

NASA ponders 'carbon copy' of crashed mission

Since the Orbiting Carbon Observatory (OCO) crashed into the ocean minutes after its 24 February launch, researchers at NASA and elsewhere have been working on how else they might get the data on atmospheric carbon dioxide levels that the mission was meant to collect.

Within a week of losing the satellite, NASA, which spent US\$278 million and seven years developing OCO, put together a committee

of two dozen climate scientists to weigh up various options. Should they rebuild OCO with existing designs and launch it as quickly as possible? Start a new design that would take longer to develop? Or fund ground and sub-orbital carbon measurements, while working with

existing greenhouse-gas monitoring satellites such as Europe's Envisat and Japan's Greenhouse gases Observing Satellite (GOSAT, also known as IBUKI).

The case against reincarnating OCO is that the spectroscopy it used to measure carbon levels needed reflected sunlight to work, preventing it from making measurements at dawn, dusk and night. Many scientists, including OCO's principal investigator David Crisp, of the Jet Propulsion Laboratory in Pasadena, California, think that probing the atmosphere

with lasers will eventually offer a way to get round-the-clock data and thus see important effects such as those of nocturnal respiration by soil organisms.

But laser-based systems are technologically challenging. In a recent competition to design atmospheric-science satellites the European Space Agency eliminated a laser-based carbon-dioxide-monitoring mission, A-Scope, citing insufficient readiness. The technology for a

similar NASA mission called ASCENDS (Active Sensing of CO₂ Emissions over Nights, Days and Seasons) is still in development.

Crisp, who chaired the post-OCO working group, says that something like ASCENDS wouldn't launch until at least

2015. Other options — putting OCO-type instruments on weather satellites or on the International Space Station (ISS) — would also take a long time, and in the case of the ISS would miss the polar regions.

So — as expected — the bottom line of the report by Crisp's committee, submitted to NASA on 2 April, was that the agency should build an OCO "Carbon Copy" with the same design and instruments and launch it as soon as possible. Getting the data quickly is "critical to support national policy initiatives", says

"In all our opinions, the need for these data is just as high, if not higher, now as when the observatory was first planned."



Crisp. The repeated mission would cost more or less what OCO cost, and could be ready for launch in the autumn of 2011.

Michael Freilich, head of NASA's Earth-science division, has sent the white paper out for review and says he will make a decision "possibly in May". But even if he plumps for a rebuild, paying for it might be difficult. As

NASA/JPL

Collision debris increases risk to Earth-observing satellites

The collision of two communications satellites on 10 February has significantly increased the risk to Europe's Earth-observing programme.

The European Space Agency's ERS-2 and Envisat missions are 30% more likely to face a catastrophic impact from space debris in the wake of the collision, according to Heiner Klinkrad, head of ESA's Space Debris Office in Darmstadt, Germany. The absolute risk remains small, but there were seven 'near misses' last year in which objects passed within 200 metres of the satellites. The satellites provide

a range of environmental data, including in the case of Envisat some measurements of carbon-dioxide levels similar to, although less precise than, those that were expected from NASA's lost Orbiting Carbon Observatory (see "NASA ponders 'carbon copy' of crashed mission", above).

The increased hazard is the outcome of a collision between a spacecraft in the Iridium satellite constellation and a defunct Russian military satellite (see *Nature* **457**, 940; 2009).

At present, the debris cloud from the collision contains roughly 800 items of 10 centimetres or larger.

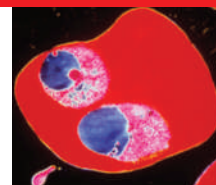
Models show that number could rise to more than a thousand by the end of the month, says Richard Crowther, head of the United Kingdom's delegation to the United Nations Committee on the Peaceful Uses of Outer Space.

The debris field is smaller and more concentrated than many had originally feared, according to Brian Weeden, a technical consultant with the Secure World Foundation, based in Superior, Colorado. That is probably because the two satellites dealt each other only a glancing blow. "It wasn't a dead-on collision," he says.

The concentrated debris field

means that only satellites at fairly similar altitudes face a significantly enhanced risk. That could include some US and Canadian Earth-observing satellites. But spacecraft farther away, such as the Hubble Space Telescope and, when it services Hubble, the space shuttle *Atlantis*, seem relatively safe. US Space Command is tracking the larger pieces of debris, and ESA is making its own radar measurements, with the aim of arranging evasive action, if necessary, to avoid another accident.

