

U.S. ATC Safety

Regulatory Process for Air Traffic Control

Presented to: WakeNet 2 Europe

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Federal Aviation
Administration

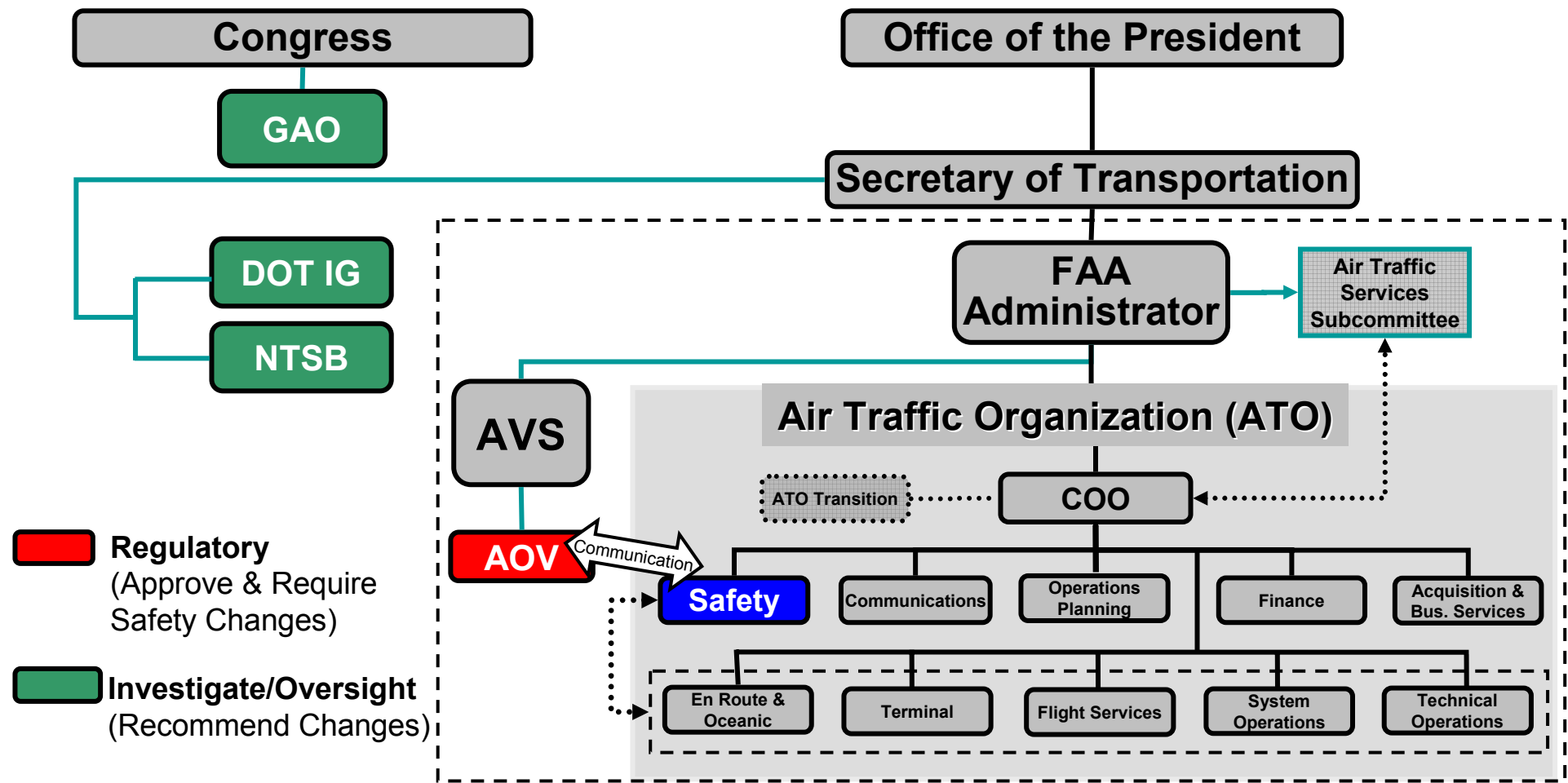


=Overview

- **In Aug. 2003, FAA's Air Traffic Organization (ATO) was formed. Implementation of FAA SMS underway:**
 - Process fully defined and documented based upon work started in FY-02
 - FAA SMS developed based upon lessons learned from international Air Navigation Service Providers (ANSPs).
- **Prior to 2004, FAA ATC function was self-regulated.**
