



## 5.0 COMMUNICATION



### CAIB Report Chapter 6, p170:

*Management decisions made during Columbia's final flight reflect missed opportunities, blocked or ineffective communication channels, flawed analysis, and ineffective leadership. Perhaps most striking is the fact that management – including Shuttle Program, Mission Management Team, Mission Evaluation Room, and Flight Director and Mission Control – displayed no interest in understanding a problem and its implications.*

### Communication did not flow effectively.

#### Agency-wide Themes

- Anomalies should be considered problems until proven otherwise.
- Responsibility, authority, and accountability must be clearly understood and communicated.
- Communications need to flow both up and down the chain of command.
- Diverse viewpoints must be fostered and minority views considered.
- Communication practices must be validated and tested to ensure effective communication across NASA.

codification of formal communication and reporting policies and procedures. This cultural change requires that NASA return to the process that considers anomalies as problems until proven otherwise. This philosophy, supported by a clear chain of command also supports contingency communication, or escalation paths, so that disagreements can be addressed to enhance anomaly resolution. Furthermore, this process needs to be well documented and rehearsed so that procedures in normal and extreme situations are well understood.

From a cultural standpoint, one of the major resonating communication themes is “shooting the messenger” in that bringing up issues can be career limiting. It may be perceived that it is counterproductive to brand what some people have to say as “minority views.” The prevailing culture should recognize the value to be derived from all viewpoints. Confidence in prevailing views may actually be strengthened by being tested by alternative views.

The feedback from Safety and Mission Success Week reinforced the Diaz Team assessment:

- » When concerns are raised, the prevailing attitude in NASA management is to require that the concerned person or organization prove that something is a problem before action will be taken. The action may be just more analysis and testing. If the concerned person or organization cannot furnish data to prove a problem exists, no action will be taken.
- » One of the barriers that should be broken down is the communication barrier. The NASA workforce should feel comfortable to bring forward comments.
- » Why is it not OK to ask Why?
- » There is fear of reprisal for openly communicating dissenting opinions.
- » Most are reluctant to say anything for fear of criticism or they feel it isn't worth it. People have tried in the past to point things out but know it's not going to get them anywhere. NASA culture does not encourage or reward people who speak out.
- » There is a lack of a formal and effective structure to facilitate information flow up and down the management chain.

The Safety and Mission Success feedback indicated a sense from some in the workforce that they have lost the ability to participate in the decision-making process. In part, this may be due to the fear of retribution for airing minority views, but it is amplified by the concern that too many filters and “too much secrecy across the whole management chain” limit the communication flow. Another concern is that personnel do not understand their organizations or the management rationale for their establishment as

## 5.1 INTRODUCTION

The Diaz Team Communication category addresses deficiencies in NASA's organizational communication. This category interrelates with the other categories focusing on NASA's leadership behavior, organizational structures, and management practices. Collectively, weaknesses in these areas may contribute to the development of communication barriers across Centers and within programs. The CAIB came to several findings regarding the effect of NASA's communication practices as contributing to the loss of *Columbia*. Over time, NASA elements have evolved to a stove-piped hierarchy where specific individual accountability may be lost, resulting in individuals not fully understanding their roles, responsibilities, and vested authority. In reaction, informal networks and chains of command have formed that are organizationally dispersed and may inhibit the clear flow of information. Consequently, problems may manifest themselves in tension between Center authority and Program management direction of multi-Center activities.

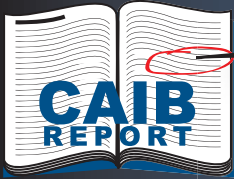
## 5.2 CATEGORY R-O-F SUMMARY

Overall there were no recommendations, no observations, and five findings that the Diaz Team determined had broad NASA applicability to Communication. Table 15 shows the five findings in brief summary statement form, along with brief discussion points on NASA applicability. Five themes emerge from these discussion points as listed above.