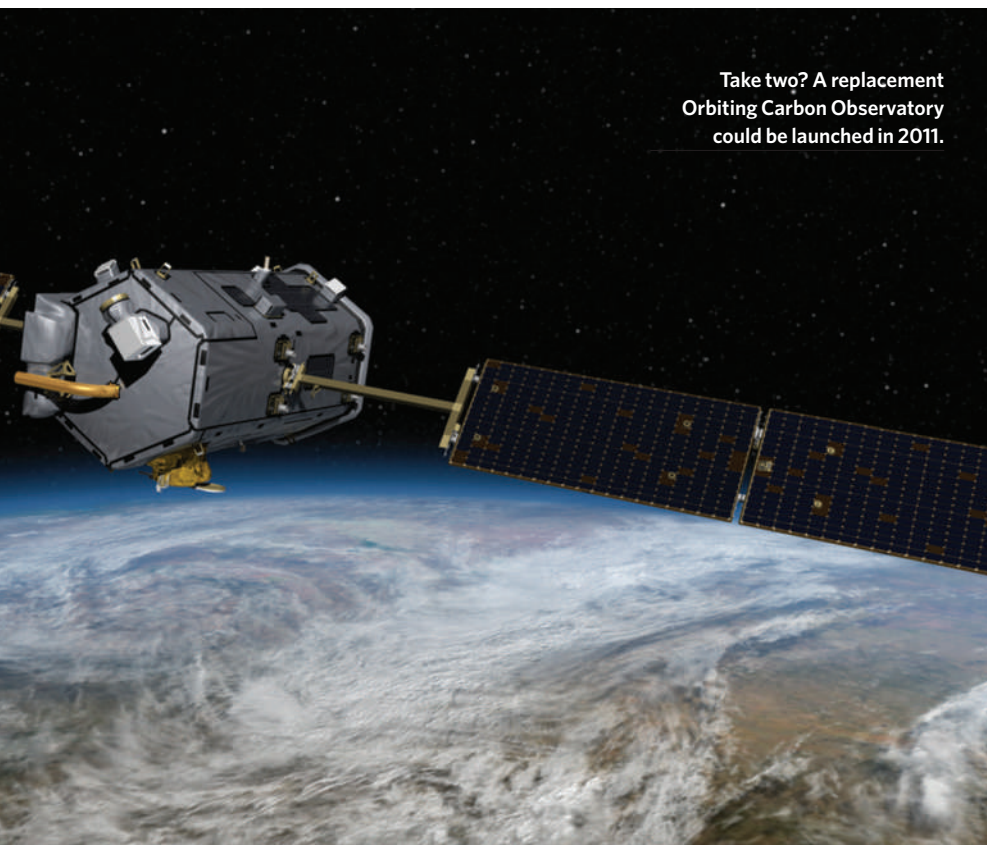
Geoff Brumfiel

**FIGHTING MALARIA**

Drug helps quinine kill resistant parasites.

www.nature.com/news

CNR/SPL



Take two? A replacement
Orbiting Carbon Observatory
could be launched in 2011.

Little progress seen at climate talks

On 29 March, the initial day of the first of three preparatory meetings for the Copenhagen climate-change summit in December, Todd Stern, the US special envoy on climate change, drew thunderous applause when he told the delegates that he was “determined to make up for lost time”. When the meeting ended on 8 April many of the 2,000 delegates had the impression that there was still a lot of making up to do.

Stern told the 175 national delegations that the implementation of a national cap and trade programme could help cut US emissions by around 15% from current levels by 2020, and by 80% by 2050. But he declined to say how feasible such a policy might be politically. Illustrating the challenges, 89 US senators recently voted to adopt a non-binding budget amendment stipulating that climate legislation should not increase gasoline or electricity prices.

Developing countries, including South Africa, India and China, told the Bonn meeting that they expect rich nations to commit to a 40% cut by 2020. Yvo de Boer, the executive secretary of the United Nations Framework Convention on Climate Change (UNFCCC), acknowledged that getting rich nations to agree to 25–40% emissions cuts by 2020 will be “very difficult”.

Another point of contention was the money that poorer countries will need for adaptation programmes. The UNFCCC's Least Developed Countries Fund allows rich countries to support such programmes in the poorest nations and thus meet some of that need, but to date it stands at only US\$172 million. Overall, development agencies talk of a need for sums at least 100 times greater. “There is still no clarity over the scale of financial and technological resources that would be available to developing countries,” said Shyam Saran, the Indian prime minister's special envoy on climate change.

Oil-exporting nations, led by Saudi Arabia, are also interested in a transfer of funds, saying they will demand compensation if a climate agreement cuts oil revenue. “We share the concern for climate change but at the same time we don't want to be a victim,” Mohammad Al Sabbah, an adviser to Saudi Arabia's Ministry for Petroleum and Mineral Resources, told reporters in Bonn.

Quirin Schiermeier

OCO was lost just six weeks ago, the only money in the budget that might naturally flow to Carbon Copy is the \$23 million earmarked for OCO's operating costs. That might be a start — and might hold Crisp's team together after its current budget runs out in June — but if Carbon Copy is to fly it needs either new or diverted money.

It might seem that the \$150 million recently added to NASA's fiscal-year 2009 budget for Earth science by Congress, or the \$400 million more given to the same end in the stimulus package, would fit the bill. But there is a queue for that windfall. Landsat, a US Geological Survey land-mapping mission that NASA is procuring, and Glory, a mission due to be launched later this year to study aerosols and clouds, could both use more money if they are to stay on schedule. And other new Earth-science missions recommended as priorities by the National Academies also need to get started. “We have far more to do than the available resources given us,” says Freilich.

There are other options. Carbon dioxide can be monitored from the ground. Pieter Tans, who heads ground-based carbon-cycle monitoring for the National Oceanic and Atmospheric Administration from the University of Colorado in Boulder, points

out that with his \$5-million annual budget, he can monitor 84 spots, mostly in North America, via ground-based sites, aircraft, or ships. That represents approximately half of the world's non-satellite effort to monitor carbon dioxide.

Tans was on the OCO science team, but says he has long worried that excitement about satellites — which are, after all, NASA's stock in trade — leads politicians and policy-makers to neglect ground- and aircraft-based measurements. A more even split in spending between ground and space would allow him to boost his network of sensors by an order of magnitude, he says.

Crisp acknowledges the importance of the ground-based network — OCO needed it to calibrate its indirect measurements — but says there are things only a satellite can do, especially considering the importance of enforcing international climate treaties. “Try putting a CO₂ station the middle of China,” says Crisp. “Try it in the Congo.”

What all concerned agree on is the need to do something soon. Says Ken Jucks, OCO programme manager at NASA, “In all our opinions, the need for these data is just as high, if not higher now [as when OCO was first planned].”

Eric Hand