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President Accoyer, distinguished members of the Parliamentary Group on Space, and guests, thank you for the opportunity to address you today. I am honored to be with you and look forward to the opportunity to discuss bilateral cooperation with France as well as more general European space collaboration with NASA, and my perspective on the prospects for the future of space exploration. I firmly believe it is a future that will be full of opportunities for meaningful collaboration, but that achieving it will take hard work and determination. With France assuming the Presidency of the European Union this year, and with a European Space Agency Ministerial in November to help define ESA's future direction, I am aware that I am speaking to you at a crucial time, when France is considering how best to exercise its leadership in space to benefit its citizens and the broader European community.

Among the many distinguished guests gathered here today I would especially like to take the opportunity to acknowledge the presence of the Director General of the European Space Agency, Mr. Jean-Jacques Dordain, the Chairman of the German Aerospace Center Executive Board, Professor Jan Wörner, and the Italian Space Agency President, Professor Giovanni Bignami. It is indeed an honor to be able to address such a distinguished group of colleagues that stand at the forefront of European space activities.

As has been the case with CNES, we have enjoyed excellent relations and have had the privilege of robust civil space cooperation with ESA, DLR and ASI. As we proceed with space exploration we look forward to continuing to work with France, Germany, Italy and the European Space Agency, and indeed with all of our European counterparts.

I would also be remiss if I did not take a moment to express my condolences to the Group on the recent passing of Christian Cabal – a doctor, a Deputy of the National Assembly, a President of this Group, and a space visionary. The report that he co-authored last year with Senator Revol, “Space Policy: Daring or Decline,” is an excellent analysis of the challenges facing not just France, but leaders around the world, as we consider our next steps in space exploration. France’s loss is a loss for us all.

Now, allow me to begin by highlighting a very important aspect of relations between France and the United States, which is simply that France has long been the United States’ closest partner in space exploration, by many measures. For example, NASA has more active space cooperation agreements with France than any other country. This is a relationship that goes back to the earliest days of space flight. In fact, I could note that NASA’s first overseas representative was deployed to Paris in 1964. That is a position that we have filled continuously ever since, and our base of operations in Europe remains in France. In January 2007, then-Minister for Higher Education and Research, Francois Goulard, and I signed a U.S.-France Umbrella Agreement for Cooperative Activities in the Exploration and Use of Outer Space for Peaceful Purposes. In signing this agreement as the foundation for further space cooperation between our two nations, Minister Goulard and I underscored the vital role that a robust

program in space exploration can play in sustaining our respective economic and national security interests, promoting innovation, and motivating pursuit of and excellence in mathematics, science, engineering, and technology. I would like to thank the leadership of this Group, and of the National Assembly, for ensuring that this agreement was ratified.

NASA's cooperation with France touches almost every aspect of our activities in aerospace.

In aeronautics research, NASA is working closely with the French National Aerospace Research Center and others to develop a better understanding of the issues associated with aircraft in-flight icing. These research efforts will ultimately improve ice accretion modeling techniques and refine ice detection instrumentation and measurement systems.

In space science, in addition to a long history of successful cooperative planetary missions including a robust program of Mars exploration, a variety of French institutions and scientists are important contributors to NASA's Gamma Ray Large Area Space Telescope (GLAST) mission. GLAST will, among other things, help us to study black holes and the source of gamma-ray bursts – the most powerful explosions in the universe – to probe dark matter and the early universe, and to explore early star formation, pulsars, solar flares, and the origins of cosmic rays. Cooperation in future space science missions is also being considered in the study of dark energy. Closer to home, NASA is looking forward to the upcoming four-party Ocean Surface Topography Mission (OSTM), scheduled to launch next week. This mission, involving NASA, CNES, NOAA, and Eumetsat, will continue a long line of cooperative US-French Earth

science missions, beginning with TOPEX/Poseidon and continued with Jason-1 and CALIPSO. These successful cooperative missions have provided us with an improved understanding of ocean circulation, weather, climate variability and air quality, and clearly demonstrated an effective model for transitioning research and development activities to practical applications on a day-to-day basis.

