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# Operationalizing Meaningful Human Control in MUM-T: Detecting the "False Green" in Operational Risk Management using STPA



ΔΗΜΟΚΡΙΤΕΙΟ  
ΠΑΝΕΠΙΣΤΗΜΙΟ  
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**Operationalizing Meaningful Human Control in MUM-T:  
Detecting the “False Green”  
in Operational Risk Management Using STAMP model.**



## OBJECTIVE

To inform you about the limitations of current operational risk management in flight missions and to demonstrate how a STAMP-based approach, powered by EWaSAP, can operationalize 'Meaningful Human Control' within the extreme complexity of modern, hybrid Human-AI air combat.



- 1. INTRODUCTION**
- 2. METHODOLOGY**
- 3. RESULTS**
- 4. RESEARCH's GOAL**
- 5. CONCLUSION**
- 6. NEXT STEPS**



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# 1. INTRODUCTION

## a. Definition

***Operational Risk Management** is a decision-making process used to systematically evaluate possible courses of action, identify risks and benefits, and determine **the best course of action for any given situation**. Its purpose is to increase mission effectiveness by anticipating hazards and reducing the potential for loss, thereby maximizing resources and minimizing risk to acceptable levels.*

***AFI 90-802 (U.S. Air Force)***



# 1. INTRODUCTION

## b. Background





# 1. INTRODUCTION

## c. Research's Objective





1. INTRODUCTION
2. **METHODOLOGY**
3. RESULTS
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6. NEXT STEPS



## 2. METHODOLOGY

### a. Motivation





## 2. METHODOLOGY

### b. Simulation





## 2. METHODOLOGY

### b. Simulation

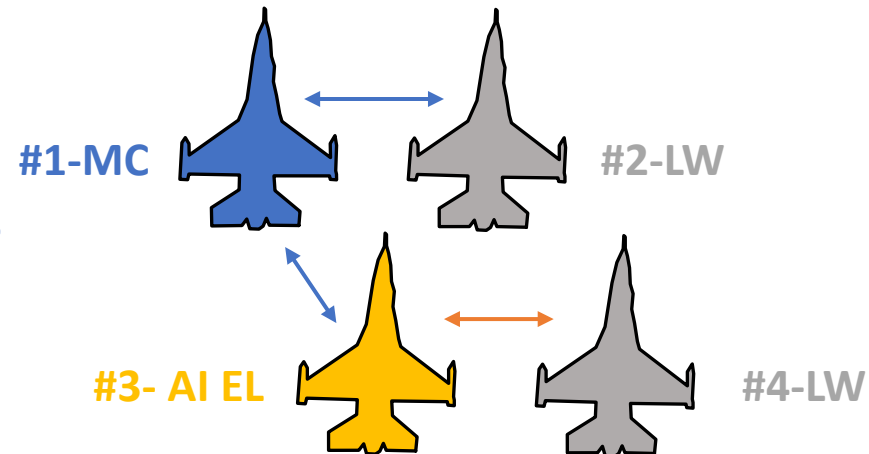




## 2. METHODOLOGY

### b. Simulation

MC: Mission Commander  
EL: Element Leader  
LW: Loyal Wingman

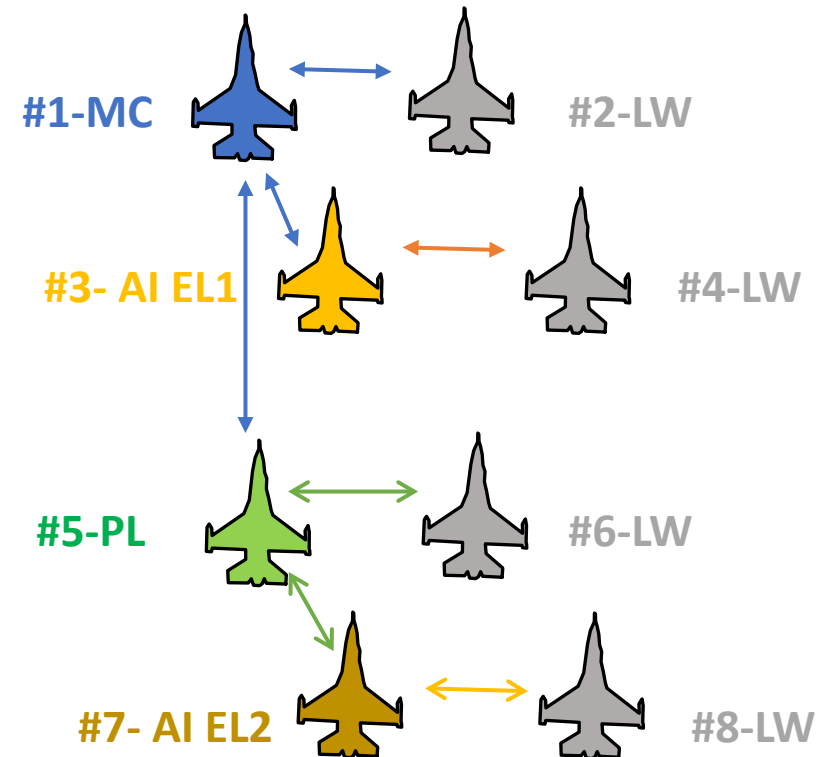




## 2. METHODOLOGY

### b. Simulation

MC: Mission Commander (Human)  
PL: Package Leader or DMC ( AI Deputed MC)  
EL1: Element Leader  
EL2: Element Leader  
LW: Loyal Wingman

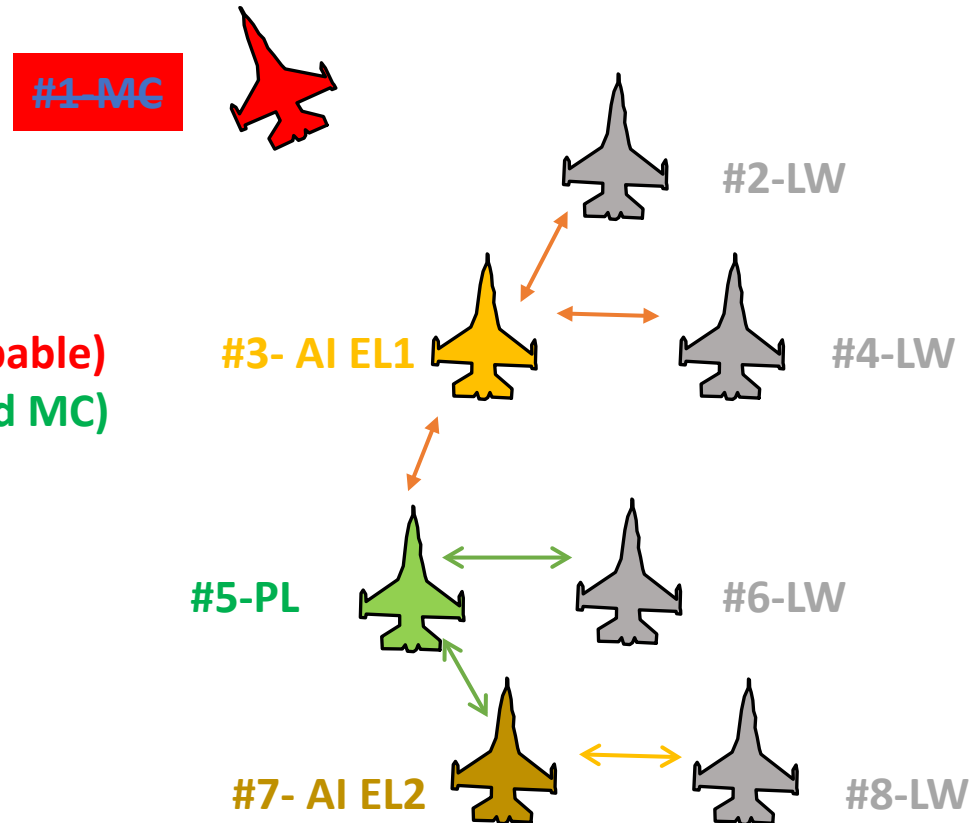




## 2. METHODOLOGY

### b. Simulation

**MC: Mission Commander (Human incapable)**  
**PL: Package Leader or DMC ( AI Deputed MC)**  
**EL1: Element Leader**  
**EL2: Element Leader**  
**LW: Loyal Wingman**





