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NASA Technical Memorandum 104781

User Observations on Information Sharing (Corporate Knowledge and Lessons Learned)

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National Aeronautics and
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PREFACE

The continuing success of any enterprise is built on the successes and failures of preceding generations of pioneers from all walks of life. Retaining what is learned during the nation's collaborative Missions to Planet Earth and to the Space Frontier in the explosion of the Information Age is a formidable challenge. The retention of such knowledge as "lessons learned" or "corporate knowledge" is not a new concept, nor is the systematic collection and centralization of such information. The information technology is available to make it happen. What has been lacking is input from the initiators and users of such information. This survey reports on the information needs and desires of a representative selection of 75 people drawn from the JSC community of NASA and contractor employees who are presently meeting these challenges.

The results of this survey will be used as follows:

(1) Identify to JSC senior managers an opportunity to improve the collecting and sharing of information as envisioned by the survey participants.

(2) Provide guidance to a JSC steering committee (to be implemented in July 1993) that will be chartered to develop JSC's vision and strategic plan and to define requirements to realize this opportunity.

(3) Provide a basis for agencywide planning by the NASA Lessons Learned Steering Committee (sponsored by the Office of Safety and Mission Quality, NASA Headquarters) to facilitate the concept of capturing and sharing information throughout the entire agency, including its contractors, and with the public and private sectors.

When it comes to retaining and communicating our knowledge and inspiration, the survey participants agree that we can — and must — do better. More importantly, the survey participants — from entry level engineers to senior managers and engineers dating back to Apollo — are willing to take the next step.

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1.0 INTRODUCTION

1.1 PURPOSE

The purposes of the survey reported herein are twofold:

a) To ensure that previous assumptions made by Lessons Learned program management and developers about "Lessons Learned" (LL) are validated by the customer population and

b) To consolidate additional requirements from a representative sample of potential customers at JSC to guide the development and implementation of an information system (including an electronic database entitled the "Lessons Learned Information System" or "LLIS") by NASA for use by the entire NASA community.

1.2 APPROACH

1.2.1 Customer Profile

The participants in this survey were drawn from the technical community within NASA - Johnson Space Center (JSC), including its contractors. At JSC, the primary target community surveyed included personnel whose tasks were directly or indirectly (example: procurement) related to space flight missions. Included in the secondary target community were "technical" personnel exposed to a larger set of workplace hazards than is typical of a research, development, or program management environment, and whose tasks tend to be loosely associated with the JSC space flight programs (examples include facilities and construction personnel). It is estimated that approximately 90% of JSC and its support contractor personnel were represented in the primary and secondary target survey communities.

A target of 15 years' average experience among the participants was selected, although this was below the population average at the time of the survey. It was found that personnel at JSC have trended toward a high average experience level due to low turnover in the past, but this trend should change and begin moving toward lower average experience levels after the retirement of personnel hired in large numbers preceding the Apollo program. It was further assumed younger personnel would use LL at higher rates due to a larger need for information and a desire and willingness to utilize others' experiences. This is supported by the survey, which shows that this younger population has encountered problems in extracting information from existing sources.

1.2.2 Customer Sampling

The sample size (75 interviews) was selected as an optimum number for the purposes of this survey. This sample size (from a total target population of approximately 6000) is large enough to lend some confidence to the survey results. The sample was not chosen completely at random; sampling was disproportionately assigned to the civil service population (50 civil service staff interviews and 25 contractor interviews). The assumption was made that contractor organizations have a larger percentage of employees at the technician and craftsmen's levels who are less likely to require direct access to LL.

Organizations were then given allocations based on either population or a minimum of one interview to represent that organization. A few organizations declined to provide an interviewee of their choice; interview opportunities were thus reallocated to preserve the original number of 75 data points. Organizational safety representatives were used to facilitate — not to be interviewees — the identification of voluntary survey participants from their organizations. The selection process was left to the discretion of the respective organizations and was generally unknown to the survey team. It is assumed most interviewees were willing volunteers based on the observation of a generally cooperative attitude during most interviews. Anonymity was promised to interviewees to encourage the widest range of critical comment. Appendix A contains the list of interviewees by organization, but with names withheld.

1.2.3 Survey Method

Individual interviews averaging 45 minutes in length were conducted by JSC and support contractor survey team members. A survey questionnaire (Appendix B) was designed as an interview guideline to be completed by the interviewers. The interviewers followed specific instructions (Appendix C) to ensure uniformity in the interview process.

The interview process was refined by conducting trial interviews with personnel internal to the safety organization at JSC. The interview questionnaire and technique was subsequently revised. The customer survey was then conducted in two phases. Phase 1 was completed by accomplishing 30% (23) of the interviews. The survey was suspended as planned and an assessment of the survey was conducted to determine any additional modifications. Several changes were made, which accounts for missing question numbers on the Phase 2 questionnaire form (Appendix B). Most of the changes eliminated either redundant or irrelevant questions. To the maximum extent possible, data from Phase 1 interviews were retained in the calculations and all of the comments were retained.

1.2.4 Identification of Information Requirements

The LL report (i.e., "data entry") form available at the time of the survey was used as a guideline to assess customer information requirements. Also used to conduct the interviews was a set of 11 previously documented LL reports selected to represent a cross section of disciplines. The interviewee selected 3 from the set of

11 from a listing of "subjects" as they appeared on the sample set. This increased the likelihood that each interviewee would find some LL of personal interest. The set of LL used are provided as Appendix D.

2.0 RESULTS OF THE SURVEY

The interview questionnaire has questions that can be numerically evaluated (yes, no, or adjectives convertible to values) and questions that contain comment only. Appendix E is a listing of calculated values (mostly averages) for numerically answerable questions listed by question number. Appendix F contains comments solicited and/or volunteered by survey participants. The responses to the questions were categorized as follows: 2.1, DEMOGRAPHICS AND STATISTICS, 2.2 INFORMATION REQUIREMENTS ANALYSIS, and 2.3 CULTURAL ASPECTS. Conclusions and recommendations are summarized in section 3.0.

2.1. DEMOGRAPHICS AND STATISTICS

2.1.1 Question 2A, Location and accessibility of computers

Results: Of the interviewees, 91% have PCs at their desk. The remainder have access to a computer no further away than a nearby office.

Discussion of results: The workplace standard is that each employee has a PC immediately accessible. Consideration should be given to this data when evaluating probable usage of a centralized work station.

2.1.2 Question 2B, Type of computer

Results:

Computer Type	Percent Occurrence
XT	7
286	23
386	43
486	1
MacIntosh	26

Discussion of results: Upgrades of PCs occurring at JSC are assumed to generally be IBM 486 or better. The relative number of MacIntoshes is expected to remain fairly stable.

2.1.3 Question 2C, Use of modems

Results: Only 16% of the interviewees are provided modems with their PCs.

Discussion of results: Due to the availability of networks and hard-line connections, few modems are needed at JSC. Most of the modems are required for specific job tasks.

2.1.4 Question 11, Computer display and operations preferences

Results: The preferred features most often suggested by the interviewees were: keyword prompts, Windows, mouse, color choice, bolding options, and pull-down menus.

Discussion of results: Most JSC personnel, if not currently provided the "friendly" computer operating features, are apparently aware of these enhancements and prefer them. None of the suggested features were extraordinary.

2.1.5 Length of interviews and interviewee attitudes

Results: The average was 50 minutes (5 minutes longer than the planned 45).

Discussion of results: With rare exceptions, interviewees were responsive and willing to take as much time as needed to complete the interviews. The introductory statement by the interviewers included a promise to complete the interview within 45 minutes, but no limits were placed on the interviewees if they wished to take additional time to elaborate on their answers.

2.2 INFORMATION REQUIREMENTS ANALYSIS

2.2.1 Data Structure

2.2.1.1 Question 4, Customers' preferred scope of LL

Results: The dominant topics mentioned by the interviewees included (in decreasing order): testing, hardware, flight, operations, safety, design, management, facilities, failures, manufacturing, and payloads. Breakdown of the data shows interviewee preferences in decreasing order as follows:

- Operational topics - manufacturing, test, procedures, flight rules, flight control, reconfigurations, etc.
- Engineering disciplines - propellants, explosives, materials and processes, thermal control, reliability, industrial safety, industrial hygiene, and environment
- Reports - on failures, tests, innovations, new technology, engineering data such as materials properties
- Programmatic systems/subsystems/elements including payloads - observations, failure histories, any form of experimental information
- Procedural Topics - tips and rationales for specific processes and procedures (emphasis on "how to")

- Requirements and Regulations - with emphasis on insight into intent and alternative solutions

- Administrative Information - management, procurement, metrics, decision making, risk management

Discussion of results: This list could be assumed to be a universal keyword search set for JSC personnel. The tenor of the interviews tended to stress experimental "real world" information that goes beyond theory and academics. The need for insight and rationale was stressed repeatedly in the more detailed comments.

2.2.1.2 Question 5A, The usefulness of information

Results: Interviewees answered either "yes" or "no" on the usefulness of the information under headings as they appear on the LL form. There was no numerical ranking of headings by the interviewees, but additional comments provide qualitative rankings. The trend in the comments generally paralleled the binary results. The *Subject* heading received the highest rating (100%). Closely following are the narrative headings: *Lesson Learned* (94%), *Description of Source Problem or Event* (90%), and *Action Required* (86%). There is a significant gap to reach the next grouping: *System* (71%), *Subsystem* (69%), *Source* (67%), and *Additional ID* (67%). All but the bottom two of the remaining headings fall between the 61 and 57 percentiles. The bottom two, *Facility* and *Contact*, were 51%. See figure 1, page 6.

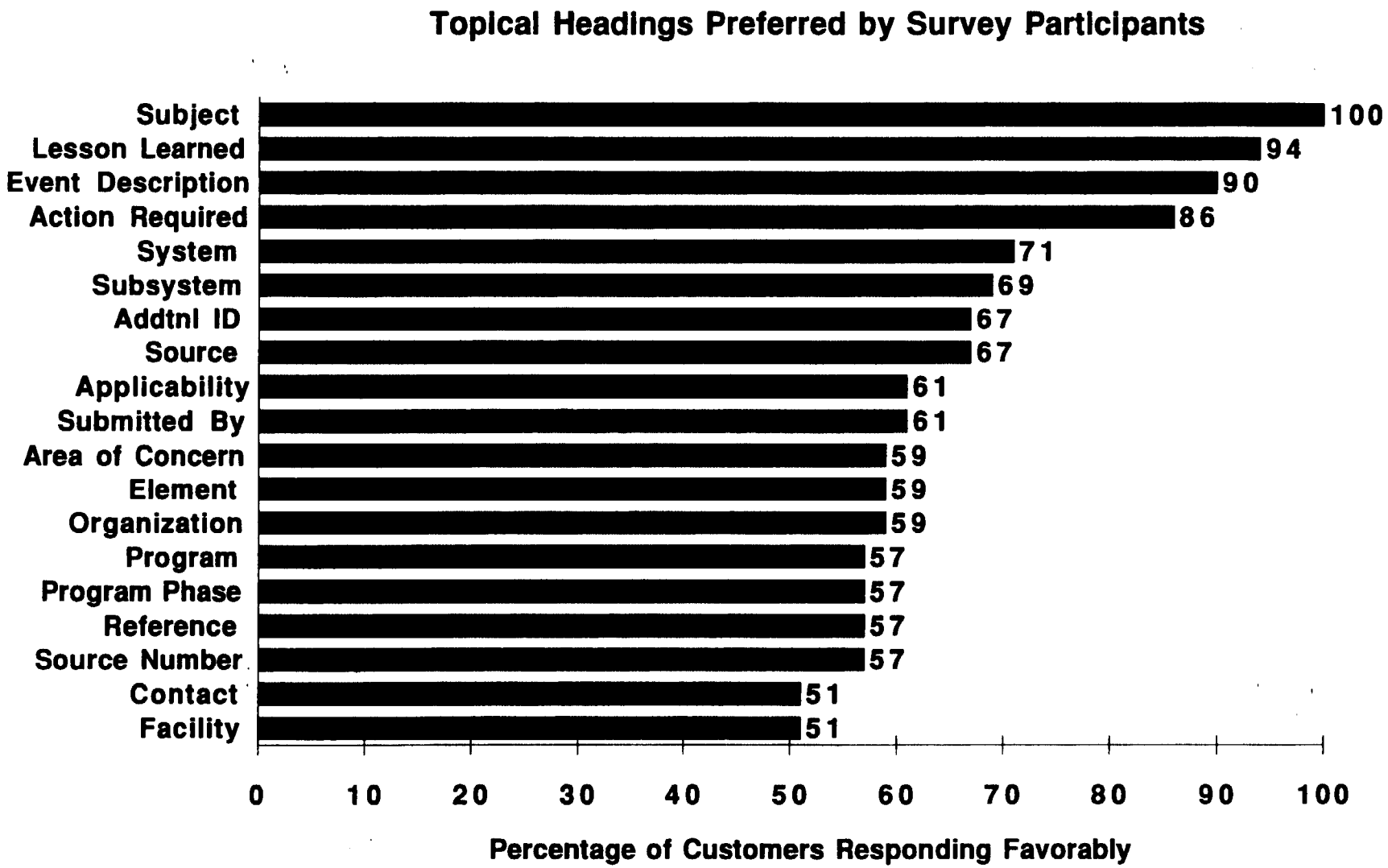
Discussion of results: The headings that provide the narrative descriptions, conclusions, and recommendations are of significantly higher value to the interviewees than other information. The moderately high value placed upon *System* and *Subsystem* identifiers is probably specific to "mission centers" such as JSC. **Note:** None of the headings were considered useless by a majority of interviewees. It can be speculated that a degree of politeness to the interviewers may have caused a positive bias to yield this result, but interviewers solicited candor from the interviewees by including a promise of anonymity to counter this potential bias.

2.2.1.3 Question 5B, Addition of headings

Results: Of 23 comment responses to this question, 12 suggested additional headings. A recurring theme was the significance of LL depicted by comments such as "frequency" and "severity."

Discussion of results: The interviewees seem to be interested in the type of data that is typically found in trend analysis.

Figure 1.


Topical Headings Preferred by Survey Participants
Subject 100
Lesson Learned 94
Event Description 90
Action Required 86
System 71
Subsystem 69
Addtnl ID 67
Source 67
Applicability 61
Submitted By 61
Area of Concern 59
Element 59
Organization 59
Program 57
Program Phase 57
Reference 57
Source Number 57
Contact 51
Facility 51
0 10 20 30 40 50 60 70 80 90 100
Percentage of Customers Responding Favorably

2.2.1.4 Question 6A, Deletion of headings

Results: The maximum response for any heading to be deleted was 12% (*Contact*).

Discussion of results: Although usefulness of some information was low (see question 5A above), interviewees were tolerant of superfluous information as part of the database.

2.2.1.5 Question 9, Preference for the listing of related LL

Results: A very large majority (97%) considered this facility useful.

Discussion of results: The convenience of the subject list is highly desired by the customer and could result in the use of other well-designed information systems. Such a listing needs to be available during an interactive session as well as part of a final printout.

2.2.1.6 Question 10, Changes to the layout or format of the report

Results: Of the interviewees, 60% suggested some changes. The most repeated change suggested (one-third of the responses) was to move *Description of Source Problem or Event* to just below *Actions Required.*

Discussion of results: The collecting of all of the narrative information in one place at the front of the report allows the reader to quickly understand it. Many of the headings are of interest to persons entering data or maintaining the information, but of little interest to the user.

2.2.2 Data Quality

Interviewees were first asked to select 3 LL "subjects." The interview continued with questions 14 and 15 pertaining to the *Lesson Learned* information, then question 16 which brings in the *Action Required* information, and finally questions 20A and 20B concerning the *Description of Source Problem or Event.* This order parallels the usual sequence used for the writing of LL and was selected for questioning for that reason. We have since determined that the writing of LL should follow the sequence *Description of Source Problem or Event, Lesson Learned, Action Required,* and *Subject.* Therefore, the questioning should have followed this same sequence for the best results. It is not clear what possible negative effects the sequence used may have had other than an assumption that the results would have probably been better.

2.2.2.1 Question 14, Sufficiency of detail under the *Lesson Learned* heading

Results: The weighted average positive response to this question was 73%. The highest approval was for Lesson Learned No 91-0016 (see Appendix D) at 95%. The lowest approval was for Lesson Learned No. 91-0056 at 41%.

Discussion of results: Field limitations may have contributed to some of the negative effects on the average rating, but probably does not account for all deficiencies as perceived by the interviewees.

2.2.2.2 Question 15, Relationship of *Lesson Learned* to *Subject*

Results:

LL No.	Avg (%)	Number selected
91-0004	83	13
91-0013	75	17
91-0016	70	17
91-0027	84	19
91-0028	79	30
91-0031	39	21
91-0044	83	13
91-0056	48	19
91-0066	85	11
92-0002	85	33
92-0008	89	18

The weighted average for this question was 68%. Most of the responses for individual LL were rated above 80% with the median at 83%. Two LL, No. 91-0031 at 39% and No. 91-0056 at 48%, contributed to the lowering of the average.

Discussion of results: The field limitations (75 characters) could have contributed to the poor average rating. The subject titles are likely to contain key words. A combination of well-chosen key words that can also serve as an understandable title is sometimes difficult to achieve within 75 characters.

2.2.2.3 Question 16, Completeness of *Subject*, *Lesson Learned*, and *Action Required*

Results: This question, which asks the interviewee if the actions required could be taken without reading further, was included to determine if the combined field limits hampered the quality of a Lesson Learned report. The result was 61%, the lowest rating for this category of questions.

Discussion of results: The wide range of approval (24% to 83%) for individual LL suggests either: a variance in clear writing capabilities for lesson learned initiators and reviewers, that limited field characters causes difficulties in explaining complex situations, or that use of narrative text needs to be augmented by other data sources such as graphics (diagrams, schematics, sketches, photographs, and drawings).

2.2.2.4 Question 20A, Clarity of *Description of Source Problem or Event*

Results: LL No.	Average (%)	Characters
91-0004	88	191
91-0013	90	280
91-0016	52	293
91-0027	90	209
91-0028	84	184
91-0031	89	301
91-0044	87	276
91-0056	63	212
91-0066	77	340
92-0002	87	594
92-0008	89	171

The weighted average for this question was 81%, the highest for this category of questions. The median, Lesson Learned No. 92-0002, is even higher at 87%.

Discussion of results: Although field limits restricted entry, the limits were apparently large enough to allow clarity for a majority of the LL. There was no direct relationship between the size of data entry (characters) and clarity.

2.2.2.5 Question 20B, Suggestions to improve *Description of Source Problem or Event*

Results: The most mentioned improvement was a general comment to provide more detail.

Discussion of results: This might reflect the original field limitations under which the JSC LL were documented at the time of the survey.

2.2.2.6 Question 26, Previous knowledge of the LL data

Results: Analysis of the data was broken into two groups: Group 1 - those with less than 15 years' experience, and Group 2 - those with more than 15 years' experience. Group 1 (the less experienced) found that 79.2% of the information they reviewed was new to them. Group 2 (the more experienced) found that 67.8% of the information was new. Overall, 35% of the information was not new to the interviewees.

