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SAFE SKIES.
SUSTAINABLE FUTURE.

ICAO APAC Regional Office
Workshop on Unmanned Aircraft System Integration in National and High Seas Airspace

Bangkok, Thailand

November, 2025

UAS Operational Risk Assessment

Objectives

- Understand the importance of a Safety Management System;
- Understand the Operational Risk Assessment; &
- Usable Methodologies.

Disclaimer:
This presentation doesn`t substitute the necessity to have training and be capacitated in the methodologies.

Reference Material

Annex 19 – Safety Management.

Doc 9859 – Safety Management Manual.

UAS for Humanitarian Aid and Emergency Response Guidance (U-AID)

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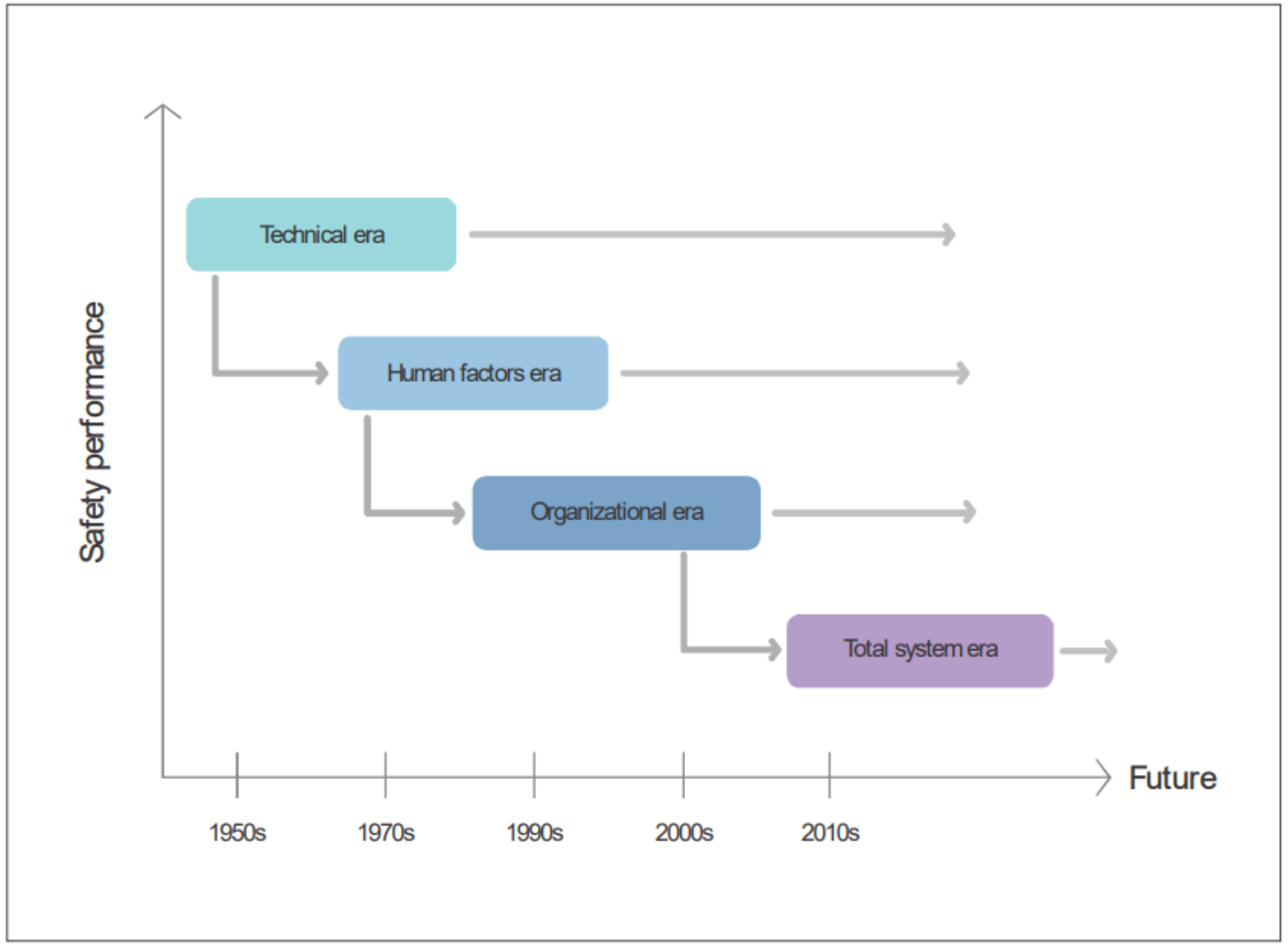
The Evolution of Safety Concept

Safety

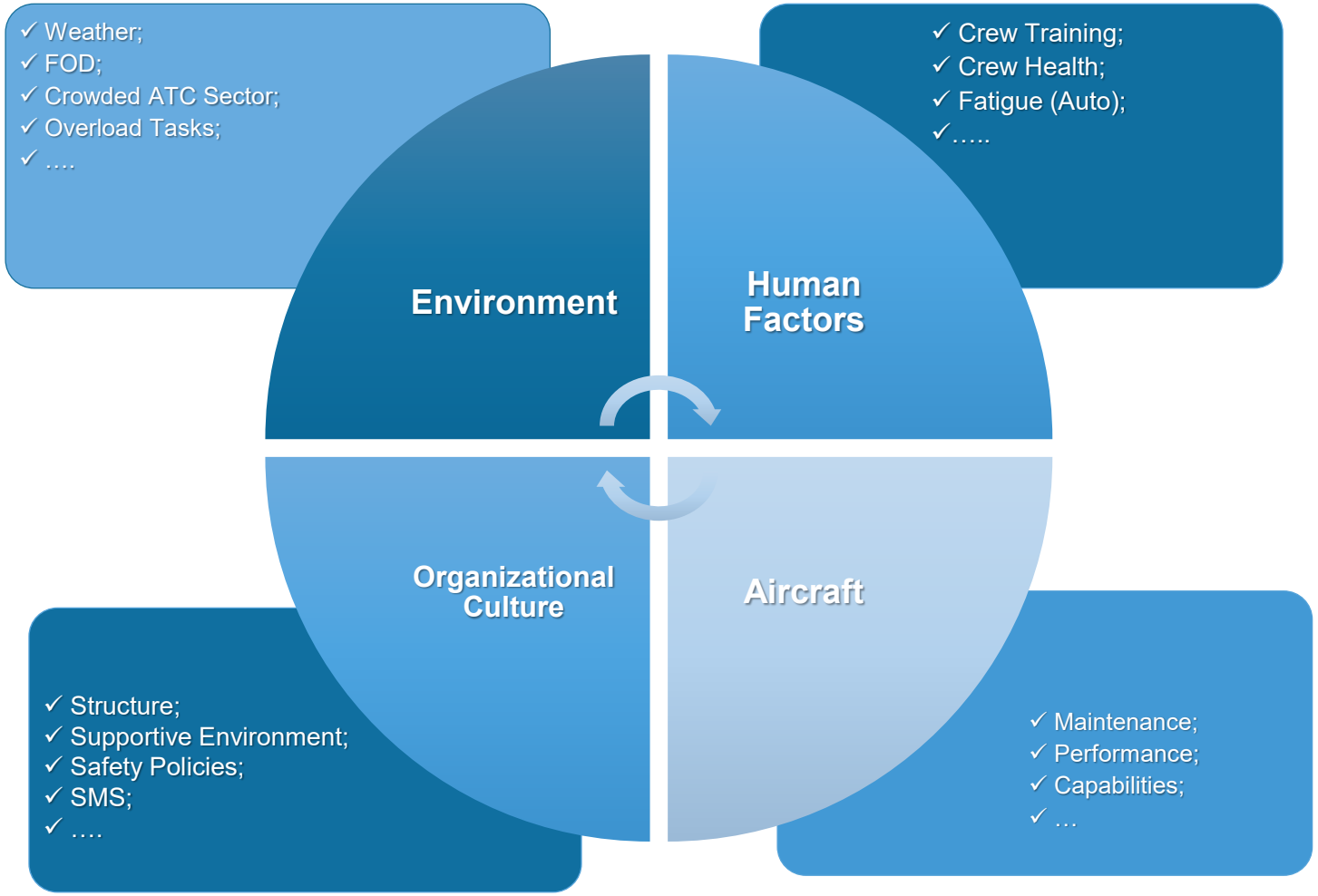
The state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level.