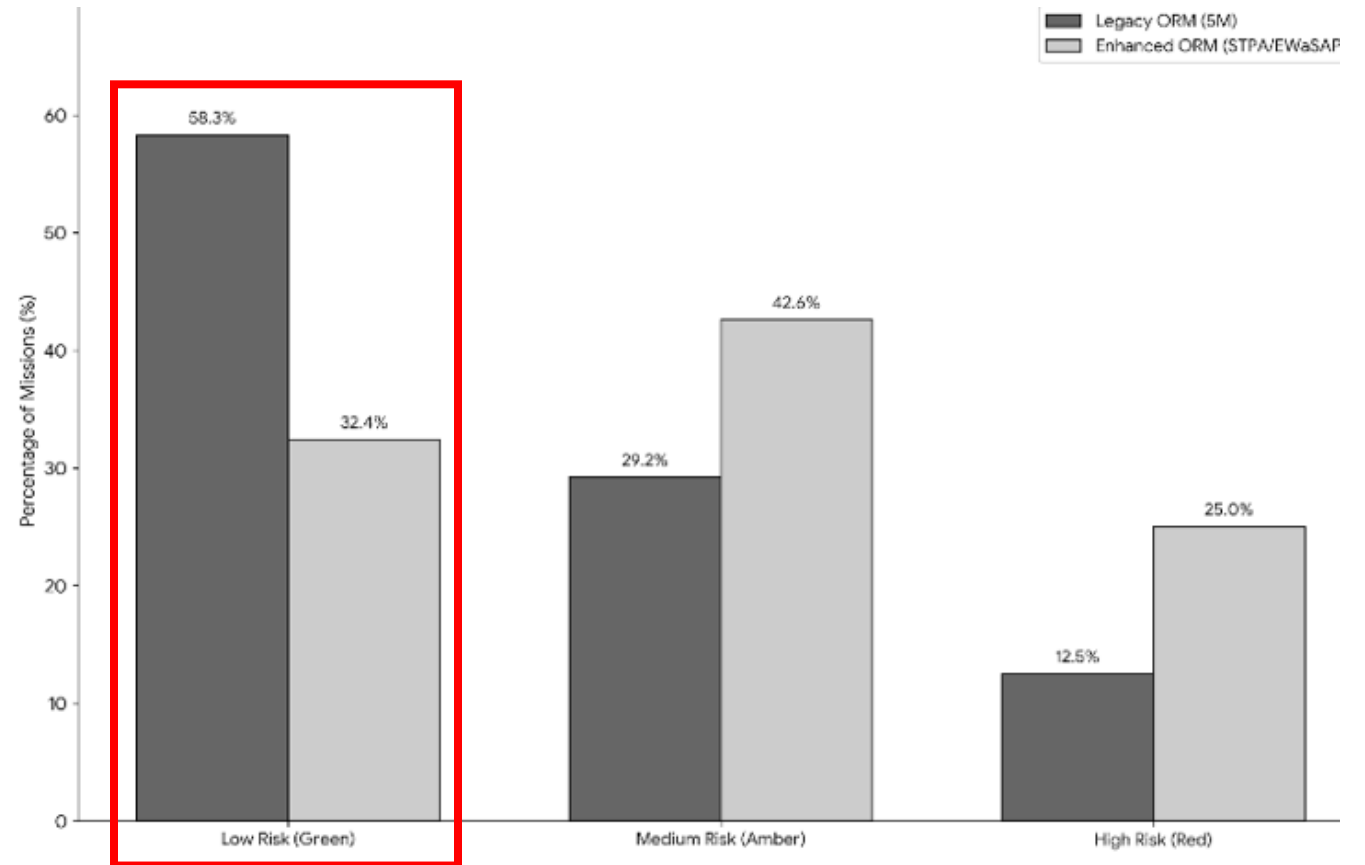
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### 3. RESULTS

#### a. Low Risk (Green)

- **ORM:** 58.3% Optimistic "Green"
- **E-ORM:** Only 32.4% Stable
- **Latent Drift:** 26% Re-classified as Hazardous
- **The Gap:** 1 in 4 missions in "False Green"