Discussion of results: Interviewees selected 3 topics from a group of 11 candidates. It is assumed they would select topics relevant to their professional backgrounds and/or current duties. This would bias the answers toward increased previous awareness. Considering this effect, the high incidence of unawareness attests to the potential value that can be added to

the technical community by implementing a LL program regardless of the degree of complexity or exotic nature of the specific lesson.

2.3 CULTURAL ASPECTS

2.3.1 Question 3A, Previous familiarity with other information systems similar to LL

2.3.2 Question 3B, Appraisal of survey participant experience with other LLIS

Results, 3A: Less than half (43%) of the interviewees had used information sources similar to lessons learned. Similarity was not defined as safety related only, but was limited to "decision making" systems (such as problem resolution) and "experience capture" systems (such as documented collections of experiences and observations). *Results, 3B:* For those interviewees that were familiar with similar systems, 80% considered the experience positive and helpful.

Discussion of results: The nearly even split in responses indicate that we had two groups of people from whom we obtained information on the LL concept and information sharing in general. One group (those with prior exposure) is extremely supportive of the LL concept. The other group (those without prior experience) can be considered a control group to check for hidden biases (negative or positive) in this survey. Results have shown that there was very little negative bias toward LL within the workforce.

2.3.3 Question 7A, Use of an intermediary to obtain source material

2.3.4 Question 7B, Preference for direct access to source material

Results, 7A: Of the interviewees, 65% approve of the current method of obtaining source material by calling the "submitted by" person or "contact." *Results,7B:* Given the option of retrieving source material by using an intermediary or direct access (through the LLIS or from another computer database), 90% preferred direct access.

Discussion of results: JSC personnel accept the use of intermediaries, but prefer direct access.

2.3.5 Question 13, Key word type search preferences

Results: These preferences fell within two groupings. The higher group consisted of "subsystem" (84%), "system" (81%), and "discipline" (73%). After a gap of 18%, the lower group contained "date" (55%), "organization" (47%), and "location" (44%). See figure 2, page 12.

Discussion of results: These results reflect the orientation of JSC personnel toward flight systems and missions.

2.3.6 Question 18, Willingness to add "actions taken" to an existing lesson learned

Results: Of the interviewees, 84% answered positively to this question.

Discussion of results: This question assumes that there can often be more than one plausible solution to problems depicted in a specific LL and that people want choices.

2.3.7 Question 23A, Willingness to use LL

Results: A high percentage (90%) of the interviewees answered positively to this question. For those with less than or equal to 15 years' experience, 88% responded positively; for those with more than 15 years' experience, 92.6% responded positively.

Discussion of results: At this point in the interview, interviewees are quite familiar with three LL of their choice. When these results are compared to those of Question 26 (where 35% of the interviewees were previously familiar with the data), the results for this question might be better understood. If data are new or are known but useful to keep available, utilization of the system providing it will be greatly enhanced — regardless of the experience of the individual customer.

2.3.8 Question 23B, How customers might use the LL

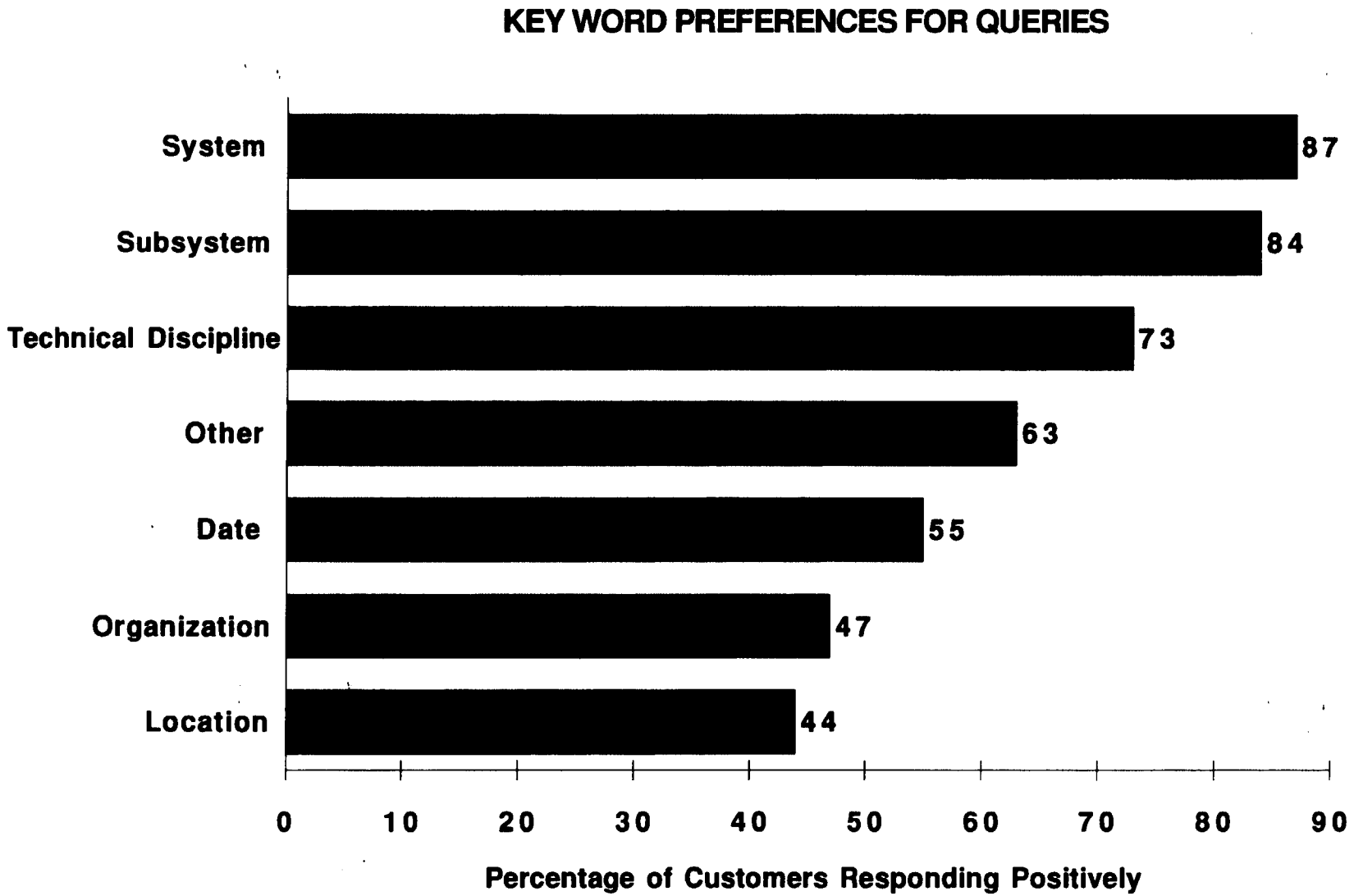
Results: The leading comments for this question, used during test (including procedure review) and design activities, reiterates some of the keyword preferences from questions 4 and 11 above. Additional uses identified include training and requirements.

Discussion of results: It appears that customers would utilize LL as part of their primary tasks. The potential use of LL for training may influence its format and content.

2.3.9 Question 25A, Perception of the application of LL as beneficial

Results: A very high percentage of interviewees (96%) answered this question positively.

Figure 2.


KEY WORD PREFERENCES FOR QUERIES
System
Subsystem
Technical Discipline
Other
Date
Organization
Location
87
84
73
63
55
47
44
0
10
20
30
40
50
60
70
80
90
Percentage of Customers Responding Positively

Discussion of results: The results of this question when compared to question 23 might indicate the judgment on the part of some interviewees (10%) that they have little need for LL, but they see the value for others (possibly less experienced). Keeping in mind from Questions 3A and 3B that 80% of the interviewees who were familiar (43%) with other similar systems found value in them, the results for this question are encouraging for a system at this stage of development.

2.3.10 Question 25B, Benefits of LL

Results: The responses from the interviewees centered around the broad subjects of knowledge, information, and safety.

Discussion of results: These responses may have resulted from the introductory statements and explanations provided by the interviewers. Interviewees had some difficulty providing specific benefits directly applicable to their tasks. This could be expected with only a brief exposure to the LL concept and representative reports.

2.3.11 Question 27, Requirement for a help desk

Results: A high percentage (87%) preferred a help desk.

Discussion of results: Help desks are provided by a majority of networked systems; it has become a standard feature. This does not preclude the addition of on-screen help features to reduce the traffic for a help desk. Staffing a help desk from a single source has the difficulty of providing service across the four time zones for most of the United States.

2.3.12 Question 28, Requirement for a service group

Results: A service group to receive search requests and then forward information to requesters is much less desirable (56%) than direct access with a help desk immediately available.

Discussion of results: Many interviewees, although agreeable to having a service group, would prefer direct access. These results are somewhat redundant to and reasonably consistent with Questions 7A and 7B.

2.3.13 Question 29, Willingness to add LL to the LLIS

Results: This question was the last one during the phase 2 interviews (questions 24 through 75) to allow the interviewee maximum exposure to LL before answering. The 92% positive response is consistent with other cultural questions on the value of LL.

Discussion of results: The responses were encouraging, but some caution should be used in predicting future willingness to initiate LL. There could be a "politeness" factor in answering this question; pleasing the interviewer or providing the expected dutiful response can sometimes influence questions of this type.

2.3.14 Question 30, Potential usage of the LLIS if: (1) access is direct, (2) with an exclusive use in-office PC, and (3) training requirements are minimal

Results: Under this scenario, usage response was 84%.

Discussion of results: This most convenient scenario is acceptable by most interviewees. Of those that declined usage by this method, some commented that a service group was preferred. A minority of PC owners are not avid users of computers for any purposes. This could explain the preference for service groups.

2.3.15 Question 31, Potential usage of the LLIS if: (1) access is direct and (2) with a shared computer (work station elsewhere than one's office)

Results: Willingness to use the LLIS falls to 52% with this scenario.

Discussion of results: Convenience is apparently a very important factor. These results are consistent with documented information retrieval studies based on physical distance from the information source.

2.3.16 Question 32, Potential usage of the LLIS if the only access is provided through a service group

Results: Over half (56%) of the interviewees indicated a willingness to use the LLIS through a service group.

Discussion of results: A commonly expressed comment by interviewees that were unwilling to use the LLIS by this method was that they would get only what was requested without any follow-on searching based on initial results. This suggests that iterative refined searches with subsequent time delays for delivery of information and requests for modified searches may be an undesirable or unacceptable method. Some interviewees also indicated they would use a service group if time was not an issue but would prefer direct access if a rapid response was needed. (Because the question did not address both direct access complemented by a service group, no confidence can be given to the number of people who offered this comment.)

2.3.17 Question 33, Potential usage of the LLIS if: (1) access is direct, (2) with an exclusive use in-office PC, and (3) training is extensive (30 hours)

Results: The interviewees' acceptance of this scenario was only 30%.

Discussion of results: These results could be explained by the interviewees' perception that a large investment in time for an occasionally used system is unjustified. This perception could be influenced by their awareness of other very "friendly" computer applications that require little training time. Debriefing of the survey team indicates that the 30% acceptance is likely more a measure of the survey participants' "politeness" rather than an indication of a core of users that are desperate to use whatever resources that they can find — regardless of the investment of time required to learn how to use it.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 DEMOGRAPHICS AND CURRENT INFORMATION CAPABILITIES

To reach the most customers currently on board at JSC and to ensure future success, an automated LL system such as LLIS should be usable by 386 class IBM compatible PCs. Such software to support the JSC population would allow immediate accessibility to 70% of the JSC technical personnel and would grow toward 100% with information technology upgrades.

The number of modems at JSC will probably be reduced as NASA proceeds with the implementation of common network solutions. Therefore, expectations are low for customers to voluntarily purchase a modem for accessing the LLIS.

The individual interview designed for one hour duration, with a questionnaire guideline completed by the interviewer, is an effective method to obtain customer requirements information. It affords sufficient structure to obtain statistically usable responses while not appearing to be overly formal or impersonal.

We concluded that the level of experience in the survey population was not a factor in the responses. Participants with up to 35 years' experience still need access to basic information pertinent to their missions.

3.2 INFORMATION REQUIREMENTS

The extremely diverse key word topics preferred by future LLIS customers suggests that keyword indexing should be de-emphasized. Subroutines and algorithms should be developed and/or selected to search the entire text of the LL report. Emphasis should be placed on getting the information out for the world to ponder. Simplicity and ease of use is supported by the preference of

survey participants for independence and self-reliance with regard to querying a database, and by the low tolerance for any extensive training burden.

The narrative fields of the LL (subject, lesson learned, action required, and description of source problem or event) were attractive to JSC survey participants and will be scrutinized by future customers. Future solutions to querying and reporting this information must be based on this observed preference. Additional information entered in an information system (key words, etc.) is valuable to persons performing limited, "quick and dirty" queries. This perception reflects the assessments of survey participants regarding data usefulness and query design preferences.

The wide variety of comments received on the most basic questions about LL content show that, no matter how specifically a given lesson is written or however narrow the background information provided is, people will tend to perceive each lesson differently no matter what the person conveying the lesson is attempting to report. This should be encouraged, not discouraged. The high positive response to LL information is based on access to the rich storehouse of information, and the customer's use of discretionary, often inspired personal judgment on how to use the information. This melding of data with intuitive/deductive abilities is perhaps the greatest potential value of LL. Implementation of LL must nurture this climate for innovative insight and decision making, rather than forcing users to see the specific point we are trying to make in a specific report.

Some sort of method to weigh the "degree of fit" of a given lesson to the query would also be helpful. The database needs a capability to search for, count, and weigh the value of similar events to provide frequency and severity information for a specific type of occurrence or query.

LL subjects generally have been well chosen when considering the customers' previous awareness of the data.

Parts of some LL require flexibility — especially wider field limits — to enhance clarity. Criteria which strike a balance between the need for system users' recognition of the information's value (through consistency in writing) must be balanced with the communication of specific insights being reported by the individual contributor. Simple guidelines for writing lessons should be investigated, developed, and implemented.

LLIS users desire some sort of summary report or on-screen listing that identifies all LL which satisfy their query parameters.

3.3 CULTURAL ASPECTS

A LL database that contains well written lessons which are simple to generate, access, manipulate, and assess would be accepted by the JSC technical community.

An ongoing promotional campaign aimed at both management and the technical community will be necessary to achieve optimum usage of LL for both the near and long term.

Changes in the management and workforce culture (from learning from one's own mistakes to learning from others; implementation of basic Total Quality Management concepts such as empowerment and continuous improvement; recognizing and modifying outdated paradigms, etc.) may need to occur before optimal acceptance and usage of the LLIS or any similar information system is achieved. However, this should not be considered a constraint to initial implementation. The LLIS should be implemented and perfected in anticipation of the workforce moving toward the realization of a total quality culture.

APPENDIX A - LIST OF SURVEY PARTICIPANTS

The following list indicates organizations and number of interviewees, but omits names.

NASA-JSC employees

Org. code	#	Org. code	#
AH	1	IA	1
		ID	1
BC	1	IE	1
DC	1	JD	1
DE	1	JH	1
DF	2	JJ	1
DG	2		
DH	2	KR	1
DI	1		
DJ	2	ND	1
DM	1	NE	3
DP	2	NH	1
DR	1	NS	1
EA	1	PT	1
EC	1		
EG	2	RD	1
EH	1		
EP	3	SA	1
ER	2	SN	1
ES	3	SP	1
ET	1		
		VR	1
SBTTL	31		19
GROUP TOTAL			50

Contractor employees

Company	NASA org.	#
BARRIOS	ND	1
BOEING	ID	1
CALSPAN	NS	6
CSC	PT	1
LESC	EP	1
	RA	2
LORAL	NA	1
	ND	1
	NE	3
MDAC	KA	2
RI	VA	5
DPRO*	NE	1
		25

GRAND TOTAL 75

* Non-NASA government employee - Defense Programs Resident Office

APPENDIX B - SURVEY QUESTIONNAIRE

INTERVIEWER_____ DATE_____

INTERVIEWEE_____ START TIME_____

MAIL CODE_____ YEARS EXPERIENCE_____

1. ARE THERE ANY QUESTIONS AT THIS POINT?

Recording of answer is not necessary.

2. ASSESS THE INTERVIEWEE'S COMPUTER ACCESSIBILITY AND FEATURES.

A. P.C.
- AT HIS/HER DESK ____
- WITHIN THE ROOM ____
- NEARBY OFFICE ____
- SAME FLOOR ____
- WITHIN THE BUILDING ____
- ANOTHER BUILDING ____

B. P.C. XT ____
286 ____
386 ____
486 ____
OTHER ____

C. MODEM yes____ no ____

D. NETWORKS

_____

3. A. DO YOU HAVE ANY PREVIOUS EXPERIENCE OR KNOWLEDGE OF EXISTING LESSONS LEARNED SYSTEMS OR DATA SOURCES.
B. WAS IT A WORTHWHILE OR VALUABLE SYSTEM ?
C. WHAT WERE THESE SYSTEM(S)?

Answer:
A. yes____ no_____
B. yes____ no_____

C: Comment:

4. WHAT SCOPE OF LESSONS LEARNED SUBJECTS WOULD YOU PREFER IN A LESSONS LEARNED DATABASE?

Comment:

Hand the interviewee a sample LL that is not on the list. This is to be used for Ques. 5 through 13. Explain that you want an appraisal of the headings, not the information underneath; just use the information to understand the headings.

5. A. PLEASE INDICATE IF EACH OF THE HEADINGS I NAME IS A USEFUL TYPE OF INFORMATION TO YOU.
B. WOULD YOU ADD ANY HEADINGS?

Answer: A. Place a one (1) in the blank if the heading is selected.

Facility____	Subject____	Lesson Learned____
Action Required_____	Program_____	Subsystem___
System_____	Element_____	Phase____
Applies to_____	Area of concern_____	Source_____
Submitted by_____	Organization_____	Source No._____
Contact_____	Reporting Facility_____	Additional ID_____

Description of Source Problem or Event_____

Answer: B. yes____, add comment below; no_____

6. WOULD YOU DELETE ANY HEADINGS?

Answer: Place a one (1) for each heading to be deleted by the interviewee.

Facility____	Subject____	Lesson Learned____
Action Required_____	Program_____	Subsystem___
System_____	Element_____	Phase____
Applies to_____	Area of concern_____	Source_____
Submitted by_____	Organization_____	Source No._____
Contact_____	Reporting Facility_____	Additional ID_____

Description of Source Problem or Event_____

7. NOTICE THE "SUBMITTED BY" BLOCK. THIS PERSON HAS REVIEWED THE SOURCE AND PREPARED THE LESSON LEARNED. PRESENTLY, TO IDENTIFY THE ORIGINATOR OR OBTAIN THE ORIGINAL SOURCE MATERIAL, YOU MUST CONTACT THIS PERSON OR SOMEONE WITHIN THE SAFETY ORGANIZATION. A. IS THIS ACCEPTABLE TO YOU? B. WOULD YOU PREFER TO HAVE DIRECT ACCESS TO THE SOURCE MATERIAL THROUGH AN ELECTRONIC DATABASE, LESSONS LEARNED OR SOME OTHER?