Annex 19 – Safety Management

The Evolution of Safety Concept



The Evolution of Safety Concept



The Evolution of Safety Concept

✓ Weather;
✓ FOD;
✓ Crowded ATC Sector;
✓ Overload Tasks;
✓ ….

✓ Crew Training;
✓ Crew Health;
✓ Fatigue (Auto);
✓ …..

✓ Structure;
✓ Supportive Environment;
✓ Safety Policies;
✓ SMS;
✓ ….

✓ Capabilities;
✓ …

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Safety Concepts

Safety Concepts

HAZARD

Safety Concepts

Safety Concepts

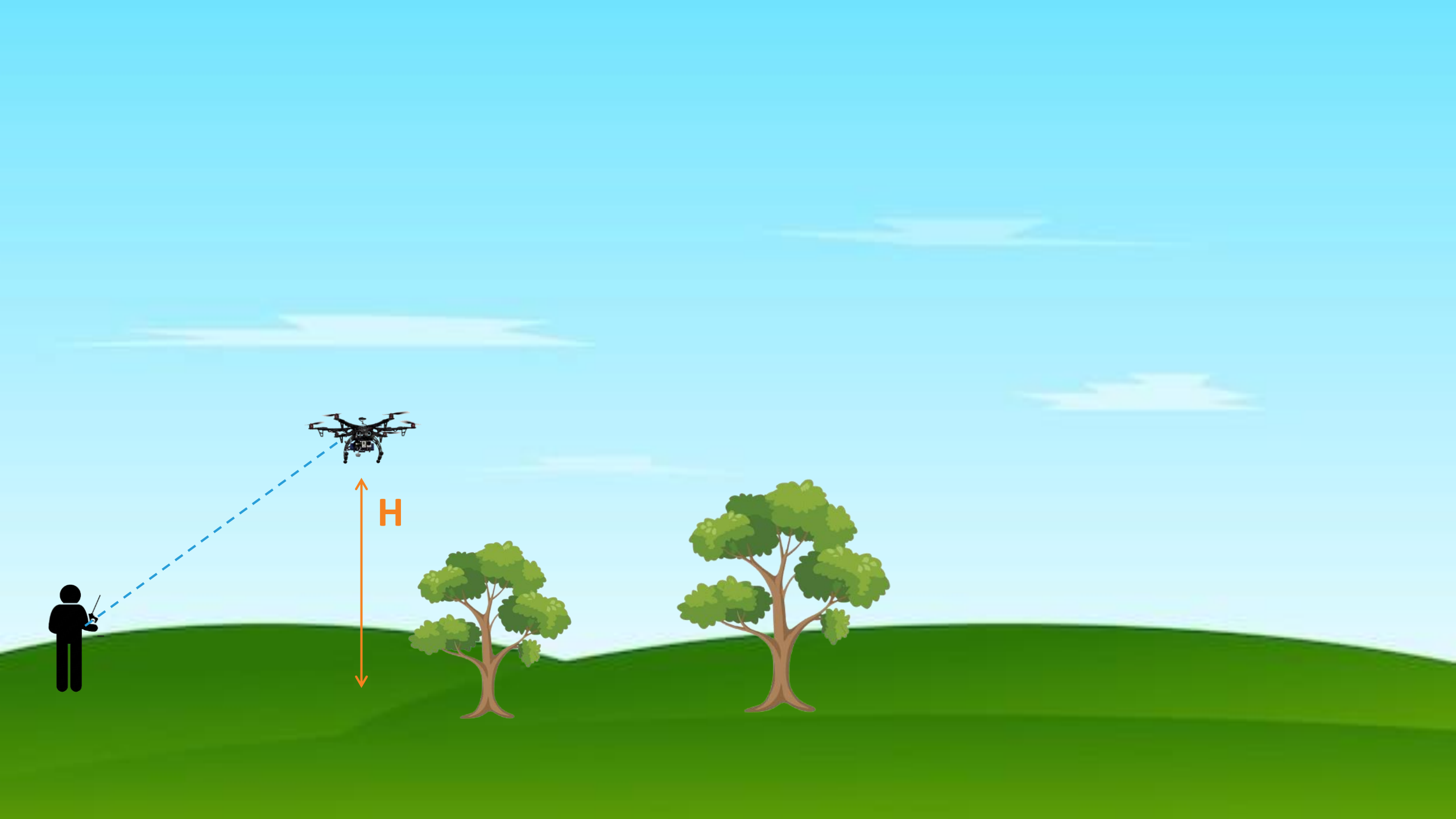
RISK

RISK

Safety Concepts

Safety Concepts

LATENT HAZARD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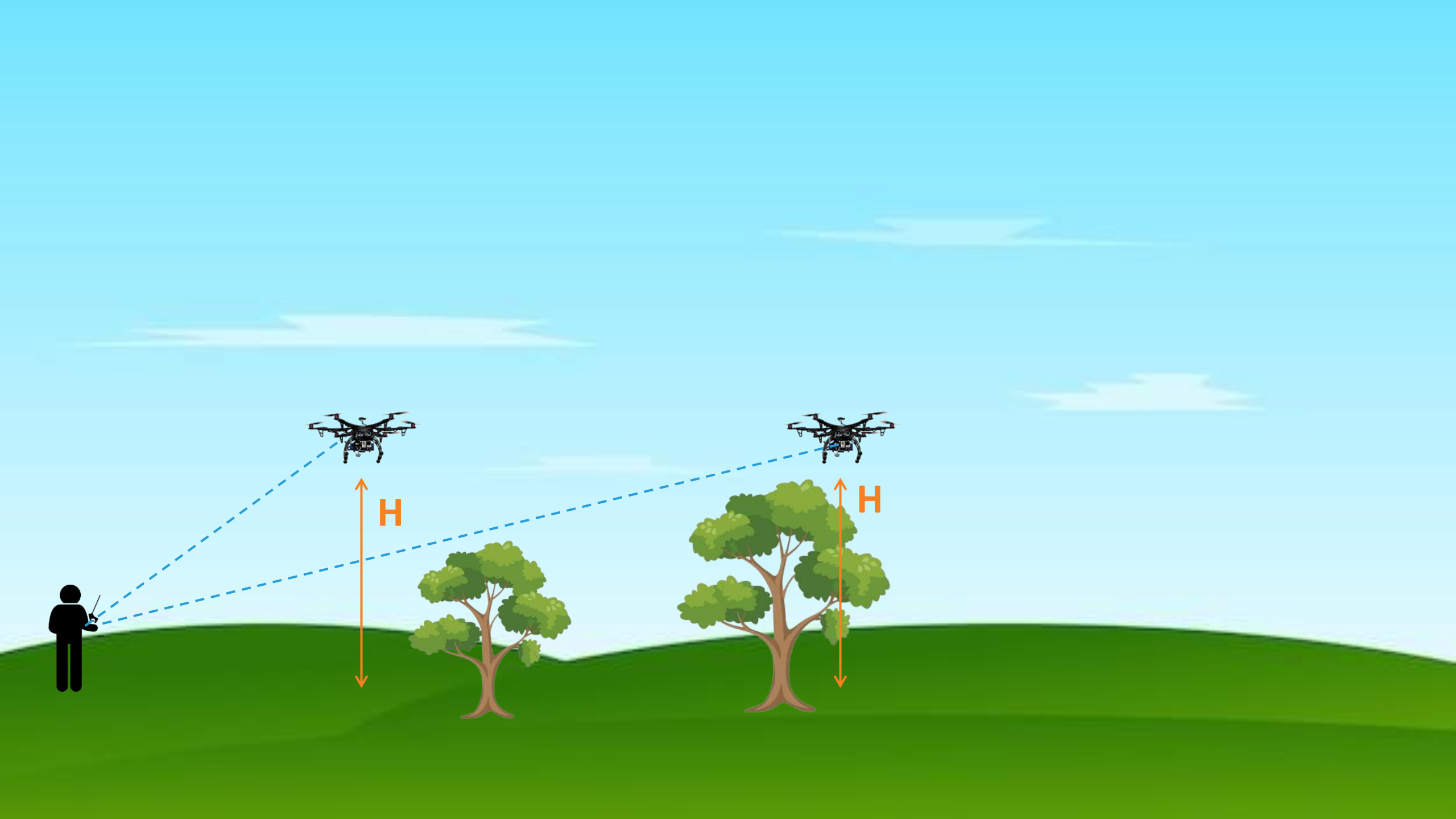
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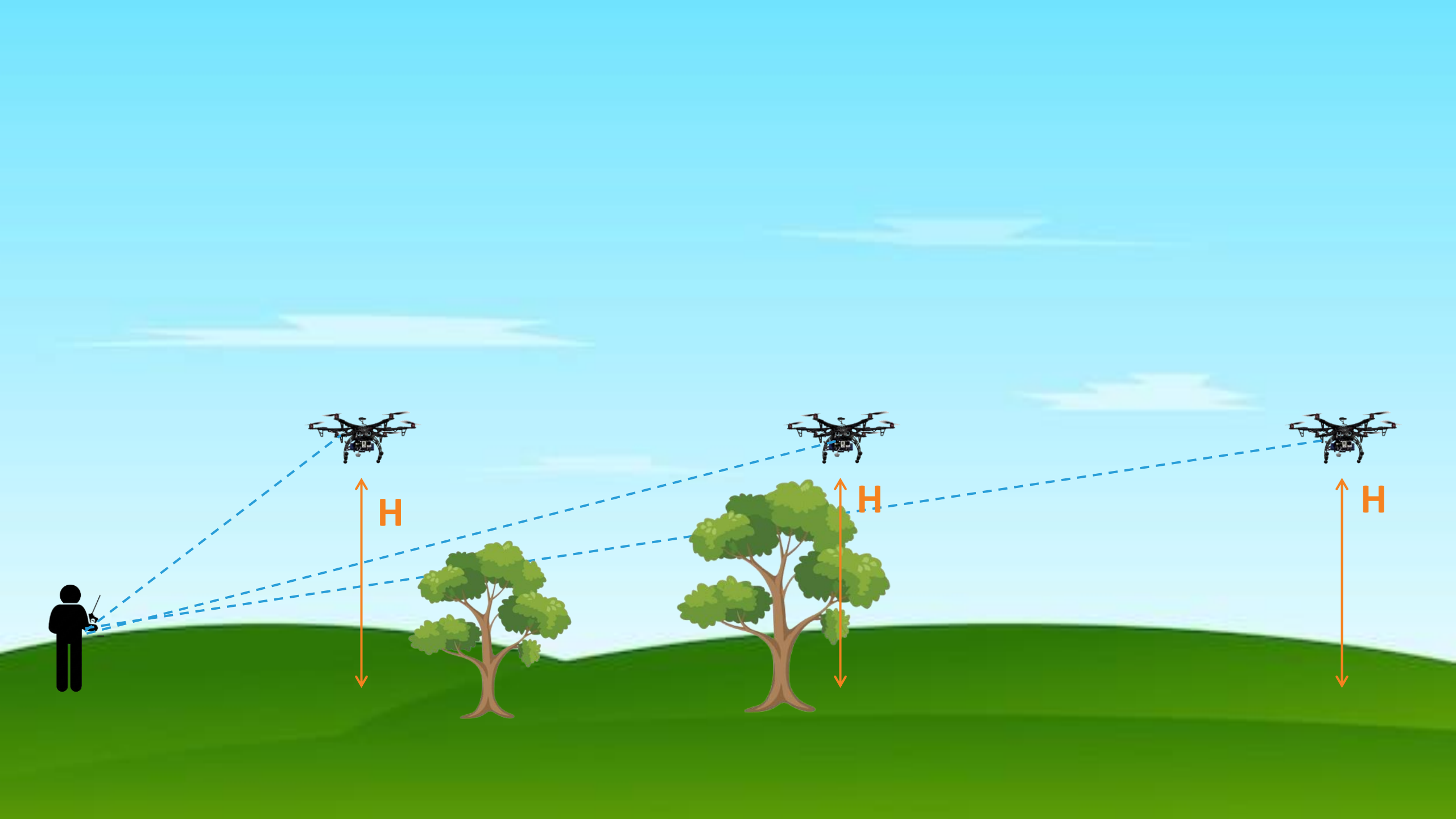
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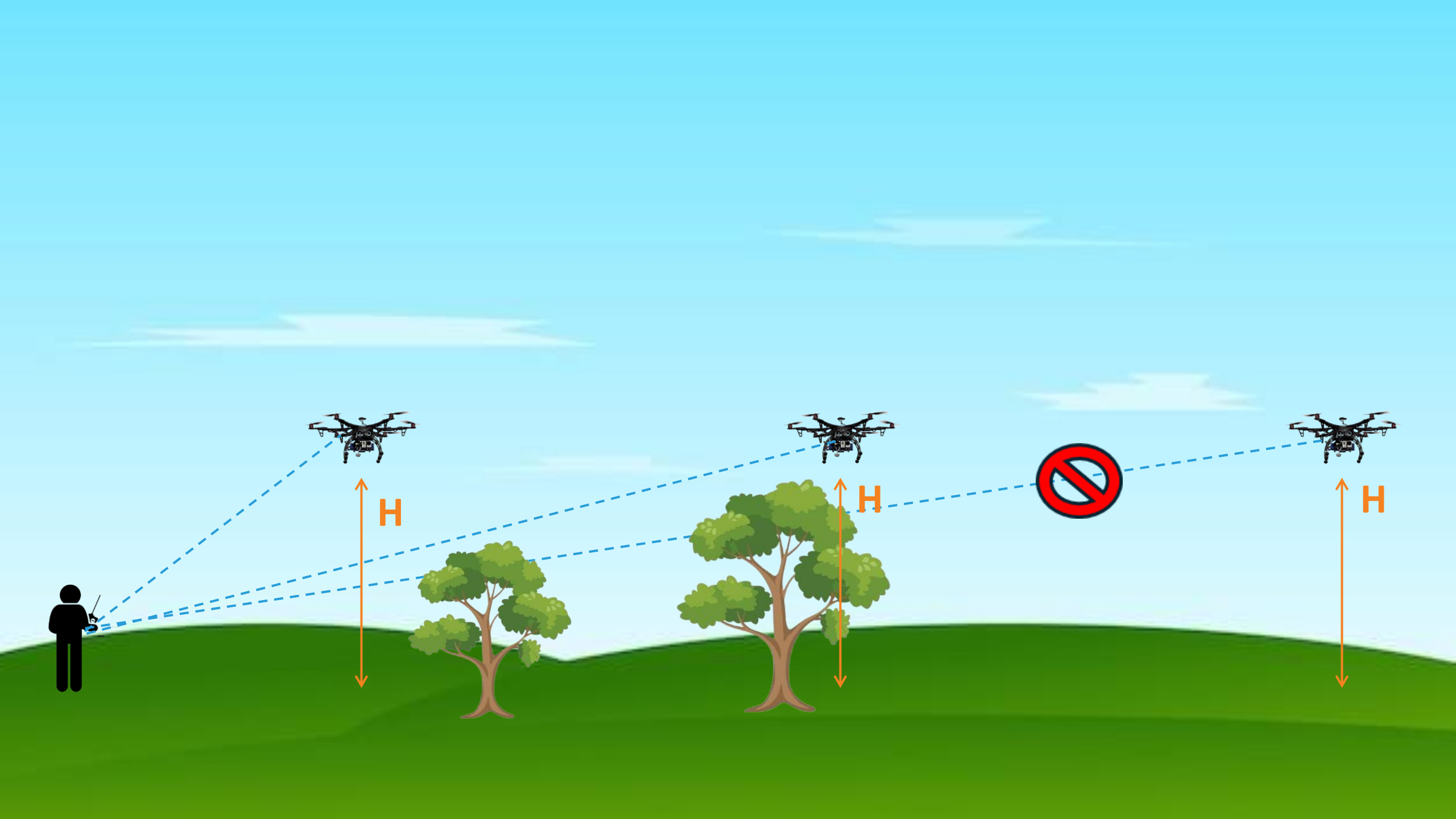
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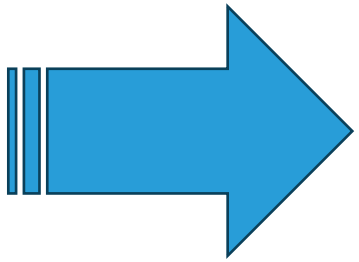
Safety Concepts

