Remarks by the Honorable Sean O'Keefe
NASA Administrator
American Astronomical Society Annual Meeting
Denver, Colorado
June 1, 2004

President Pilachowski (Pil-a-Chow-Skee) (Dr. Catherine Pilachowski) thank you so much for your warm welcome and the opportunity to speak to the distinguished members of the American Astronomical Society.

We live in an age of extraordinary scientific advancement with astronomy at the forefront.

For our part I come to Denver today with three basic messages:

First, NASA is committed to conducting world-class astronomy from space with multiple instruments on a sustained basis through our planning horizon and well beyond.

Second, in the near term we will continue to operate an enormously capable suite of astronomical instruments. We currently have 13 ongoing space astronomy missions. Among those missions, one we all care deeply about is the Hubble Telescope. We are determined to do our best to develop a reliable means for Hubble to remain among those capabilities.

Finally, NASA's space astronomy activities are integral to the President's vision of extending humanity's exploration and discovery horizons. As we pursue this vision, we will continue to build space-based telescopes to expand our capabilities.

Our sustained interest in astronomical leadership isn't new and won't diminish.

When NASA was founded forty-five years ago, the United States was just beginning to send small satellites into orbit.

Yet fueled by a charter that compelled us to advance scientific knowledge and understanding of the Earth, our Solar System, and the Universe, NASA's first scientists were already energetically planning to scan the far reaches of the heavens.

In their drawings and schemes, they were demonstrating our propensity to dare no small dreams.

Thirty-five years ago, on December 7th, 1968 we launched our first space telescope, the Orbiting Astronomical Observatory.

This was three weeks before the Apollo Eight crew gave all of us here on Earth dramatic close up views of the moon's surface for the first time while Bill Anders, Frank Borman and Jim Lovell memorably read from the book of Genesis--the story of creation--in an unforgettable Christmas Eve broadcast.

Of course, for space astronomy the best was yet to come. The development of the Space Shuttle enabled us to place in orbit the first three of our four great observatories--the Hubble Space Telescope, Compton Gamma Ray Observatory, and Chandra X-Ray Observatory.

Now, with the successful initiation of the infrared Spitzer Space Telescope, named for Professor Lyman Spitzer Jr., a true giant of 20th century astronomy, astronomers are able to look at the universe at high precision throughout almost all regions of the electromagnetic spectrum.

Today its almost as if we are celebrating a coming out party for the Spitzer Space Telescope. It's had a spectacularly successful mission thus far, helping us better understand the formation of stars and planets. I know that Lyman's wife Doreen,

whom I had the honor of meeting last December, is tremendously proud of the Spitzer team, as am I.

With the advent of the Spitzer Space Telescope, we can now better describe the different component parts of the Universe and form a more complete understanding of the objects that make up the vast expanse of creation. Indeed, this is just a recognition that we are at the beginning of this quest.

An example of how we are combining the output of the Hubble, Chandra and Spitzer telescopes with ground based telescopes and the European Space Agency's XMM-Newton to advance astronomical knowledge can be found in the work of the GOODs team, or Great Observatories Origins Deep Survey.

Using this synergistic approach, the GOODs team today is announcing results that dramatically highlight our ability to learn much more about distant galaxies and quasars. We should all recognize that

the ability to have coordinated observations of objects in space is a relatively new phenomenon. I salute the GOODs team for organizing this remarkable effort.

There are other accomplishments worth cheering about that I wish to briefly mention. The men and women of NASA were thrilled when Dr. Ricardo Giacconi (Jia-Co-Nee) received the 2002 Nobel Prize in Physics for his pioneering work on X-Ray Astronomy, which contributed to the development of the concept for the Chandra X-Ray Observatory.

As Dr. Giacconi (Jia-Co-Nee) noted in his eloquent Nobel Prize address in Stockholm, it is amazing to consider what has been accomplished in a little over forty years in this new field, when one considers the several thousand year human quest to expand our knowledge of the universe through visible means.

Of course, the best is yet to come. Just think how much our knowledge of the Universe will expand when we launch the Constellation-X armada of X-ray telescopes in the next decade.

We also continue to marvel at the output of the Wilkinson Probe, which has produced the most detailed map of the early universe ever produced.

The Wilkinson's map provides a wealth of information about conditions in the early universe, and also provides a definitive age of the universe--13.7 billion, and is refining our views of the early Universe to within 370,000 years after the Big Bang.