 - Several external U.S. government organizations could influence ... but not direct ... FAA ATC safety changes.
- **In 2004, U.S. Department of Transportation (DOT) established ATC Safety Oversight (regulatory) function within FAA's Safety Regulatory organization (Associate Administrator for Aviation Safety (AVS)).**



U.S. Government Organizations external of FAA's ATO that Influence ATC Safety



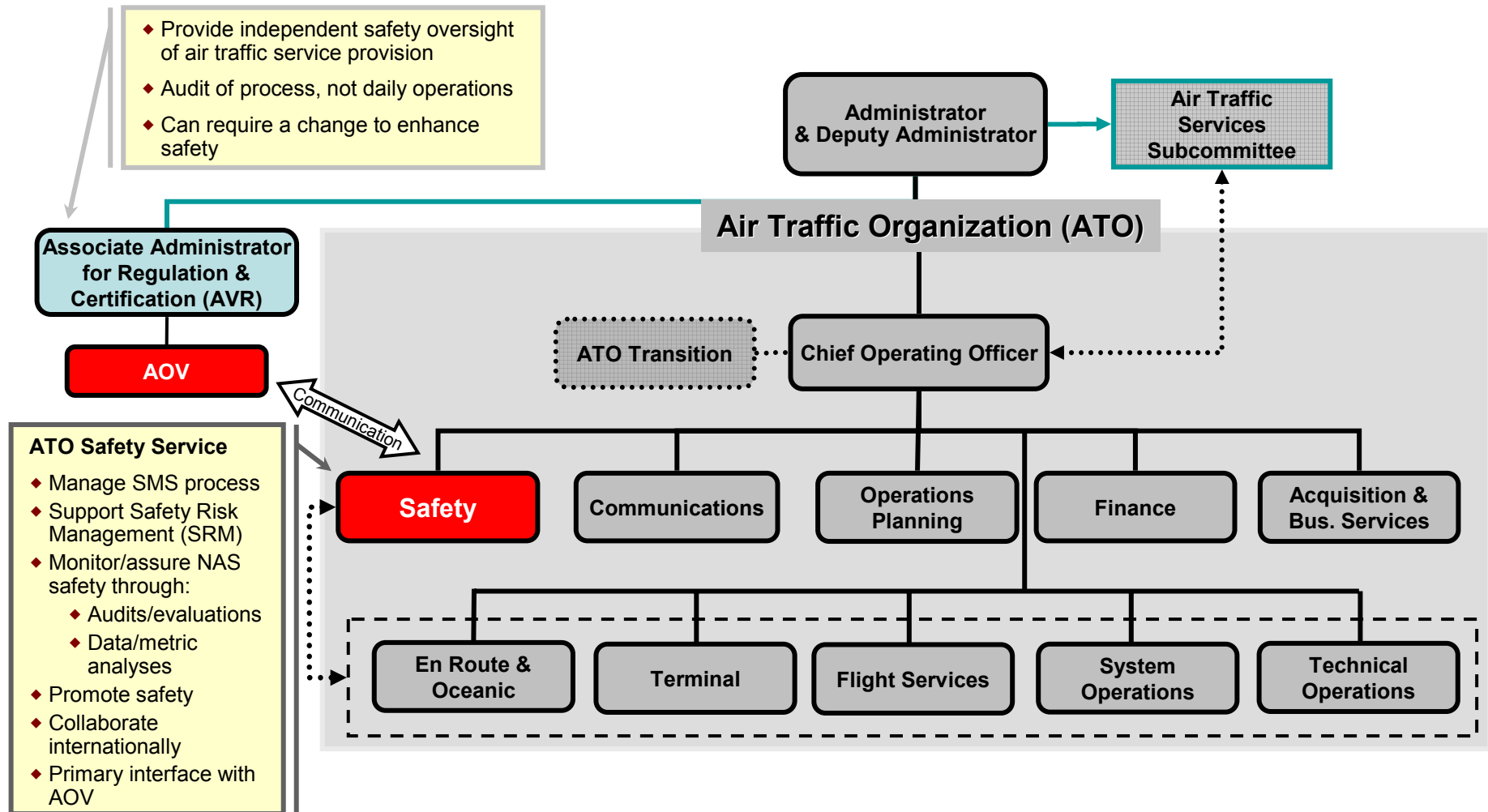
- █ **Regulatory**
(Approve & Require Safety Changes)
- █ **Investigate/Oversight**
(Recommend Changes)