## 5.3 DISCUSSION

The five findings resulted in two actions for implementation. When broadly applied, the two actions focus on developing a management and communication culture that is based on adequate discourse for anomaly resolution, a clear process for chain of command and contingency communication, and the

# COMMUNICATION



Communications did not flow effectively

## CAIB Statements

The organizational structure and hierarchy blocked effective communication of technical problems. Signals were overlooked, people were silenced, and useful information and dissenting views on technical issues did not surface at higher levels. C8, p201

Communication did not flow effectively up to or down from Program managers. Managers' tendency to accept opinions that agree with their own damps the flow of effective communications. C6, p169

Management decisions made during *Columbia's* final flight reflect missed opportunities, blocked or ineffective communications channels... C6, p170

The Board observed an unofficial hierarchy among NASA programs and directorates that hindered the flow of communications. C6, p169

## Response

Learning	Recommendations	Observations	Findings
Broadly Applicable	0	0	5
Actions	0	0	2

## Reinforcement/Feedback

### Safety & Mission Success Week Statements from NASA Workforce

Communications processes were stated to be deficient between senior/middle management and employees.

Communication doesn't flow up or down effectively; too many filters and secrecy across management chain.

Bringing up issues is career limiting. "Most are reluctant to say anything [negative] for fear of criticism or they feel it isn't worth it."

The acceptance of dissenting opinions must be unambiguously demonstrated.

Regarding accepting minority opinion and input... there is a hesitancy to communicate with someone in authority who has the power to change something or make something happen.

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evidenced by some comments. The feedback also suggests that there is a segment of the workforce with the desire to participate but who are afraid to do so. They are uncertain about their roles, and have a lack of understanding of the processes for dissent.

Employees' feedback that improved communication is occurring will be one clear sign that NASA is on the road to cultural health. The CAIB findings and Diaz Team actions identify means to start building a more effective communication strategy. However, change in communication requires that leaders adopt different behavior and communication philosophies. Leaders should promote a diversity of viewpoints. Each member of the workforce is responsible for expressing his or her viewpoint. The structure of the organization and chains of command should be sufficiently flexible to support, encourage, and objectively evaluate all viewpoints, ensuring decision-making is based on facts. This is further discussed in the Organizational Structure section. When vital messages are circulating freely within NASA, decision-making will be based on the actual information at hand, not on the false perceptions that are all too often transmitted within a poorly communicating organization. Further, critical to effective communication within NASA is sharing openly with employees the rationale which determined the decision.

Fear of retribution must be eliminated. The workforce needs a process to allow for dissenting opinion and intervention when retribution or retaliation is suspected. The new NASA Ombuds program, recommended by the Diaz Team, should serve this purpose well. The Team recommended that:

- An Ombuds role be established at every Center and at Headquarters;
- It provide an additional and supplemental channel of communication for the workforce to raise significant issues and concerns;
- It not be viewed as a substitute for any existing communication method; and
- It be a collateral duty assignment reporting directly to the Center Director, and at Headquarters to the Deputy Administrator.

The NASA Administrator announced the establishment of NASA's Ombuds program in an announcement dated January 24, 2004. Efforts are now underway at each NASA Center and at NASA Headquarters to implement this program.

In addition to the actions in the Diaz Team Matrix that address each R-O-F, the Diaz Team has one goal addressing the Communication category, as shown in Table 14.

*Table 14. The Diaz Team developed one goal for Communication.*

<b>Communication – Diaz Team Goal</b>	
The Agency should continue the dialog that it began with the NASA workforce during Safety and Mission Success Week.	

*Table 15. The Diaz Team determined that five Findings could be included in the Communication Category resulting in two actions.*

<b>Diaz #</b>	<b>CAIB #</b>	<b>CAIB Report Recommendations and Pertinent Factors</b>	<b>Diaz Summary Discussion</b>	<b>Diaz Action #</b>	<b>Responsible</b>
F41	F4.2-4	Metal objects separating from Orbiter not identified as concern	Anomalies are problems unless proven otherwise	24	AE
F97	F6.3-24	Communication did not flow effectively up or down	Multi-Center programs means Agency-wide issue	35	AE
F99	F6.3-26	Information came through informal channels	Formal reporting plans need to be codified and rehearsed	35	AE
F100	F6.3-27	PM did not communicate well with Debris Assessment Team	Formal reporting plans need to be codified and rehearsed	35	AE
F102	F6.3-29	Safety reps passive in meetings and no channel to voice views	Encourage workforce to raise issues across programs	35	AE



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## 6.0 PROCESSES AND RULES



### CAIB Report Chapter 8, p203:

*When it came to managers' own actions, however, a different set of rules prevailed. The Board found that Mission Management Team decision-making operated outside the rules even as it held its engineers to a stifling protocol. Management was not able to recognize that in unprecedented conditions, when lives are on the line, flexibility and democratic process should take priority over bureaucratic response.*

### NASA has not followed its own rules.

#### Agency-wide Themes

- Requirements, policies, procedures, and directives must be examined and adhered to.
- Best practices and lessons learned must be incorporated.
- The entire workforce must be aware of and understand the rules.