These few examples illustrate the significant benefits of our cooperative relationship, one that has produced benefits not only for France and the United States, but also for millions of people around the world. I have no doubt that such fruitful scientific collaboration will continue into the future.

Another subject that may continue to be of particular interest to you is cooperation in human spaceflight. In this regard, I must note that NASA and the International Space Station partnership have come a long way since the tragic loss of Space Shuttle *Columbia* in February 2003. That accident forced the U.S. government to reconsider the strategic reasons for human space flight. As a result, the United States has committed to a long-term program of human and robotic exploration of space for a variety of purposes – purposes that I believe we share with Europe.

When I look at the European Space Policy document released last May by ESA and the European Commission, and when I read the report by Senator Revol and Dr. Cabal published last February, or review the remarks made by French President Nicolas Sarkozy on space policy given earlier this year in Kourou, I see that we have much in common. We both see space as a strategic environment that generates multiple advantages for our economy and our people. We see it as a means of promoting peaceful international cooperation. We see that space exploration in general,

and human spaceflight in particular, energize and encourage our minds as does no other enterprise. We see that it inspires our children to study math, science and engineering so that they can be a part of this great endeavor. As President Sarkozy noted, access to space is the hallmark of major industrial and technological powers.

For these reasons, which you understand as well as anyone, the United States will never turn its back on this great endeavor. So, in the aftermath of the tragic *Columbia* accident, the United States committed to a new space policy. In my opinion, it is the best space policy we have ever enunciated. It builds upon our successes, pulls the components of our space efforts together into a more integrated whole, and keeps faith with our long-standing partners, like France. In the field of human space flight, we decided that it was time to replace the 1970s-vintage Space Shuttle with a new vehicle that will be capable of taking us beyond low Earth orbit, be safer and cheaper to operate, and be flexible enough for our children and grandchildren to use when they head for Mars and other destinations. The *Orion* crew vehicle and *Ares* launch vehicles are being developed today with these goals for the future in mind.

The first phase of this new exploration policy is to complete and operate the International Space Station together with our international partners. I am thrilled with the excellent progress being made toward that objective. Beginning with the return to flight of Space Shuttle *Discovery* three years ago, the Shuttle has conducted nine successful missions to the International Space Station. While they have continued to become, technically and logistically, ever more complex, they have been executed brilliantly, thanks to the skill, dedication and hard work of the people involved.

ESA Astronaut Léopold Eyharts, is one of those people. A credit to the ESA Astronaut Corps and the French Air Force, General Eyharts flew to the ISS on Space Shuttle *Atlantis* earlier this year, became part of the crew of Expedition 16, and returned to Earth on Space Shuttle *Endeavor* in March. While on the Station he tested and operated the European *Columbus* Module, marking a significant milestone both for Europe and the partnership. The culmination of many years of effort in Europe, *Columbus* gives Europe the capability to conduct on-board research in areas such as material science, fluid physics, life science, and Earth observation. It is a major contribution to ISS, and demonstrates the maturity and sophistication of the European space enterprise.

With respect to the recent launch of the ATV cargo vehicle earlier this year, let me re-emphasize what I said on April 3. Like many of my colleagues, I was happy to see that the first ATV was named after the French writer who was such an inspiration to so many of us in the space business. I am incredibly proud of our European partners for successfully docking the *Jules Verne* with the ISS. I applaud Europe's achievement. Only the United States and Russia have previously conducted automated dockings in space. In combination with the launch of the Columbus Module earlier this year, the success of the ATV marks the arrival of Europe as a full-fledged space power. Now that the ATV is operational, we hope Europe will utilize it to its fullest potential, providing NASA and the other International Partners with cargo capabilities through existing arrangements. Commercial services, like the ones I am working to foster through NASA's COTS program, could follow.

