

A Certification and Evaluation Approach to Counter Unmanned Aerial Systems

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Introduction

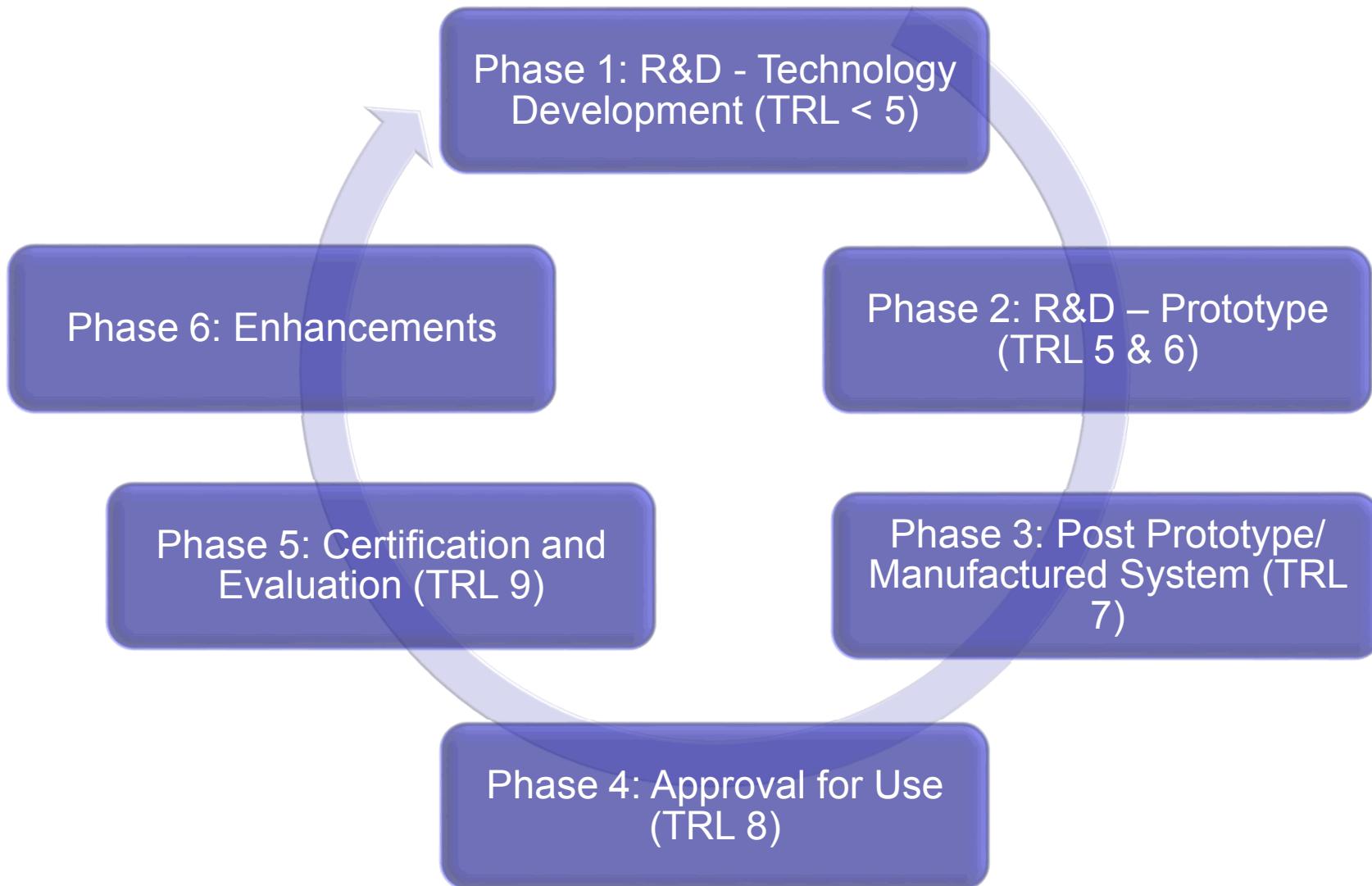
- The potential for using an unmanned aerial system (UAS) as a delivery platform for malicious intent is a security concern.
- As a result, the commercial sector has started to market detection, assessment, and neutralization systems to counter the UAS concern.
- It is important to establish a credible CUAS T&E program such that it provides:
 - Comparative Results
 - Repeatable Results
 - Quantifiable Results
 - Scalability
- Reason for this proposed graded approach is to establish a credible, consistent, and comparable T&E methodology that can be leveraged by industry, academia, and government agencies

Objectives

Evaluate the performance characteristics of COTS Counter-Unmanned Aerial Systems (CUAS) in order to inform executive decisions for acquisition, deployment, and operations:

- Establish a test methodology dedicated at providing credible, consistent, and comparable testing
- Identify capability gaps that require further technology development to meet the security needs for critical infrastructure.
- Establish a dedicated test site and test methodology for repeatable quantitative testing and allow other agencies to leverage their technology needs in a collaborative manner.

