IASS 2016 November 14–16 Dubai
69th annual International Air Safety Summit

FLIGHT SAFETY FOUNDATION
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NSPA NATO SUPPORT AND PROCUREMENT AGENCY

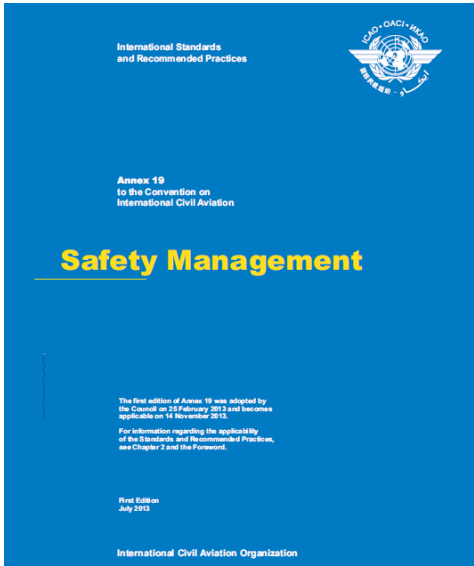
Higher Risk Operations and Dynamic Risk Management Dashboards

Presented by:

Ilias Panagopoulos
Safety Manager
NATO Airlift Management Programme
Strategic Airlift Capability

'Safety is the state in which risks associated with aviation activities are reduced and controlled to an acceptable level'.

ICAO Annex 19



Strategic Airlift Capability (SAC)

- Consortium of 12 nations
- Operate Boeing C-17A Globemaster III, as State aircraft
- Joint strategic airlift purposes
- NATO Airlift Management Programme (asset owner)
- Heavy Airlift Wing (Air Operator)
- Boeing (Aircraft Mx)
- Host Nation (HN) is Hungary
- The operating SAC home base is Papa Air Base (PAB)

- Large strategic transport aircraft
- Capable of carrying 175000 pounds (80 tn) of cargo
- 123 fully equipped military personnel
- Planned to meet SESAR/Next Gen upcoming requirements
- Operates globally in intensive threat environments

C-17A Globemaster III

SAC C-17 taking off from Gao. Photo: Royal Netherlands Army / 1Lt Arjen Bosch

C-17A Higher Risk Operations

- **Air land:** Hard- Soft, unpaved and semi prepared runways
- **Humanitarian Relief-Peace Keeping Operations:** Unplanned- UN/EU-Worldwide
- **Air to Air Refueling (AAR):** Day and Night
- **Airdrop/Air Delivery (AD) :** Parachutists and Heavy cargo
- **Dangerous Goods / Hazardous Material (HAZMAT):** Ammunition-Explosives
- **Night Vision Goggles (NVG) :** NVG Take Off- Cruise and Landing
- **Aeromedical Evacuation (AE):** Unplanned



C-17A Higher Risk Operations and Acceptable Level of Safety (ALoS)

Residents Evacuation following Super Typhoon Haiyan, which hit the Philippines Nov. 17, 2013. The C-17 is deployed from the 535th Airlift Squadron, USAF

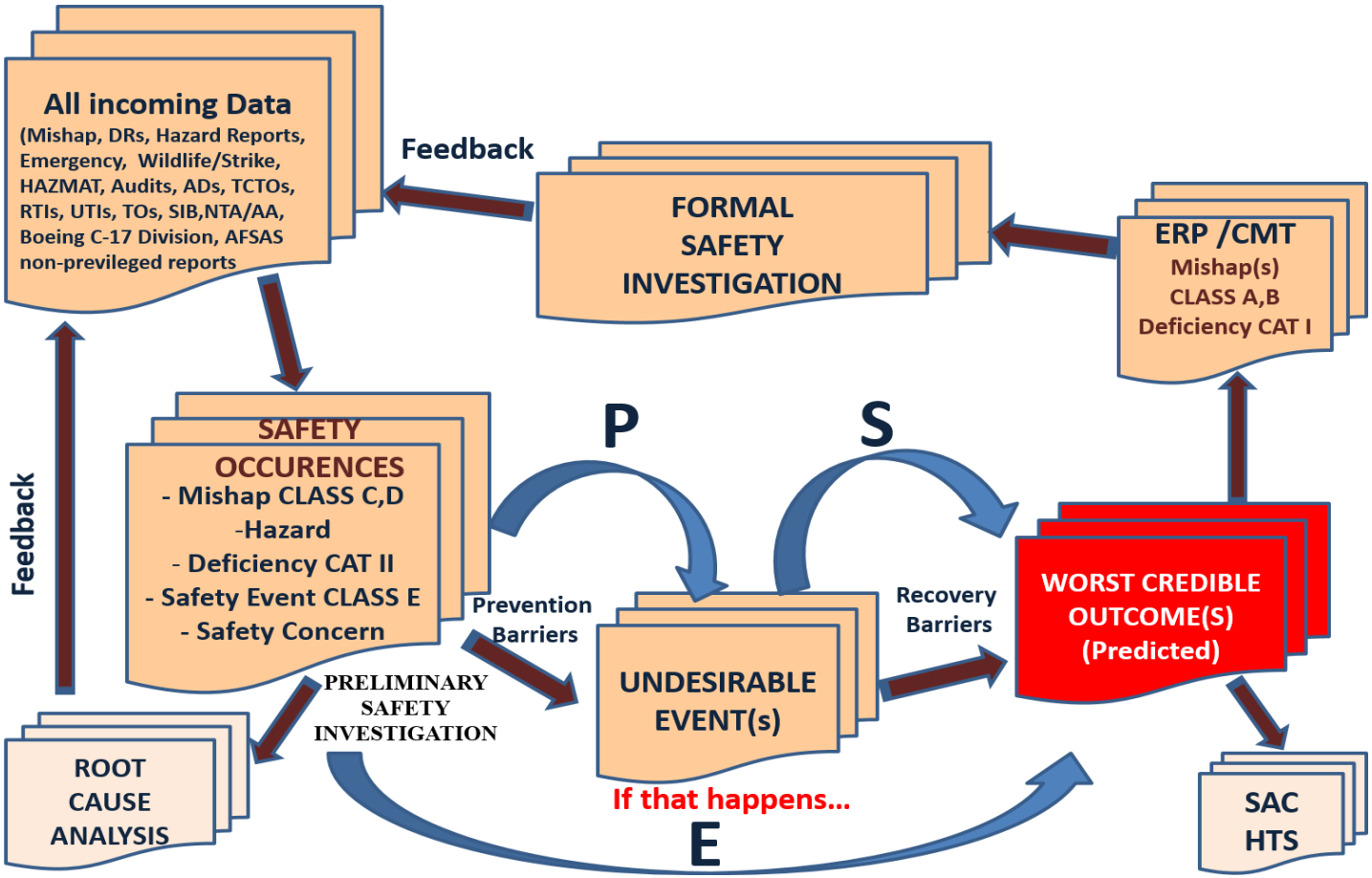
Safety Management System (SMS)