We await with anticipation the many deliveries by the ATV of critically needed cargo and equipment to the ISS. Further, the many technologies developed throughout Europe for this sophisticated vehicle offer the prospect of even greater European feats in the future, based on the use of this core vehicle. It would be a small step from today's *Ariane 5* and *Jules Verne* to an independent European human spaceflight capability. In the meantime, the ATV is a tremendous asset for Europe in space, and we expect you will make the most of its capabilities for years to come.

The International Space Station is on schedule to double its crew next year, and to be completed in 2010. For those who have heard that the US will soon abandon the ISS, let me be clear: we are committed to building and utilizing the Space Station well into the next decade. In fact, in the new U.S. space policy, the ISS is the primary focus of our near-term effort. Human research on the Space Station will directly benefit our understanding of and preparation for future activities on the Moon, and later voyages to Mars. Further, the U.S. Congress has designated the U.S. segment of the ISS as a national laboratory, and directed NASA to develop a plan to "increase the utilization of the ISS by other Federal entities and the private sector...". Congress does not create or eliminate national laboratories lightly. Thus, it is inconceivable to me that the U.S. would abandon a perfectly functional space station because we have arrived an arbitrary date on the calendar. So while I cannot speak for a future U.S. Administration or Congress, I do believe that the ISS will be around for a long time beyond 2016, and that the U.S. will remain part of it.

As I noted earlier, present U.S. space exploration policy was born of the Columbia tragedy. One of the findings of the Columbia Accident Investigation Board

was that “the loss of *Columbia* and her crew represents a turning point, calling for a renewed commitment regarding exploration.” In the U.S., the plan for space exploration was put forth by President Bush in January, 2004 and, after nearly two years of informed debate, was ratified with a remarkable level of bi-partisan support with the passage of the NASA Authorization Act of 2005. Republicans and Democrats in the United States may disagree on many things, but they found common cause in the development of a coherent space policy.

After embracing our international commitments to complete the ISS, the policy directs us to extend human and robotic presence throughout the solar system, first to the Moon, and then on to other destinations, such as Mars. At this point, I should emphasize that as part of this remarkably straightforward policy, we are also directed to seek opportunities for international collaboration in our activities. I will discuss this point in more detail later.

But before I do that, let me take a moment to address a few of the concerns I’ve heard about the path the U.S. has chosen with regard to exploration. Some in France at the time of the President’s announcement asked what France could gain from an American desire to return men to the Moon. More recently, some in Europe have suggested that any consideration of missions to the Moon is a distraction from the real goal of a human flight to Mars. Others have predicted that significant change to U.S. space policy will come with the Presidential elections, so it is best to sit on the sidelines and wait to see what the next U.S. Administration will do. I have several observations to make in connection with these points.

First, U.S. civil space policy is specifically designed for the long term, designed to be implemented affordably and systematically across many changes of Administration and Congress. In fact, those who are in favor of continuing human spaceflight, a substantial majority of U.S. policymakers, agree that we have little choice but to proceed on the path we are now following. While there will certainly be debate on the details of NASA's plans, in my view there will not be a significant change in our overall direction. There is a broad bipartisan consensus of support for today's U.S. civil space policy.

Second, after nearly thirty years of service, the Space Shuttle will cease operations in 2010. The Shuttle is an aging, fragile, and increasingly expensive vehicle to operate. Production lines are in the process of shutting down. Suppliers are no longer are making certain critical parts. Vendors are moving on to other businesses. Meanwhile, our *Orion* spacecraft and *Ares I* launch vehicle will soon come on line. The major *Orion* and *Ares I* components were put under contract last year. An engineering model of the *Orion* vehicle has been built and will be used to test the launch escape system this September. The first *Ares I* test flight, *Ares I-X*, is scheduled for mid-2009.

Finally, I should note that although the "gap" between Shuttle and Orion will be painfully long, the Shuttle will be replaced by vehicles with significantly higher reliability and flexibility. By the middle of the next decade multinational crews will be traveling to and from the ISS – six at a time – in the *Orion* spacecraft. We are committed to the new path.

