

Applying Specific Operations Risk Assessment (SORA) to UAS Emergency Response Missions

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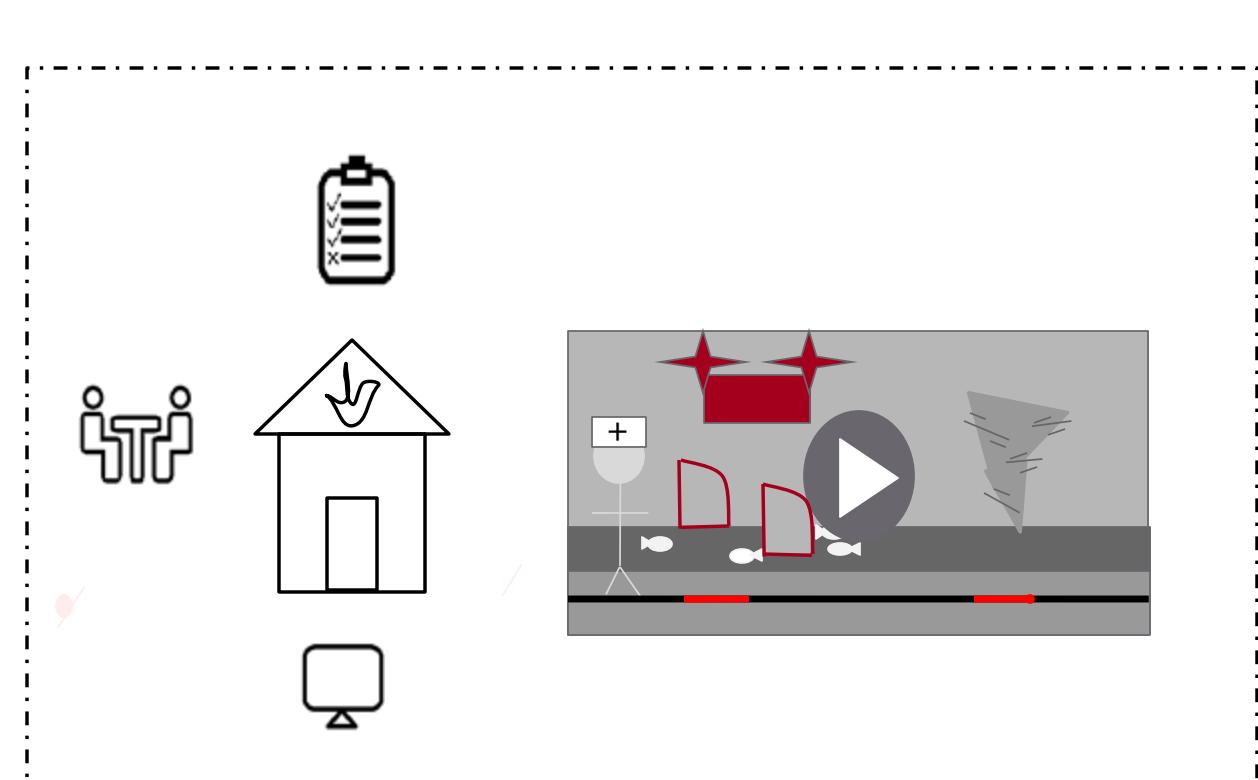
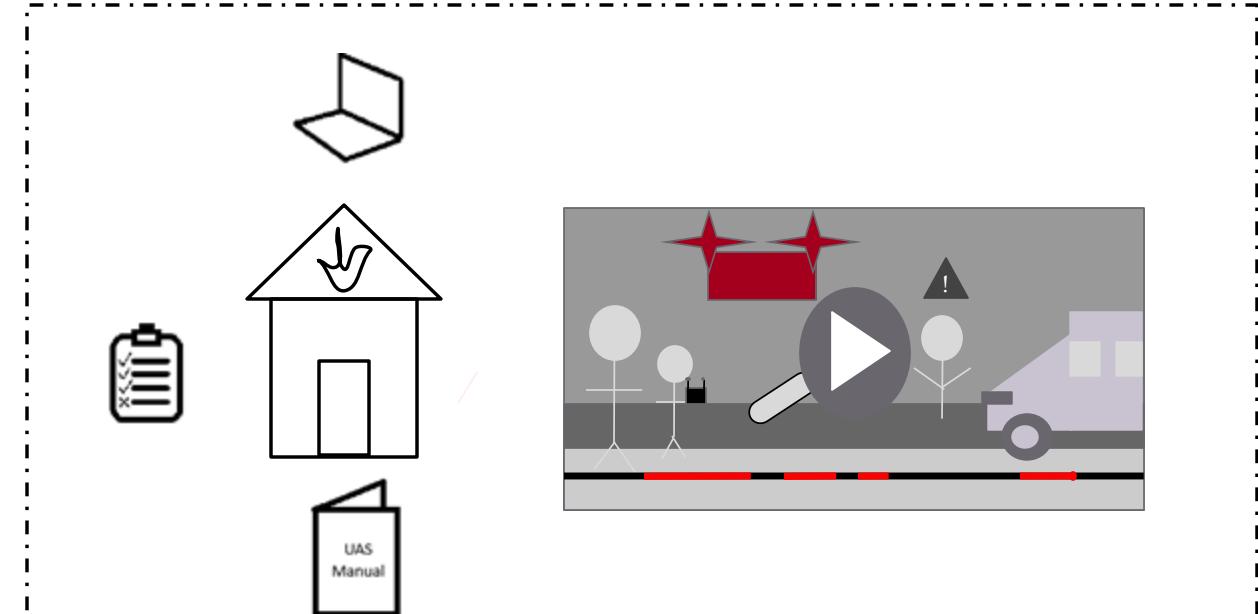
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DRONERESPONDERS

