NASA Engineering and Safety Center (NESC)
Request Closeout Summary

Submit this form, with associated documentation attached, to the NESC Review Board (NRB) Executive Secretary.

Section 1: NESC Request Database Information

Request #: TI-22-01723	**Title:** Corrosion Evaluation of Dragon Heat Shield for Reuse

Requestor: Theresa Costa

NESC Lead: Richard Russell, NASA Technical Fellow for Materials

Section 2: Request Information

Team Members:

Materials Technical Discipline Team (TDT):
Rick Russell, KSC
Mike Viens, GSFC
Eliza Montgomery, KSC
Bill Frazier, Consultant

Structures TDT:
Kauser Imtiaz, JSC
James Smith, JSC
Paul Lam, ARC
Deneen Taylor, JSC
Joachim Beek, JSC

Completion Date:

January 20, 2022

Request Scope:

Commercial Crew Program (CCP) Materials and Processes (M&P) Engineering has requested NESC assistance in the evaluation of corrosion damage of the heat shield designated for reuse on the Crew-4 capsule.

Section 3: Results of Work NESC Performed

Description of Results:

The NESC Materials and Structures TDT representatives participated in several CCP Engineering Review Boards (ERBs) supporting ERB-21-0318, "SpaceX Crew-4 Dragon Heat Shield Reuse Risk Acceptance/Hardware Acceptance/Reuse Certification." The NESC concurred with the CCP engineering position that this heat shield can be flown for Crew-4 only (b) (4) (b) (4) with the following statements:

Rick Russell: "The NESC Materials team reviewed the technical content presented from ERB-21-0318. Because of the increased risk associated with corrosion-related damage, the design and use of (b) (4) (b) (4) structures exposed to water immersion should be discouraged. It is felt the (b) (4) test results presented to date may not conservatively bound the potential degradation of the full-scale structure. The X-ray techniques are not qualified to assure that all the water has been removed during the drying operations; therefore, corrosion degradation will continue until launch. However, after reviewing the stress and loads analysis data and gaining additional understanding of the loading conditions as well the Acceptance Test Procedure, I am comfortable with a single flight of this heat shield (b) (4) . This is contingent on a verification of water removal via X-ray. Also, any reuses of this or any other heat shield should not happen without a more comprehensive testing and inspection program."

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Kauser Imtiaz: "Based on the work performed by SpaceX shown in the presentations by NASA and SpaceX and the fact that that cyclic loading is benign, I agree with the risk posture (b) (4) and a single Crew-4 heat shield reuse."

Section 4: References and Documentation (attach all associated program/project documentation and NESC products that were not presented at an NESC Review Board).

Include Title and File Name (if applicable)

NESC Products:
N/A

Program/Project References/Documentation:
"SpaceX Crew-4 Dragon Heat Shield Reuse Risk Acceptance/Hardware Acceptance/Reuse Certification Reuse Certification, Crew-4, Decisional," presented by Costa, T., Jacobs, J., Koshti, A., Stanley, D., Edgecombe, J., and Valle, G., ERB-21-0318-R2, January 14, 2022.

"SpaceX Crew-4 Dragon Heat Shield Reuse, Decisional," presented by Costa, T., Jacobs, J., Edgecombe, J., and Koshti, A., PCB-22-035, January 20, 2022.