Risky Consensus: Engineering Disasters & the Epistemology of Collective Decision-Making

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A. Overview of events leading up to the disaster

B. Apparent Consensus Proceedings

The norms in play during apparent consensus (or no-objection) proceedings differ significantly from those during typical voting procedures. Using factors outlined by John Beatty, we can note four points that played a role in the decision to launch the *Challenger*:

1. It is not sufficient to simply indicate disagreement, instead "the objector has to provide a reason."
2. There "may arise a point […] where dissenters realize that they have been heard by other reasonable people but found unconvincing."
3. Continued dissent beyond this point is a violation of the social norms. Beatty appeals to Phillipe Urfalino's explanation here: the value of objection is based on the "strength" of the arguments and not on the mere fact of the objector's disagreement.
4. Epistemic opacity: the process obscured range of views and extent of disagreement.[2]

C. Voiced & Unvoiced Dissent

Roger Boisjoly's report of the off-caucus meeting preceding the final discussion with NASA provides a useful picture:

> Those of us who opposed the launch continued to speak out, and I am specifically speaking of Mr. Thompson and myself because in my recollection he and I were the only ones that vigorously continued to oppose the launch. And we were attempting to go back and re-review and try to make clear what we were trying to get across, and we couldn't understand why it was going to be reversed. So we spoke out and tried to explain once again the effects of low temperature. Arnie actually got up from his position which was down the table, and walked up the table and put a quad pad down in front of the table, in front of the management folks, and tried to sketch out once again what his concern was with the joint, and when he realized he wasn't getting through, he just stopped.
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> I tried one more time with the photos. I grabbed the photos, and I went up and discussed the photos once again and tried to make the point that it was my opinion from actual observations
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> that temperature was indeed a discriminator and we should not ignore the physical evidence that we had observed (v4 part 7 p. 1418-1419).[1]

Brian Russell explained:

> I didn't make - I think I can only recall making one comment in the caucus. I can't even remember what that was, and it was very brief, and I don't think it made a big impact at all. And the reason that I didn't make so many comments, despite what I felt, was that Roger and Arnie were making the points to the best they could, and I couldn't see a way of making them any better (v4part7, p. 1486).

D. Impact of Procedural Norms, Changes, and Epistemic Opacity

Bob Lund, in hindsight, noted the change in procedure, stating that they had "been in the position of defending our position to make sure that we were ready to fly," but now found themselves in a situation where they needed to prove that they weren't ready for launch, which they were unable to do (v1ch5 p. 94).

Allan McDonald stated:

> And I was surprised here at this particular meeting that the tone of the meeting was just the opposite of that. I didn't have to prove that I was ready to fly. In fact, I think Bob Crippen made the most accurate statement I ever heard. His conclusion from that meeting was the philosophy seemed to have changed because he had the same impression I did, that the contractor always had to get up and stand up and prove that his hardware was ready to fly. In this case, we had to prove it wasn't, and that is a big difference. I felt that was pressure. (v4 p. 1303-1304)

Russell noted that while not all participants were understanding one another, the points being made didn't involve "any new data" but "pretty much talked over the same types of things." Russell recalled, "So we got to a point in the caucus where Mr. Mason said, *and rightfully so*, we are covering the same information, we are not talking about anything new here, and it's time for a decision" (v4 p. 1486, my emphasis).

Jerry Mason testified, "we couldn't *show* direct correlation with O-ring temperature" (v1chpt5 p. 92).

Russell worried about whether he would "have the courage" to vote against the launch if asked and "whether [he] would be alone" (v4 p. 1487). Even though he was present for the entire discussion, the fact that engineers didn't participate in the vote left Russell with some uncertainty about his colleague's ultimate positions.

Boisjoly recalled:

> From this point on, management formulated the points to base their decision on. There was never one comment in favor, as I have said, of launching by any engineer or other non-management person in the room before or after the caucus. I was not even asked to participate in giving any input to the final decision charts.
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> I did not agree with some of the statements that were being made to support the decision. I was never asked nor polled, and it was clearly a management decision from that point (v4 p. 1420).

Stanley Reinartz testified:

> I collectively asked all parties if there were any disagreement with Thiokol's rationale and recommendation as stated by Mr. Kilminster. There were none... (v5part1b p. 1666)

E. <u>Recommendations</u>

1. Determine whether a general and widespread consensus exists prior to employing no-objection proceedings.
2. Ascertain whether the proposed position or resolution seems to be in keeping with majority views. Do not prioritize a non-existent consensus (e.g. positions in opposition to the majority of participants).
3. Disparate views: avoid the use of no-objection proceedings in situations involving significant disagreement because this approach is designed to prioritize and favor a particular conclusion.
4. Encourage participants to voice positions of disagreement and provide an avenue for participants to indicate their agreement with points of disagreement expressed by prior speakers.
5. Make sure the deliberating body recognizes the ambiguity of silence.

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[1]Report of the Presidential Commission on the Space Shuttle *Challenger* Accident, Vol. 1-5. Washington D.C. June 6th, 1986. https://history.nasa.gov/rogersrep/genindex.htm

[2]John Beatty, "Consensus: Sometimes It Doesn't Add Up" in *Landscapes of Collectivity in the Life Sciences*, edited by Snait Gissis et al, MIT Press, 2017.