

Re: Fuel cell?

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- *From:* "Jeff Findley" <jeff.findley@xxxxxxxxxxxxxxxx>
 - *Date:* Fri, 8 Sep 2006 10:35:45 -0400
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<ljfinger@xxxxxxx> wrote in message
news:1157569652.794431.243700@xx

Jeff Findley wrote:

Since the fuel cells are so hard to service on the shuttle,
why not design the thing to operate nominally on three fuel cells but
include a fourth specifically to cover the case of a fuel cell problem on
the pad?

Each fuel cell weighs 255 pounds. If you carry an extra redundant fuel
cell, which crew member would you leave behind? What about extra
redundant sets of everything else that can go wrong? Is it okay to
leave the payload behind?

It depends on how important it is for the shuttle to launch on time. True
that cost is paid in terms of both dollars (for the extra fuel cell) and in
terms of payload. Note that airliners also have these sorts of issues and
will routinely fly with systems not working. I've flown on at least one
turboprop flight that was flown unpressurized and had to stay at 10,000 feet
max due to this.

As for fuel cells, I believe problems with them have delayed more than one
launch and caused one flight to return to earth early and was later
reflown. Delays and reflights aren't cheap.

At some point, you have to decide how much redundancy you **require** for
launch and then design in exactly that amount, and no more. Otherwise,
you have to carry all those redundant parts for the other redundant
parts into space with you on every flight.

Where I work, there's requirements, and there's desires. Requirements
have to be met or you don't get to ship the product. Desires are put in
only if there is room, time, money, and etc. left in the budget. Deciding

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whether to classify something as a requirement or a desirement is often the topic of many heated meetings involving middle management.

Of course this whole fuel cell thread is being done with the benefit of hindsight. When the shuttle was originally designed, there wasn't a whole lot of data about how these things perform in microgravity. But now we can use the shuttle experience to build upon for the next gener