Answer: A: yes____ no____
B: yes____ no____

8. Question has been deleted.

9. WOULD YOU WANT RELATED LESSONS LEARNED LISTED?

Answer: yes____ no____

10. A. WOULD YOU USE THE FORMAT AS IT IS?
B. IF THE ANSWER IS NO, HOW WOULD YOU REARRANGE IT?

Answer: A. yes____ no____

B. Comment:

11. CAN YOU SUGGEST ANY COMPUTER SCREEN FEATURES THAT YOU PARTICULARLY LIKE AND WOULD HELP YOU IN SCANNING INFORMATION?

Comment:

12. Question has been deleted.

13. WHICH OF THE FOLLOWING KEY WORDS WOULD YOU USE TO SEARCH THIS DATABASE?

ORGANIZATION?	___	LOCATION?	___	OTHER?	___
DATE?	___	DISCIPLINE?	___		
SYSTEM?	___	SUBSYSTEM?	___		

Answer: Place a one (1) for each key word selected. Add comment for "other."

LESSON LEARNED SECTION QUESTION

Hand the LL list to the interviewee and ask him/her to select three. Record the numbers.

LESSONS LEARNED NOS. USED FOR THIS INTERVIEW _____ _____ _____

Ask the interviewee to read only the Lesson Learned sections of all three LL and no further at this time.

14. A. IS THE LESSON LEARNED SECTION SELF-EXPLANATORY?
B. If no, ask WHAT WOULD YOU ADD?

Answer: Keep the recording of the LLs left to right above, top to bottom below.

LL NO._____ A: yes____ no_____ B: comment.

LL NO._____ A: yes____ no_____ B: comment.

LL NO._____ A: yes____ no_____ B: comment.

15. WERE THE LESSONS YOU HAVE READ RELATED TO THE SUBJECTS YOU SELECTED?

LL NO._____ yes____ no____

LL NO._____ yes____ no____

LL NO._____ yes____ no____

ACTION REQUIRED SECTION QUESTIONS

Ask the interviewee to read only the Action Required sections of all three LLs and no further at this time.

16. IS THE "ACTION" INFORMATION SUFFICIENT WITHOUT READING FURTHER THE DESCRIPTION OF SOURCE?

LL NO._____ yes____ no____

LL NO._____ yes____ no____

LL NO._____ yes____ no____

17. Question has been deleted.

18. IF THE PROPOSED "ACTION REQUIRED" WAS NOT FEASIBLE FOR YOUR TASK AND IT WAS NECESSARY TO DESIGN YOUR OWN "ACTION," WOULD YOU WANT THE OPPORTUNITY TO SUBMIT IT FOR ADDITION TO THE DATABASE?

yes____ no____

19. Question has been deleted.

DESCRIPTION OF SOURCE... SECTION QUESTIONS

Ask the interviewee to read all three of the Description of Source... sections.

20. A. IS THE DESCRIPTION OF SOURCE... SECTION SUFFICIENT AND CLEAR?

LL NO._____ yes____ no____

LL NO._____ yes____ no____

LL NO._____ yes____ no____

B. IF THE ANSWER IS NO TO THE QUESTION ABOVE, WHAT SHOULD BE ADDED?

LL NO._____Comment_____

LL NO._____Comment_____

LL NO._____Comment_____

21. This question was changed to 20B.

22. Question has been deleted.

QUESTIONS FOR THE COMPLETE LESSONS LEARNED

23. A: WOULD YOU USE THE INFORMATION IN THE LESSONS LEARNED?
B: IF YOU WOULD, HOW?

A. yes____ no____

B. Comment:

24. Question has been deleted.

25. A: DO YOU SEE THE APPLICATION OF THESE LESSONS LEARNED AS BENEFICIAL?
B: IF YES, HOW?
C: IF NO, WHY NOT?

If one or more LL are beneficial, the answer is yes.

A. yes____ no____

B. Comment:

C. Comment:

26. WAS THE INFORMATION PROVIDED IN THIS LESSON NEW INFORMATION TO YOU?

LL NO._____ yes____ no____

LL NO._____ yes____ no____

LL NO._____ yes____ no____

HELP AND CONTACT QUESTIONS

27. WOULD YOU LIKE TO HAVE AVAILABLE A PROBLEM HELP DESK TO AID IN THE MANIPULATION OF THE DATABASE TO RETRIEVE DATA?

yes____ no_____

28. IN ADDITION TO YOUR OWN RETRIEVAL CAPABILITY, WOULD YOU LIKE TO HAVE AVAILABLE A SERVICE GROUP (WHERE THE ACTUAL RETRIEVAL, SORTING, AND PRINTING WOULD BE PERFORMED BY OTHERS UPON REQUEST AND THEN FORWARDED TO YOU)?

yes____ no_____

29. This question has been moved to the end of the interview.

IMPLEMENTATION QUESTIONS

30. ASSUME THE LLIS IS AVAILABLE ON YOUR OWN PC OR THE CLOSEST ONE TO YOU AND WITH A MINIMUM AMOUNT OF TRAINING YOU ARE ABLE TO ACCESS IT DIRECTLY. COMMENT ON THE LIKELIHOOD OF YOUR ATTEMPT TO QUERY THE LLIS FOR LESSONS LEARNED PERTAINING TO YOUR TASK.

WILL ____
PROBABLY ____
POSSIBLY ____
UNLIKELY ____
WILL NOT ____

31. NOW ASSUME THAT YOU CAN ACCESS THE LLIS BY GOING TO ANOTHER BUILDING AND TO A COMPUTER WORK STATION WHERE YOU AGAIN CAN ACCESS DIRECTLY. KEEP IN MIND, YOU MAY HAVE TO WAIT OR SCHEDULE TIME AT THE WORK STATION DEPENDING ON USAGE RATES. NOW, COMMENT ON THE LIKELIHOOD OF YOUR ATTEMPT TO USE THE LLIS INFORMATION.

WILL ____
PROBABLY ____
POSSIBLY ____
UNLIKELY ____
WILL NOT ____

32. WITHOUT HAVING DIRECT ACCESS TO THE LLIS, TO OBTAIN INFORMATION, YOU MUST CALL OR VISIT A DATA RETRIEVAL SERVICE CENTER AND PROVIDE KEY WORDS AND OTHER QUERY INPUTS TO A SERVICE CENTER EMPLOYEE TO PERFORM THE ACTUAL ACCESS. COMMENT ON THE LIKELIHOOD OF YOUR ATTEMPT TO USE LLIS INFORMATION.

WILL ____
PROBABLY ____
POSSIBLY ____
UNLIKELY ____
WILL NOT ____

33. NOW ASSUME THAT TRAINING TO DIRECTLY ACCESS THE LLIS IS SOMEWHAT EXTENSIVE (MORE THAN 25 HOURS), AND THAT ACCESS AND DATA RETRIEVAL REQUIRES NUMEROUS PASSWORDS, KEYSTROKES, AND IS TIME CONSUMING. COMMENT ON THE LIKELIHOOD OF YOUR ATTEMPTS TO USE THE LLIS.

WILL ____
PROBABLY ____
POSSIBLY ____
UNLIKELY ____
WILL NOT ____

29. WOULD YOU CONSIDER ADDING LESSONS LEARNED TO THE LLIS?

yes____ no_____

ENDING TIME_____

APPENDIX C - SURVEY GUIDELINES AND INSTRUCTIONS

PRE-INTERVIEW SETUP

It is important that the interview be conducted as planned and that the guideline be followed as closely as possible. Critique the interview process and guideline as well as obtaining answers.

The interview should be held privately with a single interviewer and interviewee jointly viewing a screen print or demonstration of sample lessons learned (LL).

The interviewer should record answers to questions and comments from the interviewee. Do not hand the interviewee a questionnaire or ask for written comments. The interviewer should use techniques to stimulate responses and seek clarifications from the interviewee.

Inform the interviewee of the customer requirements process, how his input will be utilized, and the promise of feedback for his efforts.

INTERVIEWER'S OPENING STATEMENTS

Introduce yourself, the subject, and the purpose of the interview, which is to afford interviewees the opportunity to identify Lessons Learned Information System (LLIS) design requirements.

Advise interviewees that all comments are anonymous and will be combined with comments from other interviews throughout JSC. (Contractor employees should be told to withhold any information that could be construed to be trade secrets or proprietary to their company).

Describe the LL database as a NASA Headquarters-sponsored mentoring system being planned for voluntary use. The intended users are technical, managerial, and assurance personnel within NASA and NASA contractors. The purpose of this LLIS is to distribute experience-based knowledge to the NASA community. This interview and the database are not for the purpose of finding errors that organizations have committed; the generation of LL will use information sources where organizations have already reported experiences.

Explain to the interviewee that the interview can be accomplished within 30 to 45 minutes. However, explain further that if he/she wishes to elaborate on the responses to the questions, we will appreciate the added interest and information and can take as much time as the interviewee can afford.*

* Schedule interviews such that extra time, if needed, can be given for an interview where the interviewee can and wants to take additional time.

INTERVIEWER'S GUIDELINE FOR SPECIFIC QUESTIONS

QUES. 3 Assess the interviewee's experience with any previous LL or mentoring databases.

QUES. 4 Hand the interviewee the list of LL subjects and ask him/her to scan the range of subjects. Then ask question 4.

QUES. 5 Instruct the interviewee to select four LL subjects from the list to be used during the interview. From the 4 selected, choose the one that seems least interesting to be used for questions 4 thru 12. Ask the interviewee to concentrate on the format, layout, and type of information for these questions and not the content under the headings; the content will be covered later in the interview.

QUES. 8 Every database will have requirements for some "common" terminology such as "part number." It is useful to minimize the aliases necessary to link terms. This is the basis for the question.

QUES. 14 THROUGH 19 Currently, the database is designed to provide the LESSON LEARNED and the ACTION REQUIRED in a succinct 150-character form. This allows the reader to obtain the most useful information and apply it without having to view subsequent source screens. Request that the interviewee read the sections in the order asked and to please try not to read ahead.

QUES. 14 AND 15 Record the LL numbers in the space provided. Have the interviewee read only the LESSON LEARNED sections and ask questions 14 and 15.

QUES. 16 THROUGH 19 Now have the interviewee read the ACTION REQUIRED sections and ask questions 16 through 19.

QUES. 19 After completing an ACTION REQUIRED, there may be a success criteria or test that verifies the completion of the ACTION. You are asking the customer if he/she wants such information in the LL somewhere.

QUES. 20 THROUGH 22 Now have the interviewee read the DESCRIPTION OF SOURCE... sections and ask questions 20 through 22.

QUES. 23 THROUGH 26 Relate to the interviewee that you will now turn his/her attention to the usage of selected headings for critique. Stress that all comment is welcomed.

QUES. 30 THROUGH 33 Emphasize anonymity in order to determine attitudes rather than dutiful responses. Assist the interviewee if necessary in choosing one of the listed responses (WILL, PROBABLY, etc....)

INTERVIEWER'S ENDING REMARKS

Having completed the planned portion of the interview, explain to the interviewee that the database is currently envisioned as a voluntary information source and, as such, it must necessarily be usable and helpful to the customer. Solicit any comment that would make the LL database more attractive to a customer, foster a favorable attitude toward it, and possibly increase its usage rate (such as additional reports or outputs).

Before ending the interview, remind the interviewee how the information will be used and of your promise of feedback, encourage attendance to the open forum meeting, and thank the interviewee for his/her participation.

Hand the interviewee a business card (if available) and encourage him/her to call you with any additional ideas.

APPENDIX D - LESSONS LEARNED USED IN THE SURVEY

The following LL reports were previously generated during the LL research and development project. These lessons were selected based on their quality and diversity as samples to be reviewed by survey participants.

APPENDIX D - LESSONS LEARNED USED IN THE SURVEY
LESSONS LEARNED REPORT

1. LESSON NO.	2. PRIMARY SOURCE NO. AND ID	3. DATE	4. FAC. ID
91-0004	PR-028-004-010	05/03/91	JSC

5. SUBJECT
Hermetic seal failures in hybrid circuits.

6. LESSON LEARNED
Hybrid circuit with thin film resistors are subject to failure if the hermetic seal package fails. Resistors will be etched by normal environment.

7. ACTION TAKEN
Assure use of hybrid circuits are not in safety critical circuiits, provide adequate backups or redundancy.

8. PROGRAM	9. ELEMENT	10. SYSTEM	11. SUBSYSTEM
Shuttle	Orbiter	Landing and Deceleration	Nosegear

12. PHASE (CHECK AS APPROPRIATE)

_X_CONCEPT	___TEST
___DESIGN	_X_OPERATION/MISSION
___PRODUCTION/FABRICATION/CONSTRUCTION	___DISPOSAL

13. APPLIES TO (CHECK AS APPROPRIATE)

_X_AIRCRAFT	_X_GROUND SUPPORT EQUIPMENT	
___SOFTWARE	___COMPUTER SYSTEM	
___GROUND TRANSPORTATION VEHICLE	___TEST ARTICLE	___FACILITY
___HAZARDOUS	_X_FLIGHT HARDWARE	
___PERSONNEL PROTECTIVE EQUIPMENT	___OTHER (SPECIFY)	

14. AREA(S) OF CONCERN (CHECK AS APPROPRIATE)

___AVAILABILITY	___HUMAN FACTORS	_X_RELIABILITY
___TRAINING	___COMMUNICATION	___INTEGRATION
___RESOURCE MGT.	___TRANSPORTATION	___COMPLIANCE
_X_MAINTAINABILITY	_X_SAFETY	___OTHER (SPECIFY)
___CONFIGURATION MANAGEMENT	___PROGRAM/PROJECT MANAGEMENT	___SECURITY
___DOCUMENTATION	___QUALITY ASSURANCE	___STORAGE/CONTAINMENT

15. SUBMITTED	16. ORGANIZATION	17. PHONE NO.
Terry Michael	NASA JSC Safety	(713) 483-6351

SOURCE INFORMATION

18. SOURCE TYPE	19. SOURCE DATE	20. SOURCE NO.
PRACA	08/10/89	PR-028-00-010

21. REPORTING FACILITY	22. REPORTING ORGANIZATION
Lockheed Space Operations Co.	KSC

23. ADDITIONAL SOURCE IDENTIFIER
None

24. DESCRIPTION OF SOURCE PROBLEM OR EVENT: Hermetic seal leaked on main landing gear weight on wheels proximity switch. Component analysis found circuit film corroded and etched away due to loss of hermetic seal causing an open circuit

APPENDIX D - LESSONS LEARNED USED IN THE SURVEY
LESSONS LEARNED REPORT

1. LESSON NO.	2. PRIMARY SOURCE NO.AND ID	3. DATE	4. FAC. ID
91-0013	PR-27RF04-03	07/10/91	JSC

5. SUBJECT
Mechanisms adjustable locking

6. LESSON LEARNED
Set screws adjustment changed setting during launch vibration, causing intermittent switch operation.

7. ACTION TAKEN
Check locked critical mechanical adjustments (set screws) to preclude loss of setting.

8. PROGRAM	9. ELEMENT	10. SYSTEM	11. SUBSYSTEM
Shuttle	Orbiter	Electrical System	PLBD

12. PHASE (CHECK AS APPROPRIATE)

___CONCEPT	___TEST
_X_DESIGN	_X_OPERATION/MISSION
_X_PRODUCTION/FABRICATION/CONSTRUCTION	___DISPOSAL

13. APPLIES TO (CHECK AS APPROPRIATE)

_X_AIRCRAFT	___GROUND SUPPORT EQUIPMENT	
___SOFTWARE	___COMPUTER SYSTEM	
___GROUND TRANSPORTATION VEHICLE	___TEST ARTICLE	___FACILITY
___HAZARDOUS	_X_FLIGHT HARDWARE	
___PERSONNEL PROTECTIVE EQUIPMENT	___OTHER (SPECIFY)	

14. AREA(S) OF CONCERN (CHECK AS APPROPRIATE)

___AVAILABILITY	___HUMAN FACTORS	___RELIABILITY
___TRAINING	___COMMUNICATION	___INTEGRATION
___RESOURCE MGT.	___TRANSPORTATION	___COMPLIANCE
___MAINTAINABILITY	_X_SAFETY	___OTHER (SPECIFY)
___CONFIGURATION MANAGEMENT	___PROGRAM/PROJECT MANAGEMENT	___SECURITY
		___STORAGE/CONTAINMENT
_X_DOCUMENTATION	___QUALITY ASSURANCE	_X_PLANNING

15. SUBMITTED	16. ORGANIZATION	17. PHONE NO.
LeRoy Underwood	NASA JSC Safety	(713) 483-4712

SOURCE INFORMATION

18. SOURCE TYPE	19. SOURCE DATE	20. SOURCE NO.
PRACA	01/14/91	PR27-RF04-013

21. REPORTING FACILITY	22. REPORTING ORGANIZATION
JSC	Rockwell Downey

23. ADDITIONAL SOURCE IDENTIFIER
NONE

24. DESCRIPTION OF SOURCE PROBLEM OR EVENT: During STS-27 the Payload Bay door ready to latch indicator hung up when the door was opened. The adjustment set screws changed setting during launch vibration. The design was changed to require the set screws to be bonded after adjustment. This switch was readjusted and bonded.

APPENDIX D - LESSONS LEARNED USED IN THE SURVEY
LESSONS LEARNED REPORT

1. LESSON NO.	2. PRIMARY SOURCE NO. AND ID	3. DATE	4. FAC. ID
91-0016	MR-790001	06/10/91	JSC

5. SUBJECT
High pressure oxygen, heat of compression

6. LESSON LEARNED
Particle impact heating can cause ignition of non-oxidized metallic parts in high pressure oxygen environment.