Lifecycle of Product



Graded Approach to T&E

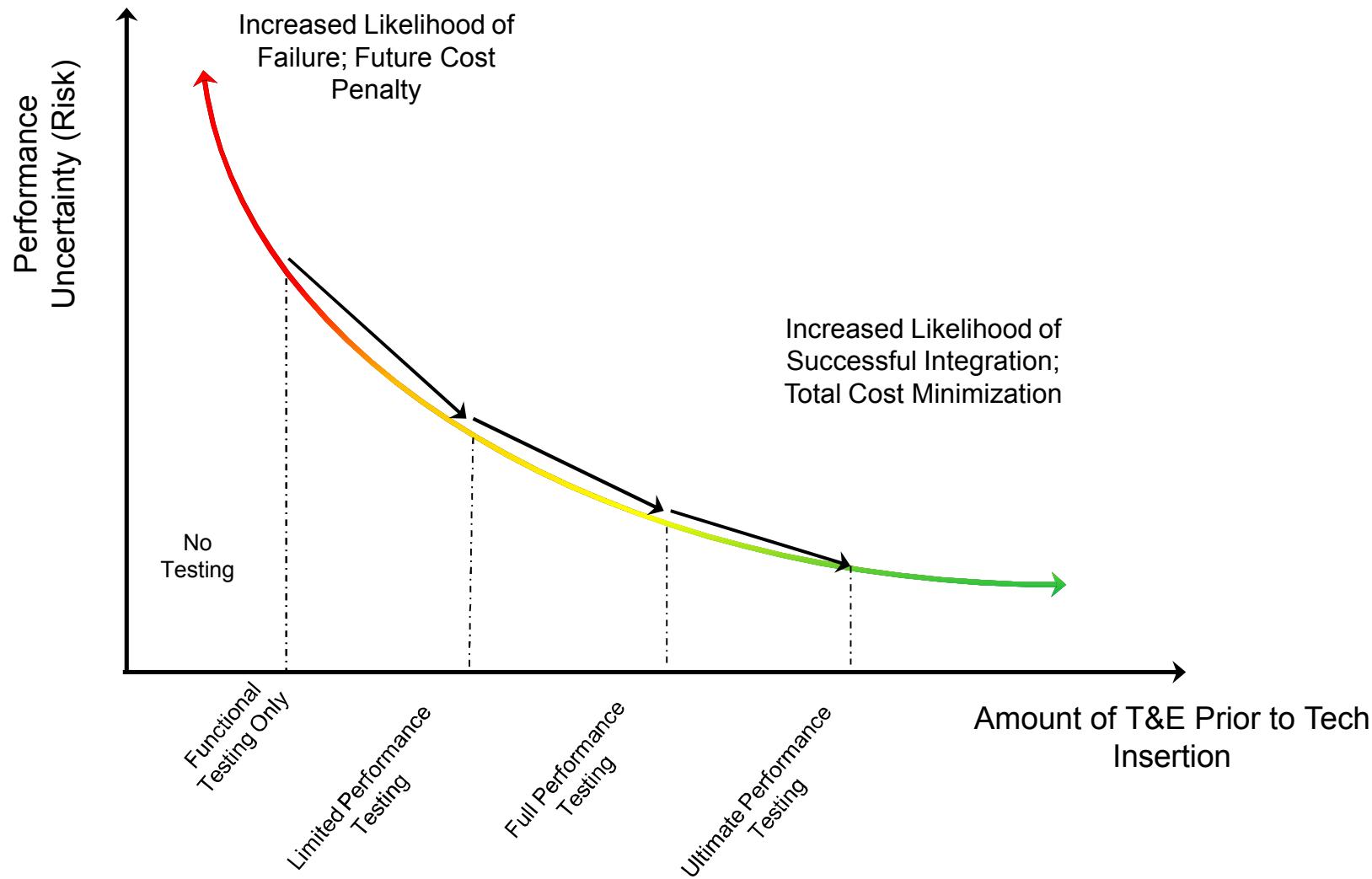


Risk

- Level 1 – Functional T&E
- Level 2 – Compatibility T&E
- Level 3 – Demo and Challenges
- Level 4 – Baseline Performance T&E
- Level 5 – Limited Performance T&E
- Level 6 – Full Performance T&E
- Level 7 – Enhanced Performance T&E
- Level 8 – Penultimate T&E
- Level 9 – Ultimate T&E