Step #1: Document Proposed Operation

INFORMATION GATHERING



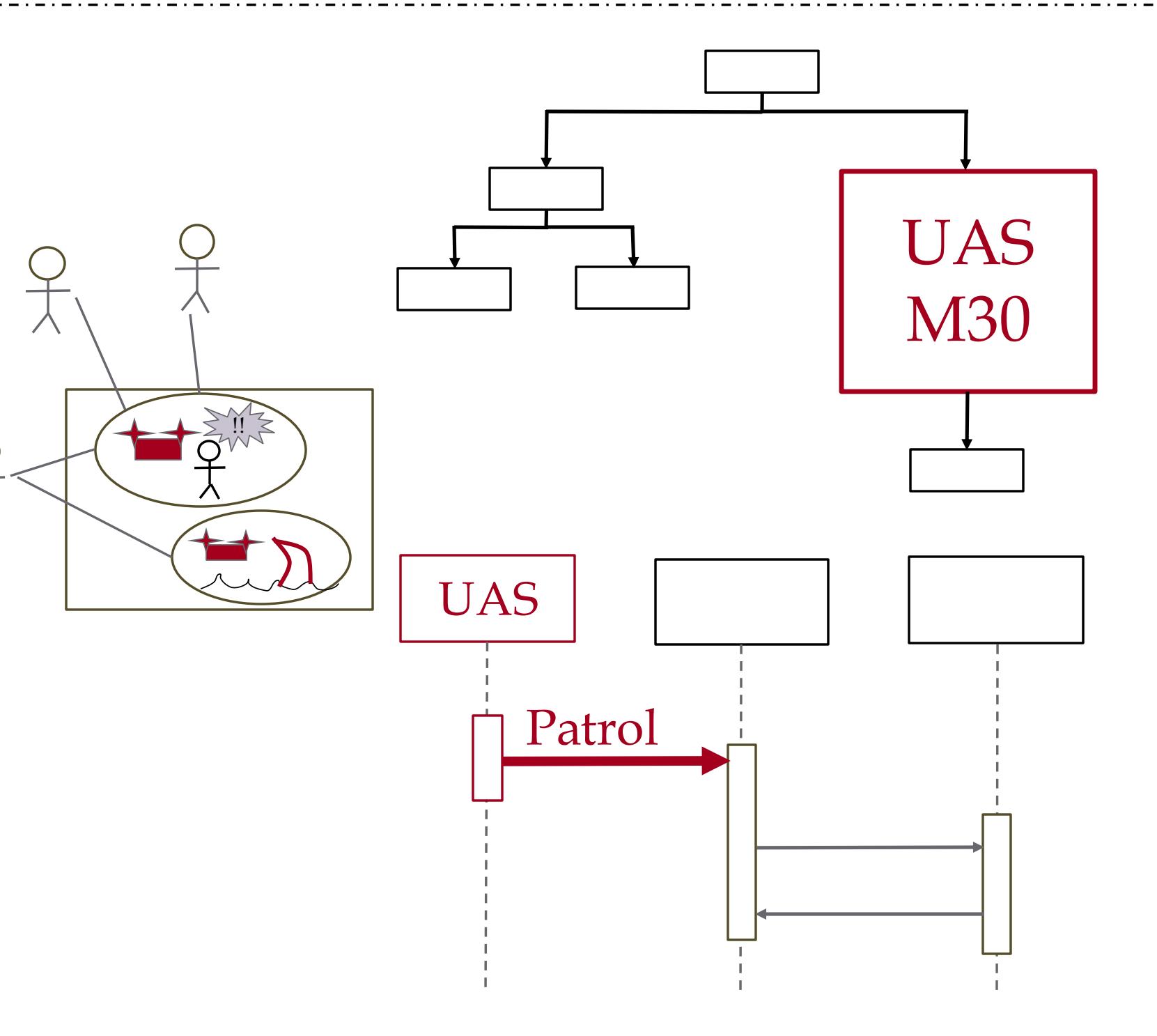
To obtain details of emergency response missions, we used videos, manuals, and interviews about a specific operation (e.g. UAS water rescue mission, UAS shark patrol)

TRANSCRIPT ANNOTATION

- 1:10 - UAS make model is M30
- 0:57 ~~~ 0:11 ~~~
- 0:35 ~~~ 1:11 ~~~
- 0:36 ~~~ 0:28 ~~~
- 0:12 ~~~
- 0:20 ~~~ 2:16 ~~~
- 5:30 - The UAS can be used for shark patrol 0:18 ~~~
- 0:35 ~~~ 3:00 ~~~
- 0:53 ~~~ 0:20 ~~~ 0:12 ~~~
- 1:12 ~~~

Factual excerpts about the mission (e.g. fleet, safety procedures, UAS models) were then collected from various resources and annotated with their timestamp / page and data source where they originated