7. ACTION TAKEN
Design to minimize heat of compression or shock loading in high pressure oxygen environment.

8. PROGRAM	9. ELEMENT	10. SYSTEM	11. SUBSYSTEM
Test	Orbiter	Environmental Control and Life Support System	02 Shutoff Valve

12. PHASE (CHECK AS APPROPRIATE)

___CONCEPT	_X_ TEST
_X_DESIGN	___OPERATION/MISSION
___PRODUCTION/FABRICATION/CONSTRUCTION	___DISPOSAL

13. APPLIES TO (CHECK AS APPROPRIATE)

_X_AIRCRAFT	___GROUND SUPPORT EQUIPMENT	
___SOFTWARE	___COMPUTER SYSTEM	
___GROUND TRANSPORTATION VEHICLE	___TEST ARTICLE	_X_FACILITY
___HAZARDOUS	_X_FLIGHT HARDWARE	
___PERSONNEL PROTECTIVE EQUIPMENT	___OTHER (SPECIFY)	

14. AREA(S) OF CONCERN (CHECK AS APPROPRIATE)

___AVAILABILITY	___HUMAN FACTORS	___RELIABILITY
___TRAINING	___COMMUNICATION	___INTEGRATION
___RESOURCE MGT.	___TRANSPORTATION	___COMPLIANCE
___MAINTAINABILITY	_X_SAFETY	___OTHER (SPECIFY)
___CONFIGURATION MANAGEMENT	___PROGRAM/PROJECT MANAGEMENT	___SECURITY
___DOCUMENTATION	___QUALITY ASSURANCE	___STORAGE/CONTAINMENT

15. SUBMITTED	16. ORGANIZATION	17. PHONE NO.
J. Chappee	NASA JSC Safety	(713) 244-5078

SOURCE INFORMATION

18. SOURCE TYPE	19. SOURCE DATE	20. SOURCE NO.
Mishap Report	05/19/80	MR-790001

21. REPORTING FACILITY	22. REPORTING ORGANIZATION
JSC	JSC Crew Systems Division

23. ADDITIONAL SOURCE IDENTIFIER
Investigation report of the shuttle EMU incident.

24. DESCRIPTION OF SOURCE PROBLEM OR EVENT: During a performance record test of the Shuttle Extravehicular Mobility Unit (EMU), a flash fire related to the use of 6200 psi oxygen and structural failure of a thin metallic section occurred, resulting in injury to two technicians and over 1,000,000 dollars of damage to equipment and facility.

APPENDIX D - LESSONS LEARNED USED IN THE SURVEY
LESSONS LEARNED REPORT

1. LESSON NO.	2. PRIMARY SOURCE NO. AND ID	3. DATE	4. FAC. ID
91-0027	MR-91010132	07/22/91	JSC

5. SUBJECT
Use of fail safe electrical heaters.

6. LESSON LEARNED
Quartz heater ignited a polypropylene bucket when the level of liquid contents was too low. The heater did not have a fail safe capability.

7. ACTION TAKEN
Use fail safe technology with heaters to detect off nominal conditions (low liquid level) and interrupt power.

8. PROGRAM	9. ELEMENT	10. SYSTEM	11. SUBSYSTEM
Shuttle	Mission Support	Ground Support	Heater

12. PHASE (CHECK AS APPROPRIATE)

___CONCEPT
___DESIGN
_X_PRODUCTION/FABRICATION/CONSTRUCTION
___TEST
___OPERATION/MISSION
___DISPOSAL

13. APPLIES TO (CHECK AS APPROPRIATE)

___AIRCRAFT
___SOFTWARE
___GROUND TRANSPORTATION VEHICLE
___HAZARDOUS
___PERSONNEL PROTECTIVE EQUIPMENT
_X_GROUND SUPPORT EQUIPMENT
___COMPUTER SYSTEM
___TEST ARTICLE
_X_FACILITY
___FLIGHT HARDWARE
___OTHER (SPECIFY)

14. AREA(S) OF CONCERN (CHECK AS APPROPRIATE)

___AVAILABILITY
___TRAINING
___RESOURCE MGT.
___MAINTAINABILITY
___CONFIGURATION MANAGEMENT
___DOCUMENTATION
___HUMAN FACTORS
___COMMUNICATION
___TRANSPORTATION
_X_SAFETY
___PROGRAM/PROJECT MANAGEMENT
___QUALITY ASSURANCE
___RELIABILITY
___INTEGRATION
___COMPLIANCE
___OTHER (SPECIFY)
___SECURITY
___STORAGE/CONTAINMENT

15. SUBMITTED	16. ORGANIZATION	17. PHONE NO.
LeRoy Underwood	NASA JSC Safety	(713) 483-4712

SOURCE INFORMATION

18. SOURCE TYPE	19. SOURCE DATE	20. SOURCE NO.
Mishap Report	06/18/91	MR-910132

21. REPORTING FACILITY	22. REPORTING ORGANIZATION
JSC	NASA JSC

23. ADDITIONAL SOURCE IDENTIFIER
None

24. DESCRIPTION OF SOURCE PROBLEM OR EVENT: A quartz heater was used to heat water in a polypropylene bucket. When the water evaporated the bucket melted and ignited. The heater was inadvertently left energized, and it did not have a fluid level cut off.

APPENDIX D - LESSONS LEARNED USED IN THE SURVEY
LESSONS LEARNED REPORT

1. LESSON NO.	2. PRIMARY SOURCE NO. AND ID	3. DATE	4. FAC. ID
91-0028	MR-910132	07/22/91	JSC

5. SUBJECT
Emergency response planning

6. LESSON LEARNED
Fire fighting operations were delayed because information identifying the correct fire fighting agent was not readily available.

7. ACTION TAKEN
Identify the correct fire extinguishing materials to be used for a hazardous materials area and include in written plans.

8. PROGRAM	9. ELEMENT	10. SYSTEM	11. SUBSYSTEM
Shuttle	Mission Support	Ground Support	MSDS

12. PHASE (CHECK AS APPROPRIATE)

___CONCEPT
_X_DESIGN
_X_PRODUCTION/FABRICATION/CONSTRUCTION
___TEST
_X_OPERATION/MISSION
___DISPOSAL

13. APPLIES TO (CHECK AS APPROPRIATE)

___AIRCRAFT
___SOFTWARE
___GROUND TRANSPORTATION VEHICLE
_X_HAZARDOUS/Toxic Material
___PERSONNEL PROTECTIVE EQUIPMENT
_X_GROUND SUPPORT EQUIPMENT
___COMPUTER SYSTEM
___TEST ARTICLE
___FLIGHT HARDWARE
___OTHER (SPECIFY)
___FACILITY

14. AREA(S) OF CONCERN (CHECK AS APPROPRIATE)

___AVAILABILITY
___TRAINING
___RESOURCE MGT.
___MAINTAINABILITY
___CONFIGURATION MANAGEMENT
_X_DOCUMENTATION
___HUMAN FACTORS
___COMMUNICATION
___TRANSPORTATION
___SAFETY
___PROGRAM/PROJECT MANAGEMENT
___QUALITY ASSURANCE
___RELIABILITY
___INTEGRATION
___COMPLIANCE
___OTHER (SPECIFY)
___SECURITY
_X_STORAGE/CONTAINMENT

15. SUBMITTED	16. ORGANIZATION	17. PHONE NO.
LeRoy Underwood	NASA JSC Safety	(713) 483-4712

SOURCE INFORMATION

18. SOURCE TYPE	19. SOURCE DATE	20. SOURCE NO.
Mishap Report	06/18/91	MR-91 0132

21. REPORTING FACILITY	22. REPORTING ORGANIZATION
JSC	NASA

23. ADDITIONAL SOURCE IDENTIFIER
None

24. DESCRIPTION OF SOURCE PROBLEM OR EVENT: Fire fighting was delayed in a precious metal finishing shop (where hazardous materials were used) while information specifying the correct agent for extinguishing the fire was obtained.

APPENDIX D - LESSONS LEARNED USED IN THE SURVEY
LESSONS LEARNED REPORT

1. LESSON NO.	2. PRIMARY SOURCE NO. AND ID	3. DATE	4. FAC. ID
91-0031	PR-24F009-010	07/30/91	JSC

5. SUBJECT
Physical access requirements

6. LESSON LEARNED
With limited visibility it is difficult to confirm that electrical connectors are locked. Unlocked connectors disconnect during launch.

7. ACTION TAKEN
Design electrical connector locations such that accessibilty to connector locking can be achieved and verified.

8. PROGRAM	9. ELEMENT	10. SYSTEM	11. SUBSYSTEM
Shuttle	Orbiter	Electrical	Electrical

12. PHASE (CHECK AS APPROPRIATE)

___CONCEPT	_X_TEST
___DESIGN	_X_OPERATION/MISSION
___PRODUCTION/FABRICATION/CONSTRUCTION	___DISPOSAL

13. APPLIES TO (CHECK AS APPROPRIATE)

___AIRCRAFT	___GROUND SUPPORT EQUIPMENT	
___SOFTWARE	___COMPUTER SYSTEM	
___GROUND TRANSPORTATION VEHICLE	___TEST ARTICLE	___FACILITY
___HAZARDOUS	_X_ FLIGHT HARDWARE	
___PERSONNEL PROTECTIVE EQUIPMENT	___OTHER (SPECIFY)	

14. AREA(S) OF CONCERN (CHECK AS APPROPRIATE)

___AVAILABILITY	___HUMAN FACTORS	___RELIABILITY
___TRAINING	___COMMUNICATION	___INTEGRATION
___RESOURCE MGT.	___TRANSPORTATION	___COMPLIANCE
___MAINTAINABILITY	_X_SAFETY	___OTHER (SPECIFY)
___CONFIGURATION MANAGEMENT	___PROGRAM/PROJECT MANAGEMENT	___SECURITY
		___STORAGE/CONTAINMENT
___DOCUMENTATION	___QUALITY ASSURANCE	

15. SUBMITTED	16. ORGANIZATION	17. PHONE NO.
LeRoy Underwood	NASA JSC Safety	(713) 483-4712

SOURCE INFORMATION

18. SOURCE TYPE	19. SOURCE DATE	20. SOURCE NO.
PRACA	04/29/85	PR-24F009-010

21. REPORTING FACILITY	22. REPORTING ORGANIZATION
KSC	Rockwell Downey

23. ADDITIONAL SOURCE IDENTIFIER
None

24. DESCRIPTION OF SOURCE PROBLEM OR EVENT: During orbit the external tank door actuator B2 was inoperative. The cause was an electrical connector which had not been locked and became disengaged during launch vibration. This connector is located in a difficult access and low visibility area which requires visual confirmation of locking devices.

APPENDIX D - LESSONS LEARNED USED IN THE SURVEY
LESSONS LEARNED REPORT

1. LESSON NO.	2. PRIMARY SOURCE NO. AND ID	3. DATE	4. FAC. ID
91-0044	PR-06F016-010	08/05/91	JSC

5. SUBJECT
Bonding surface stiffness in zero gravity

6. LESSON LEARNED
The wall surface of the orbiter lacked necessary stiffness to support a glue-bonded equipment mount in zero gravity.

7. ACTION TAKEN
Ensure that bonding surfaces are sufficiently stiff under all operational conditions to support static/dynamic loads.

8. PROGRAM	9. ELEMENT	10. SYSTEM	11. SUBSYSTEM
Shuttle	Orbiter	Crew Module	Materials

12. PHASE (CHECK AS APPROPRIATE)

___CONCEPT
_X_DESIGN
___PRODUCTION/FABRICATION/CONSTRUCTION
___TEST
_X_OPERATION/MISSION
___DISPOSAL

13. APPLIES TO (CHECK AS APPROPRIATE)

___AIRCRAFT
___SOFTWARE
___GROUND TRANSPORTATION VEHICLE
___HAZARDOUS
___PERSONNEL PROTECTIVE EQUIPMENT
___GROUND SUPPORT EQUIPMENT
___COMPUTER SYSTEM
___TEST ARTICLE
_X_FLIGHT HARDWARE
___OTHER (SPECIFY)
___FACILITY

14. AREA(S) OF CONCERN (CHECK AS APPROPRIATE)

___AVAILABILITY
___TRAINING
___RESOURCE MGT.
_X_MAINTAINABILITY
___CONFIGURATION MANAGEMENT
___DOCUMENTATION
___HUMAN FACTORS
___COMMUNICATION
___TRANSPORTATION
_X_SAFETY
___PROGRAM/PROJECT MANAGEMENT
___QUALITY ASSURANCE
_X_RELIABILITY
___INTEGRATION
___COMPLIANCE
___OTHER (SPECIFY)
___SECURITY
___STORAGE/CONTAINMENT

15. SUBMITTED	16. ORGANIZATION	17. PHONE NO.
Donna Carroll	NASA JSC Safety	(713) 335-1668

SOURCE INFORMATION

18. SOURCE TYPE	19. SOURCE DATE	20. SOURCE NO.
PRACA	01/26/91	PR-06F016-010

21. REPORTING FACILITY	22. REPORTING ORGANIZATION
KSC	Rockwell-KSC

23. ADDITIONAL SOURCE IDENTIFIER
None

24. DESCRIPTION OF SOURCE PROBLEM OR EVENT: Camera mounting bracket debonded from orbiter ceiling. The orbiter crew compartment walls are thin and change shape once in orbit due to pressurization and zero gravity environment causing glue bond to break. Stiffener plates were added to the wall for a stronger bond surface.

APPENDIX D - LESSONS LEARNED USED IN THE SURVEY
LESSONS LEARNED REPORT

1. LESSON NO.	2. PRIMARY SOURCE NO. AND ID	3. DATE	4. FAC. ID
91-0056	PR-BFCE029F009	08/30/91	JSC

5. SUBJECT
Thermal expansion of dissimilar materials

6. LESSON LEARNED
Epoxy resin plus catalyst will heat when mixed. Cooling of epoxy after setup will impart stress to materials with dissimilar thermal properties.

7. ACTION TAKEN
Verify end item performance margins are not degraded by materials used for repairs.

8. PROGRAM	9. ELEMENT	10. SYSTEM	11. SUBSYSTEM
Shuttle	Orbiter	Instrumentation	Recorder

12. PHASE (CHECK AS APPROPRIATE)

___CONCEPT
_X_DESIGN
_X_PRODUCTION/FABRICATION/CONSTRUCTION
___TEST
___OPERATION/MISSION
___DISPOSAL

13. APPLIES TO (CHECK AS APPROPRIATE)

___AIRCRAFT
___SOFTWARE
___GROUND TRANSPORTATION VEHICLE
___HAZARDOUS
___PERSONNEL PROTECTIVE EQUIPMENT
___GROUND SUPPORT EQUIPMENT
___COMPUTER SYSTEM
___TEST ARTICLE
_X_FLIGHT HARDWARE
___OTHER (SPECIFY)
___FACILITY

14. AREA(S) OF CONCERN (CHECK AS APPROPRIATE)

___AVAILABILITY
___TRAINING
___RESOURCE MGT.
___MAINTAINABILITY
___CONFIGURATION MANAGEMENT
___DOCUMENTATION
___HUMAN FACTORS
___COMMUNICATION
___TRANSPORTATION
___SAFETY
___PROGRAM/PROJECT MANAGEMENT
_X_QUALITY ASSURANCE
_X_RELIABILITY
___INTEGRATION
___COMPLIANCE
___OTHER (SPECIFY)
___SECURITY
___STORAGE/CONTAINMENT

15. SUBMITTED	16. ORGANIZATION	17. PHONE NO.
LeRoy Underwood	NASA JSC Safety	(713) 483-4712

SOURCE INFORMATION

18. SOURCE TYPE	19. SOURCE DATE	20. SOURCE NO.
PRACA	03/24/89	PR-BFCE029F009

21. REPORTING FACILITY	22. REPORTING ORGANIZATION
JSC	NASA Mission Operations

23. ADDITIONAL SOURCE IDENTIFIER
Inflight Anomaly IFA 29-08

24. DESCRIPTION OF SOURCE PROBLEM OR EVENT: The track wires in a cavity of a recorder head were accidentally potted during rework. The difference in the thermal expansion of the epoxy and the wire caused them to break during temperature excursions in flight.

LESSONS LEARNED REPORT

1. LESSON NO.	2. PRIMARY SOURCE NO. AND ID	3. DATE	4. FAC. ID
91-0066	PR-BEMU103A22	08/13/91	JSC

5. SUBJECT
Swage verification

6. LESSON LEARNED
Visual inspection alone is not adequate to assure swivel pins have been swaged against a countersink to prevent removal.

7. ACTION TAKEN
Incorporate a push test in inspection procedures to assure proper swaging.

8. PROGRAM	9. ELEMENT	10. SYSTEM	11. SUBSYSTEM
Shuttle	Orbiter	Extravehicular Activity	Restraint Bracket

12. PHASE (CHECK AS APPROPRIATE)

___CONCEPT
___DESIGN
___PRODUCTION/FABRICATION/CONSTRUCTION
_X_TEST
___OPERATION/MISSION
___DISPOSAL

13. APPLIES TO (CHECK AS APPROPRIATE)

___AIRCRAFT
___SOFTWARE
___GROUND TRANSPORTATION VEHICLE
___HAZARDOUS
___PERSONNEL PROTECTIVE EQUIPMENT
___GROUND SUPPORT EQUIPMENT
___COMPUTER SYSTEM
___TEST ARTICLE
_X_FLIGHT HARDWARE
___OTHER (SPECIFY)
___FACILITY

14. AREA(S) OF CONCERN (CHECK AS APPROPRIATE)

___AVAILABILITY
___TRAINING
___RESOURCE MGT.
___MAINTAINABILITY
___CONFIGURATION MANAGEMENT
_X_DOCUMENTATION
___HUMAN FACTORS
___COMMUNICATION
___TRANSPORTATION
___SAFETY
___PROGRAM/PROJECT MANAGEMENT
_X_QUALITY ASSURANCE
_X_RELIABILITY
___INTEGRATION
___COMPLIANCE
___OTHER (SPECIFY)
___SECURITY
___STORAGE/CONTAINMENT

15. SUBMITTED	16. ORGANIZATION	17. PHONE NO.
Shirley Martin	NASA JSC Safety	(713) 335-1607

SOURCE INFORMATION

18. SOURCE TYPE	19. SOURCE DATE	20. SOURCE NO.
PRACA	08/18/89	PR-BEMU103A022

21. REPORTING FACILITY	22. REPORTING ORGANIZATION
JSC	Boeing

23. ADDITIONAL SOURCE IDENTIFIER
None

24. DESCRIPTION OF SOURCE PROBLEM OR EVENT: Swivel pin came out of one bearing restraint bracket while being lubricated. Only visual inspection of the assembled bracket is required to verify conformance with assembly drawing. Investigation revealed that some bracket bases had incorrect countersinks. Brackets failing push test will be returned to ILC Dover for rework.

APPENDIX D - LESSONS LEARNED USED IN THE SURVEY
LESSONS LEARNED REPORT

1. LESSON NO.	2. PRIMARY SOURCE NO. AND ID	3. DATE	4. FAC. ID
92-0002	MO-PAL-3-90	12/26/91	JSC

5. SUBJECT
System level verification testing procedures

6. LESSON LEARNED
Test safety features (such as abort systems) must be verified as able to function when required prior to test runs on flight/flightlike hardware.

