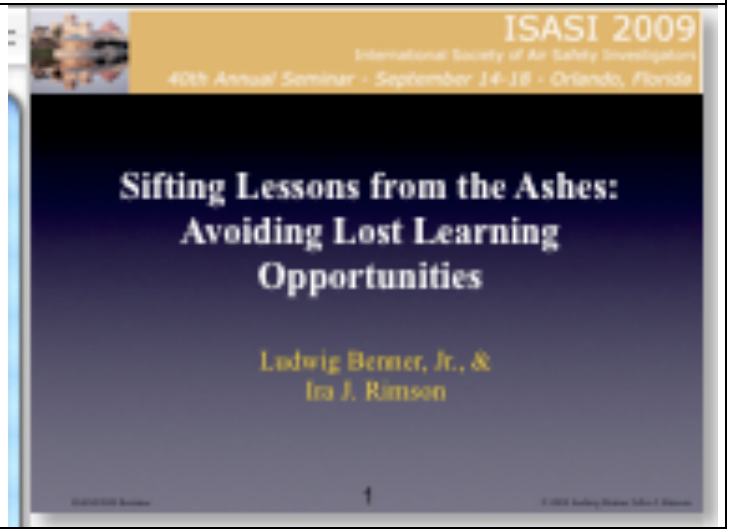
ISASI 2009 Seminar Presentation
Wednesday Sept 16, 2009
Paper:
SIFTING ASHES FROM THE WRECKAGE: AVOIDING LOST LESSONS LEARNEI
By Ludwig Benner Jr and Ira J. Rimson

Presentation Script	Commentary
Title Slide: (B) Good Afternoon. For those of you who don't know us, I'm Ludi Benner; (R) And I'm Ira Rimson. Our paper is in the Wednesday afternoon section of the Seminar Disk.	

SLIDE 2

(B) Recently we've been examining lessons learned from aviation accident investigations, and we gained some significant insights we want to share with you now. These would probably be the most significant insights for the long run.

Let's start with some basics. First, we learned that the best way to prevent new accidents is to identify and change unsafe behavior patterns that occurred during accident processes that have already happened.

Second, in order to identify the unsafe behavior patterns, we need to structure investigation data so that those behaviors will be described consistently, no matter who does the investigation or reporting.

Third, we need to analyze the investigation data as Behavior Sets.

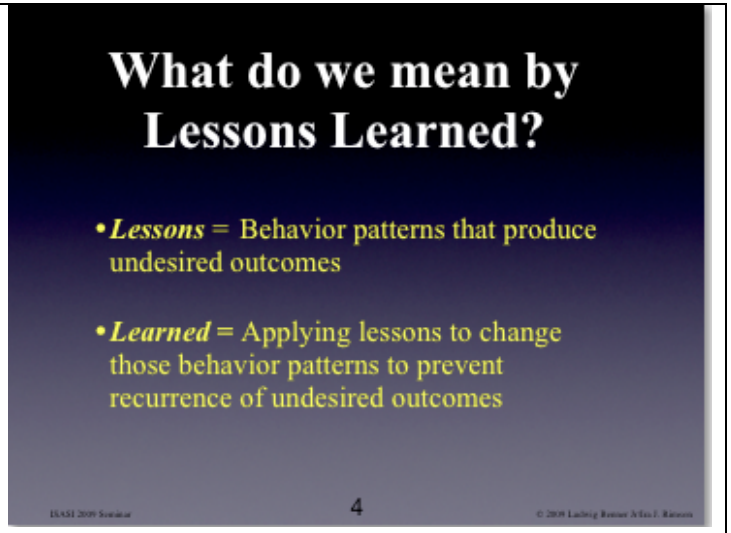
Fourth, we need to consider who is going to use the Behavior Set data, and provide it to them within a learning system that gives them lessons they can apply immediately to their activities and operation.

Lastly, we must measure the effectiveness of our lessons learning system to change undesired, unsafe behaviors.