For achieving ALoS in aviation operations, regulatory bodies have mandated their Member States and Service Providers to develop and implement effective State Safety Programmes (SSP) and Safety Management Systems (SMS)

SMS Main Components	
1	Safety Policy and Objectives
2	Safety Risk Management
3	Safety Assurance
4	Safety Promotion

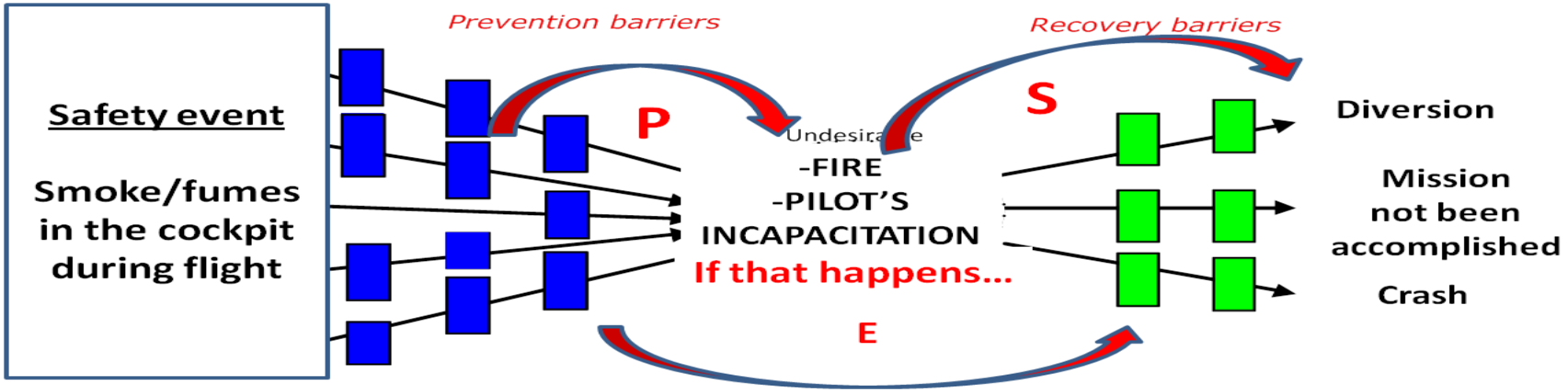
State aircraft - Military Ops : shall demonstrate 'due regard' to safety