7. ACTION TAKEN
Verify operability of safety features for system level test prior to test performance.

8. PROGRAM	9. ELEMENT	10. SYSTEM	11. SUBSYSTEM
Shuttle	Orbiter	Landing and Deceleration	Carbon brakes

12. PHASE (CHECK AS APPROPRIATE)

___CONCEPT
___DESIGN
___PRODUCTION/FABRICATION/CONSTRUCTION
_X_TEST
___OPERATION/MISSION
___DISPOSAL

13. APPLIES TO (CHECK AS APPROPRIATE)

_X_AIRCRAFT
___SOFTWARE
___GROUND TRANSPORTATION VEHICLE
___HAZARDOUS
___PERSONNEL PROTECTIVE EQUIPMENT
___GROUND SUPPORT EQUIPMENT
___COMPUTER SYSTEM
___TEST ARTICLE
_X_FLIGHT HARDWARE
___OTHER (SPECIFY)
___FACILITY

14. AREA(S) OF CONCERN (CHECK AS APPROPRIATE)

___AVAILABILITY
___TRAINING
___RESOURCE MGT.
___MAINTAINABILITY
___CONFIGURATION MANAGEMENT
___DOCUMENTATION
___HUMAN FACTORS
___COMMUNICATION
___TRANSPORTATION
_X_SAFETY
___PROGRAM/PROJECT MANAGEMENT
___QUALITY ASSURANCE
___RELIABILITY
___INTEGRATION
___COMPLIANCE
___OTHER (SPECIFY)
___SECURITY
___STORAGE/CONTAINMENT

15. SUBMITTED	16. ORGANIZATION	17. PHONE NO.
Larry Gregg	NASA JSC Safety	(713) 335-1607

SOURCE INFORMATION

18. SOURCE TYPE	19. SOURCE DATE	20. SOURCE NO.
Product Assurance Lesson Learned	01/16/90	MO-PAL-3-90

21. REPORTING FACILITY	22. REPORTING ORGANIZATION
JSC	Quality & Engineering Division

23. ADDITIONAL SOURCE IDENTIFIER
None

24. DESCRIPTION OF SOURCE PROBLEM OR EVENT: An extended tire skid occurred during a dynamometer test run of the orbiter carbon brake. Test abort feature failed to operate during the emergency. Hydraulic control modules used in test were not flight configuration units. Also brake supply lines were modified in an experimental effort to improve dynamic stability of the hydraulic system. These two conditions created a situation restricting hydraulic return flow from the brakes, resulting in uncontrolled tire skid. The abort system which had not been checked out under test conditions contained software anomalies preventing it from operating properly.

LESSONS LEARNED REPORT

1. LESSON NO.	2. PRIMARY SOURCE NO. AND ID	3. DATE	4. FAC. ID
92-0008	MR-900177	04/19/90	JSC

5. SUBJECT
Burst disc use in an oxygen system

6. LESSON LEARNED
Particles from a burst disc were ignited by entrapped oxygen in the capture vent located on the discharge (relief) side of the disc.

7. ACTION TAKEN
Locate the burst disc as close as possible to the vent system exit to prevent fire occurring from particle impacts.

8. PROGRAM	9. ELEMENT	10. SYSTEM	11. SUBSYSTEM
Shuttle	Mission Support	Venting System	GOX Recharge System

12. PHASE (CHECK AS APPROPRIATE)

___CONCEPT	___TEST
___DESIGN	___OPERATION/MISSION
___PRODUCTION/FABRICATION/CONSTRUCTION	___DISPOSAL

13. APPLIES TO (CHECK AS APPROPRIATE)

___AIRCRAFT	___GROUND SUPPORT EQUIPMENT	
___SOFTWARE	___COMPUTER SYSTEM	
___GROUND TRANSPORTATION VEHICLE	_X_TEST ARTICLE	___FACILITY
___HAZARDOUS	___FLIGHT HARDWARE	
___PERSONNEL PROTECTIVE EQUIPMENT	___OTHER (SPECIFY)	

14. AREA(S) OF CONCERN (CHECK AS APPROPRIATE)

___AVAILABILITY	___HUMAN FACTORS	___RELIABILITY
___TRAINING	___COMMUNICATION	___INTEGRATION
___RESOURCE MGT.	___TRANSPORTATION	___COMPLIANCE
___MAINTAINABILITY	___SAFETY	___OTHER (SPECIFY)
_X_CONFIGURATION MANAGEMENT	___PROGRAM/PROJECT MANAGEMENT	___SECURITY
		___STORAGE/CONTAINMENT
___DOCUMENTATION	___QUALITY ASSURANCE	

15. SUBMITTED	16. ORGANIZATION	17. PHONE NO.
LeRoy Underwood	NASA JSC Safety	(713) 483-4712

SOURCE INFORMATION

18. SOURCE TYPE	19. SOURCE DATE	20. SOURCE NO.
Mishap Report	04/03/90	MR-900177

21. REPORTING FACILITY	22. REPORTING ORGANIZATION
JSC	Lockheed Safety

23. ADDITIONAL SOURCE IDENTIFIER
None

24. DESCRIPTION OF SOURCE PROBLEM OR EVENT: Burst disc located in an oxygen system caused a fire from particle impact when it ruptured. The burst disc was in a captured vent system and burst in an oxygen environment.

APPENDIX E - CALCULATED RESULTS OF THE SURVEY

The calculations given on the following pages are expressed as percentages for each survey question. The questions are found in Appendix B; specific comments collected are found in Appendix F.

PHASE 1 + PHASE 2

QUES.	2A	%	PC	AT DESK	91
QUES.	2A	%	PC	IN ROOM	5
QUES.	2A	%	PC	NEXT OFFICE	4
QUES.	2A	%	PC	SAME FLOOR	0
QUES.	2A	%	PC	SAME BUILDING	0
QUES.	2A	%	PC	ANOTHER BUILDING	0
QUES.	2B	%	486		1
QUES.	2B	%	XT		7
QUES.	2B	%	286		23
QUES.	2B	%	OTH		26
QUES.	2B	%	386		43
QUES.	2C	%	MODEM		16
QUES.	3A	%	LL	EXPERIENCE	43
QUES.	3B	%	LL	EXPERIENCE GOOD`	80

INFORMATION VALUABLE ?

QUES.	5A	%	HEADINGS	FACILITY	51
QUES.	5A	%	HEADINGS	CONTACT	51
QUES.	5A	%	HEADINGS	PROGRAM	57
QUES.	5A	%	HEADINGS	PHASE	57
QUES.	5A	%	HEADINGS	SOURCE NO	57
QUES.	5A	%	HEADINGS	RPT FACIL	57
QUES.	5A	%	HEADINGS	ELEMENT	59
QUES.	5A	%	HEADINGS	CONCERN	59
QUES.	5A	%	HEADINGS	ORGANIZTN	59
QUES.	5A	%	HEADINGS	APPROV BY	61
QUES.	5A	%	HEADINGS	SUBMIT BY	61
QUES.	5A	%	HEADINGS	SOURCE	67
QUES.	5A	%	HEADINGS	ADD IDENT	67
QUES.	5A	%	HEADINGS	SUB SYST	69
QUES.	5A	%	HEADINGS	SYSTEM	71
QUES.	5A	%	HEADINGS	ACT REQRD	86
QUES.	5A	%	HEADINGS	DESCRIPT	90
QUES.	5A	%	HEADINGS	LES LEARN	94
QUES.	5A	%	HEADINGS	SUBJECT	100

DELETE HEADING ?

QUES.	6A	%	HEADINGS	SUBJECT	0
QUES.	6A	%	HEADINGS	LES LEARN	0
QUES.	6A	%	HEADINGS	ACT REQRD	0
QUES.	6A	%	HEADINGS	DESCRIPT	0
QUES.	6A	%	HEADINGS	ORGANIZTN	2
QUES.	6A	%	HEADINGS	SOURCE	4
QUES.	6A	%	HEADINGS	FACILITY	6
QUES.	6A	%	HEADINGS	APPROV BY	6
QUES.	6A	%	HEADINGS	SUBMIT BY	6
QUES.	6A	%	HEADINGS	SOURCE NO	6
QUES.	6A	%	HEADINGS	ADD IDENT	6
QUES.	6A	%	HEADINGS	SUB SYST	8
QUES.	6A	%	HEADINGS	SYSTEM	8
QUES.	6A	%	HEADINGS	CONCERN	8
QUES.	6A	%	HEADINGS	RPT FACIL	8

QUES.	6A	%	HEADINGS	PROGRAM	10
QUES.	6A	%	HEADINGS	ELEMENT	10
QUES.	6A	%	HEADINGS	PHASE	10
QUES.	6A	%	HEADINGS	CONTACT	12
QUES.	7A	%	OK FOR INTERMED		65
QUES.	7B	%	OK DIRECT ACCESS		90
QUES.	9	%	LIST RELATED LL		97
QUES.	10	%	CHNG LAYOUT		60
	KEY WORK PREFERENCE				
QUES.	13	%	LOCATION		44
QUES.	13	%	ORGANZATN		47
QUES.	13	%	DATE		55
QUES.	13	%	OTHER		63
QUES.	13	%	DISCIPLINE		73
QUES.	13	%	SYSTEM		81
QUES.	13	%	SUBSYTEM		84
	LL HEADING, SUFFICIENT DETAIL?				
QUES.	14	% + 91-0056			41
QUES.	14	% + 91-0066			54
QUES.	14	% + 92-0008			58
QUES.	14	% + 92-0002			67
QUES.	14	% + 91-0027			70
QUES.	14	% + 91-0044			71
QUES.	14	% + 91-0004			73
QUES.	14	% + 91-0013			78
QUES.	14	% + 91-0028			88
QUES.	14	% + 91-0031			88
QUES.	14	% + 91-0016			95
QUES.	14	OVERALL AVERAGE			73
	LL RELATES TO SUBJECT?				
QUES.	15	% + 91-0031			39
QUES.	15	% + 91-0056			48
QUES.	15	% + 91-0016			70
QUES.	15	% + 91-0013			75
QUES.	15	% + 91-0028			79
QUES.	15	% + 91-0004			83
QUES.	15	% + 91-0044			83
QUES.	15	% + 91-0027			84
QUES.	15	% + 91-0066			85
QUES.	15	% + 92-0002			85
QUES.	15	% + 92-0008			89
QUES.	15	% + AVERAGE			72
	COULD ACT ON ACTION REQUIRED?				
QUES.	16	% + 91-0056			24
QUES.	16	% + 91-0044			35
QUES.	16	% + 91-0016			42
QUES.	16	% + 91-0004			52
QUES.	16	% + 91-0013			56
QUES.	16	% + 92-0002			64
QUES.	16	% + 91-0027			65

QUES.	16	% + 91-0028	72
QUES.	16	% + 91-0066	77
QUES.	16	% + 92-0008	79
QUES.	16	% + 91-0031	83
QUES.	16	OVERALL AVERAGE	61
QUES.	18	ADD ACTION	84
		DESCRIP. OF SOURCE CLEAR?	
QUES.	20	% + 91-0016	52
QUES.	20	% + 91-0056	63
QUES.	20	% + 92-008	69
QUES.	20	% + 91-0066	77
QUES.	20	% + 91-0028	84
QUES.	20	% + 92-0002	87
QUES.	20	% + 91-0044	87
QUES.	20	% + 91-0004	88
QUES.	20	% + 91-0031	89
QUES.	20	% + 91-0013	90
QUES.	20	% + 91-0027	90
QUES.	20	OVERALL AVERAGE	81
QUES.	23	% + WOULD USE INFO IN	90
QUES.	25	% + SEE LL BENEFICIAL	96
		INFORMATION NEW?	
QUES.	26	% + 91-0013	37
QUES.	26	% + 91-0016	55
QUES.	26	% + 91-0028	58
QUES.	26	% + 91-0066	62
QUES.	26	% + 91-0027	63
QUES.	26	% + 91-0031	67
QUES.	26	% + 91-0044	67
QUES.	26	% + 92-0002	68
QUES.	26	% + 91-0004	71
QUES.	26	% + 92-0008	76
QUES.	26	% + 91-0056	88
QUES.	26	OVERALL AVERAGE	65
QUES.	27	% WANT HELP DESK	87
QUES.	28	% WANT SERVICE GRP	56
QUES.	29	% WILLING TO ADD LLs	92
QUES.	30	% USE IF IN OFFICE	84
QUES.	31	% USE IF WORK STATION	52
QUES.	32	% USE SERVICE CENT	56
QUES.	33	% USE IF EXCESS TRAIN	30
AVER TIME/INTERVIEW			50
AVER EXPER. - INTERVIEWEE			17

APPENDIX F

The comments collected during this survey are reported in this appendix as they were offered by the survey participants. These comments form the basis for many of the conclusions drawn and recommendations made.

APPENDIX F - COMMENTS COLLECTED FOR EACH QUESTION

1. *ARE THERE ANY QUESTIONS AT THIS POINT?*

ND2: Who will populate?

2. Question two is part of Lotus program.

3. *DO YOU HAVE ANY PREVIOUS EXPERIENCE OR KNOWLEDGE OF EXISTING LESSONS LEARNED SYSTEMS OR DATA SOURCES?*
B. WAS IT A WORTHWHILE OR VALUABLE SYSTEM ?
C: WHAT WERE THESE SYSTEM(S)?

DH6:	Looks at big programs, puts down what happened. 1-time system.
DP21:	No (but they have an internal program in LL)
DG11:	Put together a LL program on training. LL are worthwhile. Willing to add to ours.
DF43:	Has bias towards history & the use of technical lessons in today's systems. Very interested in history and program specifics.
F651S:	DOD Lessons Learned
DH4:	Planning functions for shuttle missions — contingency planning.
EP4:	Paper only, not well advertised.
EP6:	KSC's Lessons Learned.
IA131:	8080 is a type of LL — use to review for requirements but not applicable document — good information.
ND2:	Yes, Product Assurance Lessons (PAL) — designed for outside. Inputting a problem, would have been if used.
F651S:	Yes, paper system — was in military, used LL to track incidents — kind of like a weekly report except on monthly basis.
NS3:	LL, Kim Gray had a tracking system of some kind.
F670S:	PAL — used to maintain it.
NS4:	I know they exist, do not use them.
EG4:	LL1 is very valuable information.
ES3:	Aircraft main records.
316HB:	Quarterly summary if accident investigation.
KR:	LL paper for Orbiter acceptance test results.
DRRO/HB:	DOD LL systems have been on line last five years.
VR:	Informal notes only shared within working group (NASA and RF).
AA36:	KSC LL newsletters (ind. safety).
D/289:	DOD LL early 1970s, LL from PPACE Program 20 - 30 pp. Mercury/ Gemini/Apollo.
AE81:	GIDEP.
DG66:	Code D Q&A information system.
SN5:	Revisit Challenger LL every year, have line item in budget to revisit.
F651S:	8080 standard, payload/subsystem questionnaire. Valuable, but difficult to use.
ER511:	Trying to develop LL for a functional area (area advanced robotics automation systems for Mission Control).
ID2:	SLS-I, HQS. Code S.
EP5:	From Apollo, if used, flight/problem/failure system.
EG31:	Paper-type system.

4. *WHAT SCOPE OF LESSONS LEARNED SUBJECTS WOULD YOU PREFER IN A LESSONS LEARNED DATABASE?*

LESC/WSTF:	Pressure systems, vessels, cryogenics, fuel & oxidizer.
NH:	space station, shuttle, electrical, mechanical, propulsion (hydrazine, fuel) hazards.
RD:	System level test, development testing, flight hardware, failure analysis.
LESC/WSTF:	Heavy Construction.
PT:	Emergency, facilities, safety awareness.
DH6:	Geared toward operations (orbiter ops)
DP21:	Reconfiguration of on-board S/W P/L NASA-STS operations — problems (requirements) ok.
DG11:	Simulators, H/W & S/W, visual systems, training (vs real world)
DF43:	Operations — why not something done the way it was done, why new decisions made — both hardware, design, organizational structure, flight rules, procedures techniques....
F651S:	Hardware, shuttle, space station.
EP4:	Components, system, test results, test set up problems, materials.
JH2:	Manufacturability lessons, fabrication project management lessons.
BC:	Flight hardware, GSE, tooling and test hardware.
DF44:	Component failures in remote manipulators and systems it interfaces. Office safety items. Facility area safety, WETF, MDF.
EP6:	Hazards/failures. Not obvious from academic or success only experience.
IA131:	Failure, systems.
ND2:	Workmanship, procedures.
F631H:	All anomaly reports (flight & ground) material, process, human.
F651S:	Space Station, GFE.
F651S:	Subjects pertaining to payloads.
F670S:	All; for example, mechanical and electrical are tied together.
NS4:	All design and operations.
DC:	Procurement, government computer systems, government regulations.
EG4:	Management programs. Don't lose innovative thinking. How to handle new technology in terms of risks to take. Could have design (all kinds) approvals. Technical area could have a narrow vision.
EC6:	EVA, procedures, contracts, monitoring test facilities.
DF22:	Network, configuration (PC), LL in installing PC standards, and flight control.
F651S:	One w\ criteria — Orbiter — containing anything on the subject. Then do additional on subset.
ES3:	Thermal control, propulsion, propellants, and materials. Limitations of materials. Structural gradients of composites.
ES2:	Summary of structural test results. Orbiter maintenance, inspection findings on structure findings.
ES4:	Hardware development problems, management, technicians.

PT4:	Project time frame, differ w/ software in LL, and pitfalls of software.
EE231:	Procedures.
871HB:	Not so concerned about this — should emphasize accuracy, technical veracity.
316HB:	Would be just about anything — at top of list would be hazard-related items.
KR:	Procedural checklists for manufacturing, test, assembly, and rationale for LL associated to the same.
NE144:	Nonconformance corrective actions; manufacturing; test verification, configuration management, including innovations.
NE14:	Design issues, manufacturing, test, configuration management, administrative, all flight hardware.
AA36:	All things in manufacturing and test.
VR:	No limit — go for the widest usage.
NE211:	Quality (in-house & vendors) production/manufacturing, and test.
AA36:	Technical (but using generic key word rather than System/ Subsystem/Element).
QDLOR:	Traceability, parts interchangeability, raw materials procurements by vendors/subs/primes, local regulations and effects on product quality.
AA36:	Mfg. cranes/lifting, (material handling) safety - critical transportation - flight, hazardous operations, industrial safety, industrial hygiene, facility, unique operational conditions/environments.
D/289:	Test philosophy (test parameter configuration, etc. vs value gained), simulate rather than duplicate test conditions.
D/289:	Needs history of failures, acceptance test, interchange of hardware between vehicles, mishaps/accidents and associated correction actions, parts time in service and association changes in performance, locator system for contacts.
D/289:	Same comments as above. Two were interviewed at same time.
AE81:	Audits (recommendations and corrective actions) in NASA community. Must be sensitive to local influences/facilities and process, requirements.
ET:	Reliability, integration, LL work practices and tools.
SP44:	Management, lunar lander design, carrier development.
SP52:	Mock-ups, training vs simulation vs actions. How training simulations and mock-ups relate to actual performance.
C51:	Propellants and explosives testing aspects, storage/facilities, mechanical failure in hydraulic systems.
JJ4:	Yes, construction of facility modifications.
DE32:	Procedures, mission rules, development, training, flight control, failure analysis.
EA:	Organizational structure and management-type stuff. LL should be unique to NASA stuff and not just "industry standards" stuff.
HF50:	Accidents, cause of near misses, environment.
JD32:	Facilities, design, construction, change order.
IE3:	System design, concept stage, operation safety constraints on design, safety requirements.