Slide #3: (R) ISASI's motto reminds us of our product, or what is *supposed to be* our product. Unfortunately, "Safety" is hard to measure, because it's a negative concept. It is the absence of undesired risky outcomes. In our business, those outcomes are incidents and accidents that result from unsafe behavioral interactions – among people, objects or energies. This seminar's theme motivated us to take a closer look at research that Ludi and his grandson, Bill Carey, have been doing for the past several years: analyzing the way we have traditionally investigated accidents and incidents, the processes by which they develop in aviation operations, and how well we have succeeded in preventing those undesired risky outcomes from recurring.	

Slide #4:

(B) We'll be talking about lessons learned. Although there's an assumption in the safety field that everyone knows what "lessons learned" are, let us clarify what ***WE*** mean by lessons learned.
Lessons are the NEW knowledge gained from investigations.
Knowledge about what? About how things went wrong.
We try to look for descriptions of the processes that produced the undesired outcomes; that is, the unsafe behavioral interactions among people, objects and energies that produced those undesired outcomes.
What do we mean by "learned?" Investigators often think that means the recommendations in their report, but there's another way to look at "learned" for prevention purposes: what changes did learning the lessons achieve? Investigators identify lessons that need to be learned, but they aren't really learned until changes have been made to preclude repeating those behavior patterns involved in the undesired outcomes.

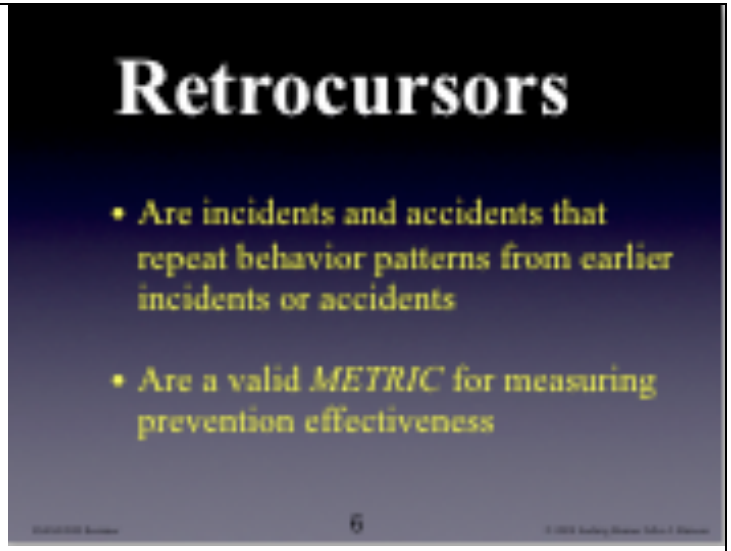


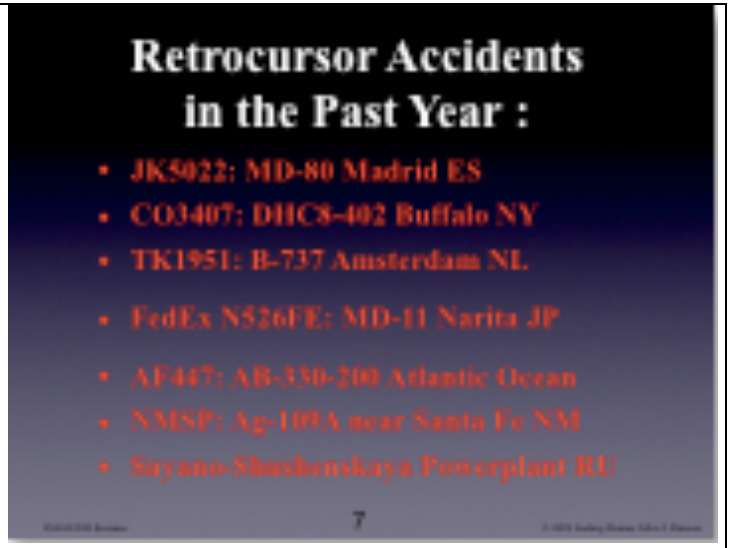
Slide #5: (R) We looked at a number of recent major mishaps to see if they might offer a way to measure how well our Lessons Learned practices meet our expectations. We think the record tells us — NOT VERY WELL. How can we say that?	