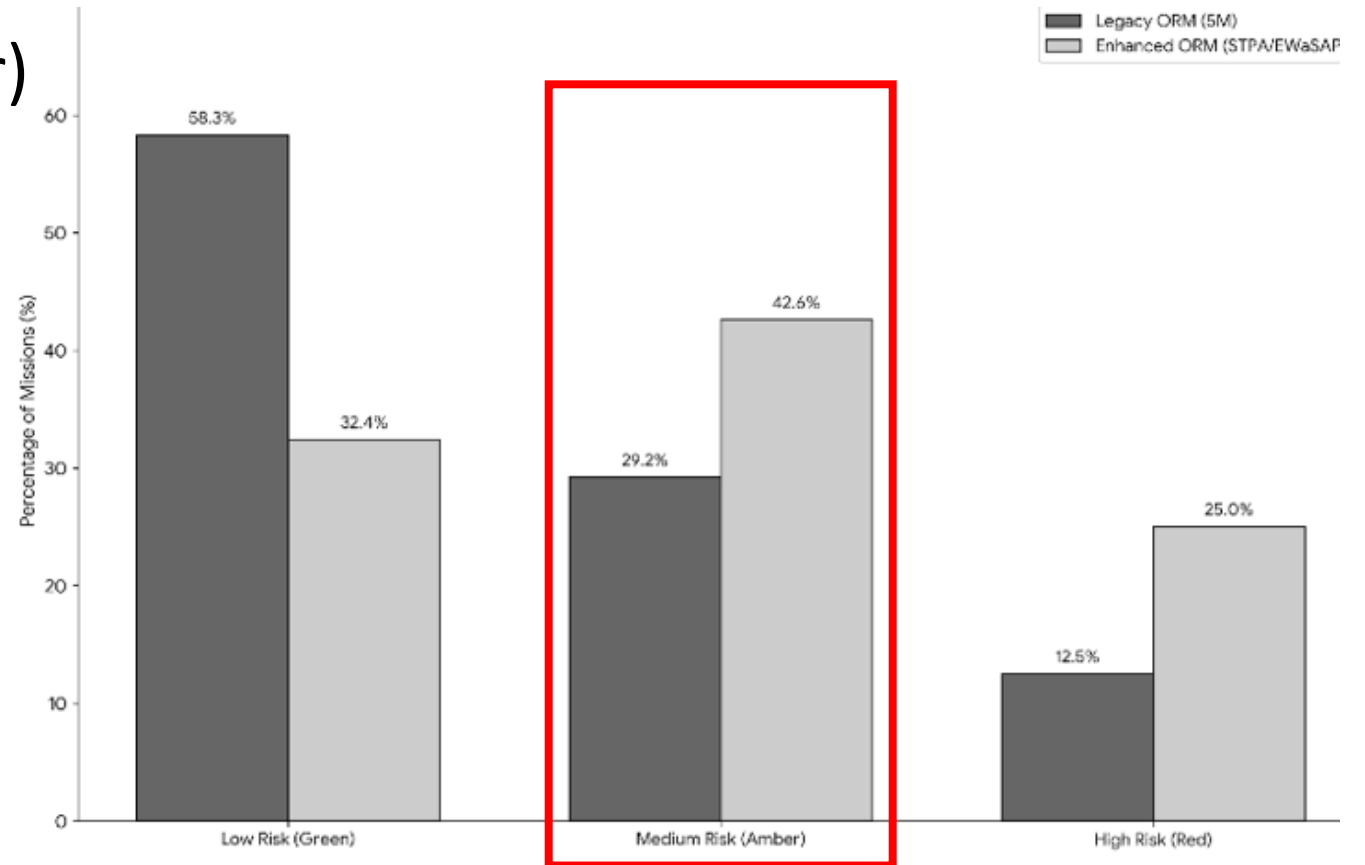




### 3. RESULTS

#### b. Medium Risk (Amber)

- **ORM:** 29.2% Amber
- **E-ORM Reality:** 42.6% Amber
- **Complexity Shift:** +13.4% Migration from Low
- **Context:** Capturing Human-AI Friction