Transition to ATC Regulation (Oversight)

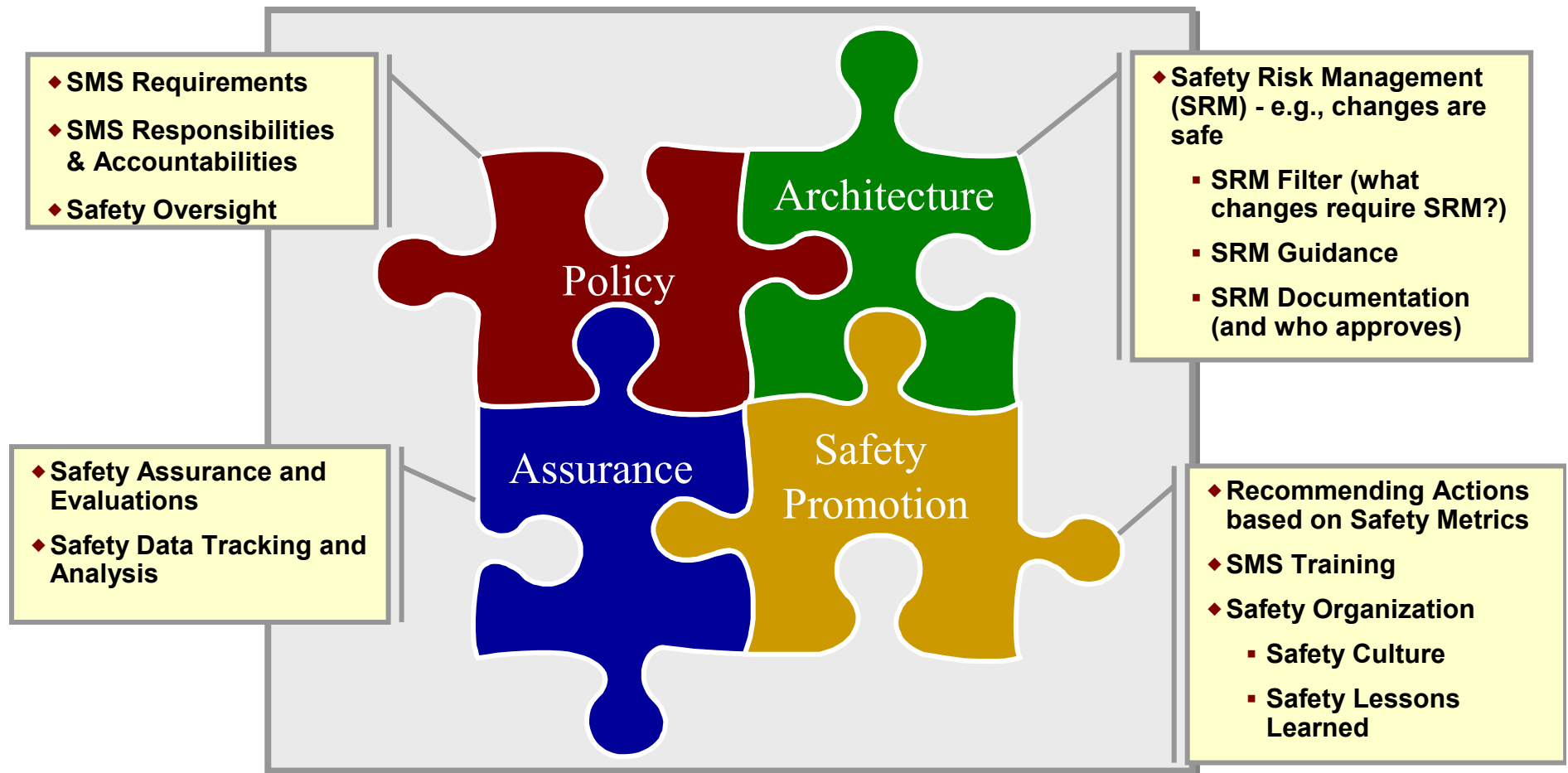
- **FAA order 1100.161 giving AVS/AOV safety oversight authority of ATO signed in March 2005**
 - Approval process for safety critical changes is in place and being used.
- **ATO Safety Service Unit leading implementation of the SMS in ATO, as documented in the *FAA SMS Manual Version 1.1***
 - AOV granted SMS interim approval in June '04
 - Version 2.0 Planned for release in January 2006
 - Application of Safety Risk Management (SRM) process has begun on target programs and will expand over time.
 - Near-term Wake Initiative has offered its participation