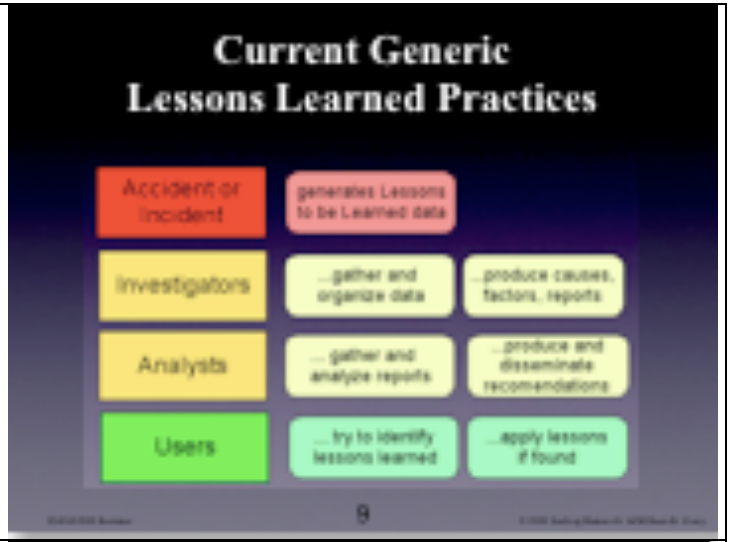
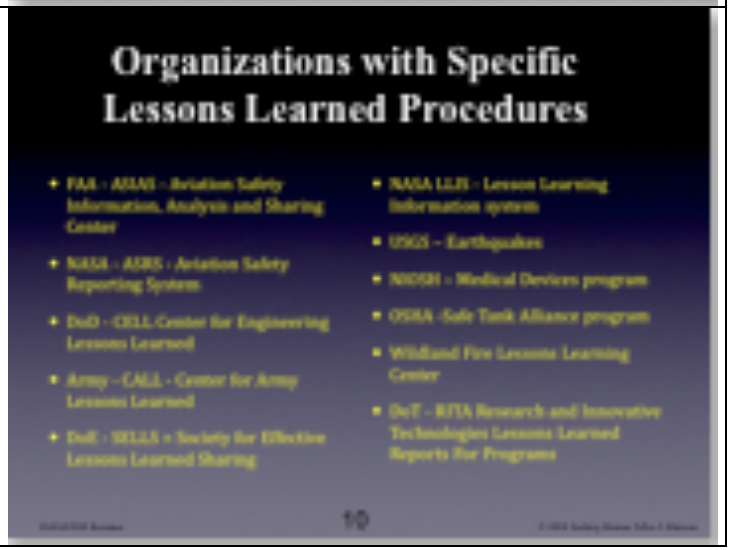
Slide #6:

