Re: Reasonable Minimal Size for a 2−Man Capsule?

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- *From*: henry@xxxxxxxxxxxxx (Henry Spencer)

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In article <1165218817.283949.304370@xxxxxxxxxxxxxxxxxxxxxxxxxxxxx>,
Oren <oren@xxxxxxxxxxx> wrote:

> that's a conservative number because aluminum is not actually the best
> shielding; something with a lot of hydrogen in it will be better.

> Water has a lot of hydrogen but unlike polyethylene it can be moved
> around easily. If you store a layer of water in the walls and then use
> it for evaporative cooling during reentry you can theoretically use the
> same mass for both radiation shielding and heat shielding. Is there a
> potential net mass gain here?

It's mildly interesting even for those modest shielding masses, and much more so if the shielding requirement is raised to handle giant flares (which Apollo just took its chances with).

However, water cooling for reentry is poorly explored and a cautious capsule designer might think it overly risky. (Another area where NASA could do spaceflight a lot of good with an X−rocket series, sigh.)

> The lunar lander also needs significant radiation shielding and all
> that mass is carried down into the moon's gravity well and up again...

Whether the lander needs significant shielding is not clear. Apollo did *not* shield its lander; the procedure for a major flare was for the guys on the surface to head back to the CSM pronto, as soon as the radiation gauges started to rise. If you can do that at any time, and you think you'll have enough time for it(*), you may not want to shield the lander.

(* The joker in the deck is the 20 Jan 2005 flare, which was the most intense in spaceflight history *and* hit like an avalanche, with none of the long slow rise seen in other giant flares. That caused a lot of rethinking of radiation−protection ideas.)

An alternative is to adopt the philosophy that the lander is only for
travel, and that the first thing you do on arrival on the lunar surface is
to unload the living quarters and bury them well enough to shield them.
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