Safety process & Risk Management



Hazard Identification and Risk Assessment process

BOW-TIE Risk Management methodology



TOTAL RISK = P x S x E

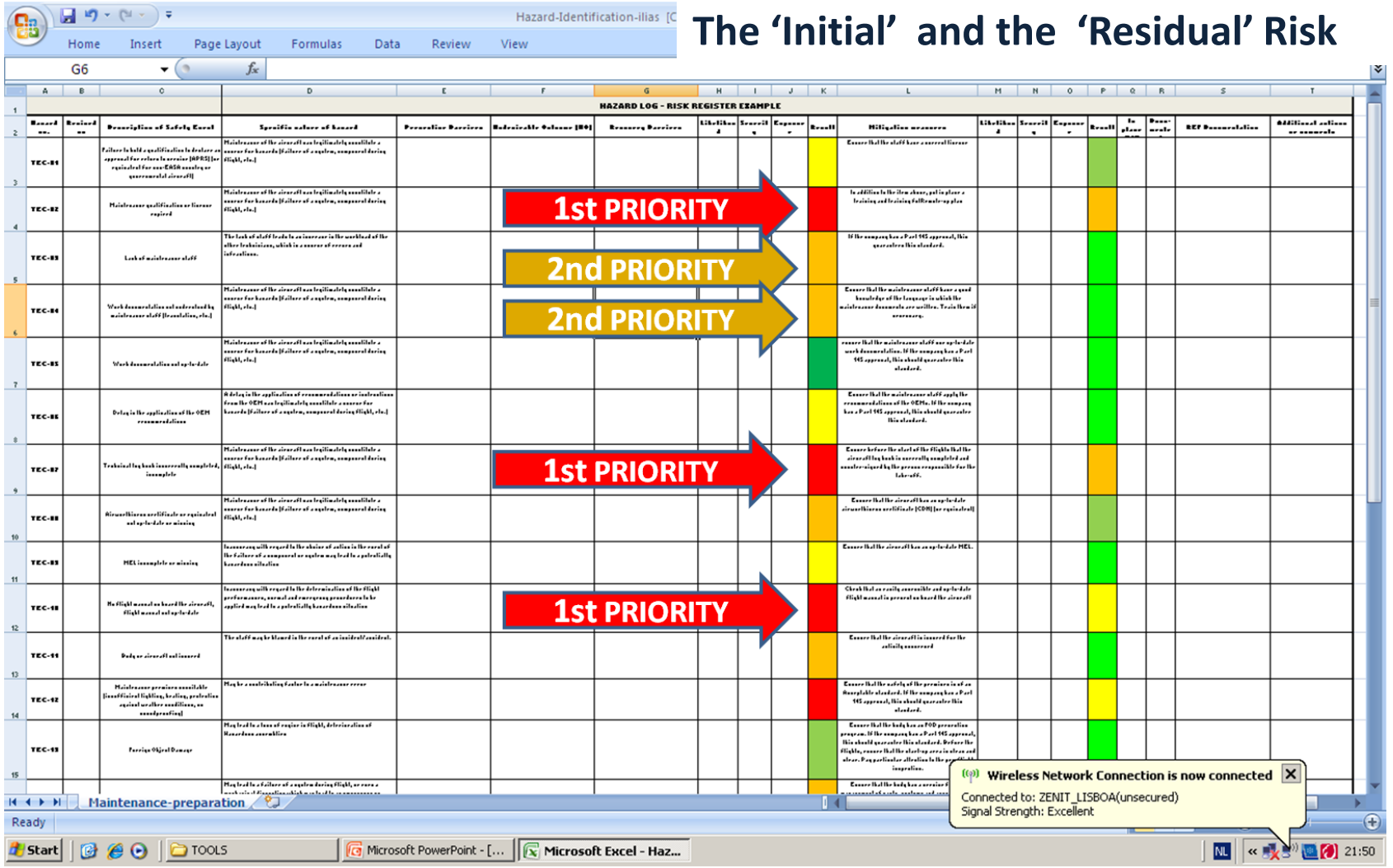
Risk Assessment and Risk Tolerability Matrix