* Certification and Evaluation

Risk Acceptance vs Testing and Evaluation

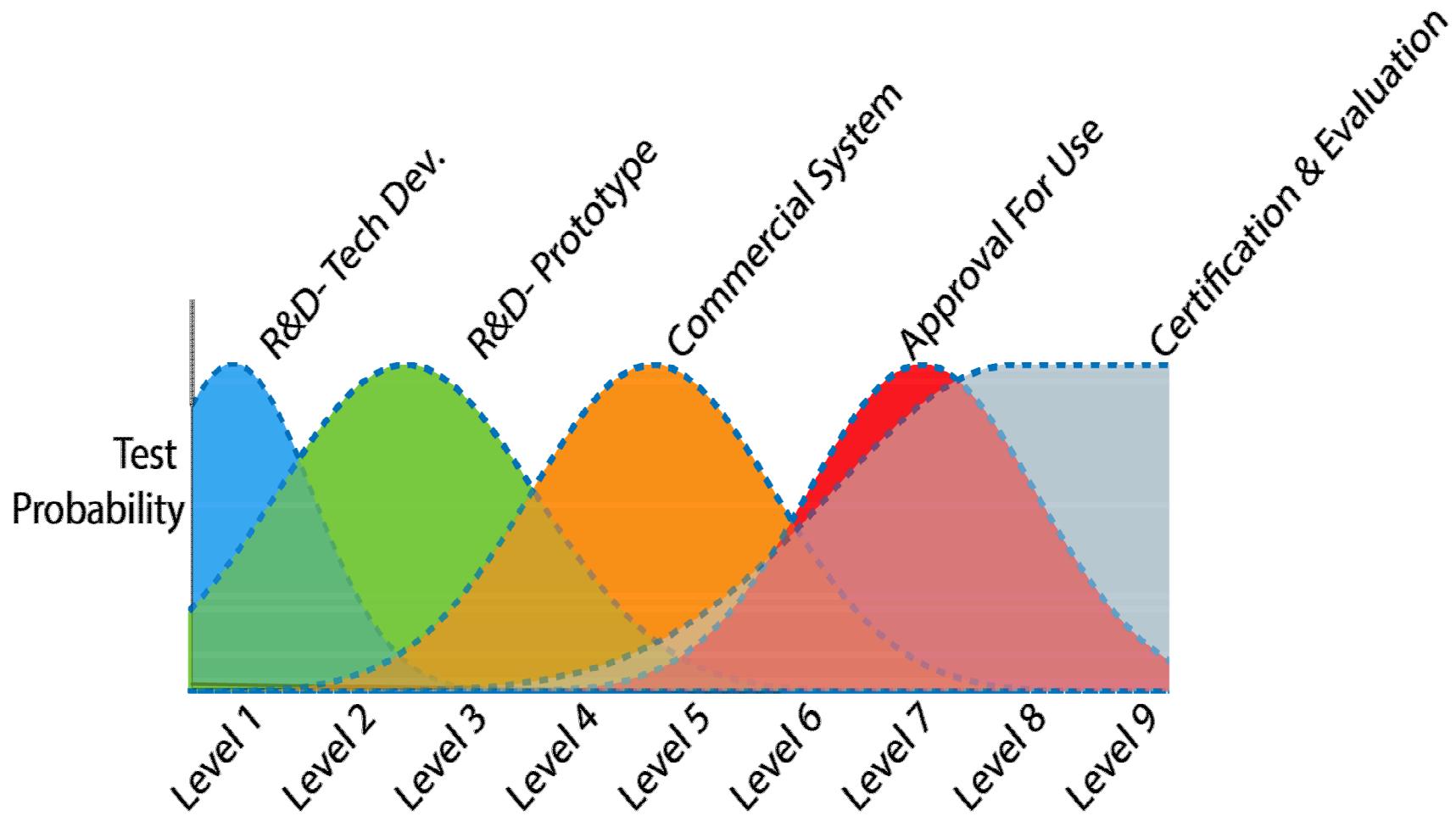


Phase 5: Certification and Evaluation



- Certification and Evaluation is commensurate with the level of testing performed and consists of:
 - 100% T&E (level dependent)
 - 72 hour operational test
 - 30 day burn in evaluation
 - Certification
- Certification and Evaluation is important in order to try to detect any premature failures and latent defects in the equipment as well as assessing the adequacy of logistics support
- Re-evaluation of significant enhancements should also occur in this phase prior to those upgrades being deployed