Another operating mission, Galex, is generating an ultraviolet sky survey of galaxies in our local Universe.

We are similarly excited by the success thus far of our Stardust probe, which on January 2nd captured ancient material from the comet Wild-2 a priceless

scientific cargo we intend to recover and study in two years.

On June 30th, we look forward to another first: the insertion into orbit around Saturn of our Cassini spacecraft. Cassini's exploration of Saturn will later be followed by the placement of the European Space Agency's Huygens (Hoi-Gens) probe into the methane rich atmosphere of Saturn's fascinating and mysterious moon Titan.

As is always the case with exploration, the real thrill and anticipation in orbiting Saturn is what we might soon discover that we never expected. It is the nature of exploration and has been so since the dawn of humankind.

Peering a bit over the horizon we are also making steady progress on some really impressive space astronomy projects. Work on the Kepler and Space Interferometry missions are progressing for

their launches later this decade to discover planets orbiting nearby stars.

Our next flagship observatory mission is the James Webb Space Telescope. This telescope, which will be placed at the L-2 LaGrange Point a million miles from Earth will help uncloak the dark age after the Big Bang. The Webb Telescope is on track for operation early in the next decade. Indeed, the President's budget increased funding to assure all resources necessary to achieve operational conditions as promptly as possible.

The only impediment to immediate operation is the time it takes to build it. I'm pleased that the Engineering test mirror segment for the Webb Telescope is in production. Also, we have made excellent progress on the near infrared detectors for the telescope. These detectors meet all of the flight requirements. Our challenge over the coming years

will be to produce a large number of these high quality detectors.

Also under development are such ambitious projects as the Laser Interferometer Space Antenna, or LISA, which is designed to detect gravity waves, and GLAST, the Gamma Ray Large Area Space Telescope. All of these are truly major scientific undertakings.

Yes, we have a lot on our plate when it comes to expanding our scientific frontiers. Indeed, we have multiple eyes on the skies today and many more on the way or actively in development. We're not about to go blind.

I also recognize that a pressing question is what we are doing to keep the Hubble Space Telescope operating?

Allow me to provide some perspective. Hubble is one of the most accomplished scientific

instruments ever created. It has helped us confirm the existence of black holes, define the nature of quasars, more precisely measure the age of the universe, examine the birth and death of stars, detect the acceleration of the universal expansion rate, and even measure the components of the atmospheres of planets that orbit nearby stars.

Indeed, this great instrument has captured the imagination of people the world over. Hubble and the people who operate this incredible device were even featured as heroes on 60 Minutes two years ago--a little different treatment than I got from Ed Bradley a few months ago.

Indeed, the achievements of outstanding scientists, many of whom are in this room, are penetrating with great meaning into the consciousness of people throughout the world. And along the way, it's been quite an adventure.

As all of you know, our four Space Shuttle Hubble servicing missions turned an instrument that was once lampooned as the telescope that couldn't pass an eye exam, into a modern marvel.

A year ago, plans were well underway for a fifth Shuttle mission to service Hubble. But all this changed following the tragic loss of Columbia.

Earlier this year, I delivered to the Hubble project team and the scientific community a most difficult decision to suspend the planned Shuttle servicing mission.

As I have publicly and repeatedly stated, we are committed to implementing the Columbia Accident Investigation Board's recommendations.

In their report, the Columbia Accident Investigation Board addressed the need for development of on-orbit inspection, repair, and

contingency rescue requirements for every Shuttle flight.

Those factors bear on any decision to proceed with Shuttle operations and acutely bear on requirements surrounding a Hubble servicing mission.

A mission to the Hubble would require the development of a unique set of procedures, technologies and tools different from any other mission we'll fly before the Shuttle fleet retires. Many of these capabilities which provide safety redundancy for ISS missions are primary or singular for a Hubble mission. Moreover, these Hubble unique methods must be developed and tested promptly before Hubble's batteries and other critical systems give out.

We are making steady progress in our efforts to meet the safety requirements for the Shuttle return to

flight next year. But based on where we are today, prospects are even more challenging than six months ago for our being able to develop in time all required safety and return-to-flight elements for a servicing mission before Hubble ceases to be operational.

The easy route would have been for us to keep plugging along and hope for the best. But "hope" is not a management method we should rely on to keep Hubble operating. The Columbia Accident Investigation Board recommended that we change our culture to a commitment to "prove that it is safe" rather than place the burden of proof on folks to "prove that it's not safe." Well, with that guidance in mind, we're nowhere near close to proving that it's safe. It's not the unknowns we are wrestling with, it's the knowns that we haven't yet devised a way yet to conquer.

