For steady-state solutions, CTAP returns single values (temperatures, heat flows, and/or mass flows) that describe the state of the cryogenic system. For transient solutions, CTAP returns rates of change of pressure and density, so that EASY5x can update the pressure and density accordingly at each time step, then pass new values of pressure, density, and any other parameters (e.g., external temperature) that might change with time back to CTAP.

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Refer to MSC-22862.

Safety and Mission Assurance Performance Metric

Relevant data are presented in formats that help managers make decisions.

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The safety and mission assurance (S&MA) performance metric is a method that provides a process through which the managers of a large, complex program can readily understand and assess the accepted risk, the problems, and the associated reliability of the program. Conceived for original use in helping to assure the safety and success of the International Space Station (ISS) program, the S&MA performance metric also can be applied to other large and complex programs and projects. The S&MA-performance-metric data products comprise one or more tables (possibly also one or more graphs) that succinctly display all of the information relevant (and no information that is irrelevant) to management decisions that must be made to assure the safety and success of a program or project, thereby facilitating such decisions.

S&MA organizations within NASA have traditionally provided data products that target specific stages of the life cycles of projects and are generally independent of each other. Such data products have included (1) critical-items lists (CILs) generated through failure-modes-and-effects analyses (FMEAs); (2) noncompliance reports (NCRs) — more specifically, reports of noncompliance with safety requirements as revealed through safety-oriented analyses and reviews; and (3) problem reporting and corrective action (PRACA) documents, which are used in tracking and classifying hardware failures that occur during testing, assembly, and operations. Notwithstanding the value of these data products, it is difficult to assess the effects on the overall program or project from the contents of such a data product considered by itself. Prior to the conception of the S&MA performance metric, there was no process for integrating the individual S&MA data products into a data product that could enhance the decisions of program managers.

The S&MA-performance-metric process is one of gathering information generated according to the various S&MA disciplines (for example, data products like those described above). The gathered information is differentiated into four categories:

- *Accepted Risk* — This category includes information from CILs and NCRs. The critical items and noncompliances can be classified against specific affected subsystems of the ISS or other system that is the focus of the program or project.
- *Anomalies* — For the purpose of S&MA, anomalies are defined as hardware or software failures, or adverse discrete events that have occurred during development and operation of the system. Anomalies include the subject matter of PRACA reports and of the corresponding reports for software, denoted S/W PRs. The PRACAs and S/W PRs can also be classified against specific subsystems.
- *Capability Reliability* — This category is particularly relevant to the ISS because the ISS is being assembled in stages over a period of several years, and its configuration and required capabilities for each stage are different. A predicted-reliability analysis is performed for each capability, and consequently for each stage. This analysis is based on the planned times between assembly flights, the predicted failure rates of the components, the system architecture, the profile of operations for each stage, and data pertaining to failures observed in flight.
- *Subsystem/Capability Dependencies* — The final piece of the ISS S&MA metric is the dependency of subsystem and stage capabilities. One relies on the ISS subsystems to realize the capabilities required at each stage. This dependency of capabilities upon subsystems provides an integrated system perspective that helps in the correlation of capability performance with anomalies and accepted risk across subsystems.

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MSC-23279