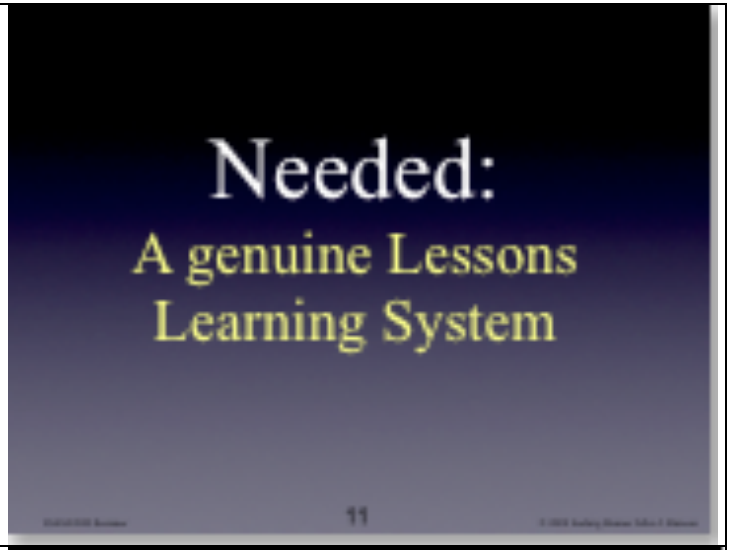
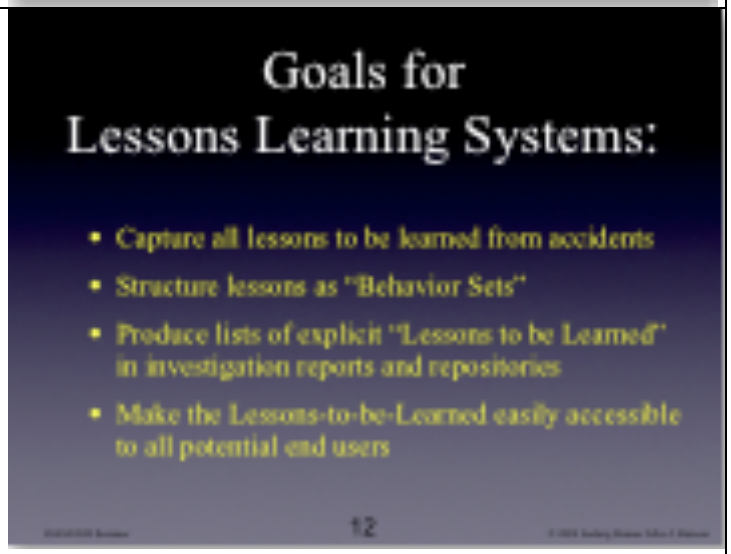
(R) We think that prevention effectiveness can be measured in terms of "retrocursors." To do this, it's necessary to define accidents as dynamic processes, within which unsafe interactions among participants in the process produce unwanted outcomes instead of the desired ones. "Retrocursors" are incidents or accidents that repeat similar unsafe interactions or behavior patterns that were found during past accident or incident processes.

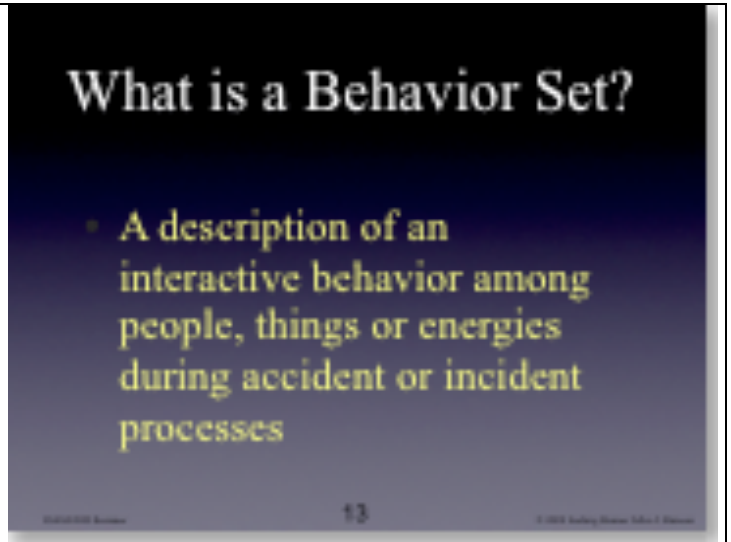
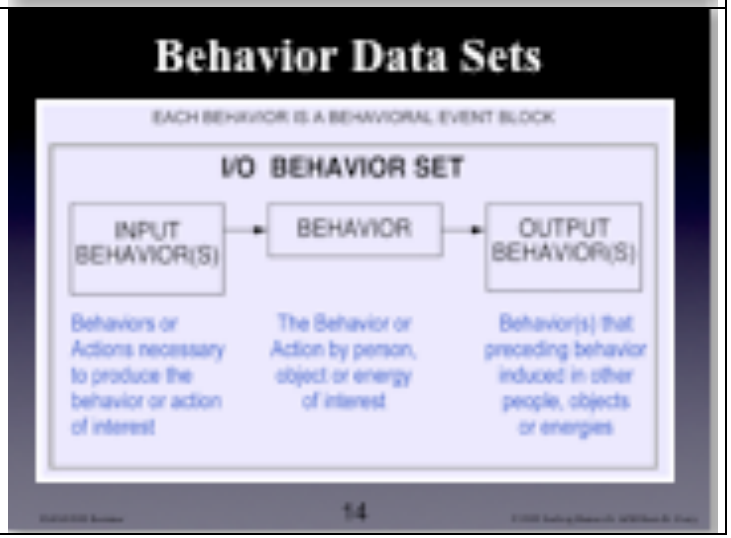
Prevention requires changing those interactions in similar dynamic activities. That gives us a METRIC, a way to measure how well we learned the lessons that were identified during the investigations. Did the reported adverse behavior patterns get changed for future operations to avoid retrocursors? For example…



