

# Metodi di valutazione del rischio

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# Risk Analysis

What is RA about

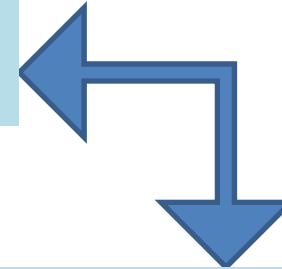
**Analisi Retrospettiva**



**Data**



**Analisi Prospettiva**



Which questions are dealt with

Question 1: We just had an Event, can we continue operate safely?

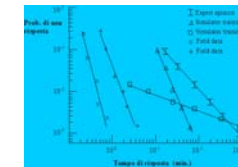
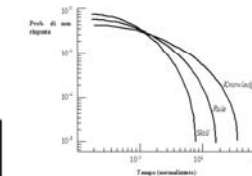
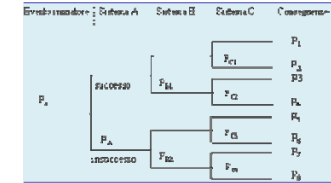
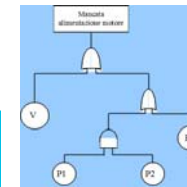
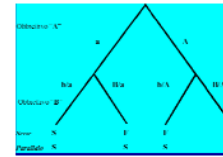
Question 2: We are starting a new route/system. Are we safe?

Question 3: We are changing contractors. Are we still safe?

# Risk Analysis

## What are the Methods for RA

- Fault Trees
- Event Trees
- Functional Safety
- HRA
- Expert Judgement
- FMECA
- Simulations/field tests



	DEMAND MODE OF OPERATION	
1	$> 10_1 \text{ \&lt; } 10_2$	$> 10 \text{ \&lt; } 100$
2	$\leq 10_2 \text{ \&lt; } 10_3$	$> 100 \text{ \&lt; } 1000$
3	$> 10_3 \text{ \&lt; } 10_4$	$> 1000 \text{ \&lt; } 10000$
4	$> 10_4 \text{ \&lt; } 10_5$	$> 10000 \text{ \&lt; } 100000$
5	$> 10_5 \text{ \&lt; } 10_6$	$> 100000 \text{ \&lt; } 1000000$
6	Failure on Demand	Failure

## What do Methods aim at

Assess the Probability

Assess the Severity

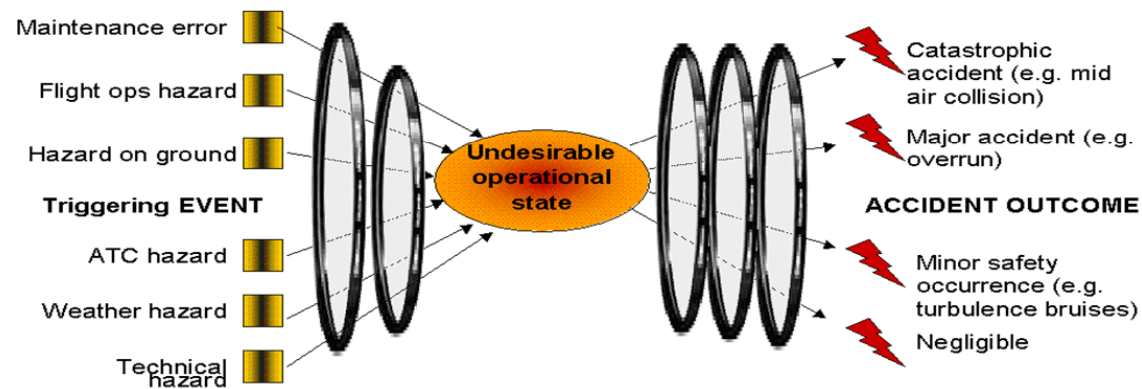
Probability Level	Severity Level				
	S5 Catastrophic	S4 Major	S3 Moderate	S2 Minor	S1 Negligible
P5 Frequent $p > 1.0E-04$	A	A	A	B	B
P4 Reasonably probable $2.0E-05 < p \leq 1.0E-04$	A	A	B	B	B
P3 Remote $2.0E-06 < p \leq 2.0E-05$	A	D	D	D	C
P2 Extremely remote $2.0E-08 < p \leq 2.0E-06$	B	B	B	C	C
P1 Extremely improbable $p \leq 2.0E-08$	C	C	C	C	C

# Risk Analysis

## What are the Methodologies for RA

Methodologies: Combination of Methods in a structured way to reach certain objectives. How to evaluate the Risk of Events/Occurrences

**ARMS**



**Bow-Tie**



# Risk Analysis

## Risk Assessment for Managing Company Operational Processes (RAMCOP)

ACTIVITY																
Phase 1			Phase 2						Phase 3							
Threats		Hazard UOS	Incident sequence description		Existing control		Outcome (Pre-Mitigation)			Add. Mitigation required		Outcome (Post-Mitigation)			Actions & owners	Monitoring & Review req.
Description	Prob.	Description and probability	Consequences	Prob. without control	Barriers	Prob. reduction	Severity	Probab.	Risk	Type of Barriers	Type of barr. Reduction	Severity	Probab.	Risk		
threat <sub>1</sub>	$p_{th1}$	Description of UOS and calculation of $p_{UOS}$ as a function of $p_{thr}$ .  $p_{UOS} = f(p_i)$	Cons. <sub>1</sub>	$p_{cons.1}/p_{UOS}$	Barrier <sub>1</sub>	$\alpha_{barr.1}$	$S_{cons.1}$	$p_{cons.1} = f(\alpha, p_{cons.1})$	$R_{cons.1}$	Add. Barrier <sub>1</sub>	$\beta_{add.barr.1}$	$S_{cons.1}$	$p_{cons.1}$	$R_{cons.1}$	Describe actions that are planned for mitigating risk and identify teh actors involved ("who should do what")	Describe monitoring and auditing activity and means of compliance with assigned actions ("how and what to monitor")
threat <sub>2</sub>	$p_{th2}$		Cons. <sub>2</sub>	$p_{cons.2}/p_{UOS}$	Barrier <sub>2</sub>	$\alpha_{barr.2}$	$S_{cons.2}$	$p_{cons.2} = f(\alpha, p_{cons.2})$	$R_{cons.2}$	Add. Barrier <sub>2</sub>	$\beta_{add.barr.2}$	$S_{cons.2}$	$p_{cons.2}$	$R_{cons.2}$		
threat <sub>3</sub>	$p_{th3}$		Cons. <sub>3</sub>	$p_{cons.3}/p_{UOS}$	Barrier <sub>3</sub>	$\alpha_{barr.3}$	$S_{cons.3}$	$p_{cons.3} = f(\alpha, p_{cons.3})$	$R_{cons.3}$	Add. Barrier <sub>3</sub>	$\beta_{add.barr.3}$	$S_{cons.3}$	$p_{cons.3}$	$R_{cons.3}$		
threat <sub>i</sub>	$p_{thi}$		Cons. <sub>i</sub>	$p_{cons.i}/p_{UOS}$	Barrier <sub>i</sub>	$\alpha_{barr.i}$	$S_{cons.i}$	$p_{cons.i} = f(\alpha, p_{cons.i})$	$R_{cons.i}$	Add. Barrier <sub>i</sub>	$\beta_{add.barr.i}$	$S_{cons.i}$	$p_{cons.i}$	$R_{cons.i}$		
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**Grazie per la Vostra  
attenzione**