

## From the APPEL Director

# Good Team Design

BY ED HOFFMAN



The decision to launch a shuttle brings together complex issues of many kinds—issues of engineering, safety, systems, technology, time, pressure, and people. All these elements are important and any of them can loom large. For me, the team dynamics on display in the long, intense Flight Readiness Review meeting are the most stunning.

In classrooms and team-building sessions, someone usually asks, “Why do we need teams?” The answer becomes self-evident during a Flight Readiness Review. The review is filled with project and engineering complexity; every decision is critical, with an impact on mission success and crew safety. The importance of effective teamwork becomes obvious in this situation. Good team design is essential, not a vaguely desirable “extra.” It makes the difference between success and tragedy. Sitting in on the Shuttle Flight Readiness Review, I saw many of the factors that go into good team design in action.

**Context and setting matter.** The entire team understands the importance of the decisions they make—to mission success and the lives of the crew. The setting supports and emphasizes their joint responsibility. The Flight Readiness Review takes place in a large, open room with a design that focuses attention on discussion and visual evidence. The primary decision makers sit at a long, central table. Anything displayed on the three large screens in front of the table can be seen from any seat in the room. Surrounding the central table are rows of seats in all directions. Everyone in the room can be seen and heard by all. At first glance, the seating may appear haphazard, but closer inspection shows it has the precision of an ant army. Special teams

are organized in different seating areas: teams from the centers, teams from engineering, teams from the program, teams from safety. Experts are gathered and organized to ensure that every relevant question will be posed and answered and every answer will be thoughtfully considered. This is not a place for hiding out or holding back. A big video eye in front records everything.

**Size and organization depend on the task.** The Shuttle Flight Readiness Review goes against the literature that advises minimizing the number of people on a team. There are more than one hundred people in the room, all of whom contribute at different points. The size of the team reflects the range of technical expertise needed and the interdependence of the systems they understand. There are no simple or isolated decisions in the review. Every decision has an impact on other systems. During the discussion about recently discovered cracks in hydrogen valves, solutions must be understood in the framework of the larger system. A seemingly reasonable solution can cause disaster if the systemwide impacts are not clearly understood and extensively tested. Schedule decisions affect numerous goals and multiple missions. For instance, a decision to reduce risk by delaying a shuttle launch creates additional risk on the International Space Station. The potential problems posed by a team of this size are reduced by organizing members into functional groups, small “communities” of experts that function as teams within the larger team.

These varied teams and sheer number of experts present provide the *diversity of ideas* essential to the complex, interdependent issues involved in Flight Readiness Review decisions. The collective

knowledge, experience, and cross-discipline wisdom are truly amazing and make it a joy and a privilege to watch the team in action. Decision making tends to take place either in the group as a whole or among the communities that work together under the broad headings of engineering, safety, and program.

Leaders—there are several leaders of the review process—must *balance* diversity of individual perspective and collective direction. They must encourage conflict and promote consensus to the appropriate degree at the appropriate times. Analysis and learning must lead to action, but the need to act cannot be allowed to undermine careful analysis.

It is impossible to overstate the amount of skill that goes into making this process work. The necessary expertise is not simply technical, because the right technical answers can only be arrived at with the help of strong project management and interpersonal skills. The project management perspective understands the implications for project cost, schedule, performance, and planning of every technical decision. And the collaboration that defines a successful review would be impossible without the interpersonal skills that build a foundation of trust, openness, inclusion, and respect.

*Good team design includes constructive feedback* that helps the team evaluate what it has done and adapt to new demands. This is where the relationship between successful leadership and the whole team is most evident. At the end of every critical phase of the shuttle review, the team is asked to provide thoughts. The leaders deliberately pause, visually scanning the room to encourage feedback. Everyone at the central table is asked for specific comments. Then industry leaders speak, taking responsibility for the elements of the system they are accountable for.

Complex, important projects make great demands on leaders and teams. Decision making under the pressures of mission aims, schedule, and life-or-death safety issues is stressful. That stress can help inspire high performance or push a team toward failure. Good team design that brings the right people

and the right processes together in the right setting is essential to ensuring the best possible decisions in such demanding situations. The STS-119 Shuttle Flight Readiness Review is a prime example of how good team design works and how it contributes to a successful outcome. ●

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