A Letter to NASA Administrator Jared Isaacman

Subject: Opportunity to Save Astronaut Lives, NASA, and the U.S. Space Program

By Dr. Charles Camarda

I have slept very little since the Artemis heat shield meeting in Washington, D.C., on January 8, 2025. What I observed during that meeting was significantly worse than I had anticipated, even prior to receiving detailed information and relying only on my professional intuition, my background in research engineering, and more than fifteen years of study in organizational behavior and accident-causation mechanisms.

My concerns were intensified by the extremely limited time available to review the NESC and IRT reports, followed by a three-hour data exchange that was largely framed and presented by the Artemis Program Tiger Team. These constraints prevented a truly independent technical assessment and reinforced organizational patterns I have seen repeatedly in the lead-up to past aerospace failures.

More than three years ago, I formally requested a proper and truly independent external tiger team review—composed of researchers and scientists from NASA, government laboratories like Sandia, and academia. That request was denied by then-senior NASA Leadership. I therefore appreciate your decision to allow me to be briefed by the Artemis team this past Thursday.

I am writing to provide you with this assessment because we are rapidly approaching the launch of Artemis II, and the technical and organizational issues associated with the Orion heat shield represent a serious risk.

Based on the information available to me, I can state the following with high confidence:

1. The Artemis Program does not understand the root cause or true failure mechanisms that led to heat shield spallation on Artemis I.

The program cannot predict failure for even small arc-jet and radiant heating test samples (12- to 24-inch scale), let alone for the full-scale 16.5-foot diameter Orion heat shield because it is not using a validated, integrated multi-physics analysis.

The Crack Indicator Tool (CIT), which has not been thoroughly reviewed and validated by external subject matter experts, is claimed to be physics-based and conservative. In my judgment, it is neither. Its predictive capability lies somewhere between the crude CRATER tool used to predict damage for the Columbia accident and the slightly better

Mark Salita model used for the Challenger accident and may be inaccurate by orders of magnitude. As such, it cannot predict the true failure mechanism, which is most likely related to crack initiation, crack propagation, and other mechanisms that lead to spallation.

If you cannot validate the failure mechanism , as stated above, you cannot predict with any certainty that the steps you claim will mitigate the problem (e.g., the trajectory modification) aren't actually exacerbating the problem and/or causing other unintended consequences.

2. Decision-making has relied on a single internally controlled narrative.

The briefing and supporting material reflected almost exclusively the Artemis Program Tiger Team's perspective. I place very little confidence in the IRT report, as it did not perform any independent analysis and did not even recognize or challenge the claim that root cause had been demonstrated through physics-based methods.

3. NASA lacks sufficient independent multi-physics expertise applied to this problem.

Only one individual at NASA conducted a true multi-physics analysis, he stated at the meeting for all to hear, that it was only qualitative and not able to predict the failure mechanism, spallation. Three years ago, I proposed forming a multidisciplinary team across Sandia and NASA centers to address this. That proposal was denied by NASA leadership.

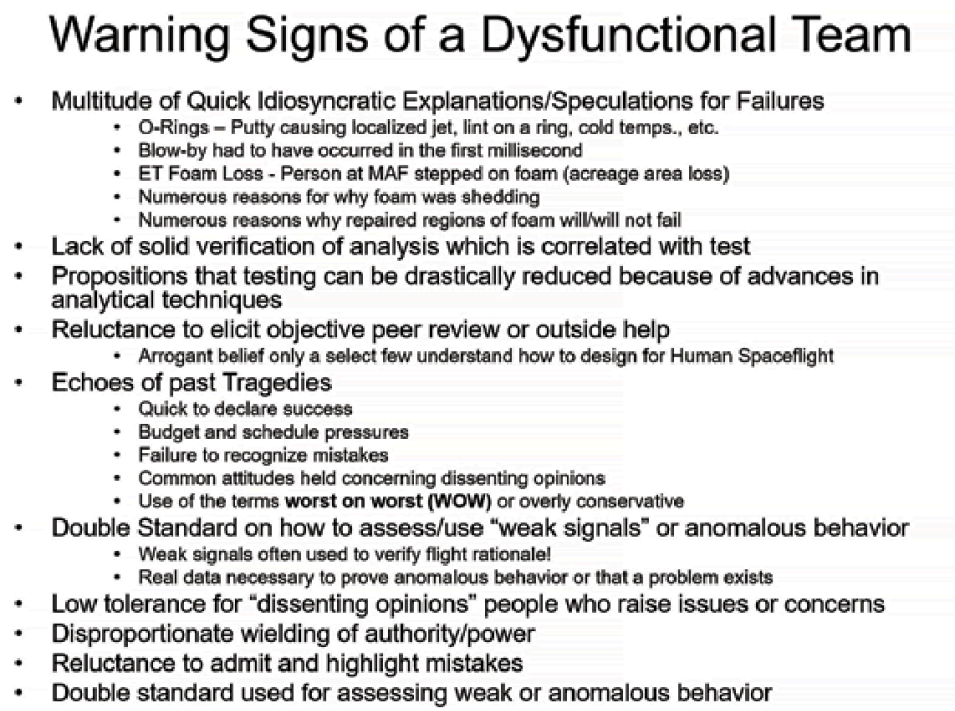
4. The NESC itself acknowledges how little is known about the true failure mechanism which is the first step in the flight rationale logic .

NESC Finding 1 states:

> **AVCOAT material response is dependent on time history of heating, sample dimensions, and manufacturing variability (e.g., local permeability/porosity, tamp planes) so its behavior cannot be characterized in ground testing to a degree that permits precise prediction of crack initiation and propagation at flight conditions.**

When the "technical" managers in the NESC and NASA HQ could not understand what I was telling them post Columbia, I had to simplify my message and give them some warning signs to calibrate the narrative they were hearing from their internal teams. I saw many signals of dysfunctional teams during that heatshield meeting in D.C. that were

related to both Shuttle accidents and the inability to understand the true failure mechanism of both prior accidents and the 8R RCC wing leading edge anomaly during and following my mission as explained in Chapter 4 of my book[1].



Conclusion

History shows accidents occur when organizations convince themselves they understand problems they do not. This issue exhibits the same patterns that preceded past catastrophes. NASA can still choose a different outcome. This is a defining moment which can set the tone for the transformation that is necessary. Every prior Administrator has passed on this opportunity!

Reference

1. Camarda, Charles J.: "Mission Out of Control – An Astronaut's Odyssey to Fix High-Risk Organizations and Prevent Tragedy". Headline Books Inc. 2025.

2. Camarda, Charles J.: "Evaluation of RCC Damage Growth Tool (RDGT) with Respect to Claims of Conservatism. November 2007. https://drive.google.com/file/d/1rCL5Zw3ZxaLm3uBVnUsxm3WVkmkkavCm/view?usp=sharing

3. Harris, Charlie: "Preliminary Findings: Peer Review – Damage Growth Tool." April 22, 2005 https://drive.google.com/file/d/1tmHhFKW0GHo5n2UPoCYDEZApciJuLXQE/view?usp=sharing