Integrating STPA in Large Organizations
(Thoughts and Perspectives)

Mark Vernacchia
GM Technical Fellow
Principal System Safety Engineer – Propulsion Systems

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Integrating STPA in Large Organizations

- Presentation summarizes observations made by the writer
  - Initial introduction activities
  - Finding an initial application for STPA
  - Demonstrating value of STPA and validating STPA usefulness
  - Comparison of STPA to other system safety analysis methodologies
  - STPA and Model-Base Safety Representation
  - STPA evaluation effort
  - Effort to educate system safety engineers
  - Expansion of STPA usage beyond initial niche
  - Use of “systems thinking” and “systems engineering” philosophies
  - Potential future areas of STPA usage

Integrating STPA in Large Organizations

Integrating STPA in Large Organizations

- Initial Introduction Activities
  - Bring back STPA information from conferences/symposiums to your organization
  - Attend MIT STPA Workshops or review presentations from MIT PSAS site
  - Be open minded
  - Perform internal review of your own safety process
  - Assess possible usefulness

Integrating STPA in Large Organizations

- Tips for success
  - First and foremost - Make sure there is a need STPA can fill (ie: HMI – socio technical benefits)
  - Don’t try to change the whole world . . .
    - The goal should be not to solve world hunger, but just to feed the family . . .[1]

[1] G. Ressler – GM Tech Fellow

  - Maintain your vision . . . but be ready to modify based on good feedback or input
  - Leverage idea of continuous improvement for existing processes by enhancing use of systems engineering and systems thinking . . .
  - Talk to other people inside and outside of your organization . . .

Integrating STPA in Large Organizations

- Finding an initial application for STPA
  - Learn STPA to a working level
  - Look for an area with the greatest need
  - Propose STPA as an alternative to struggling methodology
    - Used STPA as alternative to a DFMEA effort to deal with human factors
  - Operate below the “radar”
    - Be focused
    - Do not alienate people with grandiose statements
    - Be respectful of people’s concerns

Integrating STPA in Large Organizations

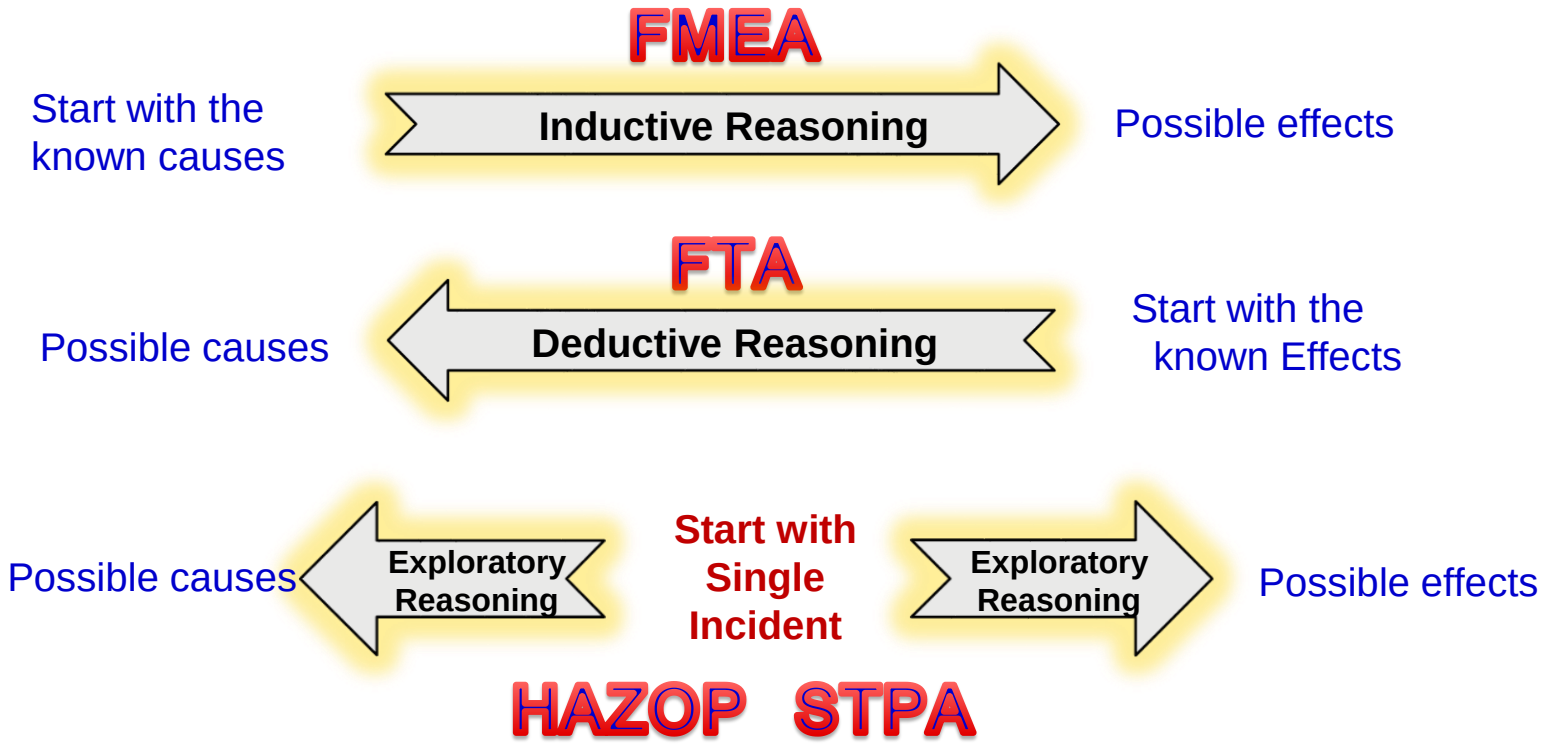
- Demonstrating value of STPA
  - Review results with program team
  - Demonstrate traceability logic
  - Emphasize STPA's use of causal scenarios
    - Do not need physical failures to have potential hazard
  - Test usefulness by assessing acceptance/rejection by program team
  - Test usefulness by evaluation how STPA supplements existing "standards" or processes
    - ISO 26262
    - HMI strength

