There exists numerous articles about the Virgin Space vehicle crash. A number of engineers quit the company a few weeks before the crash, swearing they would never work there again. In this article I will cover two areas which no one seems to be talking about.

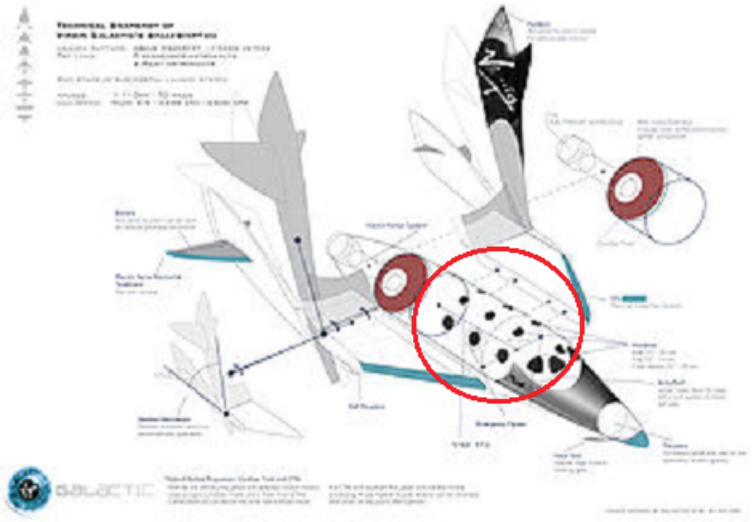

Fig. 1 – This was obtained from Wikipedia - Virgin removed images of the inside of their spacecraft from their website as of this writing. [1]

Black areas (circled) above passenger seats are probably portholes for viewing Earth. Reviewing the space-craft's specifications is lists NOTHING about safety features such as ejection seats. [2] It does claim their "hybrid engine is safe, and can be shut down anytime during boost phase." What happens if this engine shuts down when it should not? With all the space-shuttle faults it had, once those solid boosters were ignited they never went out.

In the recent crash both pilots ejected. Ejection at 50,000 feet at Mach 3.5 (a speed which Virgin claims for speed) is incredibly dangerous. Sudden exposure to this altitude is equivalent to explosive decompression. Witnesses saw the pilot that died fall to Earth in his ejection seat, hit the ground then bounce150ft. up in the air and then came down again – without his parachute opening.

Without a space-suit your blood boils. If you are a passenger on this space-plane you DO NOT GET A EJECTION SEAT. Flying in this space-plane is the same as being in one of today's commercial jetliners – you with live or die.

It is the same with Virgin as it is today on a commercial jet, but far more dangerous. Commercial pilots joke today about the jetliner "crash position:" Pilots say, "Tuck your head between your legs, and kiss your ass goodbye."

Suppose you did have a ejection seat – would you get enough nerve to pull the handle twenty miles up in the air? Many of us have not forgotten what happened to the lost Challenger astronauts, or this recent dead Virgin employee. What if only the pilot has control of your ejection seat? Will he try to save the plane to save his job, save your life – or only save his life?

Fig. 2 - Crashed vehicle has a carbon composite fuselage. It is interesting that not one single wire or cable is visible in this photo. (Photo credit: Reuters)

Interior cylindrical pressure vessel which holds passengers is visible in this photo. This vessel is black, indicating it may be a carbon composite.

FACTS ABOUT CARBON COMPOSITES

Everyone raves about how great carbon composites are. How these materials are light in weight, strong etc... but these are also brittle. When over-stressed it is well known carbon composites quickly come apart. What holds carbon composites together? GLUE.

If carbon-composites are so wonderful and weight-saving, why hasn't Boeing, Lockheed and other companies made entire aircraft from this material? There are good reasons for it which we'll cover below.

Many years ago, NASA/Langley performed a carbon composite panel test using one of their fighter aircraft. Their all-aluminum aircraft dissipates a direct lightning strike without crashing, just as modern jetliners can. This test was required to qualify carbon composites before aircraft manufacturers like Boeing and Lockheed could start using carbon fiber to reduce weight.