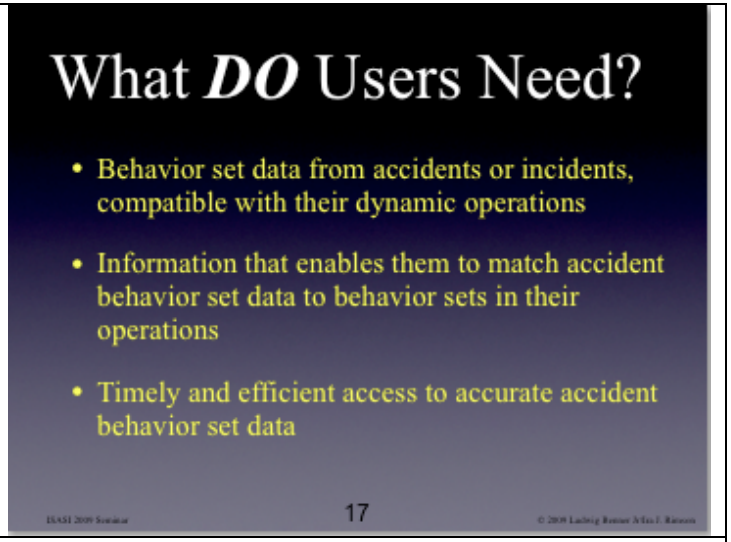
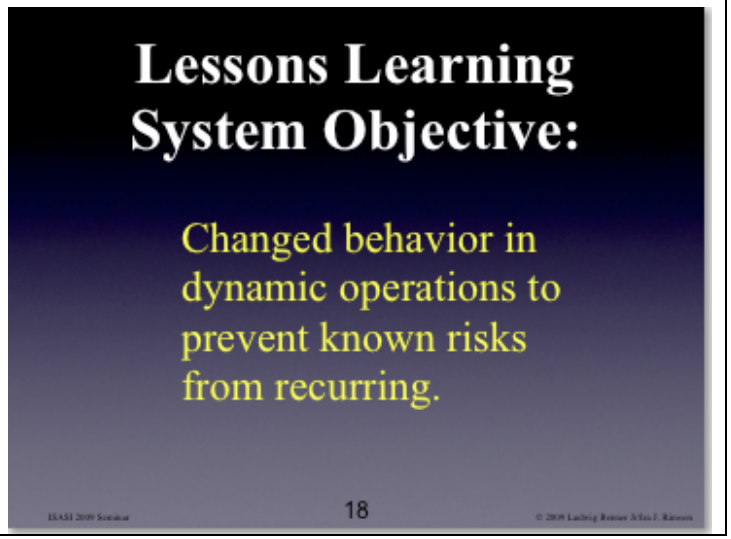
Slide #7: (B) During the past twelve months there have been some highly visible accidents that repeated the unsafe behavior patterns of prior accident scenarios. We think that you are familiar enough with those on the screen, and their predecessors, not to need detailed explanations. We'll be glad to discuss them in detail in the bar later. (If you buy!) Why weren't the historical accident lessons learned well enough prevent these? Why weren't they communicated to the people who were in position to make changes to the behaviors involved, in a way that they could use them? Why aren't Lessons earned practices more effective? Let's answer that by first looking at what we mean by lessons learned again.	
Slide #8: (B) The US built 21 B-2 aircraft to support our national interests; now we have 20. The cost of this loss: well over $1 billion + diminished capability. The quotes on the screen are from Maj. Gen. Floyd L. Carpenter, who headed the investigation board for this accident. A cheap lesson was not learned, and it became very costly. Nobody imagined that the same unsafe behavior pattern involving clogged static ports in Pipers and Cessnas could bring down an Air Force B-2 bomber. From our standpoint as accident preventers — as C.O. Miller used to define our calling — why aren't we more effective at implementing the practices that learn those lessons and prevent retrocursors?	