HAZARD

A condition or an object with the potential to cause or contribute to an aircraft incident or accident

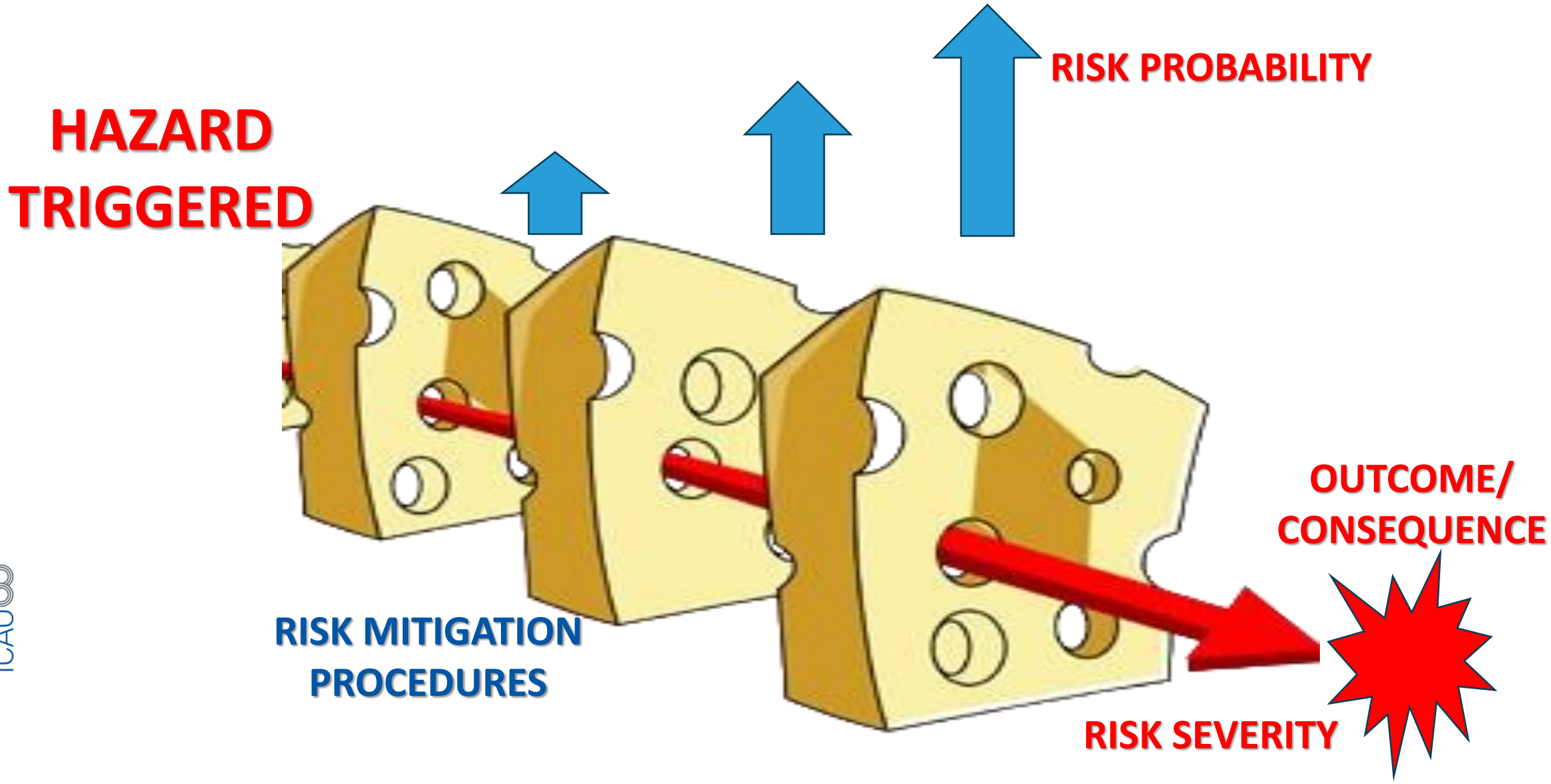
RISK

Likelihood to be harmed by a hazard.



