APPENDIX A. CENTER FOR LESSONS LEARNED
Building an Experience Base

One means of achieving an overall gain in expertise is for an organization to compile and disseminate analyses of the way critical situations were handled, and examples of good and poor decisions. This type of activity can be central to organizational learning. . Currently many different organizations are attempting to compile their lessons learned in an efficient manner. . One of the best examples is the U.S. Army's Center for Army Lessons Learned (CALL). Another is the aviation community's Aviation Safety Reporting System (ASRS). The Economist magazine (October 4, 1997, pp. 79-80) reported that the banking industry is trying to set up a method for capturing lessons learned, modeled on ASRS. These are good precedents for the wildland fire community.

This Appendix expands on the concept of establishing a "Center for Lessons Learned" for the wildland fire community, as recommended in Chapter 3, Goal 4, Implementation Strategy 2. We discuss three aspects of a Center for Lessons Learned: the nature of the information collection process; the nature of the information dissemination; and the formatting of the materials to be collected.

The Nature of the Information Collection Process

There is reluctance among firefighters to report safety incidents. If firefighters are too worried about getting in trouble, they are unlikely to be fully candid about what happened. Fear of retaliation and the difficulty of the reporting process represent the greatest barriers to collecting and to some extent using lessons learned. If the agencies use "lessons learned" to punish others, that would serve as discouragement. If the process of filling out forms and finding the correct address to send in lessons is too cumbersome, cooperation will decrease.

Therefore, a Safety Center for Lessons Learned will have to ensure anonymity of information stored and used, prevent retaliation, and yet facilitate open communication. In the aviation industry, the ASRS provides legal safeguards against penalizing those who report problems. When a pilot reports a transgression of safety rules to the ASRS the pilot is shielded from punitive action. In other settings, the lessons learned reports are sanitized by removing names and details. In the Army, the lessons learned are about neutral topics, such as the use of

equipment or dealing with various situations, and not about individuals. The fire agencies will need to determine the desired focus of their center and the safeguards to use.

There is need to consider how far to go with sanitizing the reports. Because firefighting is done in the context of large organizations, each incident will have many direct witnesses and many more indirect ones. In order to sanitize a report, and not be a recognizable incident, the incident account might have to be cleaned up so much that it would become useless. Also, because fire incidents are known by their names, some of the believability and impact of the stories may be lost. However, names of people can be dropped, and in many cases a description of the circumstances and factors associated with the 'lessons learned' may suffice. In fact, providing too many details may weaken the point to be made. Judgment will be needed on what to keep in any given preserved story.

There are other choices that could be made as to the nature of a reporting center. The Center could be restricted to anecdotes on neutral topics such as equipment and tactics. This may be a necessary restriction but many of the ways in which safety gets compromised involve personal decisions arid judgments, so this would be giving away a lot.

Another alternative for the nature of the reporting center is to focus on accountability and punishment. While this may seem harsh, several individuals in the early one-on-one interviews stated that they felt the agencies went too easy on mistakes, and that they should be more critical in their evaluations. In this case, the wildland fire community may find that a Center for Lessons Learned can provide a valuable resource, enabling people to speak up about unsafe practices, and to name names. Lessons learned reports can serve as the beginning of investigations into Crew and Division Supervisors and higher levels of command who violate safety standards. While ensuring the anonymity of the respondent, the agencies can assess whether the charges are accurate, and, if so, how to prevent similar problems in the future. This strategy would be to increase personal consequences, rather than reducing them.

We do not, however, think either of the above two alternatives are the right approach for the Center. The accountability goal can be achieved by the line management of an incident, filing formal complaints or incident reports that name names. The Center should take a more anonymous, non-punitive, non-embarrassing approach. It may indeed include cases that lead to punishment but that should not be its focus - rather, the focus should be on lessons learned, the "wisdom" gained from "errors and from case studies of successes.