T&E Level versus Lifecycle Phase



100% T&E (Level Dependent)

- Duration is level dependent (< 30 days)
- Testing may include:
 - Pass/fail criteria derived from requirements
 - Performance testing
 - NAR/FAR
 - Tamper
 - Correct Annunciation
 - Correct Assessment
 - AC power Loss
 - Battery Endurance
 - Line Supervision/Network Communication Loss
 - Vulnerability profiles

72 hour Operational Test

- Monitoring and operational test that runs for 72 hours under normal conditions with no interruptions to demonstrate that the system functions as a whole and that adequate performance can be sustained by the responsible facility operational and maintenance personnel
- Any stoppage will be documented to convey the planned corrective actions and provide an updated schedule for testing to resume.
- All alarms and issues that occur during this test will be recorded with the cause noted in the issues log sheet



Burn-in

- 30 day operational test performed by the site personnel to assess how well the system performs in its normal operating mode on a permanent basis
- Test to try to detect any premature failures and latent defects in the equipment.
- Assess the adequacy of logistics support

Certification

- Stakeholders will meet to review results of the T&E and evaluation of the CUAS technology and certify the system or identify items to resolve prior to certification.
- Determine technology gaps from T&E and evaluation and create a prioritized list to identify enhancements for the next iteration

Why this is important

- Deployment to identify impacts to normal operations
 - Local environment impact on CUAS
 - Impact of CUAS on local environment
- Challenges of potential CONOPS, certifications, and approvals
- Test to try to detect any premature failures and latent defects in the equipment.
- Assess the adequacy of logistics support
- Identify the following at the deployed site
 - Performance metrics
 - Site specific NAR/FAR
 - Site specific degradation factors
 - Site specific vulnerability approaches

Summary and Conclusions

- This certification and evaluation app
 - Data to support CUAS certification
 - Comparative Results
 - Repeatable Results
 - Quantifiable Results
 - Scalability

Variables of what T&E level is needed:

- Industry/Funding dependent
- Risk acceptance
- Timeline for deployment
- Defined threat