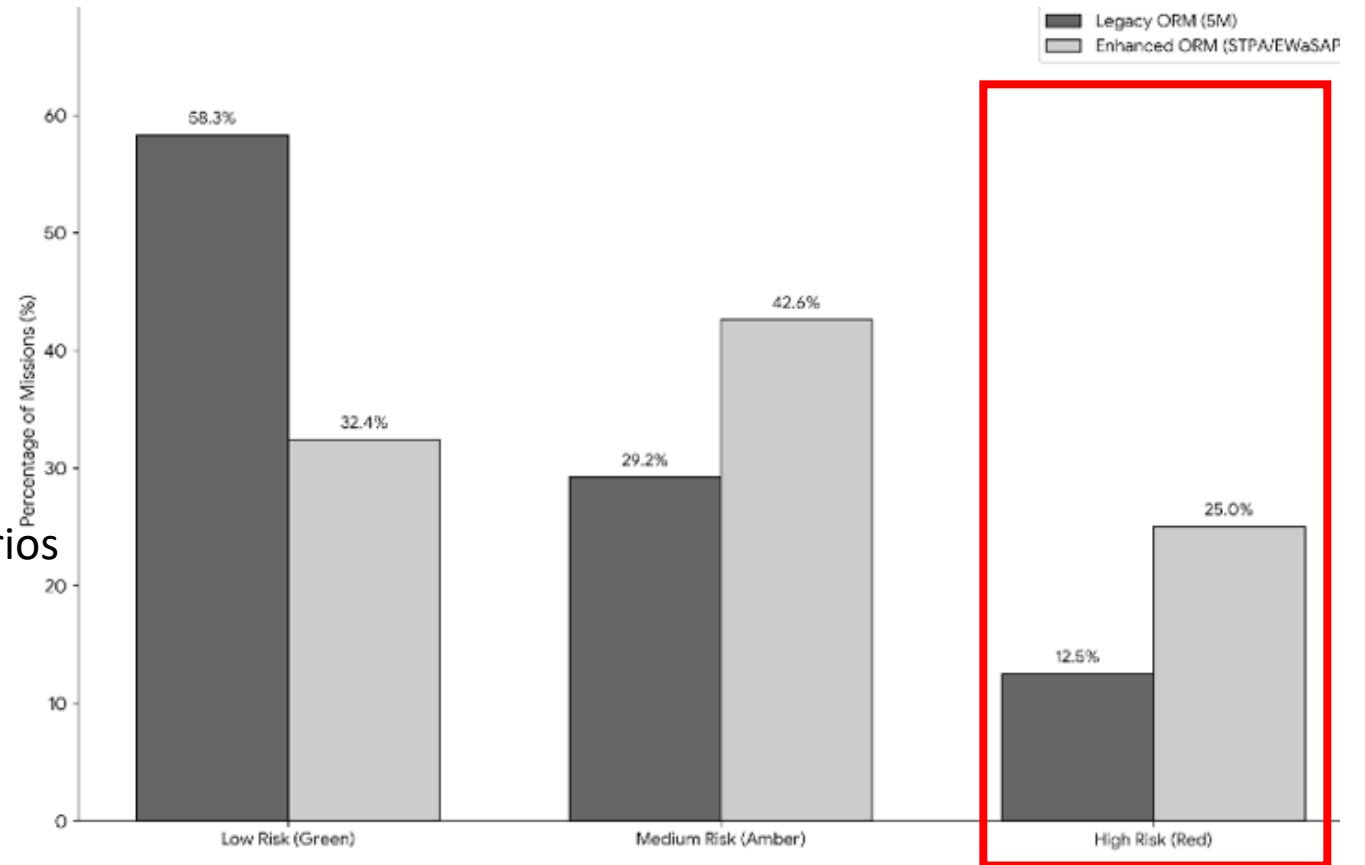




### 3. RESULTS

#### c. High Risk (Red)

- **Legacy Blind Spot:** 12.5% High Risk
- **E-ORM Revelation:** 25.0% High Risk
- **Critical Impact:** 2x Detection Rate
- **Safety Net:** Eliminating 43 "False Green" scenarios