EXPOSURE

Safety Concepts

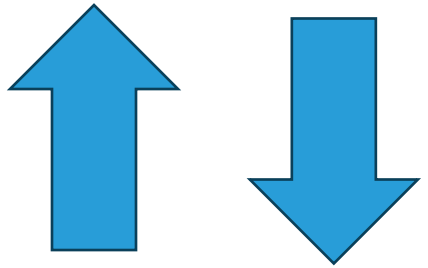


Safety Concepts

- ✓ Organizational Culture;
- ✓ Lack of Safety Policies;
- ✓ Lack of Resources;
- ✓ Lack of Regulation;
- ✓ Lack of Oversight;
- ✓ ….

GOVERNANCE

RISK



TECHNICAL

- ✓ Lack of Maintenance;
- ✓ Lack of Equipment;
- ✓ Technical Failure;
- ✓ ….

OPERATIONAL

- ✓ Lack of Training;
- ✓ Lack of Procedures
- ✓ Excess of Tasks;
- ✓ Weather;
- ✓ ATC interaction;
- ✓ Lack of Coordination;
- ✓ …

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Safety Concepts

- ✓ Organizational Culture;
- ✓ Lack of Safety Policies;
- ✓ Lack of Resources;
- ✓ Lack of Regulation;
- ✓ Lack of Oversight;
- ✓ ….

GOVERNANCE

RISK

TECHNICAL

- ✓ Lack of Maintenance;
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- ✓ Lack of Training;
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- ✓ …

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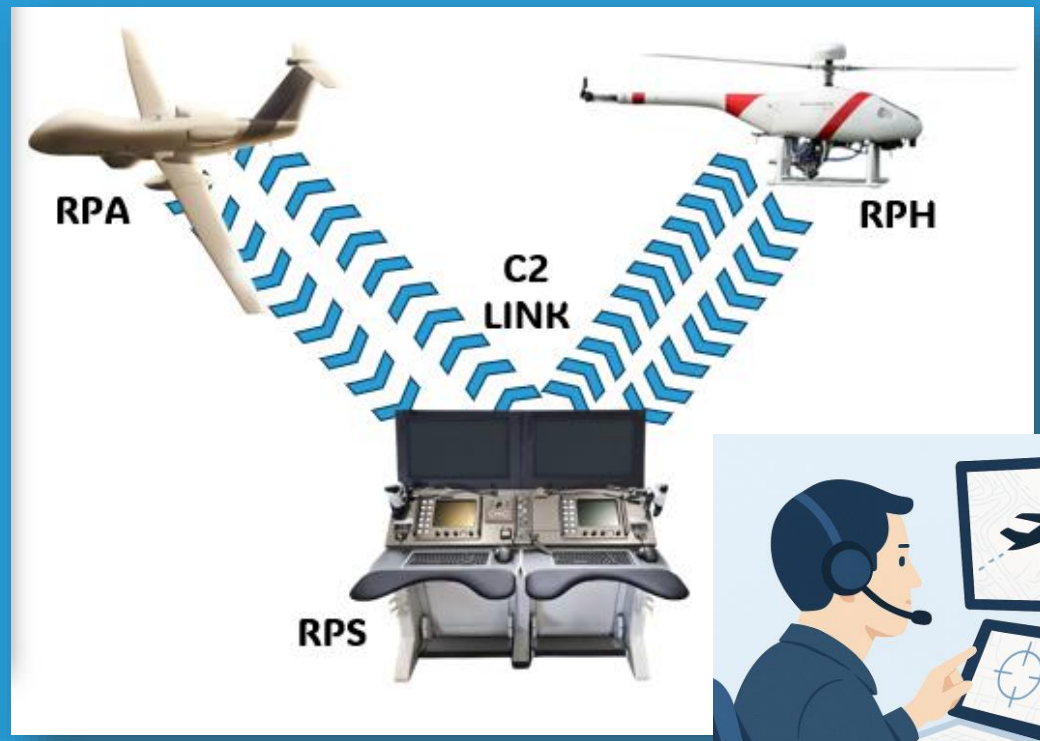
Safety Concepts

Organization

Environment



SAFETY MANAGEMENT

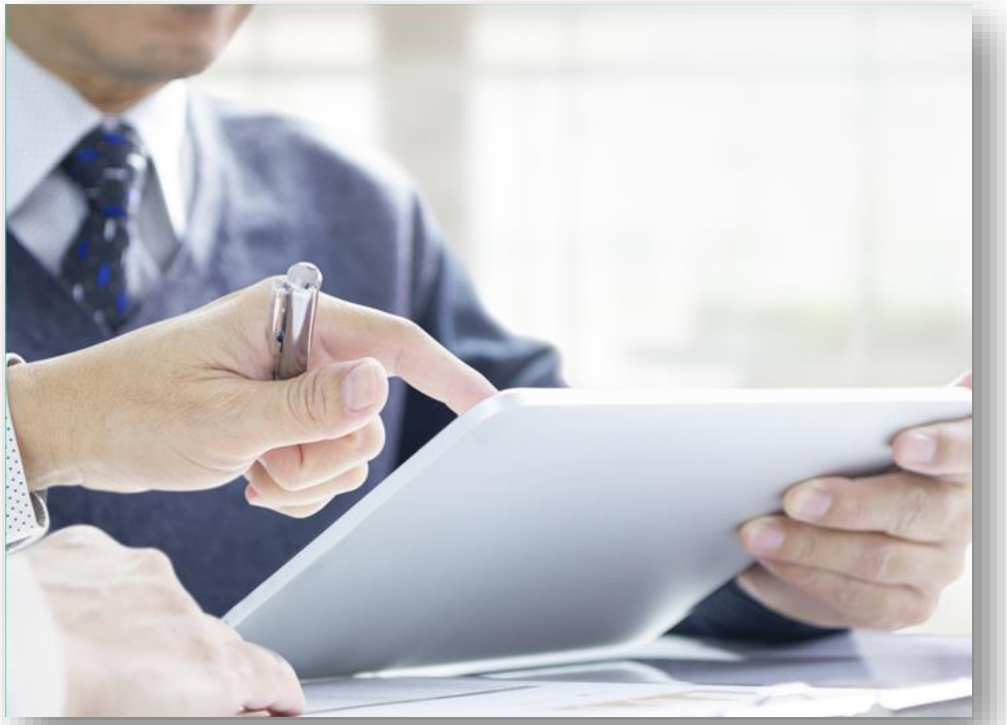
Safety Management seeks to proactively mitigate safety risks before they result in aviation accidents and incidents.