DG66:	Flight rules.
SN5:	Challenger lessons learned, involved only in Space Lab.
NS5:	All.
F651S:	Payloads, GFE, subsystem.
ND55:	Calibration of equipment, new methods, tips and t:ricks, procurement/ acquisitions — sources of information on equipment, and equipment benefits.
EK7:	Avionics/SS, design.
DI27:	OPS — operation in Shuttle to learn how to do Station. International partners — relationships, design reviews.
ER511:	Automation (robotics for flight operations).
SA:	Design and operations on hardware and software.
DJ35:	Discrepancy reporting process (experience) contents and process.
AH12:	Occupational/safety items
ID2:	Payloads, all phases of P/L integration/operation.
DM:	Safety issues, organization issues, metrics, project administration, and contracts.
SP33:	Human factors, human interface.
EP5:	Management, engineering disciplines, cost of projects, hardware, development.
EG31:	Aerodynamics.

5. *A. PLEASE INDICATE IF EACH OF THE HEADINGS I NAME IS A USEFUL TYPE OF INFORMATION TO YOU.*
B. WOULD YOU ADD ANY HEADINGS?

LESC/WSTF:	*Description of Source...* most useful.
NH:	*Subject, Lesson, Contact.*
RD:	All useful.
LESC/WSTF:	*Lesson Learned* most useful, add *Material Description.*
DH6:	*Lesson Learned Action Required, Subject, Source, Description of Source Problem/Event.*
DP21:	*Title/Subject, Description, Applies To.*
DG11:	*Action Required* may be superfluous.
DF43:	Useful: *Topic, Lesson Learned Action Required, Area of Concern, Submitted By, Organization.* Not: *Program/System/Subsystem/Element, Phase* and *Applies To* — misleading and may actually be detrimental.
F651S:	All are useful — would want part number.
DH4:	Add requirement for material #1-56 or indicate source location.
EP4:	All, would add *Engineering Concurrence* and *Engineer Name.*
JH2:	All.
BC:	All.
DF44:	*Subject, Lesson Learned,* no additions.
EP6:	All.
IA13 1:	Everything except *Phase.*
ND2:	*Program Subsystem, System Element, Phase, Applies To,* all.
F631H:	How data acquired/full description/credibility. What is the goal or requirement. How valid/update verification.
F651S:	*Subject, Lesson Learned, System, Area of Concern* needs more detail added to just safety.
F651S:	*Description of Source* very useful, *Action Required* helpful, *Lesson Learned.*
F670S:	Problem is across the board. Need other definitions in concerns — area like Product Assurance.
NS4:	Fine — all looks good.
ES3:	*Mission - Phase* of greater interest. Need to indicate that he has source document.
ES4:	*Reporting Facility, Lesson Learned/Problem, Organization* should be by name, put *Program, System,* and *Element* under *Lesson Learned.* Combine *Source Name* and *Report Number.*
KR:	Issues w/ publishing, not w/content.
VR:	Would like military method for titles.
EA:	*Applies To* — not clear use; *Life Cycle Phase,* etc.; *Date* is important.
IE3:	*Facility - LLIS Originating, AR/Taken, Submitted By* — say *Contractor, Reporting Facility - Source,* reduce acronyms.
DC:	Key word field (*Phase* - he called *Increment*).
EG4:	In this case I would stop reading after *Lesson Learned.*
DF22:	Would like to see date of last update
F651S:	Need problem oriented.

PT4:	If this was fixed, what impact on other areas?
316HB:	Modify *Contact, Submitted By* to read "*for more information, contact---*"
NE14:	Move items checked to top.
VR:	*Frequency of Occurrence.*
AA36:	*History of Recurrence, Trends*, etc.
QDLOR:	*Manufacturer* or *Supplier* or *Organization Performing Service* or *Operation.*
AA36:	Would like in the requirement documentation, "What are the requirements vs what was done?"
C51:	*Magnitude of Severity of Source Incident.*
JJ4:	*Regulation, Authority.*
DE32:	*Source Date* or some chronological marker (flight, etc.)
IE3:	*Impact* or *Criticality.*
ND5536:	*Date of Occurrence* — change to *Source Facility* (vs *Facility/ Location*).
DI27:	I think *Site* would be better than *Facility.*
AH12:	*Area of Occurrence/Occupation of Injury.*
ID2:	*Description* should be up toward the top.
DM:	*Facility* should be *Site/Center/Agency/Company*; *Phase* could be *Cycle*; *Organization* and *Phone* ok; need *Mail Code*; *Contact* should say *NASA Approval*, *Source Number* should be the driver, *Reporting Facility and Facility* at top are misleading. *Facility ID* needs number of times the problem has been reported.
EP5:	What about using *Activity Response* for a source of information number?

6. *WOULD YOU DELETE ANY HEADINGS?*

LESC/WSTF:	*Contacts, Remarks.*
NH:	*Area of Concern* would almost always be Safety. *Submitted By* is unnecessary.
RD:	Yes, if originator wants it, but why not put *Originator*, if that's ok?
LESC/WSTF:	Need only first three and last items.
DH6:	*System, Subsystem*, etc. (*Submitted By, Organization, Mail Code* just clutter up page).
DG11:	Where you could find information (*Source*).
DF43:	*Applies To* might be misleading and actually limit applications of LL across programs.
DH4:	No deletions.
EP4:	*Applies To* is of little use.
JH2:	Use all.
DF44:	No, use all.
IA131:	Yes, *Phase.*
ND2:	From *Program* through *Contact.*
F651S:	Wouldn't use *Program* or *System.*
EG4:	Don't know the acronym.
F651S:	Need clarification on *Submitter* and *Contact.*
KR:	Need to simplify for publishing.
AA36:	Need to better assess context of *Lesson Learned, AR* via source information.
AA36:	Would like to access other sources referenced with minimum pain.
ER511:	Would re-emphasize the following areas: *System, Program, Subsystem, Element, Phase, Applies To,* and *Area of Concern.*
DJ35:	*Area of Concern*, too general, do we need?
ID2:	*Responsible Organization* should be up front. *Name Change* — don't really need — need *Organization/Number.*

7A. *NOTICE THE "SUBMITTED BY" BLOCK. THIS PERSON HAS REVIEWED THE SOURCE AND PREPARED THE LESSON LEARNED. PRESENTLY, TO IDENTIFY THE ORIGINATOR OR OBTAIN THE ORIGINAL SOURCE MATERIAL, YOU MUST CONTACT THIS PERSON OR SOMEONE WITHIN THE SAFETY ORGANIZATION. IS THIS ACCEPTABLE TO YOU?*

DH6:	Prefer direct access.
DG11:	Prefer to go direct.
DF43:	No, anything between is a waste of resources and time. Need to go to organization where LL originated and organization needs to be descriptive enough to outlast personnel/organization.
F651S:	No — what if he's gone — need to get directly to data.
IA131:	Doesn't have to be tied to a person, should be able to a have a file in a library. Don't need to call Safety — would call technical library and they would give information.
F651S:	Don't need another group of people. This statement/question is not clear; eliminate this group and *Contact* — add person who approved the closure with authority.
F651S:	Likes the idea.
F670S:	Look at question 5.
EG4:	No, because it depends on the information. Would prefer to look at the source before contacting the submitter.
DRRO/HB:	LL should be stand-alone; no need to call person or look at source data.
NE144:	Choke point.
NE14:	Not necessarily custodian of information.
VR:	Like to have option.
AA36:	Nice to have.
ET:	Rather go to source.
C51:	But will cut down on the number of people using the system.
DE32:	Prefer direct.
DI27:	No, person maintaining the database would be the one to contact.
ER511:	Better chance of getting information w/ little fuss. Would call contact, not submitter.
SA:	But not on individual use.
DJ35:	But have two names — who do I call?

7B. *WOULD YOU PREFER TO HAVE DIRECT ACCESS TO THE SOURCE MATERIAL THROUGH AN ELECTRONIC DATABASE, LESSONS LEARNED OR SOME OTHER?*

F651S:	Most desirable.
PT4:	Remove this layer.
316HB:	But technologically questionable at this time.
KR:	If really helpful to establish validity, reassessments subsequent.
NE144:	Volumes of data!!
AA36:	Preferred.
VR:	Like to have option.
AE81:	Preferred.
NE211:	Rather call a person, spell out first name, need area code for phone.
AA36:	This is not reasonable for submitter to all source documentation.
AA36:	Nice to have.
D/289:	Combined with a library function.
SA:	But would use a reliable contact instead.
DJ35:	Prefer to make LL stand-alone.
EG31:	Very computer oriented.

9. *WOULD YOU WANT RELATED LESSONS LEARNED LISTED?*

DH6:	Not if this type of search was available. If not, yes.
DG11:	Yes, with titles/topics. Question: What does *Element* refer to? Confusing.
IA131:	Would want everything related.
F631H:	Yes, but want certain time frame.
F651S:	With listing of LL number and subject, not the whole paper.
F651S:	Definitely — very good.
F670S:	Yes, even if not used, sometimes titles are misleading.
EG4:	No, unless closely related.
F651S:	Would not want to imbed in this LL — tie together in retrieval database.
KR:	Not usually needed because problem is fixed real time.
AA36:	On source and hard copy.
NE211:	Menu screen, not hard copy.
QDLOR:	Would like related LL listed on each report.
AA36:	Especially if not part of original query or report.
AE81:	Point and shoot on screen to hard copy.
SP52:	If related were concise and subjects clear. Area between *Program* and *Element* seems out of place, needs to be separated out more from info above.
SN5:	But not on the screen that's pulled up — need option.
NS5:	If a technical issue.
SA:	But not necessary on report, a separate list.
DJ35:	List on report.
AH12:	If there was a way of sorting them.
EG31:	Cross reference capability, one event - multiple LL, one Lesson - multiple corrective action.

10A *WOULD YOU USE THE FORMAT AS IT IS?*
10B. *IF THE ANSWER IS NO, HOW WOULD YOU REARRANGE IT?*

LESC/WSTT:	*Description of Source...* at the top.
LESC/WSTT:	*Description of Source...* move up to *Action Required.*
DH6:	Take out section between *Other/Source.*
DP21:	Set off *Subject.*
DG11:	Too jumbled up, too busy, no real order. New order: *Program, System, Subsystem, Title - Lesson Learned,* and *Recorder.*
DF43:	No. Need to set off titles to make for easier scanning - bold, all caps, in boxes, underlined, etc. Text should be in text form. Make sure there is enough room on the data fields to explain.
DH4:	Use as is.
JH2:	Yes, not cluttered.
EP6:	No, move up *Description of Source...*
ND2:	*Description of Source...* under *Action Required.*
F631H:	No, *Lesson Learned, Description*, add *Action* later.
F651S:	*Description* should be at the top; this is important. Next would want *Action Required.* Following, wants to know problem and how it was fixed. Wants history — problem more than once.
F670S:	Ok.
F651S:	Would concentrate on problem being stated first or have a field that states the problem.
AA36:	For the most part.
DC:	Wants to see whole report on one screen.
EG4:	It's not bad.
EC6:	Move *Description* to top, up by the *Lesson Learned.* Put all in center (*Applies To*, etc.) to the top of page.
ES3:	Move up *Submitted By.*
ES4:	Put *Program, System, Subsystem*, and *Element* under *Problem/Lesson Learned.*
PT4:	Would change *Description* to top. Want *Problem* up front.
871HB:	Can use other alternate format for double purpose.
316HB:	*Problem or Event* at top (chronological logic), executive.
KR:	Simply publish information (*Subject/Lesson Learned/Action Required* usually enough).
DRRO/HB:	Form not readable — looks like data entry form.
NE14:	Put source info (*Description of Source Problem/Event* only) after *Subject.*
AA36:	Add *Cause* or *Root Cause for Event.*
AA36:	Use blocked areas (solid lines) not open now; intimidated by open format.
AA36:	Move *Description* or *Event* upward, group with the *Subject/Lesson Learned/Action Required.*
DE32:	Move *Source Description* up to top after *Lesson Learned.* Group problem information, administration, etc. areas together and set off from each other.
EA:	Move *Description of Source...* up higher in the form, maybe after *Subject.*

IE3:	All caps not easy to read. MAC with better fonts is better.
DG66:	Move *Description of Source* and *Source Title* up.
SN5:	If I had need — the true data is when you start using.
EK7:	Kind of — depends.
DI27:	It's good and to the point, but would have to go back to the submitter. Need to expand text fields.
ER511:	Menu-driven, mouse-driven environment (MS windows or MAC equipment).
DJ35:	Move *Facility* down to after *Submitted By*, before *Organization*.
DM:	Would like option (window) to get related LL. Go through pop-up "note pad" for thought process.
EP5:	Go from *Program* to *Element* to *System* to *Subsystem*.

11. *CAN YOU SUGGEST ANY COMPUTER SCREEN FEATURES THAT YOU PARTICULARLY LIKE AND WOULD HELP YOU IN SCANNING INFORMATION?*

LESC/WSTT:	Colors, mouse, Windows.
NH:	Mouse-driven, shading.
RD:	Mouse, Windows.
LESC/WSTF:	Fast page down and up. Color highlights.
PT:	Likes information because it's brief. Have name and number to make contact.
DH6:	Would like capability to sort several topics side by side or in a list with some other key identifier as a second level sorting process. Harris County Library.
DP21:	Set off major headings (bold, etc.)
DG11:	Set off major elements (bold, etc.)
DF43:	Set off titles.
F651S:	Under titles the information should be spaced two spaces. Likes all titles in left column. *Phase* is in the middle of the page.
DH4:	Bold face, underline, colors to break data away from headings.
EP4:	Don't like page down and then can't page up. Want screen print capability.
BC:	Windows, macros.
DF44:	Side-by-side instead of over-and-under for convenience.
EP6:	Macro options.
IA131:	Would like to see all headings in bold. Don't like all caps. It's too hard to read and gets boring.
ND2:	Key word, other LL.
F631H:	Deviation, non compliance, corrective action, anomaly.
F651S:	Change headings to bold print; change actual statement to regular type.
F651S:	Would use *Description of Source Problem, Action Required*, and *Lesson Learned.*
F670S:	Key word search.
DC:	Full screen format. Would want to jump around and see different fields.
EG4:	Depends on commands to use and lack of uniformity w/ other systems.
EC6:	Like to "find," do key words to search. Would like to have previous.
DT22:	Hypertext - This is a quick access - goes directly to next LL.
F651S:	Ability to do a search. Like Folio program. It gives number of times the word is in the database.
ES3:	De-emphasize headings, emphasize data.
ES2:	Key in on "element," receive related LL.
ES4:	Key bullets all caps, and highlight what the question is. It would make a difference if inputting or querying.
PT4:	Color for key words.
871HB:	Pull-down menus (menu-driven).
316HB:	Pull-down menus and help screen.

KR:	Speed, least number of key strokes, versatility.
DRRO/HB:	Windows w/ mouse.
NE144:	Windows w/ mouse (no mysterious key word combination); has taken LL training at JPL.
NE14:	Help screen, quick exit (no multiple-step back-out — 1 step only back to main menu).
AA36:	Nothing special.
VR:	Windows, mouse.
NE211:	Nothing special.
AA36:	Subject titles, key words - type in own query rather than be prompted. (Is very computer literate; agrees, he is not typical user.)
AA36:	Point and shoot with mouse.
D/289:	Neither were familiar with querying systems; skipped this question. Later indicated need for hands-on, user friendly system.
D/289:	Query systems on key words. Pull-down menus, cursor movement, etc.
D/289:	Comments same as above. Two were interviewed at same time.
AE81:	Directory of information system on line?
SP44:	Pull-down menus and mouse, scroll bar (all-in-one) features; highlighting key words or in text.
C51:	Subject should be highlighted somehow and LL statement.
JJ4:	Sort by most important LL.
DE32:	Set off by boxes.
HT50:	Make subject distinctive.
JD32:	Titles one color, action in different color, would like as much information as possible on the screen.
IE3:	Hypercard system (MAC software) better. More depth of fields, user friendly.
DG66:	Windows environment ability to key word search.
SN5:	Out of context — need the screen — looking at a piece of paper — need to download — may want large amount of information.
ND55:	Be able to tab from field to field, headings bold, highlighted, reverse video, etc. "Safety" highlighted if area of concern (color, etc.).
DI27:	Would want user friendly; search by categories.
DJ35:	On-line helps; need to get into and use almost immediately with little training.
ID2:	Key words, responsible organization should stand out.
SP33:	Highlighting.
EG31:	Pull-down menus, mouse-driven, Windows.

13. *WHICH OF THE FOLLOWING KEY WORDS WOULD YOU USE TO SEARCH THIS DATABASE.*

ORGANIZATION?___ LOCATION? ___ OTHER?___
DATE? ___ DISCIPLINE? ___
SYSTEM? ___ SUBSYSTEM?___

DF43: Suggestion — Make people want to use the system by adding some other "historical" types of things for general knowledge.
F651S: Doesn't see anything related to Topic.
JH2: Other: Phase or Project.
EP6: Other: Components.
F651S: Definitely these.
F670S: Eliminate early information.
EG4: #1-28, Subject needs to be up above w/ other choices. Source and Source Number — fire fighting, emergency, hazardous materials.
EC6: Would key word search by subject. Example: "Swage."
DF22: Other: Element, Subject, and LL.
F651S: Don't understand Discipline! Other? Folio Style.
ES3: Program: Air Force, NASA.
ES4: Other: Subject.
PT4: Other: Element and Program partial match with Discipline of Problem.
EE231: Other: Subject.
871HB: Other: Key word with string searches; "contain."
316HB: Other: Key word.
AA36: Key words can be a problem.
VR: Program Phase.
AA36: Prefers contains verses matched query.
D/289: Other: Key word on text.
D/289: Other: Key word.
D/289: Comments same as above. Two were interviewed at same time.
AE81: Subsystem, less so.
ET: Program, Project.
SP44: Other: LL itself, Application, Action Requirement.
SP52: Subject activities — fabrication activities, etc. "Action" verbs.
C51: Subject, i.e., "brazing" type of operation, "cleaning" key word.
JJ4: Other: ORI documents, Subject, Testing Requirements, Product Selection, Product Availability, Design.
DE32: Program, data management, functional areas.
EA: Materials, processes — i.e., brazing, joining, fluxes, for example LL. query by "word strings."
HF50: Accident classifications.
IE3: Criticality, hazard, design, conceptual, requirements.
SN5: Without log-on, I don't know. Key word search for any LL.
NS5: Other: Subject, Action Required.
F651S: Location within a spacecraft. Other: hazard category; type of hazard.

ND5536:	Subject, word strings, ID #s (m numbers) for calibrated equipment at JSC.
SA:	Other: Text search, separate key word of applicability.
DJ35:	Confusion — center who reported LL vs reporting organization for *Description of Source Event.* Confusion — too many dates — report date, lesson date vs source date.
AH12:	Specific types of work done, injuries and time of occurrence.
ID2:	Payload key words under individual payloads, manufacturing, test and checkout, integration, operations, training, simulation, and analysis.

14. *A. IS THE LESSON LEARNED SECTION SELF-EXPLANATORY?*
B. If no, ask, WHAT WOULD YOU ADD?