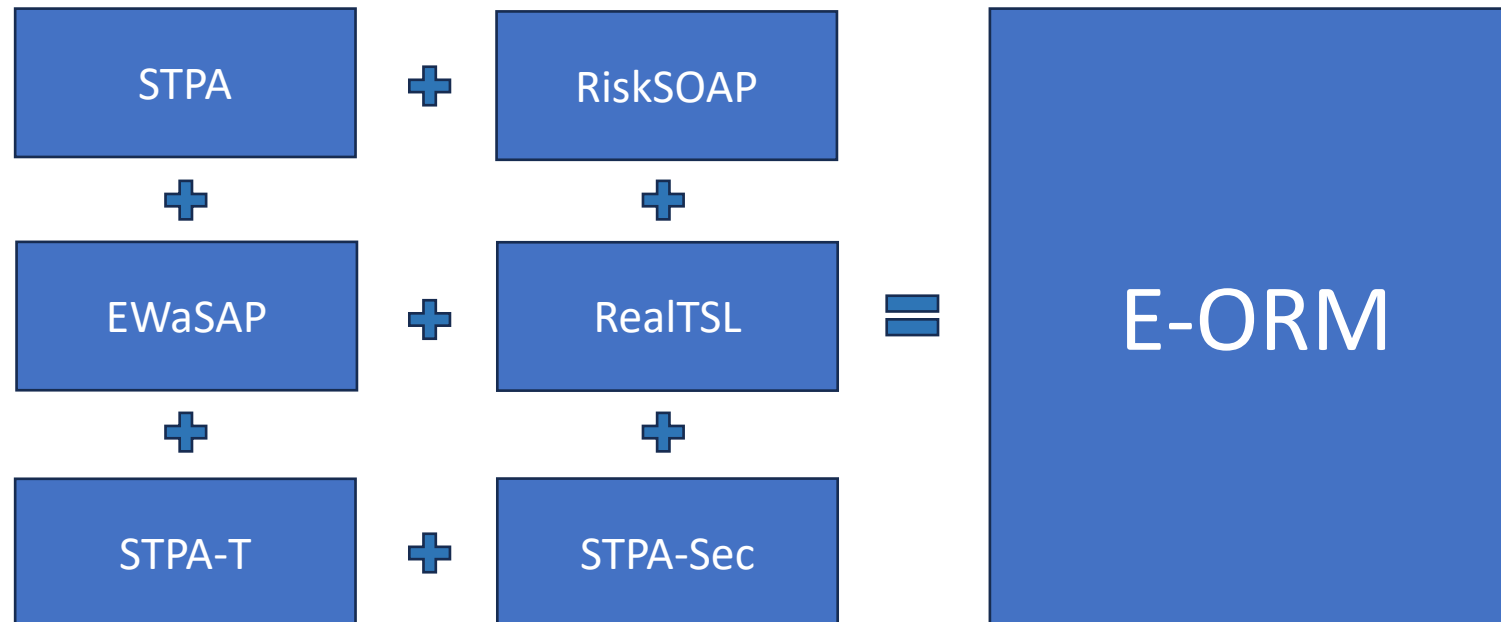


1. INTRODUCTION
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## 4. RESEARCH'S GOAL

### a. The E-ORM Methodological Synthesis





1. INTRODUCTION
2. METHODOLOGY
3. RESULTS
4. RESEARCH'S GOAL
5. CONCLUSION
6. NEXT STEPS



## 5. CONCLUSIONS

### a. Validation of the E-ORM





## 5. CONCLUSIONS

### b. Bridging the "False Green" Gap





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6. **NEXT STEPS**



## 6. NEXT STEPS

### a. Software





## 6. NEXT STEPS

### b. Human-Machine Interface





## 6. NEXT STEPS

### c. Tactical Stress-Testing





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- c. Research's Objective

## 2. METHODOLOGY

- a. Motivation
- b. Simulation

## 3. RESULTS

- a. Low Risk (Green)
- b. Medium Risk (Amber)
- c. High Risk (Red)

## 4. RESEARCH'S GOAL

- a. The E-ORM Methodological Synthesis

## 4. CONCLUSIONS

- a. Validation of the E-ORM
- b. Bridging the "False Green" Gap

## 5. NEXT STEPS

- a. Software
- b. Human-Machine Interface
- c. Tactical Stress-Testing



***"Creating safe systems requires moving beyond the traditional focus on failures and understanding safety as an emergent property that arises from complex interactions within the system."***

**Nancy G. Leveson**



Questions?



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