### 6.1 INTRODUCTION

The Diaz Team Report category of Processes and Rules addresses how NASA conducts its programs and operational missions. The nature of this category is multi-faceted. In a complex government organization such as NASA, many policies, requirements, and procedures are developed for employees to follow in the conduct of programs, missions, designs, tests, and operations. Included in this category are the many processes for managing the external workforce of NASA through its large cadre of contractors. Many of these rules and processes were established as a result of adoption of best practices or lessons learned from program history. Some are the result of informal adoption into the culture of NASA – in essence – how NASA conducts its business. Others may be conflicting among organizations, outdated, or merely bureaucratic in nature offering little concrete benefit. The CAIB examined NASA's processes and rules closely as it related to the Shuttle accident and arrived at some key conclusions.

### 6.2 CATEGORY R-O-F SUMMARY

Most of the 40 Diaz Team actions defined for Agency-wide applicability require that the policies governing the R-O-F area be reviewed and modified if necessary. But in this category specifically, there were two recommendations, three observations, and six findings that the Diaz Team determined had broad NASA applicability to Processes and Rules. Table 17 shows these 11 R-O-Fs in brief summary statement form, along with brief discussion points on NASA applicability. Three themes emerge from these discussion points as highlighted in the bullet points above.

### 6.3 DISCUSSION

The CAIB recommendations described the need for the Shuttle Program to integrate the ability to cover launches with an upgraded imaging system and include its status in the Launch Commit Criteria and in monitoring key events. When applied broadly, NASA must look at all programs and determine the appropriate monitoring of critical events and the pre-commit data criteria for initiating those events. But the availability of data is not enough. Appropriate integration of the data to make informed decisions

must be tied to processes and rules that ensure its timely availability. Programs that create the mechanisms for generating decision-making data, yet continue to operate in the face of inadequate, untimely, or failed data flow, increase the level of program risk and decrease safety. The Board, in essence, stated that NASA must set required processes that ensure accurate and timely information flow and then “follow the rules” established for making decisions with this data.

Throughout the CAIB Report, a recurring observation was that NASA did not follow its own rules. One of the findings directly stated that NASA did not follow its own rules on evaluating foam-shedding from the External Tank. The Board discovered organizational practices detrimental to safety and reliability including the “evolution of an informal chain of command and decision-making processes that operated outside the organization's rules.” Yet, the Board believed rules which were followed within NASA were often more bureaucratic and had the effect of stifling critical communication. According to the CAIB, “program leaders spent at least as much time making sure hierarchical rules and processes were followed as they did trying to establish why anyone would want a picture of the Orbiter.” However, the managers themselves would operate by their own rules while requiring engineers to adhere to a “stifling protocol.”

The feedback from Safety and Mission Success Week reinforced the Diaz Team assessment:

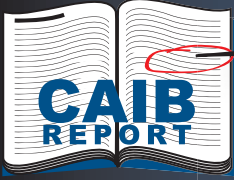
- » We say all the right language and have all the right procedures, but don't follow them.
- » When internal and contracted requirements are not firmly established, employees can feel that nothing is mandatory.
- » Crew Resource Management is a process used in other industries that can be applied across NASA and in particular mission-critical management positions.

The observations and findings of the CAIB also revealed a need for NASA to examine its processes, make changes where appropriate, and apply the processes uniformly across programs. CAIB findings included the need for improved and uniform statistical sampling, audit, and certification processes. The CAIB observed that NASA needs an oversight process for work performed and documented by United Space Alliance to ensure process control, compliance, and consistency. Application of these processes is important for all NASA programs.

Many Safety and Mission Success Week comments and recent events validated ideas and themes related to Agency-wide processes and their uniform application across NASA. The feedback suggested technology development processes are needed to improve legacy system operation and safety, and mission success.



