SPACE EXPLORATION

NASA human space-flight programme lost in transition

US space agency is wrestling with competing visions and uncertainty of budget deadlock.

BY ADAM MANN

NASA should be revitalized "not just with dollars, but with clear aims and a larger purpose," US President Barack Obama said last April, after cancelling the previous administration's under-resourced Constellation programme of rockets and capsules for human space flight. But 12 months later, money and clarity are in short supply at the agency, which finds itself hamstrung by a budget showdown and buffeted by conflicting messages from Obama and the US Congress about the next steps in human space flight (see 'Space wars').

This week may finally bring some relief on the fiscal front — if Congress manages to pass a 2011 budget, now more than six months overdue. That would free NASA from its lingering 2010 budget requirements, which have prevented it from starting new projects or from terminating funding for Constellation. But a larger debate remains unresolved over what rockets to build to replace the venerable space shuttle, due to make its penultimate flight on 29 April.

"I've spent over 40 years closely observing the US space programme and I've never seen it as confused as it is now," says John Logsdon, former director of the Space Policy Institute at George Washington University in Washington DC. "It's simply a mess."

The goal of the Bush-era Constellation programme was to develop rockets and capsules that could both replace the shuttle and take astronauts beyond low-Earth orbit to the Moon and, ultimately, to Mars. In cancelling it, Obama called for increased spending on new rocket technologies for voyages beyond Earth's orbit, extended the end date of the International Space Station (ISS) from 2015 to 2020, and invested in private space-flight companies to ferry crew and supplies to low-Earth orbit.

The plan failed to impress Congress, particularly those members representing regions that benefit from the federal dollars NASA contracts bring. It "has spawned thousands of lost jobs" and "cast fear and doubt" throughout the space-flight industry, said Ralph Hall (Republican, Texas), chairman of the House Committee on Science, Space, and Technology, during a House subcommittee hearing on human space exploration on 30 March. Other legislators caution that Obama's proposal to buy space transportation services from private contractors is an invitation to delay and possibly disaster.

SPACE WARS

NASA is currently bound to continue funding the cancelled Constellation programme. President Obama wants to shift low-Earth-orbit launches to commercial companies such as Space X (maker of the Falcon 9 rocket and Dragon capsule, pictured right, top and bottom), whereas Congress wants NASA to develop its own vehicles (such as the Orion capsule, top left, and the cancelled Ares V rocket, bottom).

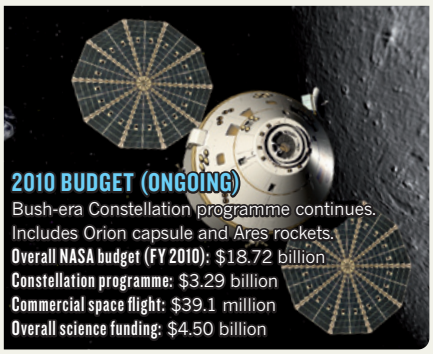

IMAGE LEFT, C. THOMPSON/SPACE X; FAR LEFT, NASA

IMAGE LEFT, SPACE X; FAR LEFT, NASA

In September 2010, Congress offered up a proposal to resurrect parts of Constellation under another name. In an authorization bill — which provided direction but no money — it told NASA to produce a multi-purpose crew vehicle (MPCV) and a heavy-lift launch system with similar specifications to those of Constellation's Orion crew capsule and Ares V rocket. The new rocket, to launch by 2016, would have to be capable of taking astronauts beyond low-Earth orbit. The bill calls for NASA to maintain as many contracts from Constellation as possible to avoid the US$2.5 billion in termination fees that Obama's plan would have triggered. The plan's overall budget comes in about $1 billion lower than projected for Constellation.

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Obama signed the bill into law in October, but the debate is far from settled. In its 2012 budget request, the administration allocates $850 million towards aggressively promoting the development of commercial space transportation — 70% more than Congress authorized. And although Obama's request includes $2.81 billion for work on the MPCV and heavy-launch vehicle, it does not specify a target date for the launch of the rocket, or what vehicle might carry the MPCV in the interim.

The Obama administration and Congress also differ on what size the heavy-lift rocket should be. The authorization act says it must be capable of delivering 130 tonnes into orbit, 4.5 times more than the shuttle. Last month, NASA administrator Charles Bolden told reporters that he does not think that the 130-tonne lift capability is necessary for at least a decade, when the president's plan calls for

manned missions beyond low-Earth orbit. Doug Cooke, NASA's associate administrator for exploration systems, expanded on this during the House subcommittee hearing, saying that NASA officials plan to develop a vehicle with an initial capability of 70–100 tonnes, which would allow the agency to launch it by 2016 or soon after.