STRATEGIC AIRLIFT CAPABILITY (SAC) RISK ASSESSMENT MATRIX Should be considered by NAMP – HAW - HDF PAB - BOEING/CLS on a case by case basis IAW the particular facts relating to each situation					Qualitative Probability		Has already occurred within SAC enterprise more than 3 times. Has occurred many times in the operational lifecycle of C-17 fleet. Continuously experienced.	Has already occurred within SAC enterprise less than 3 times. Has occurred frequently in the operational life-cycle of C-17 fleet. Will occur frequently.	Has already occurred within SAC enterprise at least once. Has occurred several times in the operational life-cycle of C-17 fleet. Will occur several times	Not known to have occurred within SAC enterprise but has already occurred at least once in the operational lifecycle of C-17 fleet. Very unlikely to occur but can be expected to occur.	It has never occurred in the history of SAC enterprise and in the operational lifecycle of C-17 fleet. Improbable that will occur, but possible to occur.	Incapable of occurrence within SAC enterprise – C17WS. Only use when the potential hazard has been identified and later eliminated.
					Quantitative Probability		Probability of occurrence greater than or equal to 10^{-1}	Probability of occurrence less than 10^{-1} but greater than or equal to 10^{-2}	Probability of occurrence less than 10^{-2} but greater than or equal to 10^{-3}	Probability of occurrence less than 10^{-3} but greater than or equal to 10^{-4}	Probability of occurrence less than 10^{-4}	Probability of occurrence less than 10^{-5}
PEOPLE	MISSION-C-17WS CAPABILITY OR UNIT READINESS	FINANCE	REPUTATION	ENVIRONMENT	RISK SEVERITY / RISK PROBABILITY		FREQUENT	LIKELY	OCCASIONAL	SELDOM	UNLIKELY	IMPROBABLE
							A	B	C	D	E	F
At least one fatality or permanent total disability	Permanent loss of mission / C-17WS capability or Unit Readiness	> $2 million Destruction of a SAC aircraft. Loss of asset. Catastrophic damage to the C-17WS	International exposure	Irreversible environmental damage	CATASTROFIC Mishap Class A or MHAP/Deficiency CAT I, Priority Emergency or Urgent	I	EXTREMELY HIGH (EH) RAC: 1 IMMINENT Multiplier (M): 188 RHI: 1	EXTREMELY HIGH (EH) RAC: 1 IMMINENT Multiplier (M): 63 RHI: 2	HIGH (H) RAC: 2 SERIOUS Multiplier (M): 21 RHI: 4	HIGH (H) RAC: 2 SERIOUS Multiplier (M): 7 RHI: 8	MEDIUM (M) RAC: 3 MODERATE Multiplier (M): 2 RHI: 12	ELIMINATED (E)
Permanent partial disability, or when three or more personnel are hospitalized for inpatient care	Significantly degraded mission/ C-17WS capability or Unit Readiness	$500,000 or more, but less than $2 million Critical damage to the C-17WS	National exposure	High but reversible environmental damage	CRITICAL Mishap Class B or MHAP/Deficiency CAT II, Priority Emergency	II	EXTREMELY HIGH (EH) RAC: 1 IMMINENT Multiplier (M): 6 RHI: 3	HIGH (H) RAC: 2 SERIOUS Multiplier (M): 21 RHI: 5	HIGH (H) RAC: 2 SERIOUS Multiplier (M): 7 RHI: 6	MEDIUM (M) RAC: 3 MODERATE Multiplier (M): 2 RHI: 10	LOW (L) RAC: 4 MINOR Multiplier (M): 1 RHI: 15	
Non fatal injury or illness that results in one or more days away from work,	Degraded mission / C-17WS capability or Unit Readiness	$50,000 or more, but less than $500,000 Moderate damage to the C-17WS	Within SAC enterprise exposure	Significant but reversible environmental damage	MODERATE Mishap Class C or MHAP/Deficiency CAT II, Priority Urgent or Routine	III	HIGH (H) RAC: 2 SERIOUS Multiplier (M): 21 RHI: 7	MEDIUM (M) RAC: 3 MODERATE Multiplier (M): 7 RHI: 9	MEDIUM (M) RAC: 3 MODERATE Multiplier (M): 2 RHI: 11	LOW (L) RAC: 4 MINOR Multiplier (M): 1 RHI: 14	LOW (L) RAC: 4 MINOR Multiplier (M): 0.26 RHI: 17	
Works partial days, restricted duties or transferred to another job. Requires medical treatment greater than first aid. Loss of consciousness	Limited - No impact to mission / C-17WS or Unit Readiness	$20,000 or more, but less than $50,000 Negligible damage to the C-17WS	Within SAC Units-/Divisions exposure	Minor and reversible environmental damage	NEGLIGIBLE Mishap Class D or Deficiency CAT II, Priority Routine	IV	MEDIUM (M) RAC: 3 MODERATE Multiplier (M): 7 RHI: 13	LOW (L) RAC: 4 MINOR Multiplier (M): 2 RHI: 16	LOW (L) RAC: 4 MINOR Multiplier (M): 1 RHI: 18	LOW (L) RAC: 4 MINOR Multiplier (M): 0.26 RHI: 19	LOW (L) RAC: 4 MINOR Multiplier (M): 0.1 RHI: 20	EXTREMELY LOW (EL) RAC: 5 NEGLIGIBLE Multiplier (M): 0.01 RHI: 22
Not Affected.	No Impact	Insignificant or less than $20,000 damage	No exposure	No environmental damage	Class E Event - No Deficiency or Non Reported Deficiency	V	IN-CONSEQUENTIAL: Sufficient performance is achieved through minimal compensation.					

Hazard Log- Risk Register

(indicative example)

The 'Initial' and the 'Residual' Risk



The Safety Risk Management problem….

Fatal hull loss accidents appear to have resulted from a combination of factors, none of which can alone cause an accident, or even a serious incident.

Therefore, traditional safety risk assessment processes, risk matrices, hazard logs and conventional risk management methodologies, remained less effective in preventing major accidents.

The Safety Risk Management problem….(cont')

Consequently, air operators have the need not only to proactively identify the 'Initial' and the 'Residual' risk of a hazard, but also…

to recognize the 'current' or 'actual risk state of our system' and to take the necessary mitigation actions for preventing an accident or a serious incident that may result of a combination of factors .

In fact, this is one of the desired outcomes of a proactive and effective SMS.

Dynamic Risk Management Dashboards (DRMD)

-A combined, cross-departmental effort for identifying hazards and assessing risks resulting from a combination of factors

- On a real time basis.

-Could concurrently examine and visualize the actual risk state of:
  - an aerodrome, an aircraft, an aircrew or an air traffic route
  - (buying-in) spare parts, crew fatigue

-Are based on a set of pre-defined Risk Acceptance Criteria that have been developed and tailored by the Operator.

How could we develop Risk Acceptance (appraisal) criteria?

Risk Acceptance (appraisal) Criteria

As a rule of thumb, for developing the Risk Acceptance Criteria, the key question that needs to be answered is:

'What are the criteria or conditions that may put an aerodrome, an aircraft, an aircrew in a high, medium or low risk state successively?'

Without a doubt, assigned Subject Matter Experts (SMEs) could provide an exhaustive and accurate list as an answer to this question.

That makes Risk Management not only a process, but also a 'collaborative effort'!