STATE SAFETY PROGRAMME (SSP)

- The SSP is developed and maintained by each State as a structured approach to assist in managing its aviation safety performance.
- Annex 19 – Chapter 8

SAFETY MANAGEMENT SYSTEM (SMS)

- A systematic approach to managing safety, including the necessary organizational structures, accountability, responsibilities, policies and procedures



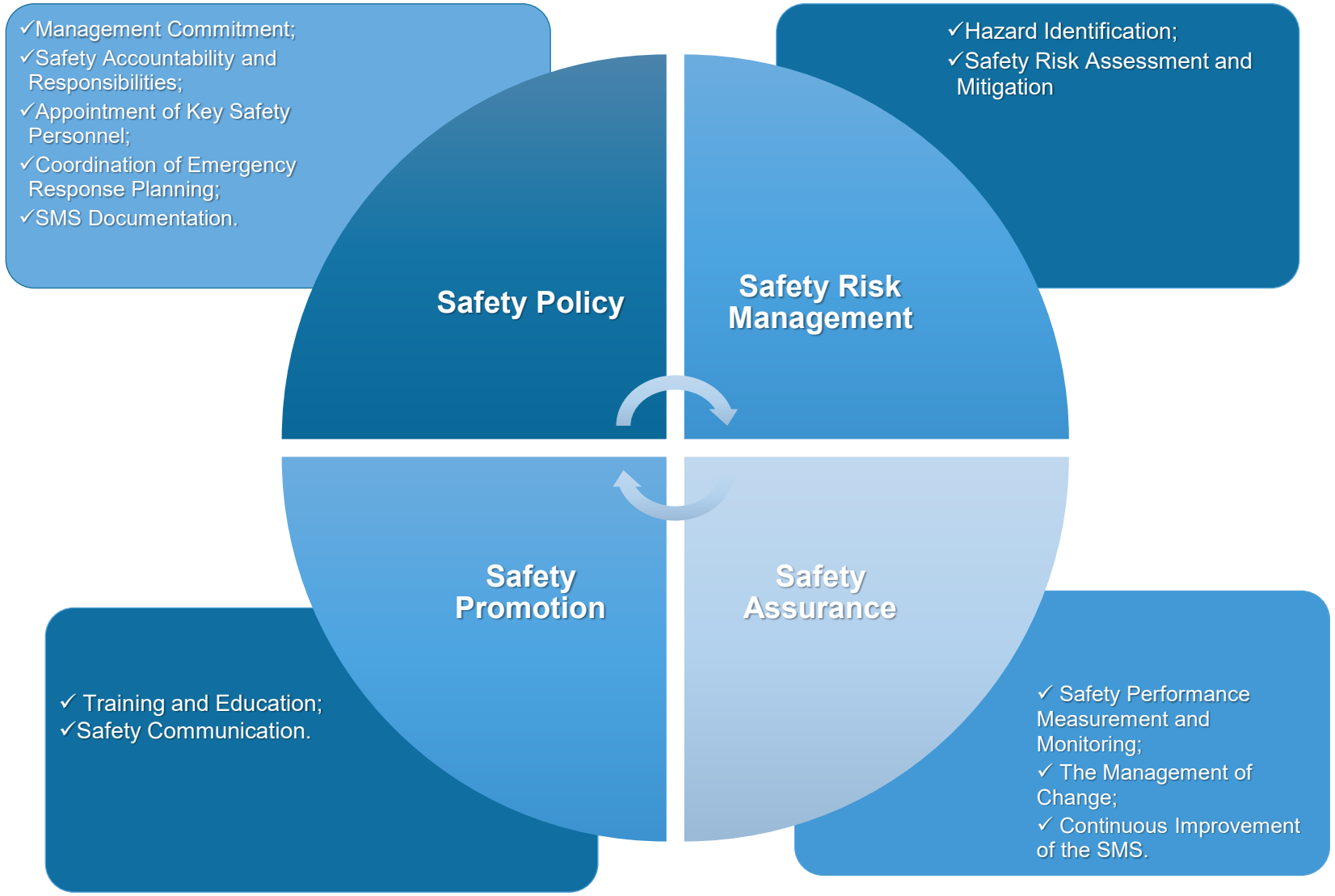
SAFETY MANAGEMENT SYSTEM (SMS)

- Strengthened safety culture
- Documented, process-based approach to assure safety
- Better understanding of safety-related interfaces and relationships
- Enhanced early detection of safety hazards
- Safety data-driven decision-making
- Enhanced communication of safety

- Evidence that safety is a priority
- Possible financial savings
- Improved efficiencies
- Cost avoidance

BENEFITS OF SMS

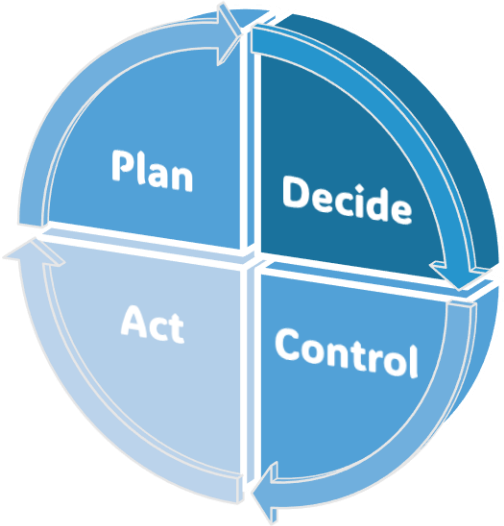
SAFETY MANAGEMENT SYSTEM



SAFETY RISK MANAGEMENT

- Safety Risk Management (SRM) is a key component of safety management and includes **hazard identification, safety risk assessment, safety risk mitigation** and **risk acceptance.**

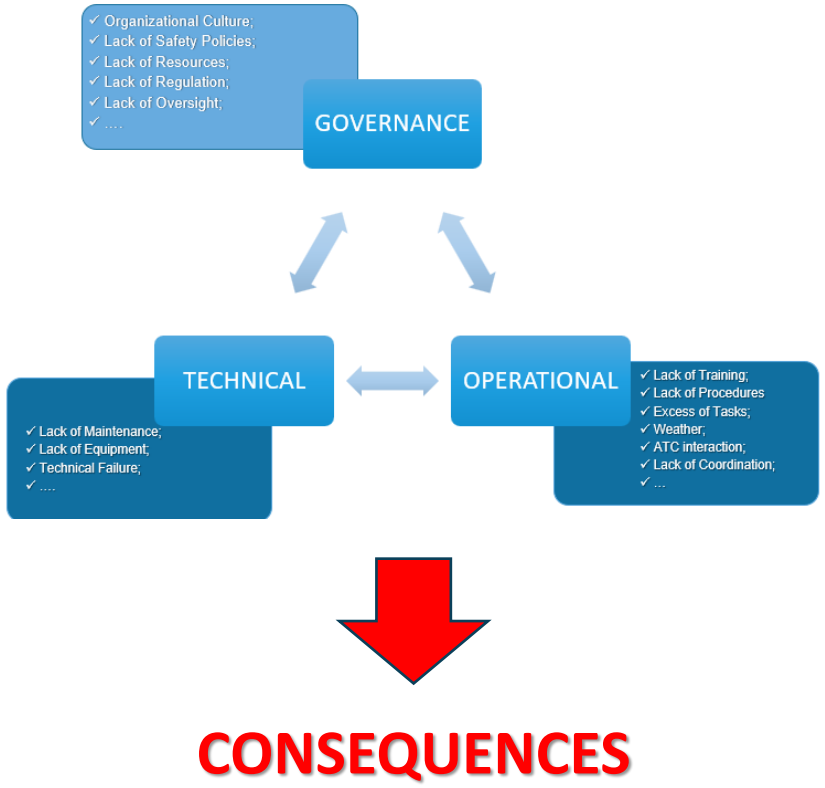
- SRM is a **continuous activity** because the aviation system is constantly changing, new hazards can be introduced and **some hazards and associated safety risks may change over time.**



- In addition, the effectiveness of implemented safety risk mitigation strategies must be monitored to determine if further action is required.