NH:	#1-31, don't know; #2-02, add how to verify.
PT:	#1-27, ok; #31-28, could be something else; #1-31 ok.
DH6:	#1-13, # 1-28, and #1-44, not LL — scenario of what happened.
DP21:	None of real interest to area. #1-13, ok; #1-27, lacking; #1-28, ok.
DG11:	#1-28, #1-31, and #2-02, "guess so."
DF43:	#1-13 vague — What is screw adjusting? #1-28, good; #1-27, probably the best.
EP4:	#2-02, more qualifiers.
BC:	#1-28, insufficient information; #1-31, what does visibility mean?
DF44:	#1-56, no, more about use of words or during manufacturing.
EP6:	#1-56, second sentence unrelated.
IA131:	#1-16, no, statement is true but what's the problem? #1-31, yes, would re-word.
ND2:	#2-08 and #1-13, not a complete Lesson Learned.
F631H:	#2-02, not specific enough.
F651S:	#1-13, doesn't clarify which switch; #2-08, doesn't say what type of particles.
F651S:	#1-04, too general — how did it fail, what is etched? #1-13, understandable; #1-27, too general.
F670S:	#1-13, #1-56, and #2-08, all need more detail.
NS4:	#1-13, #1-16, and #1-28, yes, more detail in other areas.
EG4:	#1-04, LL isn't a LL; #1-56, looks pretty good; #2-02, need to look further into LL.
ES4:	#2-02, #1-13, and #2-08, too brief.
871HB:	#1-27, what's fail-safe capability? #1-56, not a positive or negative.
316HB:	#1-28 and #2-08, subject's too broad.
DPRO/HB:	#1-44, lacked substance; #2-02, need AR to make sense.
NE144:	#1-44, vague LL.
NE14:	#1-66 and #2-08, subject needs to be more specific (less vague), LL sounds like ground information — what was the LL?
AA36:	#2-02, vague.
VR:	#1-66, needs to know what swivel pin is.
NE211:	#2-02, poorly written!
AA36:	#1-04, didn't know of problem; #1-66, a little fuzzy — but alert or advisory.
D/289:	#1-13, cause to inspection may restrict insight of readers; #1-27, use of "fail-safe" questionable; #2-02, couldn't understand content.
D/289:	#1-56, vague LL.
D/289:	Comment same as above. Two were interviewed at same time.
SP44:	#2-08, more detail.
SP52:	#1-66, where? circumstances too general.
EA:	#1-27, more information; #2-08, not quite — where did energy come from?
HF50:	#1-04, but need to expand "normal" environment.

IE3:	#2-O2, vague.
SN5:	#2-O2, describes solution. Need to describe what happened in all LL.
F651S:	#1-27, inference needed; #1-56, inference needed.
ER511:	#1-27, need more information; #1-28, vague — need more detail; #2-02, vague — need more detail.
SA:	#1-04, pretty good; #31-44 and #1-56, vague.
DJ35:	#2-02, fuzzy, poorly written.
DM:	#1-31, visibility problem; two Lessons Learned in this LL.
EP5:	#1-56, Subject should be expanded, maybe add word "restrained" — more information needed.

15. *WERE THE LESSONS YOU HAVE READ RELATED TO THE SUBJECTS YOU SELECTED?*

LESC/WSTF: #1-16, the Subject should include particle impact.
PT: #1-27, yes; #1-28, needs to be more specific; #1-31, yes, ok.
DP21: #1-28, too general.
DF43: #1-13, not looking for mechanism; #1-28, no; #1-27, the closest to what I expected.
F651S: #1-28 and #1-31, don't like the titles; Lesson Learned should address as a key word in subject.
DF44: #1-13, no, quite pertinent.
IA131: #1-13, yes, "Compression" should be "Impact."
F651S: #1-13, Action Required inappropriate to correct problem; #2-08, need to read on.
F670S: #1-13, #1-56, and #2-08, all need more description.
F651S: #1-27, marginal, not what I expected.
ES2: # 1-04, thought I would see the seal failure instead of seal component; Subject should be shorter, words don't match up.
ES4: #1-13, not clear.
EE231: #1-56, should epoxy be in Subject?
871HB: #1-27, in warped sense, did relate; #1-31, do not relate to each other; #1-56, AR looks like it's considered to be the lesson.
NE144: #1-04, Subject vague; #1-56, wire incidental to Lesson Learned (could become "victim" of epoxy heat/cool).
QDLOR: #1-66, a little fuzzy, but readable, understandable.
D/289: #1-56, Lesson Learned vague.
D/289: Comment same as above. Two were interviewed at same time.
SP44: #1-16, delete Heat of Compression, add Particle Impact.
SP52: #1-56, "Electric wire" was misleading; #1-66, too general to tell.
C51: #1-44, 32-08, and #1-16, a little too general.
JJ4: #1-31, need identification to eliminate; #1-04, wrong subject — more detail needed.
DE32: #1-16, esoteric subject.
EA: #1-27, #1-31, and # 2-08, need to be more generally related to topic.
JD32: #1-31, looking for facilities.
IE3: #1-31, "Visibility Access" requirements; #2-02, nothing to do with procedures.
SN3: #2-02, could have written better subject.
SA: #1-044 and #1-56, still vague.
DJ35: #2-02, unsure because was fuzzy.
ID2: Odd to be a database related to payloads only; don't want to sift through orbiter/system.
EP5: #2-02, "Action Required" is bad repair, not clear on Description, not intended to be potted.

16. *IS THE "ACTION" INFORMATION SUFFICIENT WITHOUT READING FURTHER THE DESCRIPTION OF SOURCE?*

LESC/WSTF:	#1-16, incomplete.
PT:	#1-27, good as a highlight, probably would want more; #1-28, want more, unless looking for a quick overview; #1-31, want more — good as a highlight.
DF43:	#1-28, it is obvious what action to take from the *AR*; #1-27, would rather expand the *Lesson Learned* section with more background detail.
DH4:	#1-31, too broad; #2-02, a little broad.
DF44:	#1-04 and #1-56, not enough information.
IA131:	#1-13, yes, don't like the words, but it's ok.
F631H:	#1-44, not specific enough.
F651S:	Should be narrative w/ enough information on what occurred. *Description* should follow *Lesson Learned* instead of at the end. Would want to see *Description* along w/ *Lesson Learned* and *Subject.*
F651S:	#1-04, #1-13, and #-27, understand why, but need more detail.
NS4:	#1-13, #1-16, and #1-28, no, more.
EG4:	#1-04, disagree w/ action, it draws a conclusion — I don't think it's valid; #1-56, motherhood kind of thing, doesn't really tell me much. Didn't know it was talking about repairs. *Action* needs to be more specific.
ES4:	#2-02, #1-13, and #2-08, too brief.
EE231:	#1-56, not enough information.
871HB:	#1-27 and #1-31, this was the *Lesson Learned*; #1-56, *AR* looks like what he considered to be the lesson, also, could incorporate recommended specific solutions, not just intent.
316HB:	#1-16, vague *AR* — need source; #1-28, *AR* switched from *Lesson Learned* — needed tech. review; #2-08, need source to clarify *AR*, etc.
KR:	#1-16, need more information; #1-44, too elementary; #1-66, need more information.
NE144:	#1-04, does not relate to *Subject, Lesson Learned*; #1-44, does not understand what happened; #1-56, does not relate with *Subject, Lesson Learned.*
NE14:	#2-08, does not understand what's being said. Background! Sketch might help.
VR:	#1-13, what does "check" mean? #1-66, What is "push test?" What kind of swaging?
QDLOR:	#1-13, *AR* was inadequate; #1-66, *AR* was inadequate, needed more information on criteria, would also do the action even if he had doubts it was enough.
D/289:	#2-02, *Subject* now disconnected from *Lesson Learned*; created confusion, choice of words in *Subject* seems to be the problem.
D/289:	#1-56, disconnects between *Subject/Lesson Learned/AR.*
D/289:	Comment same as above; two were interviewed at same time.
SP52:	#1-56, weak.

JJ4:	#1-04, need more detail. Would like to move *Description of Source* to just below *Subject.*
DE32:	#1-16, how do I do this?
EA:	#1-27, may not be only solution or right solution. Best LL should identify new, high-tech type solutions to problems rather than common sense industry standard.
IE3:	#2-02, vague.
SN5:	#1-28, understand but don't agree with it; #2-02, sounds like general procedures; *Lesson Learned* shouldn't be general; #2-09, out of context of my area — fairly well written.
ER511:	#1-27, better, too high level of detail; #1-28, better, but still vague; #2-02, better, but needs more detail on context.
SA:	#1-44 and #1-56, still vague.
DJ35:	#1-28, was already established in Lesson Learned; #1-31, needed background for specific.
AH12:	#1-28, #1-31, and #1-44, all need more information.
DM:	#1-28, does not answer what I thought would come out of this Lesson Learned.

18. *IF THE PROPOSED "ACTION REQUIRED" WAS NOT FEASIBLE FOR YOUR TASK AND IT WAS NECESSARY TO DESIGN YOUR OWN "ACTION," WOULD YOU WANT THE OPPORTUNITY TO SUBMIT IT FOR ADDITION TO THE DATABASE?*

DH6:	Needs to be some incentive.
DP21:	Suggestions should be made to originator for inclusion or not.
DG11:	Yes, definitely.
DF43:	Yes, very much, but making time to do so would probably be a problem.
F651S:	All I'm looking for is his/her actual use.
DF44:	Yes, allow others to do so.
IA131:	If it's something that bothered me, yes; if it isn't any of my business, leave it alone.
F651S:	Wouldn't do it all the time but if I thought it was wrong, would contact the originator and give my opinion about making changes.
F670S:	#1-13, #1-56, and #2-08, all.
NS4:	#1-13, #31-16, and #1-28, yes, would keep it current on all.
EG4:	No, because I wouldn't feel responsible. If I was in NASA Safety, I would feel responsible to design my own.
ES4:	How would you resolve different opinions?
871HB:	But peer review must be used.
DRRO/HB:	I am giving away a trade secret.
AA36:	But only after peer review.
JJ4:	Would look at new lesson learned or subject, subtopics, no description of source.
SN5:	Absolutely!
ID2:	Yes, because that's what is missing on #1-27.
DM:	Just so it would identify area.
EG31:	Needs peer review first.

20A. *IS THE DESCRIPTION OF SOURCE SECTION SUFFICIENT AND CLEAR?*

EG4:	#1-04, sufficient to understand, acronym isn't spelled out; #1-56, fairly clear — now I understand why "repairs" were mentioned in Action Required; #2-02, it's hard to follow and try to describe a complicated information, again acronym I don't know.
ES3:	#1-16, alloy is missing; #1-02, type of wire is missing.
ES4:	#2-002, #1-13, and #2-08, all too brief.
PT4:	#1-28 very good; after reading description, subjects are much clearer on #2-02 and #1-31.
871HB:	#1-27, #1-31, and #1-56, informative, good.
316HB:	#1-16, clear; #1-28, sufficient for reference only; #2-08, restates *Lesson Learned.*
DPRO/HB:	#1-04, except for long title to switch.
NE144:	#1-44, filled in gaps left by *Lesson Learned/AR.*
NE14:	#1-04, poor sentence structure, especially name of part, main landing gear weight on wheels proximity switch.
AA36:	#1-16, nothing in description about particle impact.
AA36:	#1-66, was very critical — would move up under *Subject, Lesson Learned* and *AR.*
QDLOR:	#1-66, needs to look at drawings, spec., etc.
AA36:	#1-28, not complete — other *Action Required.*
D289:	#1-13, wanted to use alternative solution; #1-27, a rather "common" problem — delete?
AE81:	#1-28, one action only; asked about other actions known to be in system.
C51:	#2-08 and #1-16, a little more needed.
JJ4:	#1-28, need to know more, specifically source, repeated *Lesson Learned*, too general.
SN5:	#1-28, some is repeat of the *Lesson Learned*; #2-02, some terms difficult — but don't work in the area.
ER511:	#1-27, #1-28, and #2-02, would put description at top.
DJ35:	#2-02, with better *Lesson Learned* entry, many not needed.
EP5:	#1-56, conflicts with *Lesson Learned* and *Action Required.*

20B. *IF THE ANSWER IS NO TO THE QUESTION ABOVE, WHAT SHOULD BE ADDED?*

ES4:	#2-02, #1-13, and #2-08, more details on C/A. What is the problem? #1-16, need to explain why it happened — just tells how; #1-28 & #2-08, need to revisit format to something like an "executive summary."
DPRO/HB:	#2-02, too long, but needed.
KR:	#1-16, what should I look for? Good otherwise; #1-44, this helped but should have been captured above; also, the issue is pressure, not zero gravity; #1-66, would leave, called it "stating."
NE144:	#1-04, needs more information — too brief; #1-56, *AR, Lesson Learned* need better wording/detail to capture what happened.
NE14:	#1-04, did not describe end outcome of hermetic seal failure.
AA36:	#1-16, nothing in description about particle impact.
VR:	#1-66, need to look at source document, especially drawings.
QDLOR:	#1-66, needs to look at drawings, specs, etc.
AA36:	#1-28, needed other actions, Material Safety Data Sheets (MSDS), prefer planning, etc.
C51:	#2-08 and #1-16, a little more needed.
EA:	#1-27, not enough; #2-08, best.
DG66:	#1-56, insufficient description, not self-explanatory.
ND55:	#l-l6, doesn't tell you how to fix; #1-56, not as clear as 13, needs expansion.
DI27:	#1-27, don't see connection between heater and fluid level.
ER511:	#1-27, #1-28, and #2-02, put *Description of Source* after *Subject* next needed here, but drawings and schematics may be needed on occasion.
AH12:	#1-28, need more; #1-31, "maybe."
DM:	#1-31, not clear on who is going to do this. Is it prior to flight or during flight? #2-02, glad the last sentence was there.
EP5:	#1-56, add why potting was used.
LESC/WSTF:	#1-16, more specific at where thin metallic section is.
NH:	#1-28, need more technical data; #2-02, need information on verification.
RD:	#1-16, more technical information; #1-31, drawings, inspection, technique; #2-02, if working on a specific system, more information.
PT:	#1-27, #1-28 and #1-31, reference to locate more detail.
DH6:	#1-13, #1-28, and #1-44, would like to see "identifiers" date, STS flight, other event, tied into *Description.*
DF43:	#1-13 and #1-28, ok; #1-27, what was burning?
F651S:	#1-13, nomenclature/PN — need manufacturer ID and S/N; #1-28, doesn't say what they looked for.
DH4:	#2-02, too wordy, poorly written.
EP4:	#2-08, material of burst disc, configuration.
DF44:	#1-56, information on configuration on wiring.
EP6:	#2-08, unclear as to particle source.

IA131:	#1-16, complete; #1-31, no, doesn't say how they arrived at solution and implementation.
F631H:	#1-28, planning, non-conformance.
F651S:	#2-08, someone who doesn't understand the system would be totally lost — particles from rupture — high rate.
F651S:	#1-04, needs more information; #1-13, ok; #1-27, needed temperature — don't be so general — be more specific.
F670S:	#1-13, #1-56, and #2-08, expand to be more specific what is necessary to avoid problems.
NS4:	#1-13, #1-16, and #1-28, more details needed.

23A. *WOULD YOU USE THE INFORMATION IN THE LESSONS LEARNED?*

LESC/WSTF:	Would use to search in areas where local sources (people or records) did not exist.
NH:	Prepare for meetings, System Safety Analysis, Reporting Activities, Test Readiness Reviews.
RD:	Go to database and look for LL prior to test.
LESC/WSTF:	1) Preparing estimates, look at Safety, LLIS; 2) In writing procedures; 3) In training on construction.
PT:	To gain knowledge in areas I work. #1-27, not important in my area; #1-28, real useful data; #I-31, not important on my area.
DH6:	Flight Rules generation, Safety Reviews (reviewing hazard reports would be easier if you could check out history easier.
DP21:	Planning for future P/L interfaces.
DG11:	Sometimes, if putting together future programs.
DF43:	Working a mission, have a problem, go back and ask, "Has this happened before? If so, what was the problem/how was it fixed?" System such as this already exists and is working.
F651S:	Needed LL on velcro, what satellite has been used before? Need to know materials, need pip pin info.
DH4:	Use information to fill in knowledge. Look for related problems, plan for contingencies.
EP4:	Payload Safety Reviews.
JH2:	If a similar operation is to be done, we would review the database.
BC:	Defining contracts. Help assess what goes wrong, understand complete story.
DF44:	Research anomalies, causes of malfunctions, malfunction procedures.
EP6:	Use as a mentor at levels beyond current experience.
IA131:	Would use to justify adding requirements to write requirements documents. Would actually put in rationale portion.
ND2:	Stay current on new items in order to take action. Stay abreast at beginning of major projects.
F631H:	Look for trends, negative or positive frequency, severity.
F651S:	To identify possible hazard.
F651S:	Wouldn't use #1-04 or #1-13. If #1-27 had more information, I would use it as a guide for my payloads using these materials — would make sure the payloads wouldn't use these to avoid the problem again.
F670S:	If you had a problem and we were trying to evaluate problem and cause, use LL to look for similar problems and corrective action.
NS4:	Look for solution to present problems, look at similar activities.
DC:	My position now is networks and software.
EG4:	#1-56, I might use, involved in design.
ES4:	Design/Development/Test/Phase to foresee a problem.
EP5:	Review of specifications, SOWs, etc. In test reviews, test request reviews making sure materials are correct.

23B. *IF YOU WOULD, HOW?*

DC:	My position now is networks and software.
EC6:	Good information during design and test. Can see others using them in their areas, just doesn't apply in my area.
DF22:	Would search for key words to verify if it's been done before, to make sure.
F651S:	#1-27, being Safety — identified another control.
ES3:	Search as a consultant for potential areas.
ES2:	#1-04, not directly, thought I was going to get H seal information; #1-13, would question anytime using set screws during launch vibration; #2-02, would use.
PT4:	We deal w/ software.
EE231:	Being careful when using Epoxy 56.
871HB:	Design, requirements, new projects, products, improvements, guidelines, inspections, and training and awareness.
316HB:	Assessments, awareness, training — review of procedures.
KR:	Procedures, design requirements, inspection, test, etc.
DPRO/HB:	Process evaluations, process improvement, inspection points, training of certified operations, specifications modifications.
NE144:	Systems conformance, process flows, inspection material, actions review.
NE14:	System design, manufacturing, process/procedures, inspection, concurrent engineering training (team training), verification of operators/technicians.
AA36:	Planning and procedures.
VR:	Production operations, especially procedures, testing, inspections, examples for training (certification of operators and engineers doing design work).
NE211:	Possibly, inspection procedures, test procedures.
AA36:	"Action Items" related to material and process (scopes, procedures, test date) records of inspections vs process, especially those that are constraints to flight.
QDLOR:	Inspection procedures, training, awareness, case study, for training or shop talk.
AA36:	Recommendation for action, procedures, awareness training.
D/289:	Subsequent hazard reports, references to failure investigations (thought joggers); other areas: planning, procedures for all areas.
D/289:	Comments same as above. Two were interviewed at same time.
AE81:	Better planning, coordination.
SP44:	Designing hardware, writing design specifications. Use for recurrence control.
SP52:	Develop design, fabrication, operation procedures.
C51:	Buildup test stands, design of test facilities, test procedure development.
JJ4:	Emphasize point to improve situation, same situation would use LL data to improve design.
DE32:	Knowing where to focus your time and energy based on what has gone wrong in the past.

