

Oberg-Fobos-Nov21-Surviving Reentry

JimO Nov 21 // 08:10 PM gmt

Replying to [quote author=Ben the Space Brit link=topic=27289.msg831516#msg831516 date=1321882677] -- *I think that the hope is that the heat of re-entry will cause the propellant to explode. However, if the tanks retain integrity (and the Russians do like building stuff tough), you get several 'bombs' full of pressurised, boiling hydrazine dropping on a random part of the globe.* [/quote]

Since tank valves usually are in piping external to the tanks, as the vehicle is torn apart by entry deceleration forces [15 to 20 Gs], the tank contents will have access to space. As the exterior heats, the internal fluids will carry off the skin heat by boiling, bubbles rapidly 'rising' to the back of the tank, and expelling prop [in liquid or gas form] out the broken lines. This will usually induce tank rotation, which will then distribute the external heat load over a wider region of the external skin, delaying tank skin physical failure.

You also have to realize that in a high-G entry environment the entering object very rapidly drops below the max heating regime -- MUCH more quickly than human-carrying vehicles that have to stretch out the heating regime to keep from crushing their contents.

In a 20-G profile you are braking at 200 meters/per second per second, enough to drop your 8000 meters/second orbital speed by 3/4 in about 30 seconds [along a track about 150 km long]. That's a SEVERE 30 seconds and most structures and contents probably WILL tear apart and disperse, but experience has shown that a lot of them do NOT, and spacecraft propellant tanks in particular are fairly common 'finds' across the face of the Earth.

So you are correct to say this is the policy of 'hope', and trusting in the odds -- but considering the cost of coming up wrong, it's not a bet anyone should be satisfied in choosing, if there's any other choice.

If the Russians were so darned sure that everything would always burn up completely and safely, why not deorbit their end-of-life spacecraft over Russian territory? They don't make a habit of that because they DO know the odds.

Although -- they DO routinely deorbit Soyuz 'service modules' along with the crew descent modules aimed at Kazakhstan, and I've never seen any report of tanks surviving from THOSE vehicles. Nor would I expect to see them, even if they are found from time to time.