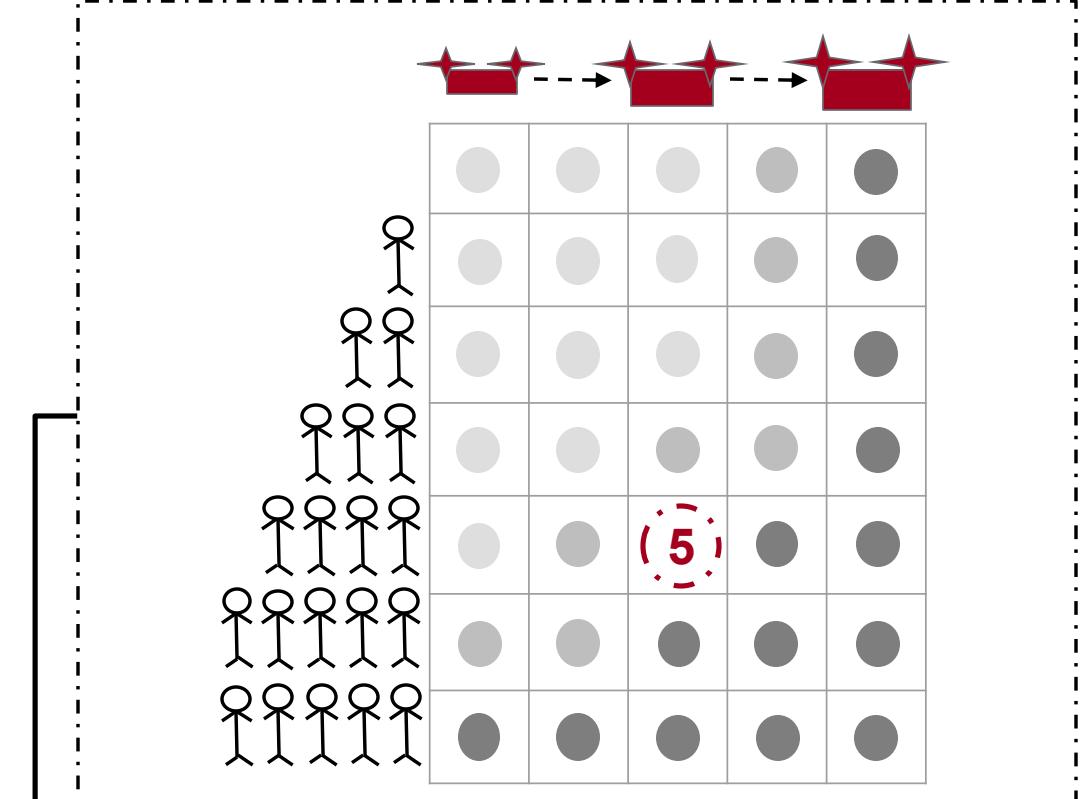
MODEL BASED SYSTEMS ENGINEERING



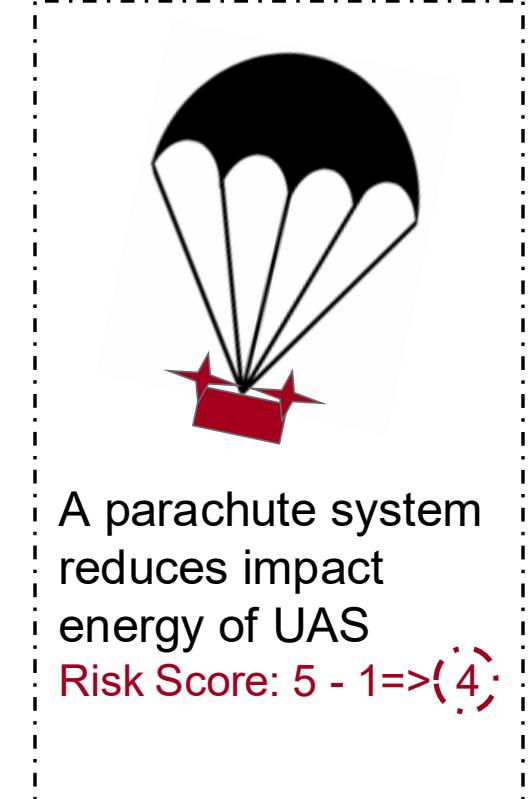
The annotated information was then reconstructed into a set of use case, block definition diagrams and sequence diagrams to provide a comprehensive picture of the missions

Step #2-#6: Volume, Risk and Mitigation Measures

GROUND RISK CLASS (GRC)

