Doubts linger about space station's science potential

April 20 2012, By Mark K. Matthews, The Orlando Sentinel

After more than 12 years and at least $100 billion in construction costs, NASA leaders say the International Space Station finally is ready to bloom into the robust orbiting laboratory that agency leaders envisioned more than two decades ago.

"The ISS has now entered its intensive research phase," said Bill Gerstenmaier, head of NASA operations and human exploration, in recent testimony to Congress in defense of the roughly $1.5 billion the agency spends annually on the outpost.

But doubts linger.

More than a quarter of the space that NASA has designated for experiments sits empty. Much of the research done aboard the station deals with living and working in space - with marginal application back on Earth. And the nonprofit group that NASA chose to lure more research to the outpost has been plagued by internal strife and recently lost its director.

And more broadly, questions remain about whether NASA can develop U.S. capability to send experiments up and bring them back to Earth - and whether, in fact, the station can live up to the promises that were used to justify its creation.

"Now that NASA has finished ISS construction, I hope the incredible potential of ISS is not squandered," said U.S. Rep. Ralph Hall, R-Texas,

chair of the House science committee.

This "incredible potential" is what NASA used to justify the decision to build a space station, which has been in the works since the Reagan administration.

"When we finish, ISS will be a premier, world-class laboratory in low-Earth orbit that promises to yield insights, science, and information, the likes of which we cannot fully comprehend as we stand here at the beginning," said then-NASA chief Dan Goldin during a 2001 congressional hearing.

In the decade following, NASA and its international partners used the space shuttle and other vehicles to assemble the station, complete with several on-board laboratories lined with science "racks." These racks, each about as big as a telephone booth, provide a home for dozens of experiments and can stream data and video to researchers back on Earth.

But then - as now - some questioned the station's future as a center of science. They note much of the research done aboard the station deals with surviving the space environment, from studies of spaceflight's effect on human muscles to developing improved smoke detectors for human spacecraft.

Privately, some NASA officials worry the outpost could feed into the agency's reputation as a "self-licking ice-cream cone" in that space-based experiments help NASA keep doing space-based experiments.

Others note that station research - there have been about 500 American experiments and 800 international ones - has produced comparatively little scientific literature. Thomson Reuters Web of Science, which tracks such publications, has identified about 3,000 scientific articles that have resulted from station research.

By comparison, a 2001 satellite that cost about $150 million - NASA's Wilkinson Microwave Anisotropy Probe - has generated more than three times as many papers; many scientists used the probe's analysis of temperature differences in space to theorize about the origin and structure of the universe.

"If you wanted to grade space-station science, it would be an incomplete right now," said Jeff Foust, editor of The Space Review, a popular online magazine.

He said critics could make the argument that money spent on the station might be better invested in other missions. For example, the budget-busting James Webb Space Telescope, seen as successor to the Hubble telescope, still is only a fraction of the station's cost at nearly $9 billion.

But, Foust said, "there is a rationale for the ISS that goes beyond simply science" - promoting partnerships and better relations among space-faring nations, including Russia.

NASA officials, however, say research is just beginning and already there have been advances.

Scientists at Johnson Space Center have taken advantage of the station's lack of gravity to develop "micro-balloons" the size of red blood cells that can carry drugs to cancer tumors. And the European Space Agency is looking to help doctors better diagnose asthma by using an air-monitoring device developed for astronauts.

"It's the tip of the iceberg," said Marybeth Edeen, NASA manager of the station's national laboratory.

The inability to completely fill NASA's science racks, she said, is simply one of priorities. Up until now, NASA has been more focused on

building the station. Indeed, the station crew - which expanded from three to six members in 2009 - now spends about 50 hours a week on science, as opposed to just three hours a week in 2008.

"Our goal is to get the racks fully utilized," she said.

To help do that, NASA hired a nonprofit group last summer called the Center for the Advancement of Science in Space (CASIS) to manage the national lab and find new experiments.

The early efforts of the Florida-based group, however, hit a bump when the center's director resigned in March and lawmakers started to raise concerns about its effectiveness. Congress since has put CASIS on notice to get its act together or risk losing its contact.

These issues, though, are less worrisome to Congress than concerns about how NASA plans to resupply the station with U.S. crew and cargo.

The retirement of the space shuttle last year left NASA completely reliant on its international partners - primarily Russia - for these services, and NASA's plan to fix that situation depends on new commercial "space taxis" from companies such as SpaceX.

While tests have been promising, these companies have yet to successfully dock with the station.

A key test is scheduled later this spring when SpaceX attempts to berth its Dragon capsule to the station.

If successful, SpaceX could start hauling cargo - and experiments - to and from the station later this year, a company spokeswoman said.

In the meantime, NASA is making plans to expand its research

capability.

This summer, the agency plans to fly a small centrifuge to the station aboard a Russian rocket to increase the capability to conduct cellular investigations.

"The whole attitude and focus of the program has shifted in the last year," Edeen said. "We are increasing utilization as fast as we can."