FAA Safety Organizations



FAA Safety Management System



ATO Transition- Key Safety Milestones

- **SMS Implementation Approved – September 2003**
- **ATO Established – February 2004**
- **ATO/AOV Safety Council Established – February 2004**
- **DOT establishes Air Traffic Safety Oversight within FAA/ AVS – April 2004**
- **ATO SMS Manual Version 1.1 approved by AVS - June 2004**
- **Air Traffic Safety Oversight Order Signed – February 2005**
- **AVS/AOV Safety Audits Commence – April 2005**
- **SMS Familiarization Training completed for all ATO Executives, Managers and Key Employees – October 2005**
- **FAA/ATO Outsources AFSS function (excluding Alaska) to Lockheed-Martin – October 2005 (largest “outsourcing” in U.S. history)**



What the Future Holds re: Safety

- **ATO relationship with regulator continuing to evolve and mature.**
- **FAA Administrator expected to direct AVS to establish license/credential program for U.S. ATC functions:**
 - Initially FAA-employed/Military Air Traffic Controllers and Maintenance Engineers/Technicians
 - Could expand to also include all contracted ATC services
- **ATO Safety actively pursuing improved monitoring of ATC separation compliance and better safety measures/metrics**
- **Major initiatives ongoing to measure and improve safety culture**
- **Safety Risk Management (SRM) training/integration ongoing**
- **ICAO Safety Audit scheduled for 2007**