EA:	Shape process and design actions.
HF50:	Use directly in implementing corrective actions.
IE3:	Developing requirements for a new system.
DG66:	Ability to perform tests more efficiently.
SN5:	Not unless there was an orbiter accident. Then we would work with SR&QA. Photos/TV - we would use in contingency on Mishap Report.
NS5:	As background information for design reviews.
ND55:	#I-56, for repairs on flight hardware.
ER511:	For planning, real-time operations, responsiveness of LLIS, ability to locate relevant data.
SA:	Design procedures, planning.
DJ35:	Requirements/programs and contract.
AH12:	Insight into potential causes/solutions for recurring problems (injuries, etc.); training for back injuries, back supports.
ID2:	Deep yogurt if you didn't. Code S, Code SM Flight Project in Headquarters has a database for payloads. We maintain a LL database.
SP33:	Direct contractor to view and implement.
EG31:	Is in aerodynamics — none of the LL in system now cover this.

25A. *DO YOU SEE THE APPLICATION OF THESE LESSONS LEARNED AS BENEFICIAL?*

LESC/WSTF:	More info is always better. Increase your own database.
NH:	Increase knowledge base. Might change procedure and design. Benefit Safety organization by having technical information.
RD:	Time savings; quality of design, safety.
LESC/WSTF:	Reduction of losses: people, time, material.
PT:	Everyday use and passing information to others.
DH6:	Eliminates opinions; is reviewing hazard reports/generating flight rules.
DP21:	Better planning of interactions with payloads. Improve processes, avoid recurring problems.
DG11:	Not these — (training function) only setup, developing and establishing new training program.
DF43:	Real time during missions. Interest in historical perspective.
F651S:	Save a lot of time, checking to see what has presented real hazards.
DH4:	#1-28, #1-31, and #2-02, knowledge.
EP4:	Eliminate hearsay!
JH2:	Would not need to always start a project at a zero knowledge base. Could take advantage of other experiences.
BC:	More technical than contract proposals.
DF44:	Chance to get historical data.
EP6:	Confidence in safety of system. Less chance of incident or failure.
IA131:	Justification/rationale for requirements document.
ND2:	Use to create better products.
F631H:	#1-44, #1-28 and #2-02, broadens scope of knowledge.
F651S:	Would pass information on to others.
F651S:	#1-04 and #1-13, no benefit; #1-27, check and make sure my payloads wouldn't be using this material.
F670S:	Astronauts, crew ability to complete mission.
NS4:	Whole program.
ES2:	Given enough.
EE231:	Keep from having same problem.
SP33:	Safety considerations. Caution in modifications.

25B *IF YES, HOW?*
25C *IF NO, WHY NOT?*

DC:	If the subject was related to procurement and/or government regulations.
EC6:	Use in design/testing.
EG4:	On #1-56, because I'm in.
DF22:	Prevent same situation from happening again.
ES3:	Eliminate a problem without a failure.
ES4:	Preclude making same type of mistakes.
PT4:	#1-28, firefighting delayed.
NE144:	General purpose.
AA36:	Can cover wide range of uses. However, at what point in time will LLIS ever be authoritative? Takes time to put in data/build knowledge base.
QDLOR:	Inspections, etc.
D/289:	University/academic, use in courses with latest information.
AE81:	Thought joggers for parallel lines of inquiry.
ET:	Problems to be prevented.
SP44:	Share learned experiences. Help new engineers learn old problems.
SP52:	Save rework/prevent mistakes.
JJ4:	Orientation purposes for less experienced personnel. Contractors information.
HF50:	Proactive, eliminates losses.
IE3:	Opportunity to avoid hazards, lower system risk.
NS5:	Yes, as basic knowledge.
ND55:	Note — injuries/prevention.
EK7:	If they read them.
DI27:	Would be a good starting point. Something previous to check.
SA:	Readability, logic of flow of LL presentation could be improved.
DJ35:	Topics not generally applicable for simulations (my area of work).
AH12:	Out of my technical competence; can't answer.
DM:	#1-28, I'm a safety rep.; make sure my plan is ok. Do I need to look at anything? We write software.

26. *WAS THE INFORMATION PROVIDED IN THIS LESSON NEW INFORMATION TO YOU?*

DH6:	#1-13, #1-28, and #1-44, new.
DP21:	#1-13, #1-27, and 1-28, all new.
DG11:	Yes, don't really care, not applicable to me.
DF43:	#1-13 and #1-28, one thing in these really excite me. #1-27, new but obvious.
F651H:	It is obvious after reading — not used to inform me but to convince someone else of my opinion.
871HB:	#1-27, #1-31, and #1-56, AR application was an occasional surprise.
DPRO/HB:	Thought joggers, not requirements.
AA36:	#1-04, was an expert on this area.
QDLOR:	#2-08, #1-13, and #1-66, liked as thought joggers or reminders to be on lookout (may otherwise overlook).
D/289:	#1-13, #1-27, #2-02, both engineers familiar with LL through PRACA.
EA:	#1-27, #1-31, #2-08, specific situation was, but not general LL.
SN5:	#2-28, but not important.

27. *WOULD YOU LIKE TO HAVE AVAILABLE A PROBLEM HELP DESK TO AID IN THE MANIPULATION OF THE DATABASE TO RETRIEVE DATA?*

DH6:	Yes, "Mandatory."
DG11:	Probably not necessary if icon-driven system. Doesn't justify full-time person, maybe part time.
DF43:	Yes, necessary.
DH4:	No, depending on built-in help.
IA131:	If I used, I would need more data on the form. With this information, it doesn't say. I would use the library; would not have a help desk for this.
F651S:	Would like to use if user friendly.
NS4:	Yes, if lost, only if problem encountered.
EG4:	If I had a problem using the system.
EC6:	Would be great, very useful to find what you are looking for.
DF22:	For problems.
F651S:	Would be a requirement.
ES3:	Good tutorial.
ES4:	Have a system which is user friendly, thus minimizing need for help.
PT4:	Definitely.
316HB:	But helpful availability an issue.
NE144:	On-screen help also.
DE32:	But, self help on database best. Make it user friendly.
SN5:	If I thought I would need it. Need name of someone that knows the system.
DI27:	I don't know if you need a help desk if you call the submitter.
DJ35:	MOD has bad help desk function, not responsive (hours).
ID2:	Always nice if you have a problem to turn to someone. Definitely worth the expense.

28. *IN ADDITION TO YOUR OWN RETRIEVAL CAPABILITY, WOULD YOU LIKE TO HAVE AVAILABLE A SERVICE GROUP (WHERE THE ACTUAL RETRIEVAL, SORTING, AND PRINTING WOULD BE PERFORMED BY OTHERS UPON REQUEST AND THEN FORWARDED TO YOU)?*

RD:	Yes, use myself if friendly and efficient.
DH6:	Possibly useful if system cannot do things directly.
DP21:	Nice to have.
DG11:	Not used that often.
DF43:	Not very useful if you are browsing and don't know exactly what you want. May lose some synergism if individual does not look through himself.
F651S:	Yes, if database is large enough. Code fields would be really good, would simplify work.
DF44:	If you need a service desk, LLIS is not as good as it should be.
IA131:	No, I use the library, I would not ask another group, incorporate in library.
F651S:	A big help on key words.
F651S:	Would want to look up and print — right now!
F670S:	No need to select information at desk.
EC6:	Wouldn't use, too difficult to describe, would be too much paperwork.
F651S:	I wouldn't use it; however, it could be beneficial to others.
ES3:	If a good job is done.
PT4:	But probably wouldn't be used very much. Like to have things right away.
EE231:	Rather do it myself.
871HB:	Prefers on-line for himself, but sees it as complementary.
316HB:	Had bad experience, prefer do it myself in interactive mode.
DPRO/HB:	Too expensive!
NE144:	What about cost? Other resources to implement service center?
NE14:	N/C or electronic summaries.
AA36:	Backup or alternate system; time constraint may require personal use.
VR:	Backup system only, prefer own capability.
NE211:	In addition to own capability — time, ease will drive.
AA36:	Sure, I want the world.
QDLOR:	If no time constraint, could use service group. If time constraint, would want to do myself.
D/289:	See service center as complement to in-house resources.
JJ4:	More thorough on review.
EA:	Not worth the dollars unless a general help desk for several database systems.
DJ35:	Stay away from help resources, make user self-sufficient.
ID2:	Not that lazy, but do need help sometimes. Someone needs the database background.

29. *WOULD YOU CONSIDER ADDING LESSONS LEARNED TO THE LLIS?*

DH6:	Probably not — too busy, should be made mandatory — important!
DP21:	Yes, some which go across organizational/center lines (was protective of "internal" errors).
DF43:	Yes! But would I have time? Also, less likely if I was forced into rigid format for input.
BC:	Encourage technical persons to do it.
EP6:	No, too much time. Might consider if LLIS was well used.
F651S:	By all means.
F651S:	Firm NO!
F670S:	Some things.
NS4:	No, maybe later.
316HB:	Under certain conditions would use data entry service to preserve integrity.
DPRO/HB:	Need some sort of review/screen process at working level.
NE14:	Peer review desirable.
AA36:	Peer review.
VR:	Peer review process needed.
QDLOR:	Before submitting to next higher level.

30. *ASSUME THE LLIS IS AVAILABLE ON YOUR OWN PC OR THE CLOSEST ONE TO YOU AND WITH A MINIMUM AMOUNT OF TRAINING YOU ARE ABLE TO ACCESS IT DIRECTLY. COMMENT ON THE LIKELIHOOD OF YOUR ATTEMPT TO QUERY THE LLIS FOR LESSONS LEARNED PERTAINING TO YOUR TASK.*

WILL ____
PROBABLY ____
POSSIBLY ____
UNLIKELY ____
WILL NOT ____

DH6: Mandatory — have someone else do it (he may be pencil whip).
F651S: Who makes it mandatory?
EP6: Mandatory: Will, but shouldn't.
IA131: Nothing is mandatory.
F651S: If it is, I would have to.
F651S: Mandatory? Dumb question, if told to do it, you do it.
EG4: Will, if easy to use and find out about.
EC6: Once for sure to see how useful it is.
ES3: No long wait times.
ES2: Would expect the ones in the Branch instead of myself.
SN5: Will not; on day-by-day basis.
SA: Will not; informal self-education at most. Wrong level of organization — users closer to working level.
DM: Probably; for now, will as the database grows.
EP5: Probably; if easy to use, well-designed and if meaningful data.

31. *NOW ASSUME THAT YOU CAN ACCESS THE LLIS BY GOING TO ANOTHER BUILDING AND TO A COMPUTER WORK STATION WHERE YOU AGAIN CAN ACCESS DIRECTLY. KEEP IN MIND, YOU MAY HAVE TO WAIT OR SCHEDULE TIME AT THE WORK STATION DEPENDING ON USAGE RATES. NOW, COMMENT ON THE LIKELIHOOD OF YOUR ATTEMPT TO USE THE LLIS INFORMATION.*

WILL	____
PROBABLY	____
POSSIBLY	____
UNLIKELY	____
WILL NOT	____

DH6:	Mandatory? Pencil whip.
DF43:	Must be: 1) useful, 2) easy.
F651S:	Who would make it mandatory?
DF44:	If good data is in it.
IA131:	Nothing is mandatory.
F651S:	If I would have to. Depends on frequency — once in a while, sometimes, once a month.
F651S:	Mandatory? Dumb question, if told to do it, you do it.
EC6:	Only after saving things to look at, all at same time. Won't use the technical library for that reason. It's too much trouble.
DF22:	Unless told to.
ES3:	Depending on frequency of use.
C51:	Goes up to "probably" if there were something like an index or table of contents to show a specific subject; no browsing.
DE32:	Will not, unless specific problem.
SA:	Unlikely, accessibility, interconnectivity needs to be emphasized.

32. *WITHOUT HAVING DIRECT ACCESS TO THE LLIS, TO OBTAIN INFORMATION, YOU MUST CALL OR VISIT A DATA RETRIEVAL SERVICE CENTER AND PROVIDE KEY WORDS AND OTHER QUERY INPUTS TO A SERVICE CENTER EMPLOYEE TO PERFORM THE ACTUAL ACCESS. COMMENT ON THE LIKELIHOOD OF YOUR ATTEMPT TO USE LLIS INFORMATION.*

WILL	____
PROBABLY	____
POSSIBLY	____
UNLIKELY	____
WILL NOT	____

DH6: Mandatory? Pencil whip, "At your PC or in immediate area is best, by far."
DG11: May be easier and better for me.
DF43: Slightly higher than question 31.
F651S: Who would make it mandatory?
IA131: Nothing is mandatory.
F651S: Same as question 31.
316HB: Bad experience with similar capability.
KR: More important, more thorough, but time may be more constraint. Time less important.
NE144: Within team environment.
NE14: Real response time may be critical.
AA36: Possible time constraint — local service better (less risk).
C51: Possibly, if you don't have a specific topic you know is covered.
EA: Possibly, if I had a specific requirement. Less likely to browse.

33. *NOW ASSUME THAT TRAINING TO DIRECTLY ACCESS THE LLIS IS SOMEWHAT EXTENSIVE (MORE THAN 25 HOURS), AND THAT ACCESS AND DATA RETRIEVAL REQUIRES NUMEROUS PASSWORDS, KEYSTROKES, AND IS TIME-CONSUMING. COMMENT ON THE LIKELIHOOD OF YOUR ATTEMPTS TO USE THE LLIS.*

WILL	____
PROBABLY	____
POSSIBLY	____
UNLIKELY	____
WILL NOT	____

DH6:	Mandatory? Expect him to pencil whip.
DF43:	No! NO! NO!
F651S:	Shouldn't take more than I5 minutes. Should work as a normal word processor.
IA131:	Nothing is mandatory!
F651S:	Same as question 31.
F651S:	Will not never try something — will check it out.
871HB:	Good training, transparent to user, can be on-line and use immediately.
316HB:	Used to information systems where I can, "cold start, be up and running in 5-15 minutes w/o training."
KR:	Five minutes max.
DPRO/HB:	But should be one-half day, at most.
NE144:	One day at most.
NE14:	One-half day max.
NE211:	Maximum one day, three days excessive.
AA36:	Training, access via multiple passwords, etc.
D/289:	Thirty minutes to one hour, use on-screen learning or walk through.
D/289:	One-half day if better for training.
D/289:	Comments same as above. Two were interviewed at same time.
AE81:	Excessive — one day or less is better.
SN5:	Will not: forget it!
SA:	Two hours optimum.
DJ35:	One hour max.
LESC/WSTF:	Add a list of related sources.
NH:	Voluntary on own PC, minimum training, pull-down menus.
PT:	Glad to hear about LL.
DH6:	Suggest system is designed to be flexible and easily reconfigurable when changes are identified — as they will be. Suggest phased implementation. Prove the system is useful and "fun/easy" to use before spending big bucks.
DP21:	Has LLs, some of which would be willing to share, could be of interest to other organizations.
DG11:	Should be done by senior, experienced (>10 yrs) people, especially those getting close to retirement.

F651S:	DOD data — you should check with Norton AFB and the Army and Navy in Virginia — System Safety database.
EP4:	Don't make it a mandatory system. Contractor can use it to not perform in innovative ways.
BC:	If not mandatory, probably not used.
EP6:	Intern training.
IA131:	Make it easy, give me the paper — self-guidance — no training. Would like to have LL in 8080.
ND2:	Impressed with the interview to determine customer requirements.
F631H:	Change font style.
F651S:	Wants to make sure he receives the results of the survey.
F651S:	Wants copy of survey results.
NS4:	Folio, database program, look at as place to access LL.
EG4:	The *Description of Source* problem needs to go under *Action Required*. Move all of the rest down. Need to have *Description* following *LL* and *Action Required*.
EC6:	Would be nice if everybody would prepare and add LL to the database. I think it's a good idea from what I've learned from the interview.
F651S:	I would enter if it's valuable enough. Should be a living database. Should be control over adding changes to the database information. Any changes requested should go before a "board" for approval.
PT4:	Would add for own documentation. In case I forgot how I did fix something, W/O approval loop configuration would be difficult.
871HB:	Do not want to use to surprise or beat on programs/contractor. Want ability to make judgement calls, lightly describe to have insight into implementation costs/resources to AR. Want maximum flexibility to alternative courses of action.
NE144:	We could survive without peer review. Something like an Opportunity for Improvement (OFI) system (continuous improvement of LLIS).
D289:	Quality control will be important.
CS1:	Subject/topic listing available for people to see what is available.
JJ4:	Would like LL for a legal position in construction, environmental spill; also, to what degree response is required.
EA:	1) Familiar with PRACA and does not like the way it works for two reasons: A) Summary is not the full, technical summary which would be the most useful, B) Access is difficult and data is too "protected." 2) LL should be "new" solutions to NASA-related, NASA-specific problems. Not common sense or industry standard. 3) Most important aspects to consider: A) "Automatic" data entry (maybe sources second in db). B) Quick from occurrence to appearance on db. C) Easy to access and manipulate (for users).
SN5:	Consider something other then Oracle. IAMs developed in bldg. 8, has laser disk running under R:Base, everything is scanned into the database (including pictures). Mainframe from desk can be used from all over the world, Ethernet part of JIN.
DI27:	If I had something to benefit others.

ER511: Would make more commitment to participate even if information is not available now.

SA: SR&QA is in best position to start doing LL. Must pass on knowledge to line organizations throughout training (awareness — cited Alerts system as good approval).

DJ35: Only with responsive peer review process (internal review) sensitive to innovative approaches — with this you could overcome that. Do not want to "have" to check for LL every time a project comes up. Make it voluntary/individual whenever a project comes up.

ID2: Believe in LL — we do our own.

DM: Feels very strongly that if not done correctly, this effort will die and we will not realize the benefit. It needs to be integrated at least within JSC, so all the JSC databases will talk to each other. Should be integrated across the agency. I appreciate the interview. Something like this needs to be done again to get requirements from each of the directorates. Networking will help make this a reality.

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13. ABSTRACT *(Maximum 200 words)*
The sharing of "corporate knowledge" and lessons learned in the NASA aerospace community has been identified by Johnson Space Center survey participants as a desirable tool. The concept of the program is based on creating a user friendly information system that will allow engineers, scientists, and managers at all working levels to share their information and experiences with other users irrespective of location or organization. The survey addresses potential end uses for such a system and offers some guidance on the development of subsequent processes to ensure the integrity of the information shared. This system concept will promote sharing of information between NASA centers, between NASA and its contractors, between NASA and other government agencies, and perhaps between NASA and institutions of higher learning.

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