

Book Review

The Challenger Launch Decision. Risky Technology, Culture, and Deviance at NASA

By Diane Vaughan. The University of Chicago Press, Chicago and London, 1996, ISBN 0-226-85175-3, US\$24.95, 575 pp.

This is an exceptionally interesting book at two levels. It is a painstaking analysis of the ill-fated decision to launch the *Challenger* space shuttle: it is also a framework of analysis for decision processes within complex organisations. It is, in fact, the second in a series of three books on theorising about organisations while also dealing with specific instances. It is not easy to read—not for any deficiency in style, for it is an admirably written book, but it is full of detail, the subject is inherently complex, and the author is engaged in what resembles a personal odyssey through what she terms a ‘straw man’ account, to her ‘revisionist’ explanation of the disaster.

The tragedy occurred in January 1986 when *Challenger* was destroyed 73 seconds into launch, and all seven crew members perished. The technical cause of the failure was subsequently ascribed to the rubber-like O-rings which were intended to seal the joints of the solid rocket booster and to the decision to launch when the calculated O-ring temperature was below 53°F. In the Report of the Presidential Commission which followed, and in other sources, it became evident that design problems with O-rings had long been known to NASA, as were problems with them associated with low ambient temperatures at launch.

A fundamental question which this posed was: why, given this knowledge, was the decision to proceed with the launch on 28 January 1986, nevertheless, taken? In other words, technical failure was the proximate cause; it did not explain why NASA went ahead at that time. A further fundamental question was: why did NASA persist with a design which had occasioned so much concern over a prolonged period prior to the *Challenger* launch?

Professor Vaughan approached this by looking at the decision process as it unfolded. Studies of disasters tend to look on them with hindsight and to ask how they can be avoided in the future: this book is an exercise in ‘historical ethnography’ in which the decision process is presented as the decision makers saw it in an evolving situation. This situation or environment she categorises as “the production of culture, the culture of production, and structural secrecy”. Within this culture are to be observed:

- (a) “An incremental descent into poor judgement”. Thus, for a variety of reasons, problems with the rocket joints were met, not by re-designing of the joint, but by attempts to make adjustments in the existing design. At each stage of the process, the book argues, the engineers and managers believed that they had contained the problems so that flight was an ‘acceptable risk’. By that phrase—which so disturbed the distinguished physicist on the Presidential Commission, the late Richard Feynman—NASA meant that, on the basis of experience, the corrected

faults were now most unlikely to lead to mission disaster.

- (b) Given that the first decision in a prolonged process tends to become a precedent for future decisions, the stage is set for just this kind of incremental descent. Since, moreover, NASA was operating with untried technology, they tended to rely on the experience base so that, in effect, the risk boundary was shifted on the basis of experience in which it appeared that O-ring problems had been contained.
- (c) Ways of thinking and acting become institutionalised, a scientific paradigm becomes established. Hence, the warning signals about the O-rings, specifically the problem of erosion, were met by the following of established procedures rather than by fundamental reappraisal. Moreover, the language of decision making was specific to NASA: for example, a difficulty with rocket joints might be described as a ‘Launch Constraint’. The Presidential Commission interpreted this to mean that it should constrain a launch, i.e. it should not take place; but, in NASA, the term “was frequently used to assure that problems so designated received special attention in reviews”. It did not mean that a launch be aborted: the designation would be lifted if, and only if, contractor engineering analysis and recommendation was to proceed.

Professor Vaughan here seems to be making a rather fine point, but there is force in her general point about the use of language and in the numerous examples she cites which led ultimately to what she

考虑到在一个长期过程中，最初的决策往往会成为未来决策的先例，这种“逐步滑向错误判断”的局面就被设定好了

因此，关于O型圈的警告信号，特别是腐蚀问题，是通过遵循既定程序而不是通过根本的重新评估来解决的

语言也有问题

NASA的意思是，根据经验，修正后的故障现在最不可能导致任务灾难

calls the "normalization of deviance". That such conditions tend to exist in organisations is undoubtedly true; in business corporations, they may lead to misfortunes which seriously undermine the business. In the *Challenger* case, they led to seven deaths. There were voices which raised the question of the whole design of the joints, but evidently without sufficient effect: there appears to have been no mechanism for monitoring the organisational design and processes themselves. But, there is also the question that if the disaster reflects the 'banality of organizational life', what becomes of the concept of responsibility? In his book *Global Disasters: Inquiries into Management Ethics*, published in 1993, Robert Allinson remarks, in his chapter on *Challenger*, that "Top Management cannot simply claim that 'they did not know'. They have a responsibility for finding out." (p. 142: his italics: he does not, of course, ignore the importance of management and structure—on the contrary—but he does focus attention on the theme of responsibility). It is fair to add, however, that Professor Vaughan, while absolving managers from the charge of amoral misconduct, is explicit about the role of NASA's top administrators, for example, in changing the "goals, structure, and culture" of an institution faced with transformed conditions of economic resource pressures.

To recur to engineering and

the experience base: Professor Vaughan depends on an interpretation of both which underlies her judgement. She quotes with approval: "a design is a hypothesis to be tested", emphasises that it is illusory to think of engineering as always wonderfully precise—there is "debugging through use"—and quotes again that in a satisficing world, "conflict between cost and safety is an endemic struggle"; but, there then follows a striking section of the book which refers to the loss of "the institutional consensus for its mission that gave it abundant resources" and hence to "a compromised Space Shuttle Program but only with the promise of cost-effective space transportation". This change, already referred to in this review, is a significant element in the argument of the book; it is reinforced by reference to serious problems in NASA-contractor relations from 1971 and beyond.

The eighth of the ten chapters of the book is entitled "The Eve of the Launch Revisited" and, in emphasising that the decision to launch has to be seen as "one decision in a decision stream begun many years ago", it echoes what is said in the Preface—"how accumulating history intertwines with structural and cultural factors to affect decisions in organizations". It is hardly possible to form a definitive conclusion on the complete argument of a book which was 9 years in the

making and for which the author has examined thousands of pages of documentary evidence. There will, undoubtedly, be areas of controversy; that is already to be seen in other accounts which preceded this book, e.g. by Feynman and by Allinson. However, Professor Vaughan's work is formidable and is placed in the whole context of organisational study. Important lessons can be drawn from it, and it stands as a significant contribution to the study of decision-making in conditions of 'unruly technology'.

As regards the role of managers, the disaster is seen to arise from conformity within a rule-based system. Accidents, it holds, are inevitable. This is true, of course, in that there cannot be that perfection which would ensure that accidents were eliminated from human activity. However, it remains reasonable to ask, in any particular case, when and where things went wrong, and why the decision stream flowed in one direction rather than another. This, and the whole question of the nature of managerial responsibility at all levels, are critical both to an understanding of the *Challenger* disaster and of organisational behaviour as a whole. Professor Vaughan's book is a major contribution to these subjects.

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