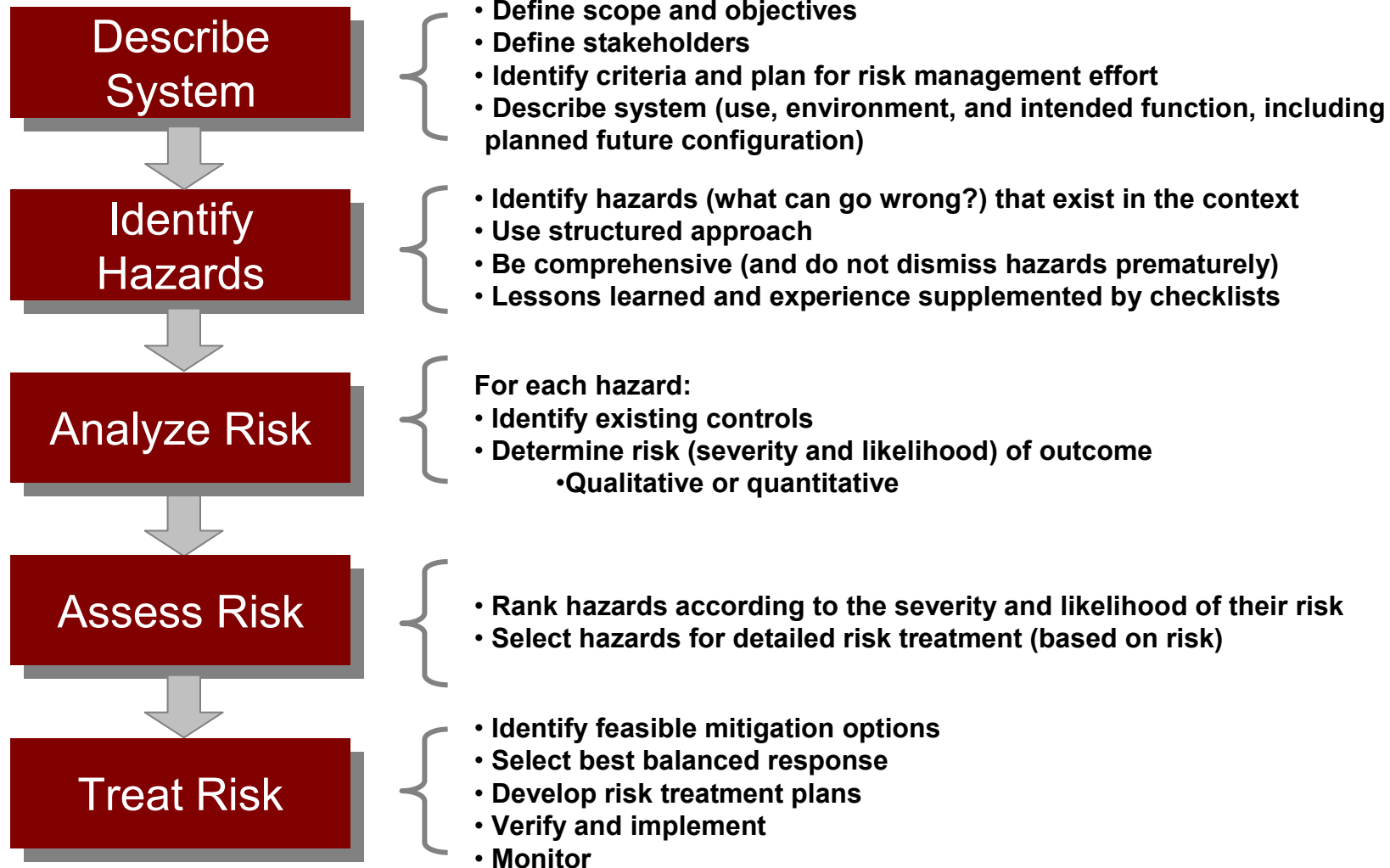


Safety Risk Management (SRM)

- **SRM is a component of the SMS**
- **Formalized proactive approach to system safety**
 - Safety related changes are documented
 - Risk is assessed and analyzed
 - Unacceptable risk is mitigated
 - Hazards are identified and tracked to resolution
 - Effectiveness of risk mitigation strategies are assessed
 - Performance of change is monitored throughout lifecycle
- **The wake program began using this process in late 2003 with the first stakeholder roundtable meeting**



SRM Process



When is SRM Required?

