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# Defensibility: Legal Liabilities of Acts and Omissions in the Practice of Systems Engineering

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*Note: this presentation does not purport to offer any sort of legal advice and presents defensibility from a United States legal perspective*

# System of Interest (SOI)
# Feller/Lopper/Buncher (F/L/B) Machine

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Photo Source: http://www.ponsse.com/products/harvesters/bear

- Tree harvesting machines
- Fells (cuts-down), lops (removes branches) and bunches (cuts and stacks)
- An inherently dangerous system
- This paper presents a **hypothetical** F/L/B accident that has resulted in legal actions

# F/L/B Machine Video



https://www.youtube.com/watch?v=nuuPI2hyt6M

# The (Hypothetical) Accident

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- Feller/Lopper/Buncher Machine Operator grasped a tree with the boom
- F/L/B was not able to securely grasp the tree and it fell on the machine, crushed the cab, and seriously injured the operator
- The operator is suing the equipment manufacturer for negligence

# Trial Assumptions

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- The Plaintiff has called a Systems Engineering expert witness that has established the following Standard of Care for Risk Management:
  - Per the *Guide to the SEBoK* and the *INCOSE SE Handbook v4*, a good Risk Management process begins with Risk Identification
  - Industry standard risk ontologies are available to support effective Risk Identification
  - Commercially available software tools exist to help implement ontology-based Risk Identification

Note: Special thanks to Laurie Wiggins of Sysenex in framing this position

# Trial Scenario #1

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- Key actors
  - Lawyer for plaintiff (operator)
  - Witness (Lead Systems Engineer) for defendant (equipment manufacturer)
- The witness has been qualified to testify
- Lawyer for the plaintiff questions the witness to show that the Standard of Care established by the expert witness was not met by the defendant
- Therefore, the defendant was negligent

# Defensibility

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- Systems engineers rely on specialty engineering activities to balance performance requirements with non-functional requirements (the “ilities”)
  - The INCOSE SE Handbook lists 14 “ilities” (including affordability, reliability, resilience, safety, and usability)
- This paper introduces defensibility
  - Attempts to balance the legal aspects of the system and its development effort
  - Professional legal liabilities stem from two primary sources: ***acts*** and ***omissions***

# Negligence

- In an action for negligence, the lawsuit is brought by a plaintiff who must allege that they have been injured by some action or inaction of the defendant
  - the plaintiff was owed a duty of care by the defendant
  - there was a dereliction or breach of that duty
  - the defendant's dereliction directly caused the injury [but for the defendant's actions, the plaintiff would not have suffered an injury]
  - the plaintiff suffered damage as a result of that breach
  - the damage was not too remote (i.e., there was proximate cause that show the breach caused the damage)

# Duty or Standard of Care


- General duty of care that everyone owes to persons who are likely to be affected by our conduct in a particular context is the same care that would be exercised by a reasonable person under similar circumstances
  - The “reasonable person standard.”
  - It is important to note that this standard does NOT require perfection – only the exercise of such care as is reasonable under the circumstances
- In the case of professionals acting in the exercise of their profession, this standard is heightened to take into consideration their specialized knowledge and experience.
  - “The level and type of care that a reasonably competent and skilled professional, with a similar background and in the same professional community, would have provided under the circumstances that led to the alleged breach.”
- Expert Witnesses are typically used to establish the Standard of Care

# Potential Sources of a Standard of Care for SE

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- SE Products
  - INCOSE SE Handbook (SEH)
  - INCOSE Systems Engineering Competency Framework (SECF)
  - Guide to the Systems Engineering Body of Knowledge (SEBoK)
  - INCOSE (and others) code of ethics
- SE Standards
  - ISO
  - IEEE
  - EIA
  - etc.
- Professional Certification
  - INCOSE ESEP, CSEP, ASEP
- Organizational Assessments
  - ISO 9001
  - CMMI
  - ISO/IEC 15504-6 (ISO/IEC 33000)

# Breach of Duty for Systems Engineers

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- Breaches of ***acts*** are where a necessary activity has been done, but the systems engineer did the activity poorly or did not take the proper action based on the situation.
- Breaches of ***omissions*** are where the systems engineer has not done something that should have been done.

# Example Breaches of Duty

- Examples of ***acts*** include
  - Minimum amount of SE performed, a knowingly substandard job of systems engineering was performed on a product
  - Risk assessment performed, but a high risk item was incorporated into the design without any treatment
  - Trade-off studies performed, but different unsubstantiated alternative was intentionally chosen
  - Specialty engineering (the “ilities”) performed, but results intentionally not reflected in design (e.g., system safety)

- Examples of ***omissions*** include
  - SE cut from project
  - Requirements not captured
  - Requirements captured, but design performed without meeting the captured requirements
  - Requirements traceability not established
  - Requirements traceability initially established but changes were made without impact assessments
  - Baselines not established
  - Baselines established, but no formal change process was used
  - Risk assessment not performed or incomplete
  - Risk assessment performed, but treatment on high and medium risks was not done
  - Trade-off studies not performed
  - Specialty engineering (“ilities”) not performed
  - Specialty engineering (“ilities”) performed, but results not reflected in design – example: FMEACA/hazard analysis done but no changes were made to the design
  - Lessons learned not captured or used

# Trial Scenario #2

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- Key actors
  - Lawyer for defendant (equipment manufacturer)
  - Witness (Lead Systems Engineer) for defendant (equipment manufacturer)
- The witness has been qualified to testify
- Lawyer for the defendant questions the witness to show that the Standard of Care established by the expert witness was met by the defendant
- Therefore, the defendant was not negligent

# Summary & Conclusions


- Defensibility arises from quality work
- The engineer who is knowledgeable and current in the professional best practices and applies those practices in the day to day work of the systems engineering practice will do “defensible” work
- Defensibility is not a matter of positioning and disclaiming our way to a legally insulated position
- Rather, it is a matter of performing our work in a professional manner that delivers value for our customers and stakeholders
- This will not guarantee freedom from legal claims
- But knowledge of, and compliance with, the reasonable standard of care accepted in our profession will ensure that our practice is not negligent, thereby providing defensibility against liability for negligence