# PROCESSES AND RULES



NASA  
has not followed  
its own rules

## CAIB Statements

Cultural traits and organizational practices detrimental to safety and reliability were allowed to develop, including... the evolution of an informal chain of command and decision-making processes that operated outside the organization's rules. C7, p177

The Board found that Mission Management Team decision-making operated outside the rules even as it held its engineers to a stifling protocol. Management was not able to recognize that in unprecedented conditions, when lives are on the line, flexibility and democratic process should take priority over bureaucratic response. C8, p203

Over time, slowly and unintentionally, independent checks and balances intended to increase safety have been eroded in favor of detailed processes that produce massive amounts of data and unwarranted consensus, but little effective communication. C7, p180

Program leaders spent at least as much time making sure hierarchical rules and processes were followed as they did trying to establish why anyone would want a picture of the Orbiter. These attitudes are incompatible with an organization that deals with high-risk technology. C7, p180

## Response

Learning	Recommendations	Observations	Findings
Broadly Applicable	2	3	6
Actions	2	2	3

## Reinforcement/Feedback

### *Safety & Mission Success Week Statements from NASA Workforce*

Conduct an awareness campaign on the need to "follow the rules" for requirements imposed by programs.

Develop and adopt CRM (Crew Resource Management)-like process for all functions across NASA, but in particular mission-critical management positions.

In an environment where both internal and contracted requirements are not firmly established and maintained, employees come to feel that "nothing is mandatory; everything is negotiable." This... can create "dangerous situations" with "disastrous results."

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The way in which NASA develops and executes its rules and processes embodies a fundamental cultural trait for the Agency. Organizations that deal with high-risk technology must develop a best practices culture in order to operate safely and reliably. To achieve this within NASA, all programs must develop rules that lead to increased communication and enhanced decision-making. When created properly, rules adhere to the chain-of-command, are understood, uniformly apply, allow expression of minority opinions, and have the flexibility to reveal critical safety and life-threatening issues in a timely manner. They certainly must not stifle communication, evoke fear of retribution, or be applied inconsistently from one group to another.

Best practices in processes imply setting uniform standards and requirements for both NASA and its contractor community. The most modern technology, techniques, and methodologies are in-

corporated in a best practice environment to provide timely and comprehensive information to decision makers. For NASA, this means Agency-wide analysis of its current processes on a continuing basis to make sure they are relevant, technically sound, and applied in a consistent manner. Many industrial and government organizations are identifying best practices by benchmarking other leading organizations and adopting a culture of continuous improvement. NASA can look to these organizations to provide valuable lessons on how to transform the Agency's culture into one that values workforce input and seeks the right way of doing business for the right reasons.

In addition to the actions in the Diaz Team Matrix that address each R-O-F, the Diaz Team has one goal addressing the Process and Rules category, as shown in Table 16.

*Table 16. The Diaz Team developed one goal for Processes and Rules.*

<b>Processes and Rules – Diaz Team Goal</b>	
The Agency should conduct a review of its approach to maintaining and managing rules.	

*Table 17. The Diaz Team determined that two Recommendations, three Observations, and six Findings could be included in the Processes & Rules Category resulting in seven actions.*

<b>Diaz Team #</b>	<b>CAIB #</b>	<b>CAIB Report Recommendations and Pertinent Factors</b>	<b>Diaz Team Discussion</b>	<b>Action #</b>	<b>HQ Code #</b>
R7	R3.4-1	Upgrade imaging system for three views of Shuttle liftoff	All programs need to identify critical monitoring requirements	1	AE
R8	R3.4-2	Obtain and downlink hi-res images of ET separation	Monitoring requirements for major events needed	2	AE
O8	O10.4-4	KSC to examine ISO 9000/9001 needs of Shuttle system	Assess all programs for R&D or operational status	12	AE
O9	O10.5-1	Use statistical sampling for Q&E review of work documents	Program audits subject to rigors of statistical sampling needed	13	AE
O11	O10.5-3	Oversight process to statistically sample USA work needed	Program audits subject to rigors of statistical sampling needed	13	AE
F5	F3.2-5	Left bi-pod foam shedding found NASA was not aware of	Detailed understanding of root causes for anomalies needed	19	Q
F7	F3.2-7	Foam loss occurred on 80 percent of imaged missions	Trend analysis has to be correlated with program requirements	19	Q
F8	F3.2-8	Unable to determine if foam lost on 30 percent of missions	Programs cannot address anomalies if they are not observed	19	Q
F56	F6.1-1	NASA did not follow its own rules on foam-shedding	Independent audits needed to identify deviations from specs	26	AE
F89	F6.3-16	MMT meetings occurred infrequently	Operation procedures on programs need to be followed	28	AE
F93	F6.3-20	No one in chain held active security clearances	Programs could benefit from actively cleared people	34	X