- **Required for all safety significant changes to system or procedures used in the provision of air traffic services, including the following types of changes, at a minimum:**
 - Airspace changes
 - Air traffic procedures and standards
 - Airport procedures and standards
 - New equipment, systems, or facilities
 - Modifications to critical equipment, systems, or facilities
- **If the Wake program research is successful, it will**
 - Change an AT standard for CSPRs in the Near Term
 - Add new equipment and procedures for wind-dependent CSPR departures and arrivals in the Mid Term

Understanding Safety Risk

Severity \ Likelihood	No Safety Effect 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
Frequent A	Low Risk	Medium Risk	High Risk	High Risk	High Risk
Probable B	Low Risk	Medium Risk	High Risk	High Risk	High Risk
Remote C	Low Risk	Low Risk	Medium Risk	High Risk	High Risk
Extremely Remote D	Low Risk	Low Risk	Low Risk	Medium Risk	High Risk
Extremely Improbable E	Low Risk	Low Risk	Low Risk	Low Risk	High Risk *

High Risk
Medium Risk
Low Risk

* Unacceptable with Single Point and Common Cause Failures

- **High Risk: Unacceptable Risk**

- Cannot be implemented unless hazards are mitigated
- Tracking and management required

- **Medium Risk: Acceptable Risk**

- Acceptable
- Proposal may be implemented but tracking and management are required

- **Low Risk: Target**

- Acceptable
- Hazards must be documented

What is Severity?

- **Severity is determined by the worst credible potential outcome**
 - Determined prior to assessing the risk of a hazard occurring
 - Do not consider likelihood when determining severity
 - While less severe effects may be considered analytically, the most severe credible effect must always be considered

Severity

Effect On: ↓	Hazard Severity Classification				
	No Safety Effect	Minor	Major	Hazardous	Catastrophic
General		<ul style="list-style-type: none"> Does not significantly reduce system safety (see below): 	<ul style="list-style-type: none"> Reduces capability to the extent that there would be a (see below): 	<ul style="list-style-type: none"> Reduces capability to the extent that there would be a (see below): 	<ul style="list-style-type: none"> Total loss of systems control
Air Traffic Control	<ul style="list-style-type: none"> Slight increase in ATC workload 	<ul style="list-style-type: none"> Slight reduction in ATC capability or significant increase in ATC workload 	<ul style="list-style-type: none"> Significant reduction in separation or significant reduction in ATC capability 	<ul style="list-style-type: none"> Total loss of ATC capability, reduction in separation defined by high severity ops error 	<ul style="list-style-type: none"> Collision with other aircraft, obstacles, or terrain
Flying Public	<ul style="list-style-type: none"> No effect on flight crew No effect on safety Inconvenience 	<ul style="list-style-type: none"> Slight increase in workload Slight reduction in safety margin Minor illness, environmental or system damage Some physical discomfort to occupants 	<ul style="list-style-type: none"> Significant increase in flight crew workload Significant reduction in safety margin Major illness, injury, environmental or system damage Physical distress on occupants 	<ul style="list-style-type: none"> Large reduction in safety margin Serious or fatal injury to small number Physical distress/excessive workload on flight crew 	<ul style="list-style-type: none"> Outcome would result in hull loss, multiple fatalities, or fatal injury

What is Likelihood?

- **An expression of how often an event is expected to occur**
- **Severity must be considered when determining likelihood**
 - How often resulting harm can be expected to occur at worst credible severity
- **Definitions are tailored to domain and service**
 - NAS Systems
 - Flight Procedures
 - ATC Operations