Risk Acceptance Criteria: AERODROME

FLT OPS, GND OPS, SAFETY and AVSEC Depts

AERODROME RISK ASSESSMENT: INDICATIVE *EXAMPLE*					
RISK ACCEPTANCE CRITERIA	RISK FACTOR POINT SCALE				EVALUATION MARKS
	RAC 4	RAC 3	RAC 2	RAC 1	
RWY dimenSions (TORA-TODA-LDA)	>9000ft	7-8999ft	6-7000ft	<6000ft	2
Pavement Condition (RWY-TWY-APRONS	Excellent PCN>ACN evaluated by technical means	Medium PCN>ACN evaluated by experience	Good ACN=PCN	ACN>PCN or Not available data	1
NAVAIDS	Precision, ILS CAT -I-III	Precision, RNAV/GPS	Non precision APP	Visual APP only	1
RVR	>1000m	201-999m	101-200m	<100m	1
Lighting	Excellent	Good-Medium	Limited	None	1
Ground Handling facilities	Owned by the Operator	Third parties	Limited	None	2
Airfield complexity – topography-terrain	Routine	Difficult	Challenging	Hazardous	1
Operating Environment – Language difficulties	None	Minor	Major	n/a	1
Weather Conditions-METAR	CAVOK	Moderate	Severe	Extreme	1
Arrival/Approach/ Departure complexity	Routine	Difficult	Challenging	Hazardous	2
RCR-Friction	Good	Fair	Poor	Nil	2
Airport Security	Exceptional/ No recorded events	IAW international stds / 1-2 recorded events	IAW stds / high frequency security threats	IAW stds / high frequency security events	2
Perceived Threat	low	Medium	High	Extreme	2
Staying Lenght	Turn around	2-8 hrs	9-12 hrs	Overnight or more than 13 hrs	4
Recorded safety events in the vicinity	No accidents/serious incidents / no occurences	No accident but at least 1 serious incident/ few occurences	At least 1 accident-serious incident / >1-2 occurence per year	At least 1 accident-serious incident / >1-2 occurence per month	2
TOTAL AIRPORT RISK LEVEL	LOW >35	MEDIUM 26-34	HIGH 13-25	EXTREMELY HIGH <12	25

DRMD: AERODROMES

AERODROME RISK ASSESSMENT: INDICATIVE *EXAMPLE*					
LIST OF AERODROMES	RAC 4	RAC 3	RAC 2	RAC 1	Last update on
AERODROME 01					16/11/16
AERODROME 02			Due to pavement conditions		16/11/16
AERODROME 03					16/11/16
AERODROME 04					16/11/16
AERODROME 05					16/11/16
AERODROME 06		Due to bird strikes and ground handling occurrences			16/11/16
AERODROME 07				Due to FDM occurrences and weather conditions	16/11/16
AERODROME 08					16/11/16
AERODROME 09			Due to ATC / ATM re-organisation		16/11/16

Risk Acceptance Criteria: AIRCRAFT

MAINT, SAFETY & QUALITY Depts

AIRCRAFT RISK ASSESSMENT: INDICATIVE *EXAMPLE*					
RISK ACCEPTANCE CRITERIA	**RISK FACTOR POINT SCALE**				**EVALUATION MARKS**
	RAC 4	**RAC 3**	**RAC 2**	**RAC 1**	
No of Flights since last major overhaul	>10	3 to 10	1 to 3	None	2
Emergency Airworthiness Directive (EAD)-Urgent Technical Instruction (UTI) issued/pending	None > 1 year	None for the last1-12 months	EAD/UTI issued and completed	EAD/UTI pending	1
Airworthiness Directive (AD)-Time Compliance Technical Order (TCTO) issued/pending	None > 1 year	None for the last 1-12 months	AD/TCTO issued and completed	AD/TCTO pending	1
Maintenance occurrences - deficiencies/1000FH, TOTAL	None	1 or less than 3	3 or less than 5	>5	1
Engine or critical engine component replacement	NSTR	Engine component replacement with engine test run-up	Engine component replacement w/o engine test run-up	Engine replacement	1
Routine Technical Inspection (RTI) issued/pending	None > 1 year	None for the last 1-12 months	RTI issued and completed	RTI pending	2
Concequtive critical equipment failures/1000FH	None	1 or less than 3	1 or less than 3	>3	1
Number of Unscheduled removals /1000FH	None > 1 year	None for the last 1-12 months	1 or less than 3	>3	1
No of FH accomplished within the last 10 days	>120	51 to 120	1 to 50	None	1
Modifications pending	None	1 to 3	4 to 5	>5	2
Aircraft Mx status	Airworthy	MEL - non OEM spare parts installed	One time flight -Ferry flight	AOG	2
TOTAL AIRCRAFT RISK LEVEL	LOW >35	MEDIUM 26-34	HIGH 13-25	EXTREMELY HIGH <12	25

DRMD: FLEET

AIRCRAFT RISK ASSESSMENT: INDICATIVE *EXAMPLE*					
LIST OF AIRCRAFTS	**RAC 4**	**RAC 3**	**RAC 2**	**RAC 1**	**Last update on**
AIRCRAFT 01					16/11/16
AIRCRAFT 02			Engine replacement		16/11/16
AIRCRAFT 03					16/11/16
AIRCRAFT 04					16/11/16
AIRCRAFT 05					16/11/16
AIRCRAFT 06		Consecutive AP/ATHR disconnection/ failures			16/11/16
AIRCRAFT 07				First flight after major overhaul	16/11/16
AIRCRAFT 08					16/11/16
AIRCRAFT 09			EAD pending		16/11/16

Dynamic Risk Management Dashboards and the Red2Red concept

At this point, the operator could also start to apply the 'Red2Red' concept that is based on the principle:

-Avoid to assign or dispatch a 'red' aircraft' (e.g. due to its first flight after a major overhaul) to a 'red airport', (e.g. due to extreme weather conditions).

- Undoubtedly, aligning a 'Red2Red' has the potential (i.e. risk) for an accident or a serious incident.