Accordingly, I found it would not be responsible to prepare for a servicing mission, only to find that the required actions identified by the Board could not be implemented.

This likely condition would pose a Hobson's choice. It is likely we would have two untenable alternatives to choose from. Either fly the Hubble mission without fully complying with the Board's recommendations or allow Hubble to simply cease to function.

The prospect of either of these options if we had put all our eggs in the Shuttle servicing basket is simply unacceptable.

Equally untenable is the expectant atmosphere that would exist all the way up to a launch "go or no go" decision. This is precisely the type of "schedule pressure" that the Board quite correctly stated would

significantly undermine the future safe operation of the Shuttle.

Some have observed that this analysis is flawed. This might well be, but it is the analysis I've conducted and the judgment I've reached based on a very close, regular review of the Return to Flight challenges currently underway. Others may reach a different conclusion and harbor a different opinion, but none who have offered opposing views will be responsible for the outcome. In that regard, several editorial opinions have been offered asserting that my judgment is risk averse. Journalists have written stories about other journalists and the empowered opinionated who are offering this view and describe the criticism as "withering." Actually, it's pretty much standard fare for commentary on just about everything around Washington these days.

Instead, let me offer my view of "withering." Withering is the feeling you get when you are standing at a runway with the dawning realization that the Shuttle everyone is waiting for isn't going to land. Withering is when you have to explain to wives, husbands, parents, brothers, sisters and children that their loved ones aren't coming home alive. Withering is attending funerals, memorial services, and ceremonies over 16 months in number too many to count any more, yet having every single one of these events feel like the weight of that responsibility will never be relieved. Withering is the knowledge that we contributed to the Columbia disaster because we weren't diligent.

Well folks, this decision isn't because I am risk averse. Everything we do at NASA has an element of risk. Every day we operate the International Space Station with crew living aboard continuously--and

every day it takes to return to flight adds risk to that endeavor. No, this isn't about risk aversion. It is the price of diligence. The diligence we failed to exercise before. Sometimes that exercise of diligence earns you a dose of criticism. But it's hardly withering. I've seen withering and our diligence will lower the prospect that we experience that again. But we'll never erase the possibility, because everything we do will have a measure of risk. While there may be withering events again in our future, it won't be because we weren't diligent--it'll be in spite of it.

But our objective, given the constraints we've placed on ourselves even in the post-Columbia environment, is still to maintain the Hubble as a productive scientific asset. In this regard, NASA engineers are working diligently to extend Hubble's life through new and imaginative operations that will

allow it to do world-class science even as its systems degrade.

Fortunately, there may be other options for extending the Hubble's useful work…good options that are looking more promising as we've examined them more closely. Our confidence is growing that robots can do the job.

For the last few months some of the best and brightest engineers at NASA, within industry and academia have been tirelessly evaluating the options for servicing Hubble by autonomous, robotic means. This approach now appears to be technically feasible. And the way it started was that we asked the question rather than clinging to a single point solution.

Of course on any prospective complex mission of this nature, whether conducted by humans or robots, there are enormous challenges to be faced and no guarantees of success. We are not yet at a point

where we have a firm alternative, but we're getting pretty close.

But let's remember where we were 14 years ago. Many of the same critics and editorial writers that offered their opinion lately had written off Hubble as a techno-turkey, and many skeptics said humans couldn't' fix it. However, a number of dedicated people, including some of you here today, found ways to fix Hubble's vision. And on the first Hubble servicing mission, astronauts not only repaired it, but also over the years have reinvented the telescope each time they've visited the observatory.

In the same can-do spirit that propelled the first Hubble servicing mission, I am very pleased to inform this community that NASA is releasing a call for proposals today for a robotic Hubble servicing capability. This specific request for proposals calls for methods in ascending order of complexity, to:

first, safely de-orbit the Hubble; second, to extend Hubble's service life by adding batteries and new gyroscopes; and third, to install new scientific instruments.

This request for proposals is the first step in a long process of developing the best options to save Hubble. We are on a tight schedule to assure a Hubble servicing mission no later than the end of calendar year 2007. But we must act promptly to fully explore this approach.

In essence we seek capabilities that highly dexterous robots assisted by humans on the ground could bring to this mission. What we are looking for is not autonomous robotics, but tele-robotics. If this mission goes forward, people will still be servicing Hubble.