Some organizations provide a safeguard by limiting access to the lessons learned file, so that only researchers and others with a legitimate need can go through the cases and find patterns that might be important. Only selected, sanitized incident descriptions or situations are disseminated. This is a possible fallback position, but it reduces motivation to build a comprehensive lessons learned file. The correspondents would be going to the effort of filing the account with no assurance that others at their level would be able to learn from it.

We recommend that the agencies use a Center for Lessons Learned to collect and disseminate sanitized incident accounts to increase organizational learning. The Center should not deal with serious cases of safety violations, and the agencies should set up a separate mechanism for reporting these to avoid compromising the effectiveness of the Center.

The Center should encourage firefighters to send in incident accounts in order to improve the safety and professionalism of firefighting. Cash incentives do not seem appropriate in this environment, and might even be counter-productive. The Center should have writer/editors to assist fire service personnel in preparing incident descriptions, or editing what they send in.

The Nature of the Information Dissemination

A wildland firefighting Center for Lessons Learned would be challenged to find a way to make use of the incident accounts and not become a black hole. Collection organizations often find it convenient to settle into a bureaucratic mode of collecting and cataloging, taking a very passive attitude towards the work, and imposing lengthy delays on the time for getting the incident accounts into circulation.

A successful Center should compile statistics about the types of incidents, types of difficult judgments, and so forth, and make these the basis of further action. While it would not be a scientific sample, the collected incident accounts would provide a reasonably good cross-section of the types of safety concerns that exist, and the ways these change from one year to the next.

In addition, the Center should select the best incident accounts, and format them to be used as Tactical Decision Games in leadership courses and training on decision making (See Appendix C). In this way, the agencies would arrange a feedback mechanism for using the most difficult cases as training opportunities.

But most of all, the Center should emulate the Army and aviation examples, and quickly disseminate good lessons and stories in newsletter form. See, for example, the aviation newsletter on the following page.

The wildland Center for Lessons Learned might also convert incident accounts into tape recordings and make them available to crews during lengthy periods of transportation. Instead of enduring these periods as unproductive down-time, they could become learning opportunities.

Formatting the Materials Collected

There are many different ways to format incident accounts. The ASRS reports are fairly well structured, as befits the highly structured nature of commercial aviation. However, the Boeing Corporation has been developing an alternative format. They are interested in getting feedback from line pilots about problems they encounter with Boeing aircraft, and about difficult incidents. Boeing realized the futility of searching for a root cause for accidents and near-accidents, and has moved to the use of "influence diagrams." Instead of searching for <u>the</u> *root* cause, Boeing tries to identify the set of potential causes or factors influencing the incident. The participants are asked to list anything that, if changed, could have prevented the accident (or near-accident). This approach shows the set of causes that contributed. They can be arranged into an influence diagram (a sequence of what thing influenced another, which ultimately caused the problem.) This approach cuts down on "finger-pointing," because there are usually many ways in which the various participants in the incident could have acted more safely. It converts a potential witch-hunt into a legitimate search for problem sources.

Yet another format is to borrow from the "Decision Critique" approach mentioned in the sections on decision-making 'in this report (see Appendix C). The person reporting the incident could begin with a brief narrative of the incident (perhaps including a map) and then answer the following questions: Which were the difficult judgments and decisions? Why was each of them difficult? What cues or patterns got missed? What was the original size-up, and was it accurate?

It is very beneficial to gather inputs from several witnesses to an incident, to see if there is consensus, get different viewpoints and different insights.