That still leaves us the question of destinations for human exploration. I wholeheartedly agree with President Sarkozy that Mars offers us a great adventure, and

I also agree with those who say that Mars is the ultimate destination for mankind in the 21<sup>st</sup> Century. But I do not believe that Mars is the only interesting destination for mankind in the inner solar system, nor do I believe that it is reasonably within our immediate reach. As Prof. Stephen Hawking said in his April lecture at the George Washington University, the Earth's moon is an obvious first stop in human exploration, because of its proximity and the potential that water ice may exist in its polar craters. He also noted that Mars is the obvious next target after the moon. I agree with him completely.

In the United States we had similar types of discussions in the early 1960's, when we first engaged in the race to the Moon with the Soviet Union. At that time there were numerous debates about the surest path to our destination, debates which could not be resolved with only the experience accumulated during Project Mercury. We had capabilities to demonstrate and technical skills to hone before we could go deeper into space. The Gemini Program helped us to develop the needed skills for the Apollo lunar missions, while remaining safely in our own "neighborhood", which at that time was low Earth orbit.

Similarly, as we look toward Mars, continued work in Earth orbit followed by "field tests" on the Moon are, in much the same way, on the path to a successful human expedition to Mars in the next few decades. During the development of U.S. space exploration policy, consideration was given to going directly to Mars. But when we looked at it carefully, we decided that we could neither afford nor sustain the budget increases needed to ameliorate the risk of such a plan.

Let me turn now to the subject of international cooperation in exploration. It is

sometimes said that NASA was overly prescriptive of the roles of its partners in the early days of International Space Station development. I think much might be said on either side of this claim, and has. But whether or not it was so in the past, I determined that it would not be the case in the future. So, early in my tenure at NASA, I stated that we will not attempt to prescribe the manner of participation of any of our potential partners. We will work with others to define an exploration architecture suitable to all, and we will identify those portions of the task that we are willing and able to accomplish with the funding we can provide. We expect that others will do the same.

In the years since, the exploration architecture is coming together nicely, with broad international support. NASA has welcomed ideas from our friends in France, elsewhere in Europe, and from many other countries. We will continue to do so as we move forward. Just as with mid-20<sup>th</sup> century Antarctic research, some of the most creative approaches to 21<sup>st</sup> century lunar and Martian exploration will depend on international collaboration. France, through its space agency CNES, has added its voice to those of 13 other space agencies in a multilateral dialogue we collectively refer to as the Global Exploration Strategy. This effort has gone so far as to publish a framework document and establish a coordination mechanism, called the International Space Exploration Coordination Group. Exploring the Moon, and eventually Mars, will be a challenging task, one that NASA has neither the resources nor the desire to do alone. And, as I mentioned earlier, U.S. policy and law explicitly calls on NASA to engage in international cooperation in pursuit of our goals. As European experts and political leaders, many of whom sit here in this room, have noted, a global exploration effort is a key to unlocking the door to our future.

One other curious comment that I have heard in international discussion about U.S. space policy is the suggestion that the United States is somehow unfairly excluding international partners from the development of *Orion* and *Ares*. I say “curious” because I note that Senator Revol and Deputy Cabal in their report last year stated that “autonomous and competitive launchers” are an absolute priority. President Sarkozy said earlier this year that independent access to space was essential. The “vital importance” of “independent, reliable...access to space...” is also enunciated in last May’s European Space Policy statement. I fully agree, and moreover, such independent access to space is of no less importance to the United States. That is why we are proceeding with these developments as national projects, while at the same time hoping that other aspects of exploration will offer fruitful soil for international collaboration.

Let me be clear: while we know that our national capabilities allow us to reach the Moon again alone, we would not consider that to be a successful outcome. Measured against the standard of our own policy, it would be a failure. A group of nations pursuing common, coordinated goals will achieve so much more than a single country’s mission or outpost.