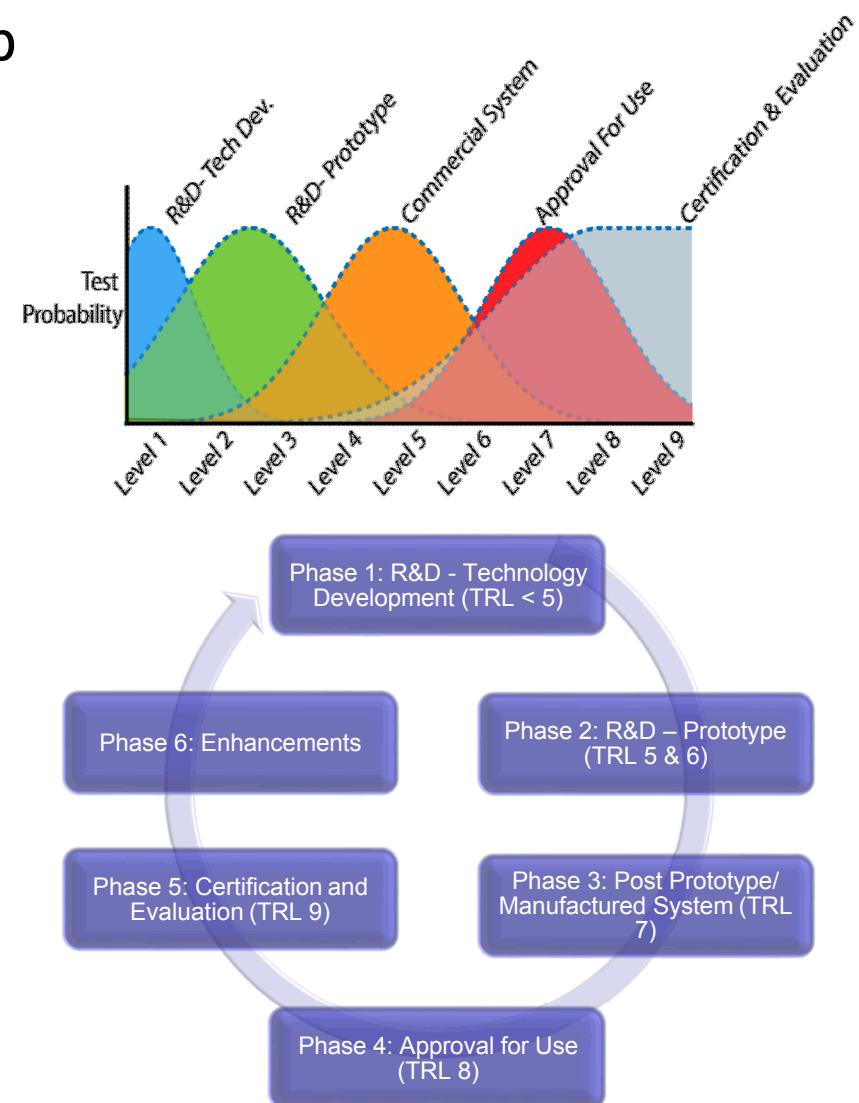




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QUESTIONS?



Photo: NASA Langley

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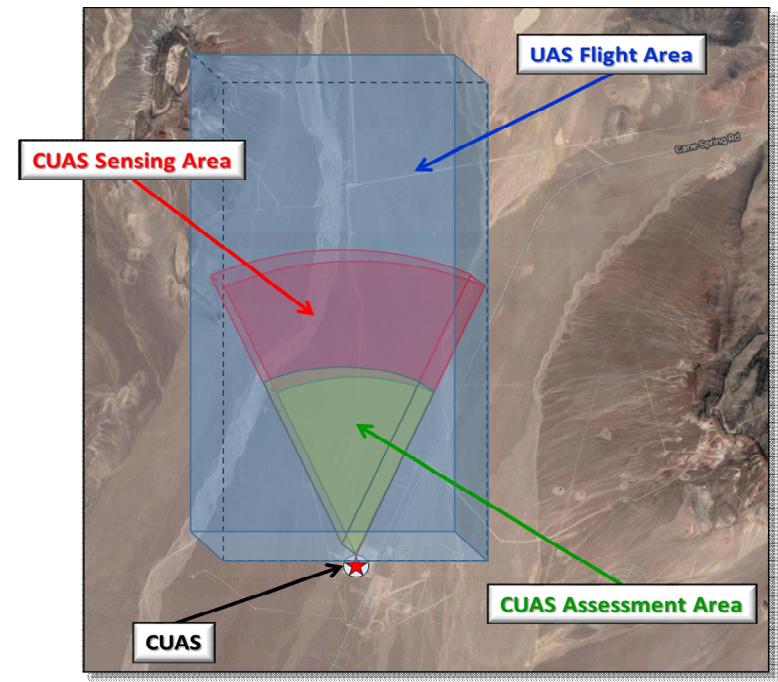
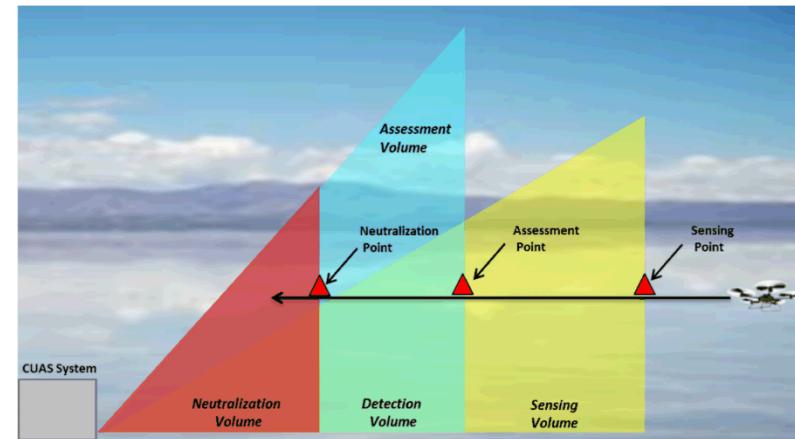
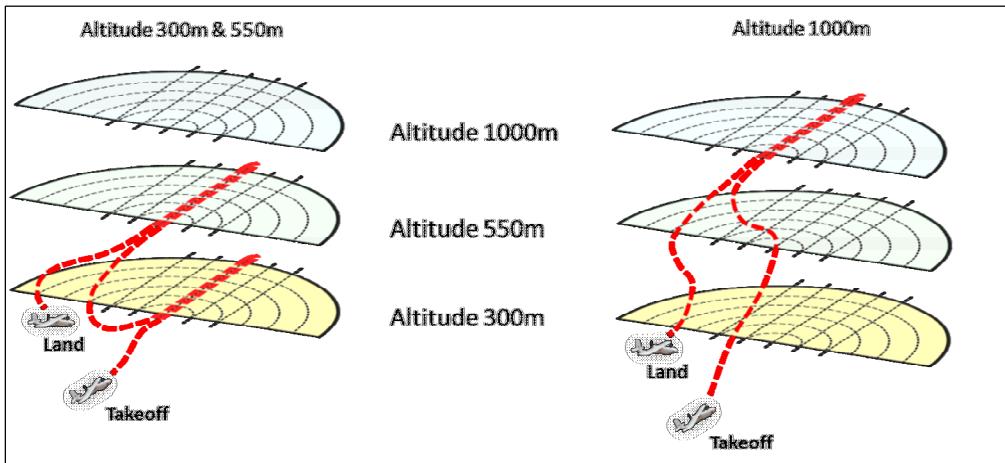