Too-Close Encounters

Even with adequate supplementary lighting, flight crews need to allow an extra margin for error to accommodate the reduction in visual perception that occurs at night. An air carrier First Officer reports that on a well-lit ramp, the crew's perception of the available parking space was still faulty:

■ *After landing...we switched to Ramp Control...and asked which taxiway they wanted us to use. Ramp Control advised us to use taxiway Z. As we approached the gate... it looked like we were getting very close to the side of the concrete wall that supports a walkway bridge over the taxiway. As we emerged on the other side of the walkway, I felt a slight bump. It felt like we had taxied over a drain grate. After we pulled into our assigned gate, one of the ramp personnel came to the flight deck and advised us that we had hit the bridge. We looked at the tail of the aircraft and could see what appeared to be some damage. The Captain went to call Flight Control. I walked to the bridge, where I was handed some pieces of the aircraft.*

The crew had NOTAMs indicating that the taxiway route was not safe for that size aircraft, and airport charts indicating maximum wingspan and tail height for clearance under the bridge. The reporter's recognition that "we were getting very close" should have caused the crew to stop and question Ramp Control's instructions.

Altered visual perception at night may be even more troublesome in flight, where a third dimension–altitude–

adds to the potential for misinterpretation of the visual cues. An air carrier Captain credits TCAS with accurately "seeing" conflicting traffic when the crew could not.

■ *While descending toward ABC, we were cleared to...intercept the localizer course for Runway 30. Center then issued a VFR traffic advisory to us—a General Aviation airplane was also descending into ABC. The GA airplane was also advised that we were descending. [Each aircraft] reported the other aircraft in sight.*

Just prior to intercepting the localizer at 12,000 feet, we received a traffic alert from our TCAS. We still had a visual on the airplane, but it was difficult to ascertain his altitude or heading due to the darkness. Very quickly after that, the TCAS issued a resolution advisory to "descend, descend now!" We complied, increased our rate of descent, and turned right to avoid the target. I estimate that our aircraft passed within a half mile of each other and were separated by 100-200 feet vertically.

At night, it is easy to misjudge the altitude and distance of closing aircraft. TCAS II is an excellent resource that can aid in determining aircraft position and rate of closure. However, pilots should also remember to ask ATC for specific assistance with aircraft separation. Brief queries directed to ATC—"Can you keep us informed on spacing?" or "What's the altitude of our traffic?"—can help illuminate the traffic picture. ▲

ASRS Incident Reports Available at Web Site

On January 15, 1998, ASRS will begin offering a selection of incident reports at its Web site:

  http://olias.arc.nasa.gov/asrs.

The reports will be grouped according to frequently requested database search topics. This new offering is intended to bring ASRS data to a wider user community, and to provide recent report samples relevant to users' training and operational activities.

Each report group (report "set") will consist of 50 recent ASRS database reports that have been pre-screened to assure their relevance to the pre-selected topic description. They will be formatted for downloading into RTF (Rich Text Format), which can be read by most word processing applications and by many other programs, including spreadsheets.

The reports sets will be updated quarterly. New topics will be added—and outdated topics removed—in response to input from the ASRS user community, and analysis of Web site usage. Following is a preliminary listing of the report topics that will be available in January 1998:

- Multi-Engine Turbojet Upset Incidents
- Wake Turbulence Incidents
- Controlled Flight Towards Terrain Incidents
- Checklist Incidents
- CRM-Related Incidents
- Commuter Flight Crew Fatigue Incidents
- Fuel Mismanagement Incidents
- General Aviation and Commuter Icing Incidents
- Pilot/Controller Communications Incidents
- Land and "Hold Short" Incidents
- Non-Tower Airport Incidents
- Inflight Weather Encounters
- Runway Incursions
- TCAS II Incidents
- Cabin Crew Incidents
- Mechanics Incidents
- Rotorcraft Incidents ▲

Weathering Heights

Two General Aviation pilots report on their challenging encounters with simultaneous IMC and mechanical difficulties. The first reporter was well-prepared with good back-up equipment.