For one of the tests, NASA replaced a section of a aluminum wing with a carbon composite panel of exactly the same size. Plane took off and headed for a thunderstorm cloud to induce a lightning strike. After the plane was hit several times, it landed for inspection. What the engineers and scientists found was shocking – a hole about 12” in diameter was made in the carbon fiber. Where other lightning strikes hit the aircraft, either no damage occurred or only a tiny pin-hole was found.

Why did this happen? Carbon is electrically resistive, unlike aluminum which has a very low resistance. When current passes through carbon it becomes hot due to electrical resistance, exactly the same way electric ranges, curling irons, toaster ovens, toasters etc... become hot when turned on. These appliances use metal elements, not carbon. Carbon has a higher electrical resistance than metal heating elements have; therefore carbon will dissipate more heat.

For more than 100 years electronics used carbon resistors for this very same reason. Most likely you have a television or radio in your home or vehicle with dozens of these resistors.

According to one of NASA's science papers on carbon-composites:

“Composite skinned aircraft are far more vulnerable to lightning strikes than their aluminum skinned predecessors. The electrical current incident on an aircraft from a typical lightning strike can exceed 200,000 amperes, occurring in less than a fraction of a second.
Without proper lightning strike protection, the carbon fiber/epoxy composites can be significantly damaged, particularly at the entry and exit points of the strike.” [3]

Did you catch the statement “far more vulnerable?”

Calculating actual lightning power in watts:
current (in amperes) x voltage = direct current power
200,000 amperes x 2,000,000 volts = 400,000,000,000 watts.

Yes, that really is 400 BILLION watts of power (lightning is a direct current pulse.)

During my career as a government contractor and project manager, while at NASA/Langley on business in the late eighties I was told by a scientist that a hole about 12” across was created in a test panel by a lightning strike on a aircraft. It shocked everyone - they never realized this much damage could happen.

Despite these test results and “claims of significant damage” their paper, NASA further states in that same science paper:

“Even though lightning damage can occur on a composite aircraft, the damage level and associated risk to flight safety is deemed acceptable by the FAA and does not compromise flight safety.”

Apparently a large hole in a wing or fuselage is not a problem with aircraft. Tell that to any pilot! But that paper makes no mention of the large hole previously encountered in a test.

Newest reference listed in NASA's un-dated paper is 2006, which dates the paper to no earlier than 2006. That was about 20 years after I was told about the test damage. Perhaps it was industry pressure that made them white-wash this entire lightning subject.

Next time you fly on a jetliner, relax in your seat and take comfort in knowing that some of the panels on the fuselage are made of carbon-composites.

Lightning itself acts very strange and is extremely unpredictable. Several people are on record of being struck by lightning with no clouds in the sky and the Sun was shining. For unknown reasons lightning is known to travel horizontally for many miles, looking for a path to ground.

Another important question remains: Has Virgin ever performed proper lightning tests on their all-carbon-composite space-craft? Does Virgin think having their spaceport out in the desert makes them immune from unexpected lightning strikes? Official cause of the catastrophic vehicle failure has not been revealed as of this writing.

I WAS optimistic about the world having a private space-craft company. Now it appears more and more this will be a death trap riddled with safety issues. How many famous people who shelled out the six figure airfare will die if this vehicle design is FAA certified and takes people into space? They are putting way too much faith in technology which is so immature and untested, it has baby crap all over it.

It clearly looks like too many corners were cut in this space-craft design to save weight and get it FAA certified as space-worthy as soon as possible. After all, Virgin is like any industry and is based on cash flow...

Ted Twietmeyer

[1] http://upload.wikimedia.org/wikipedia/en/f/f5/SpaceShipTwo_technical_diagram.jpg
[2] Vehicle fact sheet: http://www.virgingalactic.com/uploads/141501863048197/original.pdf
[3] http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20090034169.pdf