight mission; the Mars 2020 rover; and potential missions to Europa and Enceladus, will explore our solar system and search for specific signs of life. The James Webb Telescope built in collaboration with the European Space Agency will launch next year on a European rocket.

These amazing missions require a new generation of revolutionary technologies to enable us to go farther, faster and more affordably. NASA and our partners' efforts will again help to accelerate a new wave of disruptive technologies that will influence all aspects of our lives and the economy. And this time around, NASA is partnering with industries all over the world to create technology that will change our lives.

Among the most promising technologies are: In-situ manufacturing and 3D printing; advanced propulsion and power, including Solar Electric systems; nanotechnologies that can revolutionize material properties; quantum computing that promises to increase processing power by many orders of magnitude; and potentially the most impactful emerging technology is Artificial Intelligence. AI, machine learning, big data systems, promise to revolutionize every aspect of business and culture.

Never mind the luddites of today who say technology will put us all out of work. The same was said in the industrial revolution. It is true that jobs will change. Researchers estimate that almost half of the jobs in high demand today did not exist when I was a child, and over half of jobs our children will hold don't exist today. The speed of technology advancement is today driven by human innovation, but as AI becomes more integrated into the fabric of our society the pace of innovation will accelerate rapidly. There is no static model that will ensure success, but for those who adapt and collaborate, the opportunities are boundless.

The keys to the future is continual agility - adapting and collaborating with human and machine partners while digitally transforming the way we live and work. The future is incredibly exciting and we look forward to partnering with you to make that future a reality.