Slide #9: (R) This slide represents how current practices typically deal with lessons to be learned. We analyzed reported inadequacies with the ways lessons are supposed to be learned in government organizations that have established specific lessons learned procedures. We used flow charts of the procedures where they were available.	
Slide #10: (R) These are examples of the organizations studied. Each is a little different from the others, but they have many common components.	

Slide #11: (R) We found that none of the current practices adds up to a comprehensive lessons learning SYSTEM that covers all the functions needed to convert the lessons-to-be-learned data generated by accidents or incidents, to the current operational changes needed to prevent future retrocursors.	
Slide #12: (B) In view of the need, we recognized that for Lessons Learning Systems to succeed, system goals had to be established. These goals evolved from our study. First, capture and document **ALL** the lessons-to-be-learned that accidents have to offer, not just a few selected by investigators or analysts to address as recommendations. Second, structure the lessons as the Behavior Sets that produced the undesired accident or incident outcomes, so that they show What Happened in a format that is transparent to potential end users. Third, list all lessons-to-be-learned explicitly in investigation reports, and in repositories where they can be found easily by others with similar systems, operations or processes. Fourth, make those lesson repositories quickly and easily available to ALL end users who could benefit from applying that new knowledge.	

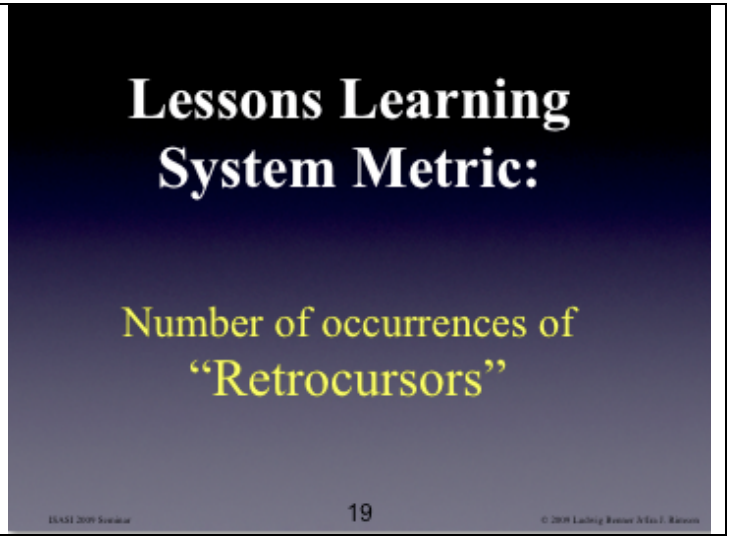
Slide #13: (R) The concept of BEHAVIOR SETs helps to emphasize behavioral interactions. That focuses investigators on finding and documenting the behavioral interactions that produced the outcome.	
Slide #14: (R) The best way we found to illustrate this is by an input/output block diagram, convenient for representing dynamic processes. We've described Behavior Sets as behavioral inputs coupled to behavioral outputs, as shown here. We've found it helpful to diagram Behavior Sets in formats that permit identification of specific participants, and their specific behaviors. Behavior sets can be displayed in graphic, tabular or narrative formats, depending on the users' needs.	