Risk Acceptance Criteria: AIRCREW

FLT OPS- SAFETY & TRAINING Depts

AIRCREW RISK ASSESSMENT: INDICATIVE *EXAMPLE*					
RISK ACCEPTANCE CRITERIA	RISK FACTOR POINT SCALE				EVALUATION MARKS
	RAC 4	RAC 3	RAC 2	RAC 1	
Aircrew total FH experience	>10000FH	5-9999FH	1500- 4999FH	<1500	2
Crew Qualification	Fully qualified	Partial qualified	Under upgrade training	Under supervision	1
In type flying experience	>6000FH	2-6000 FH	501- 1999FH	<500	1
Last 30 days FH	>90	31-89	11-30	<10	1
Destination Airport experience within 1 year	>10 times	6-10 times	2-5 times	First time	1
Last 90 days F/S	Yes with no remarks	Yes, but with 1 F/S failure	YES, but with 2 consequtive failures	None	2
Elapsed time since last flight	<10	10-19 days	20-29 days	> 30 days	1
Mental Health and stress risk factors	minor	elevated	serious	Under treatment or supervision	2
Concequative days>75% FDP	2 or less	3-4	5	More than 5	1
Fatigue score	Low	Moderate	High	Severe	2
TOTAL AIRCREW RISK LEVEL	LOW >35	MEDIUM 26-34	HIGH 13-25	EXTREMELY HIGH <12	14

DRMD: AIRCREWS

AIRCREW RISK ASSESSMENT: INDICATIVE *EXAMPLE*					
LIST OF AIRCREW	**RAC 4**	**RAC 3**	**RAC 2**	**RAC 1**	**Last update on**
AIRCREW 01					16/11/16
AIRCREW 02			Two consecutive failures on F/S		16/11/16
AIRCREW 03					16/11/16
AIRCREW 04		<1500 FH experience on type			16/11/16
AIRCREW 05					16/11/16
AIRCREW 06		First flight to LHPA & first flight after annual leave			16/11/16
AIRCREW 07				Approaching Fatigue/FTL limitation	16/11/16
AIRCREW 08					16/11/16
AIRCREW 09			First flight as a Captain		16/11/16

Risk Acceptance Criteria: AIR TRAFFIC ROUTE

FLT OPS-DISP- SAFETY and AVSEC Depts

AIR TRAFFIC ROUTE RISK ASSESSMENT: INDICATIVE *EXAMPLE*					
RISK ACCEPTANCE CRITERIA	RISK FACTOR POINT SCALE				EVALUATION MARKS
	RAC 4	RAC 3	RAC 2	RAC 1	
Radar / Radio-Comm Coverage	Both Radar / Radio 100 %	Both Radar /Radio <50%	Only Radar OR Only Radio-Comm	No coverage	2
Enroute Expected Weather Conditions	CAVOK- Not significant	Moderate	Severe	Extreme	1
Special Use Airspace / Restricted	No usage Restrictions	Special Use – Some NOTAMS apply	Restricted	Dangerous	1
Directional Route / TCAS Events	Unidirectional – No TCAS Events	Bi- Directional with at least 3 TCAS Events	Combined routes	Bi –Directional with >3 TCAS Events - RVSM	1
Alternate Aerodromes	100%	<70%	25- 50%	<25%	1
NAVAIDS	100%	<70%	25- 50%	<25%	2
Recorded Safety / Security Events	Insignificant	Moderate Turbulences – TCAS events without ATM contribution- AVSEC Notams	TCAS- Severe Turbulences – Updarfts- AVSEC Warnings	Significant safety/security events – Volcanic ash	1
Traffic Volume- Airspace Congestion	Not significant Traffic Volume- Not Airspace Congestion	several overload periods each day	Overloaded – Increased Traffic Volume	Extremely congested airspace	1
ATM Efficiency – World Region Efficiency –ICAO USOAP results	>80%	50-80% efficiency – Part of World ATM regions with medium risk state	<50% Efficiency - Part of World ATM regions with High risk state	USOAP <30%	1
Enroute Complexity	Routine	Difficult	Challenging	Unfamiliar	2
TOTAL ROUTE RISK LEVEL	LOW >35	MEDIUM 26-34	HIGH 13-25	EXTREMELY HIGH <12	14