I am personally committed to the idea that this enterprise should be international in scope. It is obvious to me that we share a commitment to international cooperation of this sort. For example, ESA’s Space Exploration Policy Advisory Group noted as far back as 2004 that “the cooperation objective among key actors should be based on heteronomy, partnership, and networking.” In our lunar ambitions, we couldn’t agree more. We prefer a coordinated effort at the moon involving many national space

programs over the alternative of exploring space alone. We are trying to behave in a manner which supports that claim.

So NASA, guided by the U.S. policy, is pursuing a path of international cooperation in its space endeavors. It is a path that differs significantly from the Apollo era, and builds on the successes of prior Shuttle missions and the International Space Station. We welcome, indeed we are asking for, European collaboration in human exploration. We welcome the development of independent European capabilities in space to provide redundant systems in the event of failure of any one partner's capabilities. Between and among us, we have seen enough such failures that we should know by now to plan for them. We think that this would be of benefit both collectively and individually, especially if we can link individual capabilities via common interfaces that will ultimately provide the robustness we need for future ventures beyond low earth orbit.

The foundation of NASA's cooperation with all of its partners is based on the principles of transparency, reciprocity, and mutual benefit. Our relationships with our long-established partners in Europe and around the world have shown that only this foundation can provide a reliable basis for cooperation in space flight, and this foundation would be a necessary precondition for any new relationship with countries such as China.

In November of this year the ESA Ministerial will make programmatic decisions regarding Europe's plans in space for the next three years, and impacting ESA's direction for a much longer time by setting the stage for the 2011 Ministerial. This period, between 2008 and 2011, will be an important time for all of us. NASA will be

working to enable early lunar exploration, following a stepping stone approach on the way to Mars and beyond. In Europe, these next years will be important for defining European objectives and putting in place the activities necessary to meet them. I hope that the decisions made at the 2008 Ministerial will hearken back to those of 1985, when the ESA Council agreed to pursue cooperation on the International Space Station program.

Regarding past decisions, we are pleased that European nations came together in 2001 and displayed their commitment to long-term robotic and human exploration with the initiation of the Aurora Program, which targets potential human presence on Mars in roughly the same timeframe as U.S. space exploration policy. We welcomed the generation of momentum in Europe toward human and robotic space exploration in the European Commission's plan for implementing European Space Policy in 2003, and ESA's publication last year of objectives and interests in space exploration. In the future, I hope that you will maintain this momentum by encouraging the ESA Ministerial of 2008 to commit to a program of synergy and common purpose, that will bring our programs closer together, and that will allow us to leverage our limited funds to mutual benefit.

In summary, we thoroughly enjoy our productive relationship with France in space activities, both through bilateral and multilateral agreements with CNES and through French membership in ESA. We understand that there are many reasons to invest in the noble goal of space exploration, but that the same reasons will not have the same weight for all participants, and that other nations will embrace similar goals from different perspectives. In 2004, Jacques Blamont wrote that in the world outside

the U.S., the decision of any government to spend money for space programs is motivated by societal factors, and not only to “fulfill the public’s sense of destiny” as some have said about the U.S. space program. I agree with Professor Blamont on this point. France will identify its own rationale for pursuing space exploration – one that meets its national goals and the needs of its unique society, just as we do. France will carry those ideas forward to its partners in Europe, and beyond. But in the end, I believe that we share common purposes and goals, and that it makes sense to pursue these mutual interests together, as France and the U.S. have done in space for the last fifty years. I sincerely hope that this will be the case for decades to come.

Not long ago, those of us in this business questioned whether we would ever again leave low Earth Orbit. But now the question is not whether humans will extend their presence throughout the Solar System. The questions are who will do it, how and when will it be done? I believe we have a firm handle on defining the “how” and the “when”. As an engineer, I understand these variables. What I cannot control is the “who.” Europe’s decision on whether or not to pursue an ambitious program in space exploration is, of course, a decision that only Europe can make. Europe certainly has the capability. I believe it has the ambition. And I believe the French people have the visionary leadership to influence the rest of Europe to choose a path of partnership with the United States that will benefit us all.

I hope my words today have given you cause to consider this question, and to join us and other spacefaring nations on what I believe will be the greatest of human adventures.

Thank you.