Slide #15: (B) The next logical question is: Who are End Users of these Behavior Set Data? They are all the entities that are responsible for minimizing risk in their products, systems, services or operations, and can apply Lessons Learning Systems to prevent future retrocursors.	
Slide #16: (B) After we established the identities and responsibilities of Lessons Learning System End Users, we were disappointed to find that current investigation outputs are geared more to the investigators' perceptions of what they should be, and not to end users' needs. In order for the lessons of investigations to achieve their greatest effect on prevention, they must be reoriented toward the needs of end users.	

Slide #17: (R) Users need: (1) Behavior set data from accidents or incidents that are compatible with their dynamic operations; (2) Information that enables them to match accident behavior set data to the behavior sets in their own operations; and (3) Timely and efficient access to accurate accident behavior set data.	
Slide #18: (R) Our work led us to conclude that an effective investigation-based Lessons Learning System should change behavior among people, objects and energies in dynamic operations, to prevent known risks from recurring.	

Slide #19:

(R) Successful employment of Lessons Learning Systems' potentials can be measured directly by the reduction in occurrence of Retrocursor accidents. A potential indirect metric is how many of the lessons produced by investigations actually changed future behaviors.



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Slide #20:

(B) This summarizes the strategic alternatives between current ad hoc attempts at learning accident lessons, and a structured system to provide data to support users' initiatives.

The old learning focus has been on finding causes; the new focus is on describing unsafe behavioral interactions among people, objects and energies so that users can change their own operational behaviors to prevent retrocursors.

Learning Systems must be designed to fulfill users' needs, rather than investigators'.

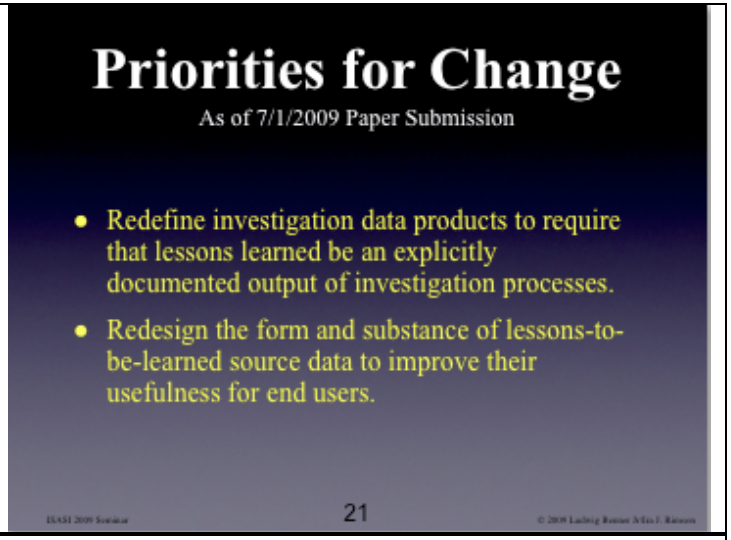
Investigators should define the Lessons-to-be-Learned, not analysts who are abstracted and remote from the input data sources. In many cases analysts may not possess sufficient familiarity with users' activities or options to make appropriate choices.

Old investigation report products were recommendations; new investigation report products will be a list of Lessons-to-be-Learned.

The new investigation Lessons-to-be-Learned list should be universally accessible to all end users that can apply the data to eliminate unsafe behaviors from its operations.