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Test Methodology

Standardized Testing

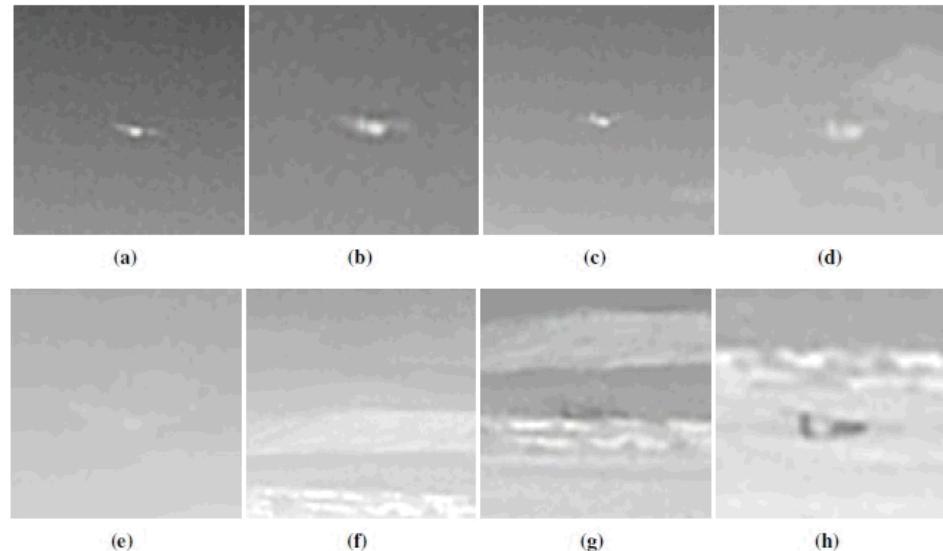
- Establish baseline performance
- Mapping out the volumes
- Same set of testing across all phenomenologies



Test Methodology

Degradation Testing

- Degradation testing is performed to investigate how a system's performance degrades from ideal performance as test conditions or factors are varied.
- Nuisance Alarm Rates and False Alarm Rates



Example

- A fixed wing UAS in the LWIR camera during a landing. The target contrast against background decreases as the UAS moved into an atmospheric region of similar temperature compared to the UAS.

UAS Fleet



Sabre



Octocopter



Phantom 3



Phantom 4



Iris+



Solo



Drak



Mighty Mini
Tiny Trainer



Mini Apprentice



Arrow



Quadcopter



Anaconda



Aeromao

UAS Group Definitions

UAS Group	Max. Weight (lb)	Nominal Operating Altitude (ft)	Speed (kt)	Representative UAS
Group 1	0-20	< 1,200 AGL	100	RQ-11 Raven, WASP
Group 2	21–55	< 3,500 AGL	< 250	ScanEagle
Group 3	<1323	< FL 180	< 250	RQ-7B Shadow
Group 4	>1320	< FL 180	Any	MQ-8B Fire Scout
Group 5	>1320	> FL 180	Any	MQ-9 Reaper

The data contained within the table provides UAS group specifications in accordance with the *Department of Defense Unmanned Aircraft System Airspace Integration Plan*