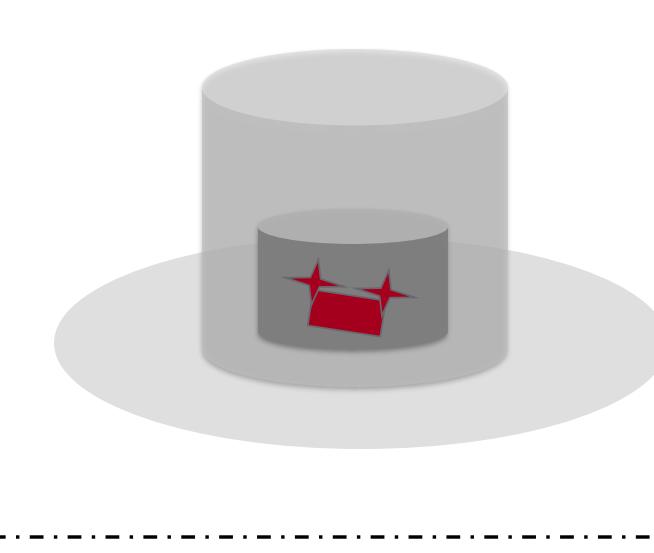


GRC MITIGATION



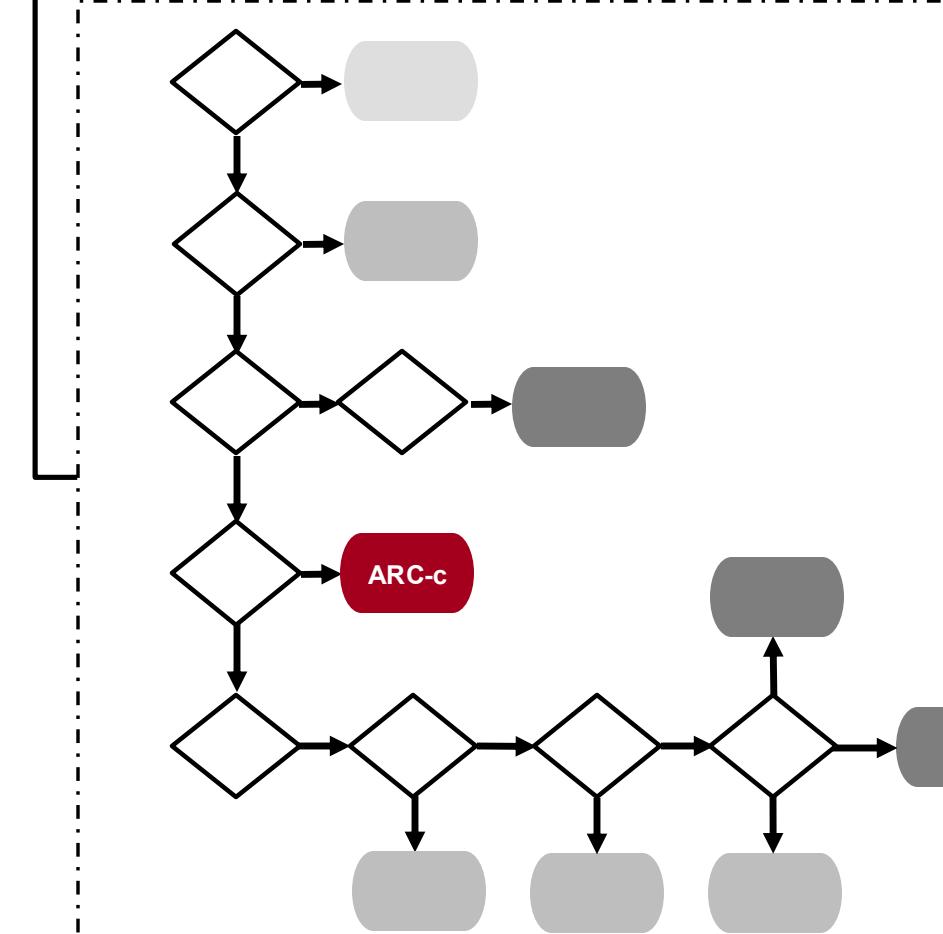
Ground Risk Class is used to evaluate the risk to people on the ground. It depends on factors such as UAS size, UAS speed, and population size. GRC mitigations are aimed at reducing potential harm to individuals below the flight path.