HAZARD IDENTIFICATION

- Hazard identification focuses on conditions or objects that could cause or contribute to the unsafe operation of aircraft or aviation safety-related equipment, products and services.
- Hazard identification may also consider hazards that are generated outside of the organization and hazards that are outside the direct control of the organization, such as extreme weather or volcanic ash. Hazards related to emerging safety risks are also an important way for organizations to prepare for situations that may eventually occur.



SAFETY RISK ASSESSMENT

RISK LIKELIHOOD

LIKELIHOOD	MEANING	VALUE
FREQUENT	Occurs Many Times	5
OCCASIONAL	Occurs Sometimes	4
REMOTE	Unlikely to Occur, But Possible	3
IMPROBABLE	Very Unlikely to Occur	2
EXTREMELY/IMPROBABLE	Almost Inconceivable that the Event Will Occur	1

SAFETY RISK ASSESSMENT

RISK SEVERITY

LIKELIHOOD	MEANING	VALUE
CATASTROPHIC	Destruction/Fatalities	A
HAZARDOUS	Large Reduction in Safety Margins/Serious Damage/Serious Injuries	B
MAJOR	Significant Reduction in Safety Margins/Serious Incident/ Injury to People	C
MINOR	Limitations/Emergency Procedures/Minor Incident	D
NEGLIGIBLE	Few Consequences	E

SAFETY RISK ASSESSMENT

Safety Risk		*Severity*				
Probability		*Catastrophic A*	*Hazardous B*	*Major C*	*Minor D*	*Negligible E*
Frequent	5	5A	5B	5C	5D	5E
Occasional	4	4A	4B	4C	4D	4E
Remote	3	3A	3B	3C	3D	3E
Improbable	2	2A	2B	2C	2D	2E
Extremely improbable	1	1A	1B	1C	1D	1E

SAFETY RISK ASSESSMENT

Safety Risk		*Severity*				
Probability		*Catastrophic A*	*Hazardous B*	*Major C*	*Minor D*	*Negligible E*
Frequent	5	INTOLERABLE		5C	5D	5E
Occasional	4	4A	4B	4C	4D	4E
Remote	3	3A	3B	3C	3D	3E
Improbable	2	2A	2B	2C	2D	2E
Extremely improbable	1	1A	1B	1C	1D	1E

SAFETY RISK ASSESSMENT

Safety Risk		*Severity*				
Probability		*Catastrophic A*	*Hazardous B*	*Major C*	*Minor D*	*Negligible E*
Frequent	5	5A	5B	5C	5D	5E
Occasional	4	4A	4B	4C	4D	4E
Remote	3	3A	3B	3C	3D	3E
Improbable	2	2A	2B	2C	2D	2E
Extremely improbable	1	1A	1B	1C	1D	1E

TOLERABLE

SAFETY RISK ASSESSMENT

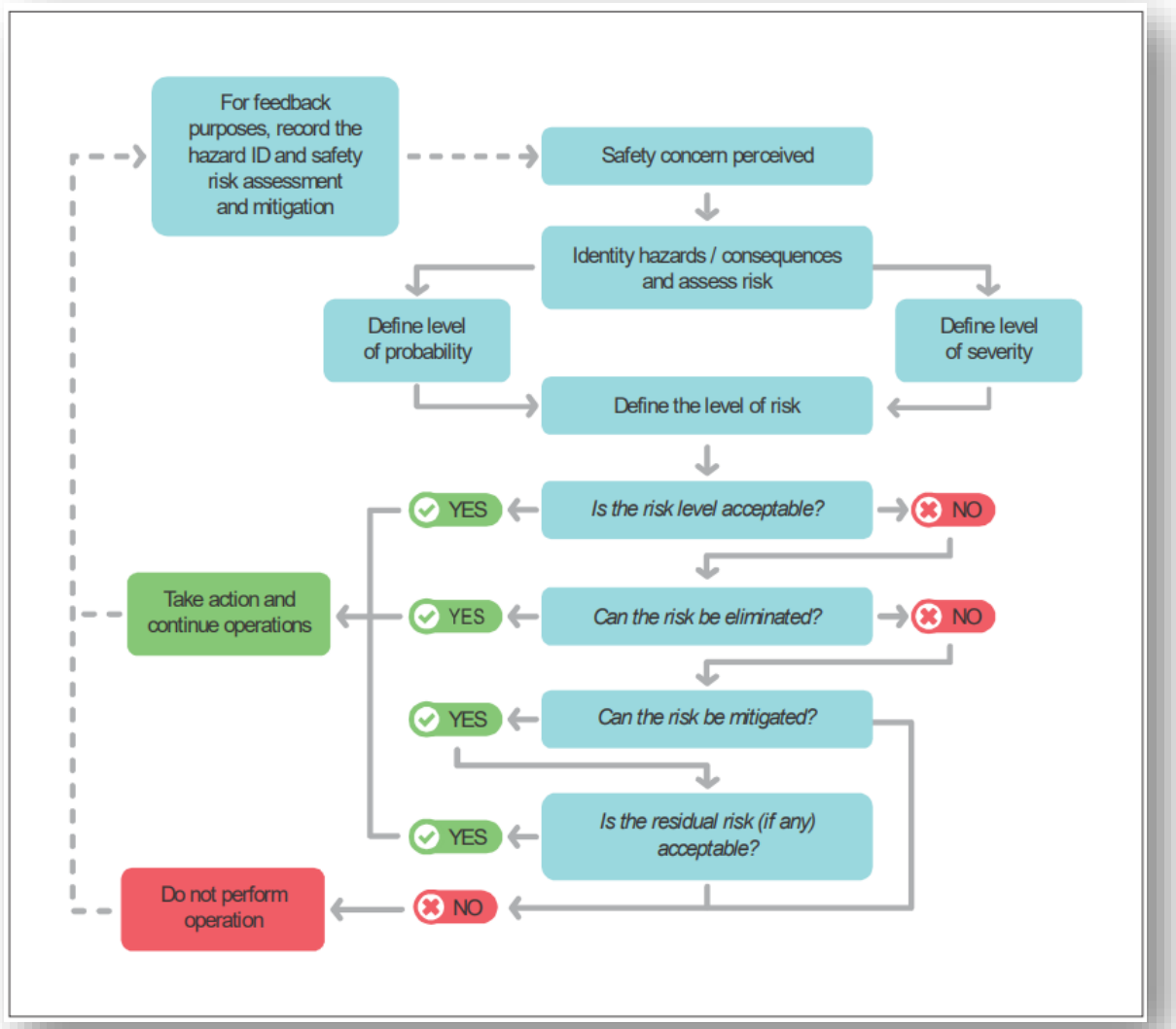
Safety Risk		*Severity*				
Probability		*Catastrophic A*	*Hazardous B*	*Major C*	*Minor D*	*Negligible E*
Frequent	5	5A	5B	5C	5D	5E
Occasional	4	4A	4B	4C	4D	4E
Remote	3	3A	3B	3C	3D	3E
Improbable	2	2A	2B	2C	2D	2E
Extremely improbable	1	1A	1B	1C	ACCEPTABLE	

