

Emergency and Abnormal Checklist Design, Development, and Certification

- Checklist ambiguities
- Prioritization within the smoke checklist for landing ASAP
- Mitigation of stressors during the non-normal event. We must design checklists to better account for this.
- KISS rule should take primacy (keep it simple, stupid)
- From an operations perspective, the simpler the better. Keep the decision points on the checklist flow to a minimum. Allow for those actions which take longer by design (i.e., movement of outflow valve by manual operation) to be incorporated within the checklist in a logical timely manner.

- Linking of various checklists, interoperability of checklists.
- Presentation suggestions: use of indentation, highlights for pertinent actions, font size.

- In Immanuel's presentation, 2 examples of aircraft in "Emergency" situations were cited. However, their context was presented as "topical" and not of the emergency condition. Neither example, in which the emergency crew was being "led by the nose" (ATC and dispatch), addressed the "HUMAN" question of the pilots' response to the outside needs which were not in the best interest of the flight (safety).
- The "EAS" study area must address:
 - The flight crews' full understanding of the power of the emergency authority granted, and,
 - That they are confident enough to use them in the best interest of their flight.
- Ben Berman –
 - Aircraft lore regarding the flight engineer getting distracted and making mistakes. Humans, driving on "cell phone", have a performance capability of a .20 BAL. The "multi tasking" issue is really a distraction in disguise - one task distracts from the other!

- The most significant point raised by Bill Jones was the notion that elements or items of the QRH are not checked, practiced, or assessed during training. This comes back to operators choosing the minimum standard to comply with regulations. Why do operators not train specifically on how to use a QRH?

- Training for transition from checklist utilization to problem solving, creative responses, and abandon ship.
- Dealing with multiple checklists.
- Reducing the number of checklists.

- Decision making and problem solving is needed to contend with problems or situations for which there is no checklist.
- Keep talking to line pilots who have emergencies and unusual non-normals. Keep asking “what worked” and “What didn’t work with the checklist?”
- Capt. Bill Jones made an important point – we (the line pilots) depend on you the designers and developers to be correct, consistent, etc. Most pilots will not question the checklist, they just learn it.
- FAA is inconsistent in what is approved. Individual fleet managers, company checklist designers don’t have to discuss checklist changes with anyone else, this leads to too many “opinions.”
- There should be a human factors review and modification of all checklists based on “FAA Human Factors Design Guide,” limitations of human performance and cognitive skills.
- QRHs do not address issue of contacting dispatch (time permitting) prior to selecting “suitable” airport.
- How does the use of flow charts compare to use of text based decision blocks?
- Critical issues include end user feedback and implementation.
- Integrated Checklist – Interesting Concept
- How much time is spent teaching how to run an emergency checklist?
- QRHs are based on safe ways of responding to system malfunctions. Knowledge of systems is essential in good use of a QRH. Is automation reducing crew knowledge of systems thus making QRHs less effective?
- Require a common industry approach to emergency and non-normal procedures.
- As a regulator we have no control over the QRH, only the AFM. Therefore the onus is on the manufacturer and/or airline to produce a usable document. We can spend hours agonizing over semantics within the AFM, with something different appearing in the QRH. Personally this is very frustrating.
- QRH design is out of control, too many inputs from manufacturers, operators, and individuals within the organizations, does it need to be pulled back to one body only?

- Message (EICAS/ECAM) context and format needs to facilitate the pilot's use of checklists and ability to identify the correct checklist.
- We must always realize that no checklist/QRH design can overcome a pilot's lack of systems knowledge. While systems minutiae is not desirable knowledge – we must not go overboard the other way and adopt an attitude of “IF its important, they will train me.” Pilots must continue to read and study.
- Even though there may be certain items in checklists that are not specifically taught in training, doesn't the pilot have a responsibility to be familiar with the airplane?
- Testing for conditions of (unreadable) is critical for effective execution of procedures.
- How do these concepts apply to electronic formats?
- Any other formats besides text available, such as the use of figures, flow charts, or perceptually driven formats instead of verbal?
- Design of checklist should include competence identification that provides guidance to training programs to ensure mapping of training needs to use of checklists.
- Testing usability of checklists should be done in pseudo realistic work settings appropriate for variation in context for use.
- Can electronic handbooks provide better match to QRH requirements than paper form?
- I agree with the assertion regarding checklist design for situation assessment. Flight deck design should start with anticipation of abnormal and emergency response and then the design can support action rather than procedures to support the design
- Stress the “time available” concept and embed the “normals” where possible.
- More guidance needs to be given to air carriers regarding anticipation and mitigation of stressors during checklist and/or procedural development. Especially relating to those checklists and procedures intended for flight attendants. Cultural differences between pilots and flight attendants are vast. Sometimes this factor seems to be overlooked when checklists are built “in house”. Obviously flight attendants have different environmental, physiological, and psychological backgrounds.

Checklist designers should look at:

- Accuracy
- Clarity
- Simplicity (regarding non-English speaking aircrews)

- Conciseness
- For example, “Do not exceed 250 KIAS” is fine for flight crews with English as their first language. Compared to “Max 250 KIAS”, or wording that work fine for everybody.
- Correctly identifying emergency or abnormal situations.
- Involving all flight crewmembers (usually 2) in accomplishment of verification of critical checklist items.
- Standardization in format, font, bold face, etc in QRH.
- We need to have facts and data to support checklist design not chief pilot opinions.
- There needs to be a clear and concise translation for what the pilots see/experience on the flight deck to the appropriate checklist (i.e., word-for-word or better yet, caption or warning to title of checklist). Bombardier seems to be on right track with matching captions for emergency and abnormals, but still falls short when it comes to multiple failures or no checklist/warning issues.
- Who are the participants of the procedures tests? (for Boeing) How realistic is the operational environment, task load, etc. of the simulator/aircraft procedure tests? What are the dependent measures?

Suggestions for Barbara Holder:

- “Group Steps Together” not necessary to explicitly state in QRH, but should be used when training, so crew understand “why” they are doing it.
- Checklist use without context of “why” is almost rote learning, which we know is poor. If “why” is understood, chance of human awareness of missed step or context of accomplishment is improved.
- Train pilots on philosophy of use of QRH. You designed it a certain way, and the user must understand that or it will not be as effective as it could be.
- The need for Ms. Holder’s, and especially Dr. Burian’s work seems to have been illustrated by Ms. Holder’s presentation.
- In order to call attention to various changes in the text format large and bold “print and arrows” were employed. Changes in margin also received the same attention. This was all done in front of a relaxed, and interested audience. Without relaxation and “arrows”, how many of these text changes would we have noticed? In a 7.5 Richter scale earthquake? Or, as a pilot in a time-pressured emergency?

Checklist Design suggestions:

- Titles should be very specific.
 - Specific references (pg. #) should be given to follow-on checklist.
 - “Notes” should precede the step.
-
- When are indicators necessary for a pilot to abandon checklist when it is evident the procedure is not solving the problem? Can we simplify checklists? Will electronic checklists help or hinder the issues?
-
- I find it unfortunate that the FAA personnel I have contact with have only a limited knowledge of checklist design requirements. Why does the FAA continue to fail to be standardized in their requirements?
-
- Has there been a consideration to employ a time limit guideline when assessing particular items on a checklist during an emergency or abnormal situation? For example if can't assess within 1 minute, skip item and proceed to next item which may speed up progress through the checklist (taking into account a previous item was skipped due to time taken to assess).