Likelihood Definitions

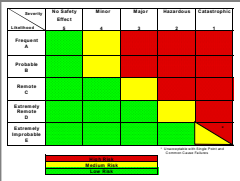
	NAS Systems			Flight Procedures	ATC Operational	
	Quantitative	Qualitative			Per Facility	NAS-wide
		Individual Item/System	ATC Service/ NAS Level System			
Frequent	Probability of occurrence per operation/ operational hour is equal to or greater than 1×10^{-3}	Expected to occur about once every 3 months for an item	Continuously experienced in the system	Probability of occurrence per operation/ operational hour is equal to or greater than 1×10^{-5}	Expected to occur more than once per week	Expected to occur more than every 1-2 days
Probable	Probability of occurrence per operation/ operational hour is less than 1×10^{-3} , but equal to or greater than 1×10^{-5}	Expected to occur about once per year for an item	Expected to occur frequently in the system		Expected to occur about once every month	Expected to occur about several times per month
Remote	Probability of occurrence per operation/ operational hour is less than or equal to 1×10^{-5} but equal to or greater than 1×10^{-7}	Expected to occur several times in life cycle of an item	Expected to occur numerous times in system life cycle	Probability of occurrence per operation/ operational hour is less than or equal to 1×10^{-5} but equal to or greater than 1×10^{-7}	Expected to occur about once every year	Expected to occur about once every few months
Extremely Remote	Probability of occurrence per operation/ operational hour is less than or equal to 1×10^{-7} but equal to or greater than 1×10^{-9}	Unlikely to occur, but possible in an item's life cycle	Expected to occur several times in the system life cycle	Probability of occurrence per operation/ operational hour is less than or equal to 1×10^{-7} but equal to or greater than 1×10^{-9}	Expected to occur about once every 10-100 years	Expected to occur about once every 3 years
Extremely Improbable	Probability of occurrence per operation/ operational hour is less than 1×10^{-9}	So unlikely that it can be assumed that it will not occur in an item's life cycle	Unlikely to occur, but possible in system life cycle	Probability of occurrence per operation/ operational hour is less than 1×10^{-9}	Expected to occur less than once every 100 years	Expected to occur less than once every 30 years



Risk Acceptance vs. SRMD Approval

- **Accepting the safety risk is a certification by the appropriate management official that he/she understands the safety risk associated with the change and he/she accepts that safety risk into the NAS**
- **Approving the SRMD (Safety Risk Management Document or safety case) means that the approving party agrees that the analysis accurately reflects the safety risk associated with the change, the underlying assumptions are correct, and the findings are complete and accurate**

Risk Acceptance

 <p>Safety Risk and/or Controls:</p>	<p>High Initial Risk*</p>	<p>Medium or Low Initial Risk</p>
	<p>Risk Accepted by:</p>	<p>Risk Accepted Within:</p>
<p>Stay Within a Service Unit</p>	<p>Service Unit VP</p>	<p>Service Unit</p>
<p>Span Service Units</p>	<p>Each Affected Service Unit VP</p>	<p>Each Affected Service Unit</p>
<p>Affect LOBs Outside the ATO (e.g., ARP and/or AVR)</p>	<p>Each Affected Service Unit VP and Each Associate Administrator</p>	<p>Each Affected Service Unit and LOB</p>

* Please note that high initial risk must be mitigated to medium or low before acceptance

SRMD Contents

- **At minimum, an SRMD answers:**
 - What is the change?
 - How has the safety risk of the change been assessed?
 - What risk has been identified?
 - How will the risks be mitigated and monitored?



Approvals in SRM

By AOV	SRMD Approved by ATO Safety Service Unit *	SRMD Approved at the Service Director/Manager Level *
<ul style="list-style-type: none"> •ATO Safety Management System (SMS) processes and changes to SMS processes (as defined in the SMS Manual) •Changes to provisions of ATO documents related to separation minima (including waivers) •Controls used by ATO to mitigate hazards with high <u>initial</u> safety risk 	<ul style="list-style-type: none"> •Items or changes that require AOV approval •Any change that has high <u>initial</u> safety risk •Changes to, or replacement of, a system that if lost or malfunctioning would require application of contingency procedures involving increased separation standards or would result in "ATC Zero" status (e.g., ATOP or C-ARTS) •Changes in the periodicity of maintenance or inspection (including flight inspection) of systems described above (in 3rd bullet) 	<ul style="list-style-type: none"> •Changes with medium or low <u>initial</u> safety risk, where safety risk and controls/mitigations: <ul style="list-style-type: none"> –stay within ATO Service Unit, the SRMD is approved within the Service Unit –span ATO Service Units, the SRMD is approved within each affected Service Unit –go outside of ATO (i.e., to ARP and/or AVR), the SRMD is approved by each affected LOB

* Please note that SRMD approval is not the same as risk acceptance





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