OPERATION VOLUME

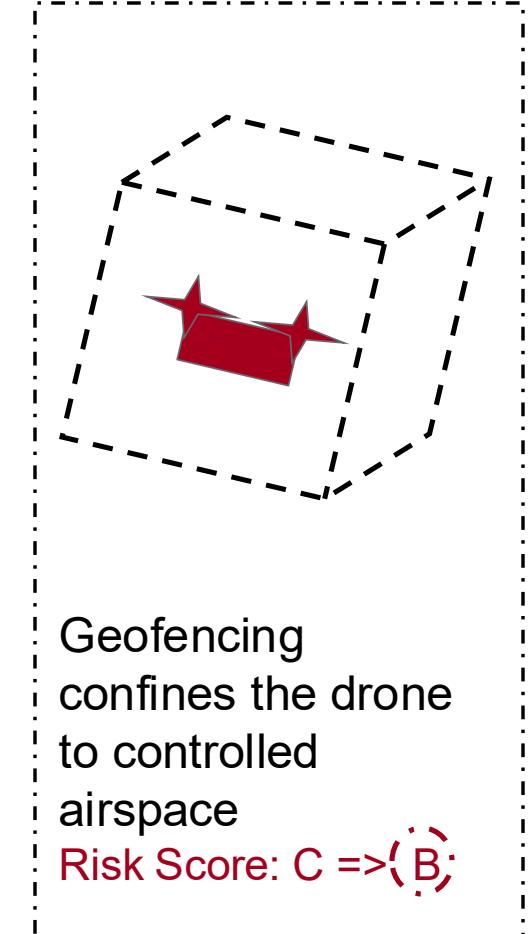


This includes the intended airspace for the drone's flight, plus surrounding buffers to ensure safety during all phases of operation

AIR RISK CLASS (ARC)



ARC MITIGATION



Air Risk Class measures the chance of your drone encountering manned aircraft. ARC mitigations focus on minimizing the chance of encountering crewed aircraft.

Risk Score: C => (B)

Step #7 SAIL

SPECIFIC ASSURANCE AND INTEGRITY LEVEL (SAIL)

	A	(B)	C	D
2	●	●	●	●
3	●	●	●	●
(4)	●	(III)	●	●
5	●	●	●	●
6	●	●	●	●

SAIL I, II (Low Risk)