We are now at a point where these proposals can give us the means to seriously judge whether a

robotic servicing mission can be mounted in time to replace Hubble's aging batteries, restore the pointing system with new gyros, and install new scientific instruments.

I would like to add that NASA's chief scientist, Dr. John Grunsfeld, the last astronaut to have touched the Hubble literally, is passionately committed to saving Hubble. John wanted to be here today for this discussion. But like the true explorer that he is, John following up on a longed planned adventure is currently climbing Mt. McKinley in Alaska. John has been one of the leading architects of this concept to save the Hubble and he believes it will work.

Other experts are also examining this matter. The National Academy of Sciences is pursuing a multi-faceted study that, among other things, will look at the state of the observatory and the options for servicing.

The 20-person study board is composed of some really stellar people, including space scientists, astrophysicists, robotics experts, and former astronauts, engineers, and systems reliability experts.

These folks were carefully chosen for the expertise they bring to the complex decision process we must undertake about how to plan for the rest of the Hubble mission.

I expect this group of experts will give us an honest, objective opinion.

But given that Hubble's service life is steadily winding down, time is of the essence. While we await the Academy's report to help guide our assessment we don't intend to sit out the summer before we move ahead.

I am charging NASA's Hubble Project Team and the Space Telescope Science Institute to continue their excellent planning for extending Hubble's

service life and to evaluate these proposals for robotic servicing so we can make an informed decision promptly. In the parlance of the "culture" gurus examining our Agency these days, this is what's called "good schedule pressure."

I would also like to discuss a central benefit of the kind of servicing mission we are investigating. Clearly, this approach will demonstrate autonomous rendezvous and docking.

Such a mission will open the door to more ambitious robotic activities to assemble and service massive telescopes in space, as outlined in the new vision for space exploration.

The vision, as directed by President Bush will have us pursue several large-scale systems integration challenges. This servicing mission could be a near-term technology demonstrator. Indeed, it is a precursor to our efforts to construct advanced

telescope searches for Earth-like planets and habitable environments around other stars.

If the Terrestrial Planet Finder, a major NASA project for the next decade, succeeds in discovering extra solar planets with evidence of life, NASA would pursue additional space telescopes that can image their features. Life Finder or Planet Imager telescopes would likely be very large and complex spacecraft located far from Earth.

We can imagine needing both advanced robotics and a human presence in deep space to help erect such future telescopes. Astronomy is an essential component as we advance this ambitious exploration agenda.

Indeed, as we push the frontiers of our knowledge and extend our exploration horizons throughout the solar system and beyond, the science of astronomy will be there. Answers to grand

questions about the history of liquid water on Mars, the possible existence of life elsewhere in the cosmos, the origin of life on planet Earth, the origin of stars and galaxies, and the nature of the elusive dark matter and dark energy are all within our grasp.

The vision for space exploration, using humans and robots, provides the framework to answer these profound questions and more.

The active support of the AAS for this vision will help make this strategy a reality. But we need your help and I implore you not just to count on others to make this vision a reality.

As we try to answer the questions that we know now to ask, who knows what new mysteries will be presented to us by the awesome Universe that lies so tantalizing close to us here in the rarified air of Denver, Colorado?

And as we examine all these options, we'll keep faith with the commitment to diligence that is the Columbia legacy. I'm reminded of that commitment every day. Every morning on the way in, and every evening on the way out, in the hallway leading to my office I pass the near life sized portraits of Rick, Willie, Mike, Laurel, Dave, Kalpana, and Ilan. By our diligence we will lower the prospect of adding to this gallery of heroic people. Among the ceremonies and gatherings I've attended over the past year was a gala for the Challenger Center. At the conclusion of the evening in Houston, the organizers invited all the survivors of the Apollo 1, Challenger and Columbia crews to gather. Scores of family members assembled. By our diligence we will minimize the chance of addition to this courageous legion who will live with our actions the rest of their lives. Each one

of you will receive a Columbia Shuttle pin as you leave this hall today if you would like one.

I thank you for all that you are doing as Dr. Einstein said to perform the mission of science totally and fully. We are all more knowledgeable as a consequence of your diligence and scientific pursuits.

I urge your active support for NASA's ambitious science, exploration and discovery agenda. Together let us continue to glean from the lights that dominate the night sky the knowledge, wisdom and perspective that will most certainly contribute to the betterment of all humanity. Thank you again for the courtesy of permitting me to join you today.