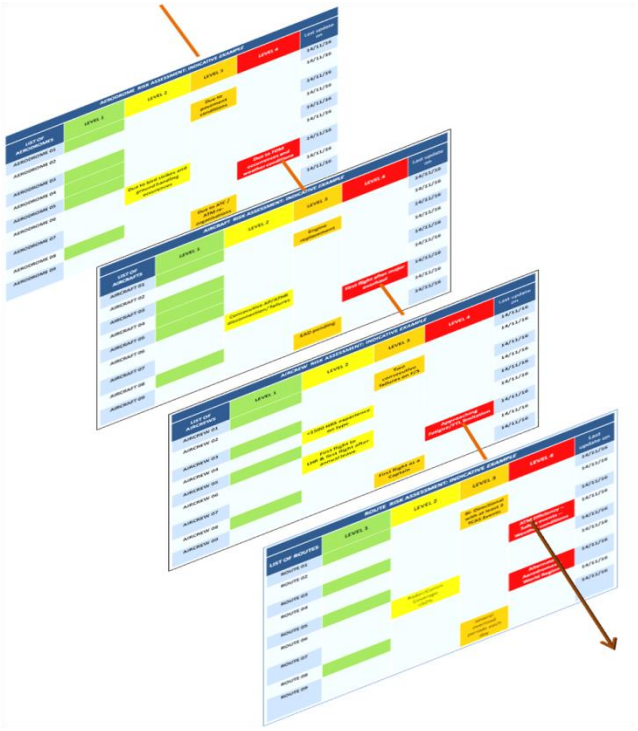
DRMD: AIR TRAFFIC ROUTES

ROUTE RISK ASSESSMENT: INDICATIVE *EXAMPLE*					
LIST OF AIR TRAFFIC ROUTES	**RAC 4**	**RAC 3**	**RAC 2**	**RAC 1**	Last update on
ROUTE 01					16/11/16
ROUTE 02			Bi- Directional with at least 3 TCAS Events		16/11/16
ROUTE 03					16/11/16
ROUTE 04				ATM Efficiency – Safety events -- Weather conditions	16/11/16
ROUTE 05					16/11/16
ROUTE 06		Radar/Comm Coverage <50%			16/11/16
ROUTE 07				Alternate Aerodromes – World Region	16/11/16
ROUTE 08					16/11/16
ROUTE 09			several overload periods each day		16/11/16

Dynamic Risk Management Dashboards (DRMD) and the Red2Red concept

Avoid to assign and dispatch…

-a ‘red aircrew’
-to a ‘red aircraft’
-for flying to a ‘red airport’
-via a ‘red route’



All the DRMDs earlier described are continuously feeding the master-dashboard that illustrates in real time, the comprehensive current (actual) risk state of a particular Flight#.

Master dashboard = practical decision making tool .

Subsequently, the management team's effort is to 'see and avoid' matching high risk level components within a particular flight.

Decide whether the organization could accept, reject or attempt to mitigate the risks before dispatching a particular flight.

RISK VALIDATION & ACCEPTANCE: THE FINAL STAGE

FLIGHT NUMBER RISK ASSESSMENT (Comprehensive): INDICATIVE *EXAMPLE* *Red2Red concept*				
DRMD	RISK FACTOR POINT SCALE			
	RAC 4	RAC 3	RAC 2	RAC 1
Departure Aerodrome				
Destination Aerodrome		Due weather conditions		
Assigned Aircraft - Registration			EAD is pending implementation	
Pilot Flying (PF)				
Pilot Monitoring (PM)		<1500 FH in type		
Additional /Augment Air Crew				
Air Traffic Route			World Region- ATM efficiency	

Acceptable Level of Safety (ALoS) Performance

RISK VALIDATION AND ACCEPTANCE				
Risk Validated by	CAPTAIN	CAPTAIN or NPH	NPH or SM	AM
Risk Accepted?	YES	UNDER CONDITIONS	POSTPONE	NO / CANCEL
Additional Remarks				

KEY POINTS

1. Hazard Logs consider the risk of the hazard (individual risk); DRMDs consider the risk of the accident (cumulative risk).

2. DRMDs should supplement the Hazard Logs; are not replacing the Hazard Logs and the existing RM process.

3. Apart from DOA/POA, clear Risk Acceptance criteria do not exist for all hazard owners.

4. DRMDs is the chance for Air Operators to develop their own Risk Acceptance (appraisal) criteria based on minimum user requirements, regulations, standards or limitations and in accordance with the type and complexity of their operations.

MORE FOOD FOR THOUGHTS……. Mx

EASA PART-66 RISK ASSESSMENT: INDICATIVE *EXAMPLE*					
RISK ACCEPTANCE CRITERIA	RISK FACTOR POINT SCALE				EVALUATION MARKS
	RAC 1	RAC 2	RAC 3	RAC 4	
Level of Training	Advance	Intermidiate and OJT	Initial	Preliminary	2
Qualifications and AML Licences	Category B (1,2) with extension	Category A1-3 or recurrent training	Under Upgrade Training	Initial training	2
Experience	>10years	3-10 years	1-3 years	<1 year	1
Years in the Company	>10years	3-10 years	1-3 years	<1 year	4
Job Type	Office	Ramp/Hangar	In Flight	Openfield/ Outstation	2
Experience on Work Order (WO) -Task	>10years	3-10 years	1-3 years	<1 year	4
Hours on Duty	0-4 hrs	5-8 hrs	8-12 hrs	>12 hrs	3
Start Duty	Early shift	Late/night shift	Unscheduled	On call duty	3
TOTAL RISK LEVEL	LOW <10	MEDIUM 10-18	HIGH 19-25	EXTREMELY HIGH >25	21

MORE FOOD FOR THOUGHTS…….Mx

Mx- WORK ORDERS (WO) RISK ASSESSMENT: INDICATIVE *EXAMPLE*					
LIST OF WO	RAC 4	RAC 3	RAC 2	RAC 1	Last update on
WO_01					16/11/16
WO_02			Limited WO experience		16/11/16
WO_03					16/11/16
WO_04					16/11/16
WO_05					16/11/16
WO_06		Hours on duty			16/11/16
WO_07				Start duty (on call)	16/11/16
WO_08					16/11/16
WO_09			Level of training - Qualifications		16/11/16

To conclude with….

Without a doubt, Prof James Reason and his ‘Swiss cheese’ model is the foundation of accident causation.

Indeed, Prof Reason is highly respected and has gained widespread acceptance within the aviation safety community.

In fact, we all learned and we are still learning from Reason.