Slide #21:

(R) In our paper we identified two proposed actions:
First, redefine investigation data formats to require that Lessons-to-be-Learned be an explicitly documented output of investigation processes; and
Second, redesign the form and substance of Lessons-to-be-Learned source data to improve their usefulness for end users.



Slide 22:

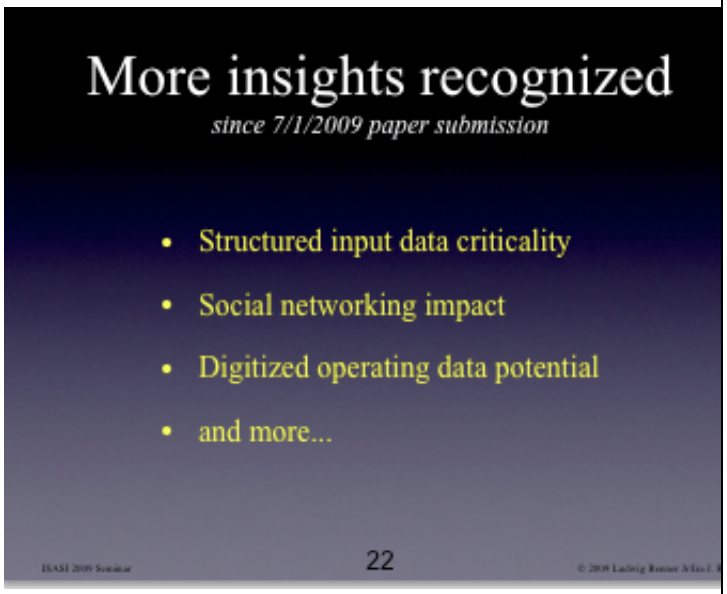
(R) As we continue studying Lessons Learning System issues, new insights continue to surface. For example, since our paper was submitted on July 1, we have realized:

Standardized structure of input data is critical to enable investigators to identify and document behavior sets. Proper data structure affects everything that follows!

Social networking, and communicating informal information about accidents and incidents on the Internet, are irreversible realities that are going to force changes in many long-held investigation attitudes. The days of controlled release of accident data have been superseded by the Internet. You can run, but you can't hide any longer.

Digitizing operational data has made capturing and communicating real-time aviation information an attainable goal in both air carrier and general aviation aircraft. This capability offers new opportunities to access the behavioral data essential to achieve optimum Lessons Learning System results.

In fact, on September 4th, *Deutsche-Presse* reported that Airbus's chief Thomas Enders proposed replacing the traditional "black boxes" with real-time flight data transmission via satellite, as is currently done with ACARS and FOQA data.



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Slide 23:

(B) To help launch the evolutionary development of improved systems, Starline Software has been persuaded, largely at the urging of Bill Carey, to make publicly available on the Internet an Open Source Library of software the company developed. This open source software is available free under a LGPL license for anyone who wants to upgrade their investigation data inputs and lessons documentation to support lessons learning system improvements we described.

Firefox, a superb Internet browser, is a good example of the open source software development model we hope will evolve in the investigation and lessons learning domains.

The library is a work in progress. Contributions of upgrades and additions are invited

Anyone who uses investigation or digital data bus processing software and academic institutions would seem logical entities to begin exploiting theses opportunities.

Handout

STARLINE SOFTWARE LTD

12105 Toreador Lane, Oakton VA 22124 USA
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Starline is pleased to announce the release of

An Open Source (LPGL)[i] Library

Meslib

to accelerate the use of formally structured mishap investigation data inputs, and enhance machine interoperability for investigation data.

Use: To program additions to current investigation applications to facilitate investigator input data gathering, documentation and use in current systems.

Contents:

- Complete OS X sample investigation support application in Objective C, including format for data entry, data linking, graphic and tabular data displays, source documentation, glossary building, and other features.
- Early alpha development library in platform-independent C++
- Some sample PHP to generate on line data entry application

View or download: http://code.google.com/p/meslib **Contribute updates:**

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