Integrating STPA in Large Organizations

- Comparison of STPA to other safety analysis methodologies
  - Need to choose your “spectrum” philosophy

  - Consider how much effort needed to get rid of other methodologies and if organization would even entertain that idea
  - STPA is an “exploratory” to complement “inductive” (FMEA) and deductive (FTA) evaluation methodologies
  - Consider how STPA would/could feed or flow into other methods
  - Emphasize STPA can be very effective in finding missing requirements especially early in concept phase on systems that have significant HMI considerations

Integrating STPA in Large Organizations



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		Causes: Unknown	Causes: Known
Effects	Unknown	*Exploratory Analysis*	*Inductive Analysis*
Effects	Known	*Deductive Analysis*	*Descriptive Analysis*

- Deductive Analysis (e.g., FTA)
- Inductive Analysis (e.g., FMEA, Interface Analysis, Sneak Circuit Analysis)
- Exploratory Analysis (e.g., HAZOP, what-if, STPA)
- Descriptive Analysis (relatively straight forward observations)

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- STPA and Model-Base Safety Representation
  - Representation Examples
    - UCA constraints equivalent to “safety goals”
    - UCA themselves equivalent to “malfunctions”
    - Causal scenarios/factors equivalent to “malfunction causes”
    - Requirements linked to “safety goals”
  - OMG (Object Management Group) standard
    - Influence on methodology
    - Tool supplier review and response

Integrating STPA in Large Organizations

- STPA evaluation effort
  - Emphasize STPA provides straightforward methodology to assess designs and define requirements necessary to prevent or manage hazard
  - STPA can be used instead of other evaluation methods
    - HMI – STPA worked better than FMEA approach to deal with causal scenarios
    - Electric Power Steering – STPA provided requirements at multiple levels more efficiently than a system element fault analysis did (use of abstraction)
  - STPA can save effort by substituting or supplementing for current evaluations methods or by filling a role for a missing evaluation.
  - Take time to work 1-on-1 with groups to educate them on STPA opportunities

Integrating STPA in Large Organizations

- Effort to educate system safety engineers
  - Having STPA as a recognized part of internal system safety process
  - Develop educational collateral to be used by SSE
    - Training sessions
    - Documents explaining and providing examples, examples, examples (did I say “examples”?)
    - Hands on sessions
  - Find willing practitioners
  - Leverage system engineering and system thinking perspective

Integrating STPA in Large Organizations

- Expansion of STPA usage beyond initial application
  - Integrate STPA as part of expected process(es)
  - Apply STPA to applications of HMI and complex programs
  - Relentless, respectful, enthusiastic support without alienating people
  - Find a different respected person/people to be STPA proponents
  - Incorporate STPA generated requirements into corporate requirement documents and specifications
  - Seek out like-minded STPA practitioners in your industry or across industries to find common interests and needs
    - SAE STPA Recommended Practices Task Force

Integrating STPA in Large Organizations

- Expansion of STPA usage beyond initial application
  - Demonstrate value of STPA requirements addressing safety concerns
  - Associate STPA with corporate initiatives when it helps those initiatives
  - Leverage systems engineering and system thinking
  - Use on programs with new functions and features that have not been implemented yet or implemented together yet
  - Gather objective data showing results
    - Requirements generated
    - Design updates and changes driven by STPA evaluations
    - Short time to get results

Integrating STPA in Large Organizations

- Use of “systems thinking” philosophies (INCOSE ref.)
  - Systems thinking is a holistic approach to analysis that focuses on the way that a system's constituent parts interrelate and how systems work over time and within the context of larger systems.
  - The approach of systems thinking is fundamentally different from that of traditional forms of analysis. Traditional analysis focuses on the separating the individual pieces of what is being studied; in fact, the word "analysis" actually comes from the root meaning "to break into constituent parts."
  - Systems thinking, in contrast, focuses on how the thing being studied interacts with the other constituents of the system - a set of elements that interact to produce behavior - of which it is a part.

Integrating STPA in Large Organizations

- Use “systems engineering” philosophies –
  - Systems Engineering is an engineering discipline whose responsibility is creating and executing an interdisciplinary process to ensure that the customer and stakeholder's needs are satisfied in a high quality, trustworthy, cost efficient and schedule compliant manner throughout a system's entire life cycle. (INCOSE)
- Apply Father Flanagan’s belief that “there is no such thing as a bad boy” to engineers . . .
  - Engineers want to do good engineering
- Realize that not all engineers can do systems engineering well

Integrating STPA in Large Organizations

- Potential future areas of STPA usage
  - More HMI evaluations
  - Complex systems evaluations
  - SOTIF evaluations
- *Questions??*