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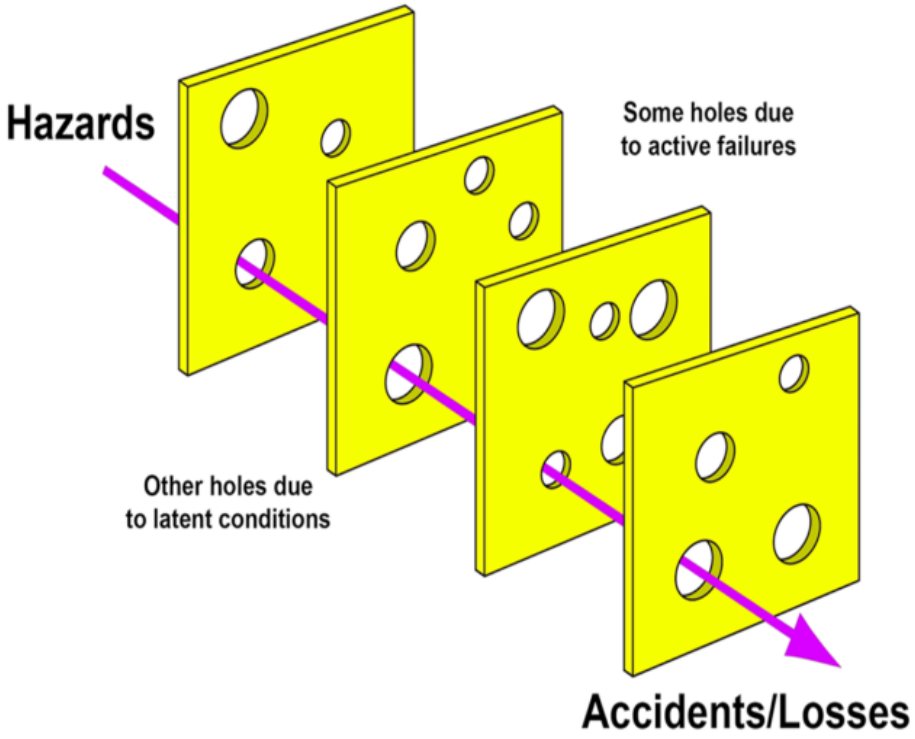
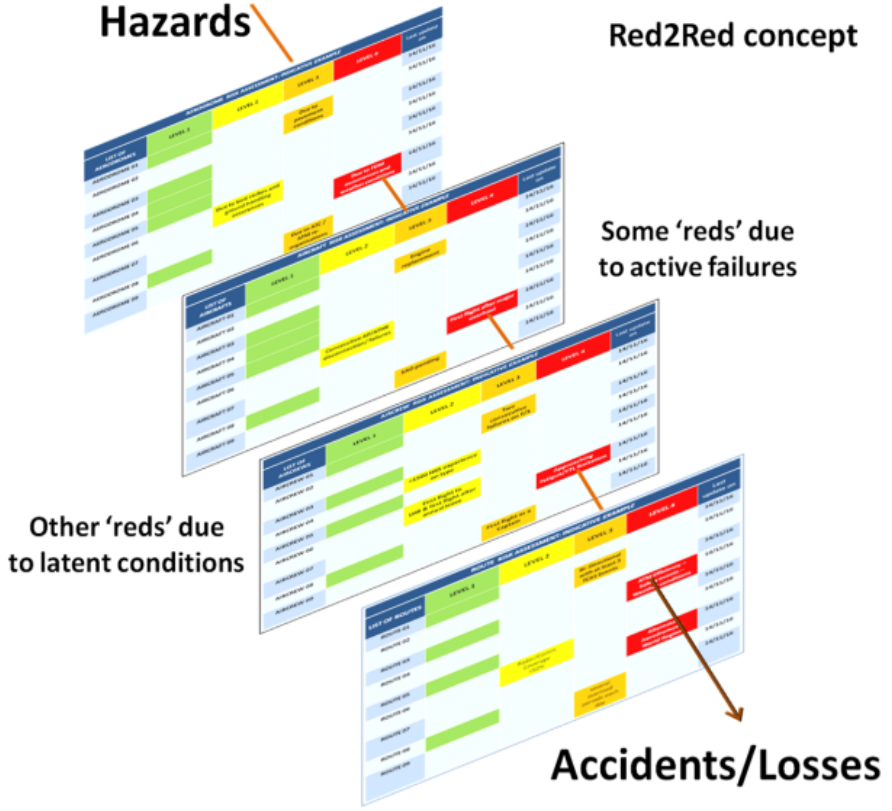
DRMD: A practical implementation of 'Swiss cheese'' model and a new way of thinking for managing risks aiming to achieve desired outcomes within agreed specification limits

The Reason Model and Accident Causal Chain



Reason, James (1990-04-12), Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences

The Dynamic Risk Management Dashboards



Ilias Panagopoulos, 69th annual International Air Safety Summit (IASS), Dubai, UAE, November 14-16, 2016

Higher Risk Operations and Dynamic Risk Management Dashboards

Thank you for your attention

Presented by:

Ilias Panagopoulos
Safety Manager
NATO Airlift Management Programme
Strategic Airlift Capability

Credit to FAA for developing the 'Flight Risk Assessment Tool', Info Paper 7/3/2007 as part of the Advisory Circular AC 120-92 on SMS
Also, credit to US Air Force for developing the Operational Risk Management (ORM) process.