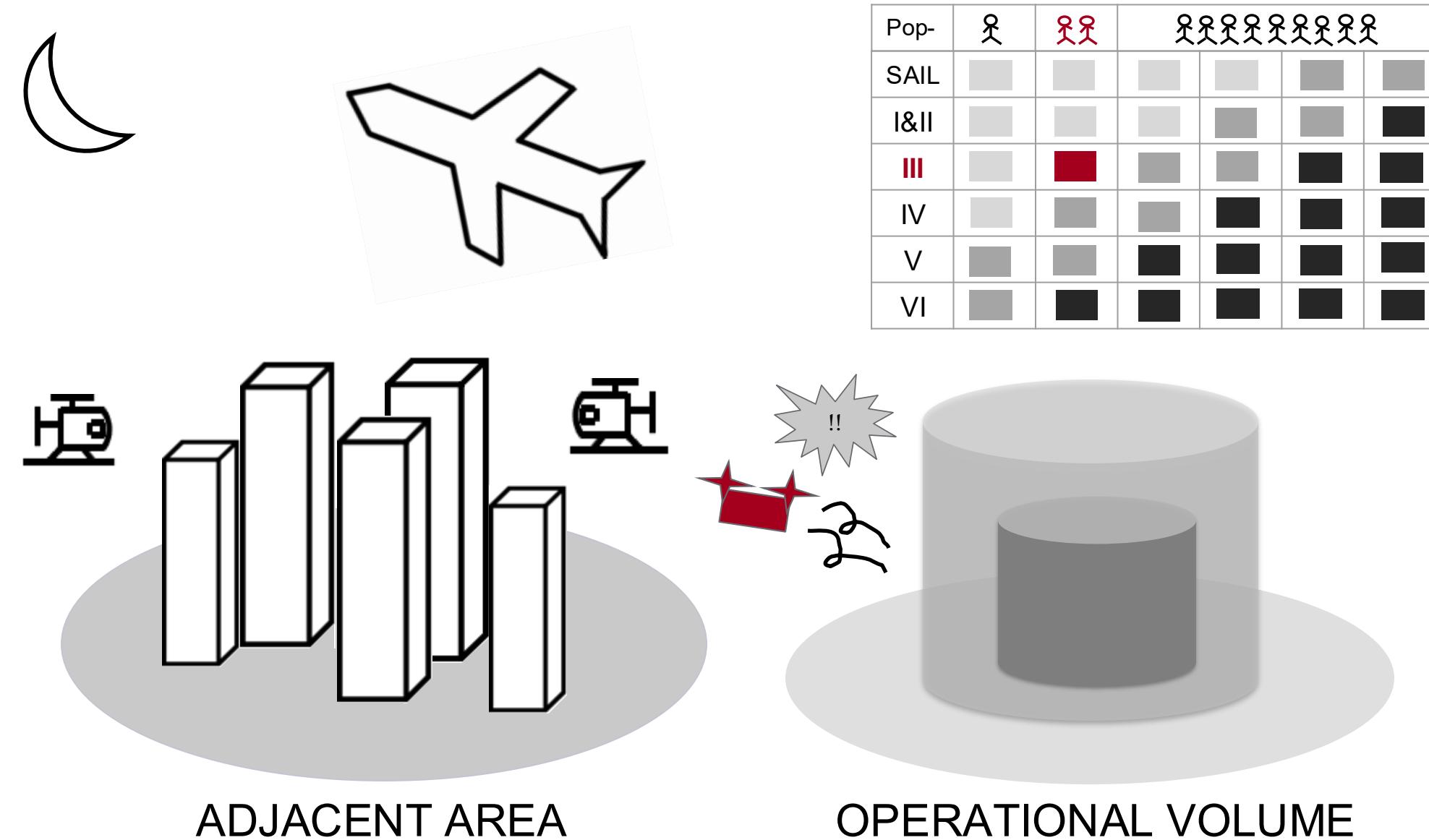
SAIL III, IV (Medium Risk)

SAIL V, VI (High Risk)

The SAIL guides safety requirements. It determines the level of safety and evidence needed based on the scores generated by the Air Risk Class and the Ground Risk Class.

Step #8 Containment Requirements

DETERMINATION OF CONTAINMENT REQUIREMENTS



The adjacent area assessment helps us plan for contingencies especially important when operating in heavily populated areas. This step checks what is on the outside of your operational volume and helps protect people outside of your intended flight zone.

www.nasa.gov

Step #9 OSOs

OPERATIONAL SAFETY OBJECTIVES (OSO)

OSO	SAIL	DEPENDENCIES
<input checked="" type="checkbox"/>	●	●
<input checked="" type="checkbox"/>	●	●
<input checked="" type="checkbox"/>	●	●
<input checked="" type="checkbox"/>	●	●
<input checked="" type="checkbox"/>	●	●
<input checked="" type="checkbox"/>	●	●
<input checked="" type="checkbox"/>	●	●

After determining the SAIL, we align with the required OSOs, each with specific robustness demands. SAIL helps determine which objectives apply and how rigorous they must be

Step #10 Portfolio

COMPREHENSIVE SAFETY PORTFOLIO



The CSP covers all elements of our safety case: The ConOps, GRC/ARC assessments, mitigations, OSOs and operational procedures into one robust package. This is the final checkpoint proving our operation is both safe and justifiable