SAFETY RISK ASSESSMENT

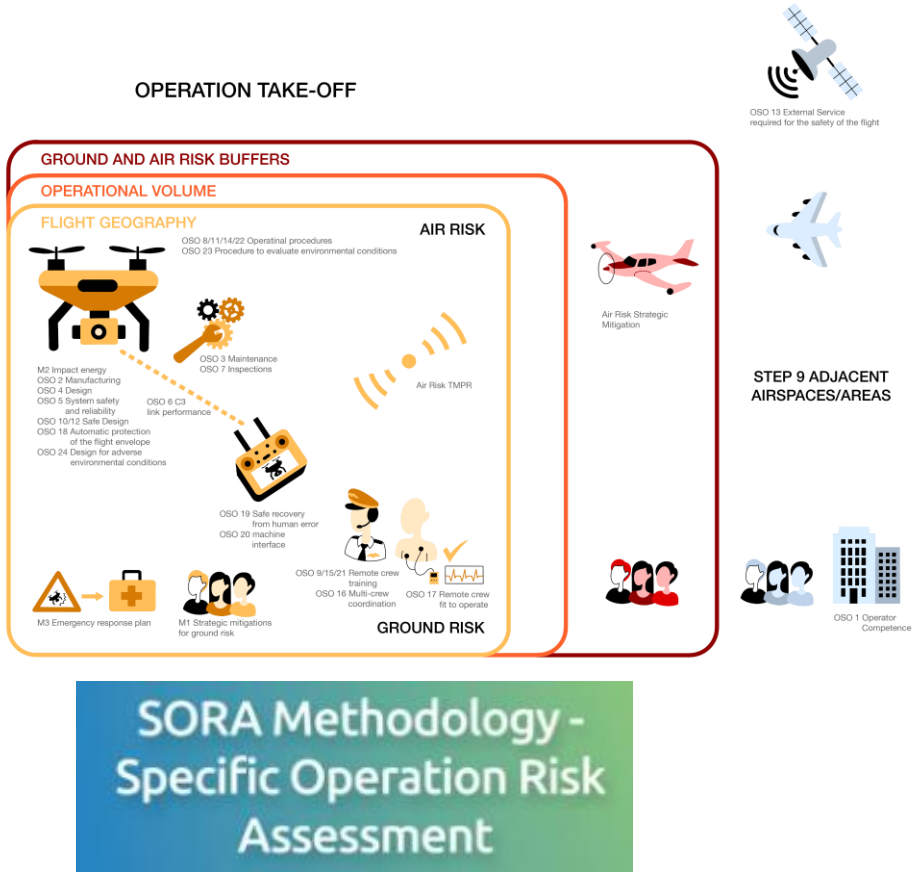
INTORELABLE	TORELABLE	ACCEPTABLE
• **Immediate action** to **mitigate** the risk or **stop the activity** • Perform **priority safety risk mitigation** to ensure additional or enhanced preventative controls are in place to **bring down the safety risk index to tolerable.**	• Can be tolerated **based on the safety risk mitigation**. • It may require **management decision** to accept the risk.	• Acceptable as is. • **No further safety risk mitigation required**.

OPERATIONAL RISK ASSESSMENT

Safety risk management decision aid

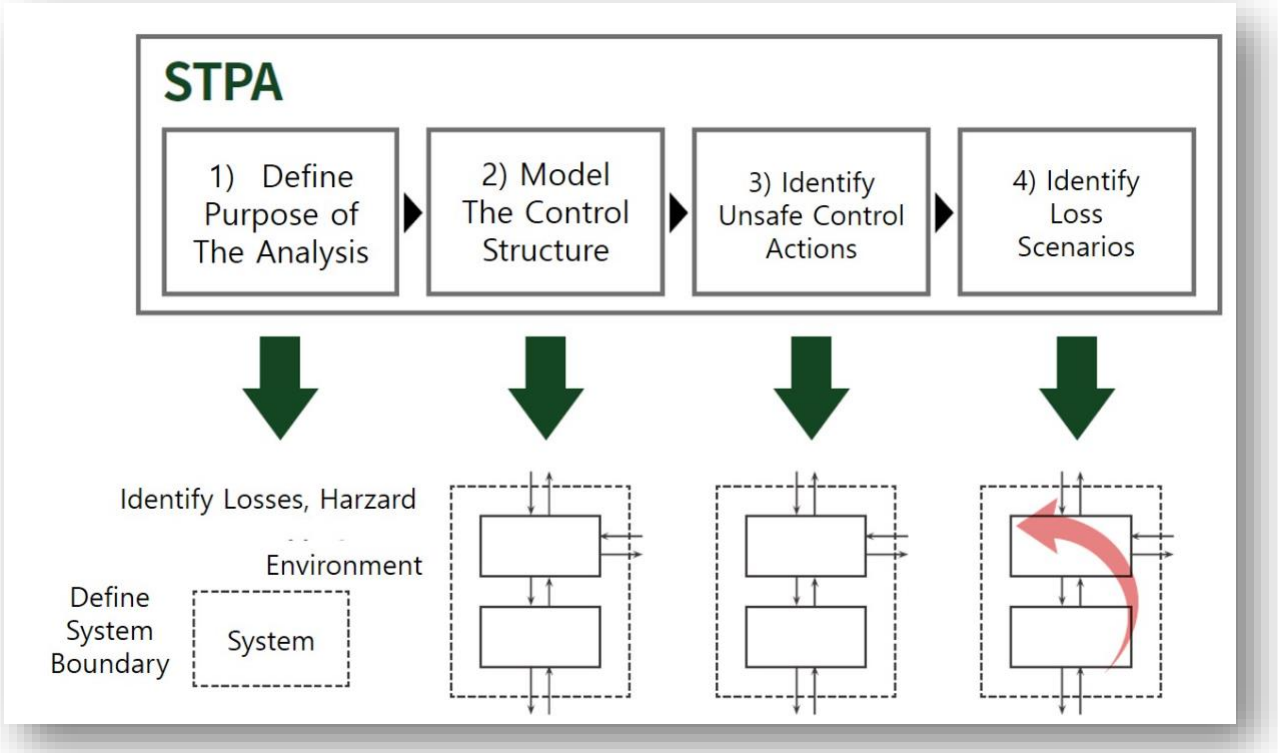


REFERENCES OF METHODOLOGIES



SORA Methodology - Specific Operation Risk Assessment

SYSTEM-THEORETIC PROCESS ANALYSIS



Thank You

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