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## 7.0 TECHNICAL CAPABILITIES



### CAIB Report Chapter 7, p179:

*As a result [of the Space Flight Operations Contract], experienced engineers changed jobs, NASA grew dependent on contractors for technical support, contract monitoring requirements increased, and positions were subsequently staffed by less experienced engineers who were placed in management roles. Collectively, this eroded NASA's in-house engineering and technical capabilities.*

**NASA's in-house capabilities and expertise have eroded.**

#### Agency-wide Themes

- Analytical models and simulation tools must be used appropriately.
- NASA must address the loss of technical expertise due to retirement and outsourcing.
- Advanced technical capabilities must be developed.

models to evaluate Thermal Protection Systems in a timely manner. When evaluated from an Agency-wide perspective, it is clear that all NASA programs need validated models and analytical tools to assess the state of their systems and components. This will enable enhanced decision-making. Moreover, this implies a need to further develop technological competency within the Agency to effectively and consistently apply, maintain, and update these models and tools. One way to achieve this technological competency is to increase investment in the development and training of NASA's scientific and engineering workforce in order to increase their skill base and overall effectiveness.

## 7.1 INTRODUCTION

NASA has always viewed itself as a cutting-edge technology organization with experienced scientists and engineers developing and applying the most modern of technology tools. During the investigation of the *Columbia* accident, the CAIB came to believe otherwise. There was evidence of erosion in NASA's technological capabilities and expertise within the Shuttle Program. This included not only a deficiency in the availability of analytical tools and simulation models, but also misapplication of those tools and models that were available. Due to limited resources and current Agency operation philosophies, NASA has come to rely on contractors to perform engineering functions on its projects. In addition, downsizing without replenishment of critical skills over the past decade has further contributed to a skill imbalance that is liable to be exacerbated by future retirements. The above conditions, occurring across the entire Agency, has resulted in a decline in NASA's technical capabilities and competencies in its civil service workforce, and the over-reliance on developmental and operational contractors.

Issues identified as being associated with Technical Capabilities are clearly interwoven with those associated with Learning. They involve the development and maintenance of skills inherent in the workforce and the use of technology tools.

## 7.2 CATEGORY R-O-F SUMMARY

Overall there were three recommendations, no observations, and thirteen findings that the Diaz Team determined had broad NASA applicability to Technical Capabilities. Table 19 shows these 16 R-O-Fs in brief summary statement form, along with brief discussion points on NASA applicability. Three themes emerge from these discussion points as highlighted in the bullet points above.

## 7.3 DISCUSSION

The first CAIB recommendation describes the need for NASA to develop, validate, and maintain realistic physics-based computer

Management and decision-makers within the Agency must also maintain the ability to understand the use of, and limitations of, the technology models and tools. Developing and training technically proficient decision-makers improves safety and mission success.

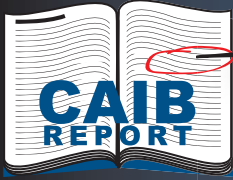
The feedback from Safety and Mission Success Week reinforced the Diaz Team assessment:

- » Technical expertise is being lost within NASA due to retirement and the outsourcing of technical proficiency to contractors.
- » There is a need to have more decision-makers with hands-on experience in addition to theoretical knowledge.
- » Technical expertise needs improvement throughout NASA.
- » Technical tools and information systems are not there for people to effectively do their jobs.

The other two recommendations associated with technical capabilities focus on the need for accurate computer-aided engineering drawings and complete as-built and closeout photographs for each mission. This core technical competency is necessary Agency-wide for proper technical management of all operating programs and missions. The theme of these two CAIB recommendations implies the Agency-wide need for technical capacity to maintain documentation and databases and the need to implement knowledge management practices and capabilities NASA-wide that are critical to technical management and decision-making.

