

# ESD.864 CLASS CASE #1

## NASA's Model Standard

Released Tuesday, February 12. Memo due Tuesday, March 5. Presentation Tuesday, March 12.

In the follow-up to the accident involving the space shuttle Columbia in 2003, the Columbia Accident Investigation Board (CAIB) identified several problems relating to the use of models and simulations in NASA's work. This stemmed from the use of a model, called Crater, to assess impact damage. The shuttle Columbia disintegrated upon re-entry into the atmosphere. The ultimate cause of the accident was determined to be damage caused to the shuttle's thermal protection, which occurred when a piece of foam struck the wing during launch.<sup>1</sup>

During the flight – after the foam strike, but before the re-entry – the Crater model was used to assess the damage, and the engineers judged that the damage would not be extensive enough to damage the shuttle's heat shield. That conclusion was wrong. Several problems with model use were identified by CAIB, including that the model was used outside its validated input domain and that assumptions and uncertainties were never discussed with the mission team.

A more general NASA report following up on the CAIB recommendations<sup>2</sup> suggested that a NASA-wide model standard to ensure the appropriate use of models and simulations in decision-making processes.

As a group, you should define your case study around the development and/or use of the NASA model standard (feel free to narrow the topic according to the elements you are most interested in). What are they? Why did NASA come up with these standards? Are they useful beyond NASA?

A few references to get you started are posted to the Course website. This include a few background papers on standard development, a copy of the standard itself, and a technical note by ESD Prof. deWeck's group on their efforts to certify a model of their design according to the NASA criteria. You are expected and encouraged to do further research on your own.

Remember to follow the general instructions for your memo and presentation.

+1 Extra credit point opportunity for anything that channels the spirit of NASA Mohawk Guy.

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1 For more information about the accident, see the report of the Columbia Accident Investigation Board at <http://caib.nasa.gov/>

2 [http://www.nasa.gov/pdf/55691main\\_Diaz\\_020204.pdf](http://www.nasa.gov/pdf/55691main_Diaz_020204.pdf)

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