Meanwhile, funding remains in limbo. The previous Congress failed to pass a budget for this year, and November's mid-term elections swept a Republican majority into the House of Representatives that is bent on making drastic cuts to government spending. With the two parties deadlocked over the 2011 budget, members have had to opt for a series of short-term measures that maintain 2010 programmes and funding levels. Constellation continues to be funded, delaying work on any new initiative.

Some argue that the roughly $250 million spent on Constellation in the current fiscal year has not been wasted. For example, on 21 March, Lockheed Martin Space Systems, based in Denver, Colorado, unveiled a new simulation centre where engineers will try out docking manoeuvres with the programme's Orion crew capsule. The capsule meets most requirements from the authorization bill and all indications are that it will be selected as the MPCV, says Larry Price, deputy programme manager for Orion. Continuing Constellation's contracts in this way is in NASA's best interests, he says. "As you can imagine, it would have been hugely inefficient to stop something, redistribute the labour force, and start it over again — especially if it's exactly the same," he says.

Even if NASA finally achieves the clarity Obama promised a year ago, it faces many years with no way to send people into space. The last time the agency had a similar gap — between the end of the Apollo programme in 1975 and the first shuttle launch in 1981 — it knew what was to come next. The shuttle programme had been announced three years before Apollo's conclusion.

The current situation is much worse, said James Maser, chairman of the corporate membership committee at the American Institute of Aeronautics and Astronautics, during the House subcommittee hearing. "We simply do not know what is next," he said. ■

BIOMEDICAL RESEARCH

Rare-disease project has global ambitions

Consortium aims for hundreds of new therapies by 2020.

BY ALISON ABBOTT

Prader–Willi syndrome. Fabry renal disease. Spinocerebellar ataxia. Few people have heard of these and the other 'rare diseases', some of which affect only hundreds of patients worldwide. Drug companies searching for the next blockbuster pay them little attention. But the diseases are usually incurable — and there are thousands of them.

This week, the US National Institutes of Health (NIH) and the European Commission launch a joint assault on these conditions, whose small numbers of patients make it difficult to test new treatments and develop diagnostic methods. The International Rare Disease Research Consortium being formed under the auspices of the two bodies has the ambitious goal of developing a diagnostic tool for every known rare disease by 2020, along with new therapies to treat 200 of them. "The number of individuals with a particular rare disease is so small that we need to be able to pool information from patients in as many countries as possible," says Ruxandra Draghia-Akli, the commission's director of health research.

At the launch meeting in Bethesda, Maryland, on 6–8 April, prospective partners will map out research strategies to identify diagnostic biomarkers, design clinical trials and coordinate genome sequencing in these diseases. Nearly all the rare diseases, of which there are an estimated 6,000–8,000, are the result of small genetic changes.

The meeting will also discuss the governance of the project, which is most likely to be modelled on the pioneering Human Genome Project. As such, the consortium is open to research agencies and organizations from all over the world. Representatives from countries including Canada, Japan and some individual European nations are all attending the meeting, and may join the consortium. Those wishing to participate will have to pledge a minimum financial contribution, which has not yet been agreed, and share all relevant data. Indeed, the project will have to overcome numerous obstacles to information sharing, such as the fact that physicians in different countries often use entirely different words to describe the same disease.

Draghia-Akli points out that the project could yield major benefits for the emerging field of personalized medicine — another political priority for the NIH and the commission — which also faces the challenge of small populations of patients.

"We need to be able to pool information from patients in as many countries as possible."

Regulatory agencies such as the US Food and Drug Administration and the European Medicines Agency rely on large, randomized and controlled clinical trials when deciding whether to approve new medicines, and one of the aims of the consortium will be to develop alternative clinical-trial methods for diseases that affect few people.

These methods are becoming ever more important now that genome analysis is helping to break down common diseases into ever smaller subclasses. "Soon there will be no disease called breast cancer," says Draghia-Akli. Instead, the catch-all term will be replaced by "a large number of rare diseases, each of which causes malignant growth in breast tissue and requires individual treatment", she says.

The commission will launch a €100-million (US$140-million) call for research proposals in July, which will support the consortium's scientific goals by focusing heavily on developing appropriate clinical trials. ■

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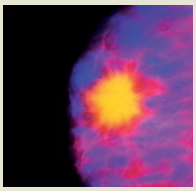

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