An example of this technical information shortfall for critical decisions was described in the CAIB Report. The Board observed that NASA normally uses closeout photos. Yet, the Agency lacked a clear system to define which critical sub-systems should have such photographs. Moreover, the capability for immediate retrieval of photographs did not exist. Safety and Mission Success Week responses validated the need for Agency-wide modern database tools and knowledge management systems for

# TECHNICAL CAPABILITIES



NASA's in-house capabilities and expertise have eroded

## CAIB Statements

Without on-orbit pictures of *Columbia*, the Debris Assessment Team was restricted to using a mathematical modeling tool called CRATER to assess damage, although it had not been designed with this type of impact in mind. C2, p38

The engineering drawing system contains outdated information and is paper-based rather than computer-aided. C10, p217

NASA normally uses closeout photographs but lacks a clear system to define which critical sub-systems should have such photographs. The current system does not allow the immediate retrieval of closeout photos. C10, p217

The Space Flight Operations Contract was intended to streamline and modernize NASA's cumbersome contracting practices, thereby freeing the agency to focus on research and development. ...experienced engineers changed jobs, NASA grew dependent on contractors for technical support, ...positions were subsequently staffed by less experienced engineers... Collectively, this eroded NASA's in-house engineering and technical capabilities. C7, p179

## Response

Learning	Recommendations	Observations	Findings
Broadly Applicable	3	0	13
Actions	2	0	4

## Reinforcement/Feedback

### *Safety & Mission Success Week Statements from NASA Workforce*

We are losing technical expertise due to retirement and A76. The technical expertise must be maintained within NASA...

The agency is losing people who were the "doers" and being replaced by "watchers" without hands-on experience.

Deficiencies in problem and waiver tracking and analysis could be addressed with an Agency-wide database for documenting problems and waivers.

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information support. Highlighted were deficiencies in problem and waiver tracking which an Agency-wide knowledge architecture could address.

Decision-making by management is often driven by cost and schedule pressures. The knowledge management systems to support decisions are inadequate. The future ability to make techni-

cally credible design, test, operational, and safety decisions will rely on NASA systematically improving its technical capabilities and competencies throughout the Agency.

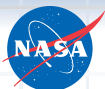
In addition to the actions in the Diaz Team Matrix that address each R-O-F, the Diaz Team has one goal addressing the Technical Capabilities category, as shown in Table 18.

*Table 18. The Diaz Team developed one goal for Technical Capabilities.*

<b>Technical Capabilities – Diaz Team Goal</b>	
The Agency should develop guidelines and metrics for assessing and maintaining its core competencies, including those associated with in-house work.	

*Table 19. The Diaz Team determined that three Recommendations, and 13 Findings could be included in the Technical Capabilities Category resulting in six actions.*

<b>Diaz Team #</b>	<b>CAIB #</b>	<b>CAIB Report Recommendations and Pertinent Factors</b>	<b>Diaz Team Discussion</b>	<b>Action #</b>	<b>Responsible</b>
R13	R3.8-2	Develop, validate, and maintain physics-based models	Technical models needed for programs for decision-making	4	AE
R28	R10.3-1	Develop closeout photo program for critical sub-systems	Photos for all programs support as-built data requirements	10	AE
R29	R10.3-2	Provide resources for Shuttle drawing system upgrade	Up-to-date configurations in CAD needed for all programs	10	AE
F2	F3.2-2	No qualified non-destructive foam evaluation techniques	Programs need testing methods to verify requirements are met	18	H
F11	F3.3-2	Inadequate current RCC component testing techniques	Need robust acceptance testing programs	18	H
F18	F3.4-3	Need for high-quality downlinked launch and ascent imagery	Ability to observe performance key to anomaly resolution	21	AE
F19	F3.4-4	Current KSC long-range camera assets inadequate	Need appropriate resolution for anomaly detection	21	AE
F20	F3.4-5	Evaluation of STS-107 debris impact hampered by poor cameras	Requirements of sampling and resolution needed for missions	21	AE
F36	F3.8-6	Current tools inadequate for use in evaluation of debris damage	Technical tools needed for critical decision making	4	AE
F38	F4.2-1	Bolt catcher certified by extrapolation with no hardware testing	Inappropriate hardware verification to be avoided	23	AE
F39	F4.2-2	“As-flown” bolt catchers do not have required safety margin	Periodic testing necessary to determine meeting design specs	23	AE
F51	F4.2-14	Photographs of every closeout activity not routinely taken	Best practices from industry include complete documentation	25	AE
F83	F6.3-10	Team’s tile damage assessments poorly executed	Technical tools needed for critical decision making	4	AE
F84	F6.3-11	Crater initially predicted deeper tile damage	Need for proper training in model use and limitations	4	AE
F124	F10.3-1	Engineering drawing system outdated and paper-based	Accurate engineering drawing in CAD needed for all programs	10	AE
F126	F10.3-3	Lack of clear and timely photo closeout system	Standards for photo management system needed Agency-wide	10	AE



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