■ *Shortly after departing on an IFR clearance, I experienced...a bad alternator...I shut down everything I could...then I lost the other alternator. Before I could request vectors from Approach, I lost total electrical. I had a hand-held transceiver to listen, but I could not transmit. I also had a hand-held GPS, and used that to navigate to my destination. It was VFR there, so I continued my flight, as I was cleared.*

Once in a while, after letting the [aircraft] battery charge, I could transmit for about 7-10 seconds. So I let Center know what was going on. They let me descend to 3,000 feet, but that did not get me out of the clouds. I let the battery charge enough to contact XYZ Tower, and they let me down still further. Still in IMC. As I got about 20 miles from my destination, I broke out into VMC. I continued and landed.

The mechanics said one alternator had a broken belt, and the other had a terminal burned out. Two totally unrelated problems.

In this case, limited communication and navigation equipment provided the reporter with enough information to relay his problems to ATC and land

safely. In instances where a failure occurs shortly after take-off, an immediate return-to-land is an option that should be considered.

The next reporter was less prepared — in knowledge of FARs — to make a decision about accepting an IFR clearance when the weather took a turn for the worse.

■ *While flying VFR with flight following, I experienced a vacuum pump failure. Conditions ahead appeared to require an IFR clearance, so I advised the Controller that I had experienced a vacuum pump failure and therefore the heading and attitude indicators were inoperative. I also told him that conditions ahead appeared to require an IFR clearance. He asked if I preferred to land or file IFR. I indicated that, since I was having no problems, I would prefer to file IFR. He issued an IFR clearance and provided no-gyro vectors to the airport. I landed with no problems.*

Since then I have learned that he probably should not have issued the clearance because you should not enter IFR conditions with an inoperative vacuum pump. He should have advised me of that.

It was the pilot's responsibility — not the Controller's — to determine the legality of IFR flight. The situation could have been avoided if the reporter had executed a 180° turn at the first sign of deteriorating weather. ▲

Between a Rock and a Hard Place

That's where an air carrier Captain found himself, with the rock being conflicting traffic, and the hard place being thunderstorm cells.

■ *Our flight plan showed SIGMETs for embedded thunderstorms in the area and PIREPs of moderate mixed ice. On departure...two thunderstorm cells popped up on the radar screen. Our company policy is to avoid this kind of cell by 5 miles or more. The Departure Controller was talking non-stop to other airplanes, preventing us from requesting a weather deviation or declaring an emergency.*

I had the choice of entering the cell, or turning to avoid the cell (by maybe one mile, by now) and hoping that TCAS and/or the Controller would warn us of traffic. I chose the latter. I didn't see any TCAS traffic displayed, and turned right. The First Officer was finally able to advise ATC. We were told to level at 12,000 feet due to traffic, and were reprimanded for not getting permission before turning.

We followed FAR guidance: ask permission; declare an emergency if necessary; if unable to make contact, for the safety of the flight, deviate, then notify ATC as soon as possible.

Part of attempting to declare an emergency should include squawking 7700. This immediately notifies ATC of a problem, at which time the Controller will be alerted that the flight crew needs to make a request.

Another Captain in a similar "hard place" deviated without any attempt at ATC contact. The First Officer reports:

■ *Over [oceanic] routes, the Captain deviated [over 20 miles] off-course when thunderstorm build-ups were along our route, without contacting any controlling agency. The routes are in an area where we are in radio contact for position reporting (usually HF), and in the area where we all think we are not in radar coverage. WRONG! I knew, and conveyed to the Captain, that ATC could see us even though we were reporting positions on HF. I don't have a problem with circumventing weather and known turbulent conditions, but some attempt must be made to communicate with ATC or other aircraft to advise them of our conditions and intentions.*

Course deviations beyond the boundaries of an airway may cause ATC to consider an aircraft lost, or worse, a national security threat. ▲

An organization designed to collect and disseminate lessons learned, regardless of the format it uses, can provide a highly valuable component of a safety program for the Federal wildland fire community. Each safety incident triggers a learning process, and the very fact that the agencies have set up such an organization sends a message that everyone is expected to contribute to a culture of safety.