The LOSA Collaborative and USAF Air Mobility Command's Joint LOSA Venture:

AMC LOSA Program Update and Comparisons Across Pilot Performance

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OVERVIEW

- Introduction to LOSA
- LOSA Airline Archive
- LOSA Mobility Air Forces (MAF) Archive
- Terms Defined
- Pilot Performance Comparisons
- Discussion Topics

What is LOSA?

Line **O**perations **S**afety **A**udit

- *LOSA is a non – jeopardy "Peer to Peer" observational methodology that provides managers with information to assist them in managing risk in flight operations*
- *LOSA is NOT a compliance audit. It is a data source that provides "lead indicator" information in safety management terms*
- *It can detect procedural "drift" in operational practices, perhaps towards less safe practices, or by adaptation towards safer practices and outcomes*
- *Looks at aspects of organizational resilience through the ability of pilots to manage both their own errors and disturbances to the system*
- *<u>LOSA is Defined by ICAO</u> through 10 characteristics (ICAO Doc 9803)*

LOSA Operating Characteristics

If your project does not meet all 10 characteristics, it is not a LOSA

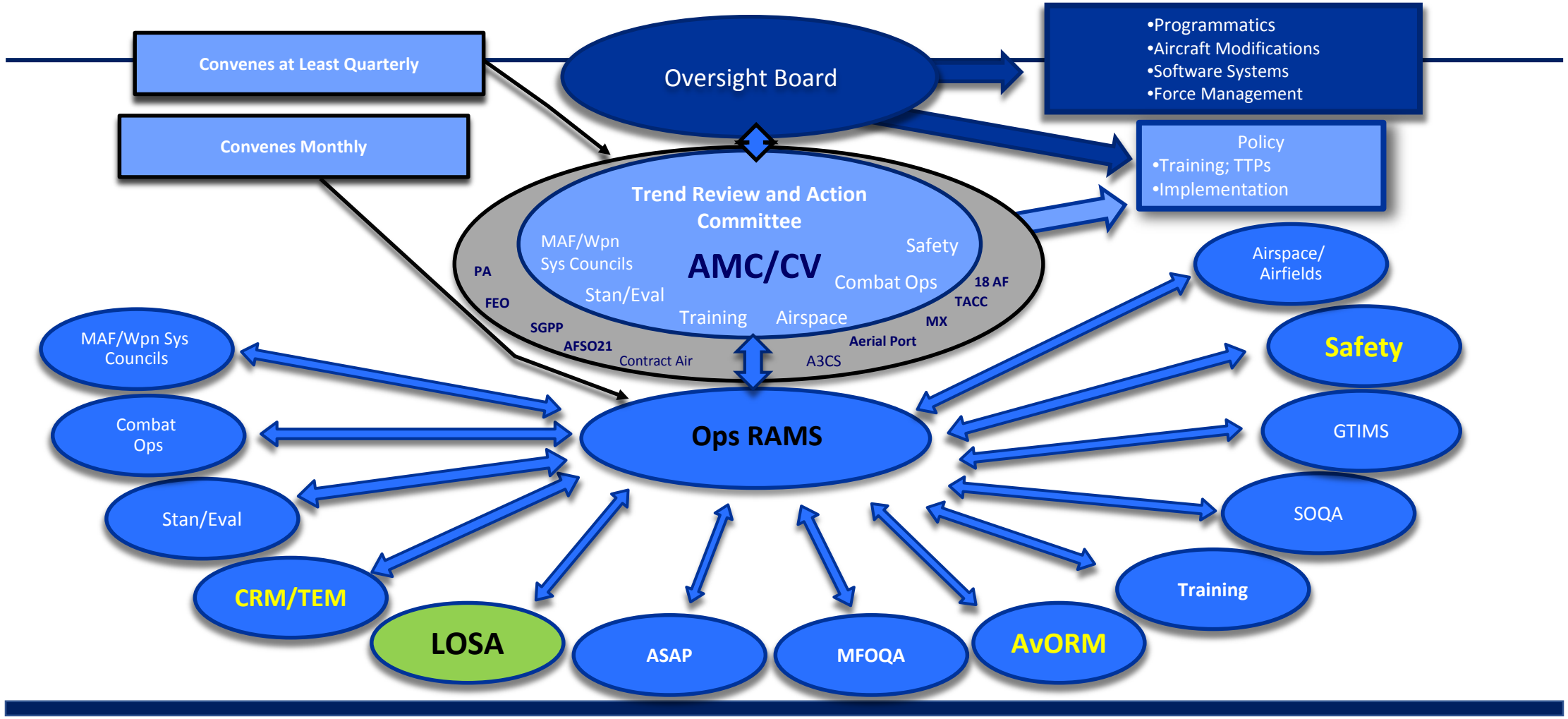
1. Jump-seat observations during regular operations
2. Anonymous, confidential, and non-punitive data collection
3. Voluntary crew participation
4. Trusted and trained observers
5. Joint management / pilots association sponsorship
6. Systematic observation instrument based on TEM
7. Secure data collection repository
8. Data verification roundtables
9. Data-derived targets for enhancement
10. Feedback of results to line pilots

LOSA Airline Archive

AeroMexico	Alaska	DHL	Malaysia	TACA
AeroMexico Connect	All Nippon Airways	Dragonair	Mexicana	TACA Peru
Air Astana	ANA/JP Express	Emirates	Mexicana Click	TAP Portugal
Air Canada	ASA	Etihad	Mt Cook Airlines	Thomas Cook
Air Central	Asiana	EVA AIR	Qantas Airways	Transavia
Air Fra				R
Air Fre				
Air Ho				
Air Jap				AMC
Air Methods	China Airlines	Hawaiian	Royal Jordanian	USAirways
Air Nelson	Continental	HNZ	Saudia	Virgin America
Air New Zealand	Continental Express	Horizon Air	Shuttle America	Virgin Australia
Air Next	Continental Micronesia	IndiGo	Silk Air	Volaris
Air Nippon	Copa	Japan	Singapore	WestJet
Air Niugini	Copa Colombia	JetBlue	Singapore Cargo	
Air Transat	Delta	LACSA	Southwest	

Benchmarking with the LOSA Airline Archive:
20,000+ observations / 15,000+ flight crews / 137+ projects

AMC's Safety Management System (SMS)



LOSA MAF Archive

Total of **1810** observations (6 years)

- **1363** pilot observations in 7 different aircraft
- **447** Loadmaster (LM) and Boom Operator (BO) observations in 5 different types

C-17 Pilot:	159	2010-2011
C-17 Loadmaster (LM):	30	2011
C-130 Pilot:	239	2011-2012
C-130 LM:	30	2011-2012
KC-10 Pilot:	83	2012-2013
KC-10 Boom:	35	2012-2013
KC-135 Pilot:	156	2012-2013
KC-135 Boom:	77	2012-2013
C-21 Pilot:	73	2013-2014
C-5 Pilot:	163	2013-2014
C-5 LM:	70	2013-2014
C-17 #2 Pilot:	128	2014-2015
C-17 #2 LM:	80	2014-2015
C-130 #2 Pilot:	255	2015-2016
C-130 #2 LM:	125	2015-2016
C-40 Pilot:	107	2014-2016

LOSA Methodology Unique to USAF

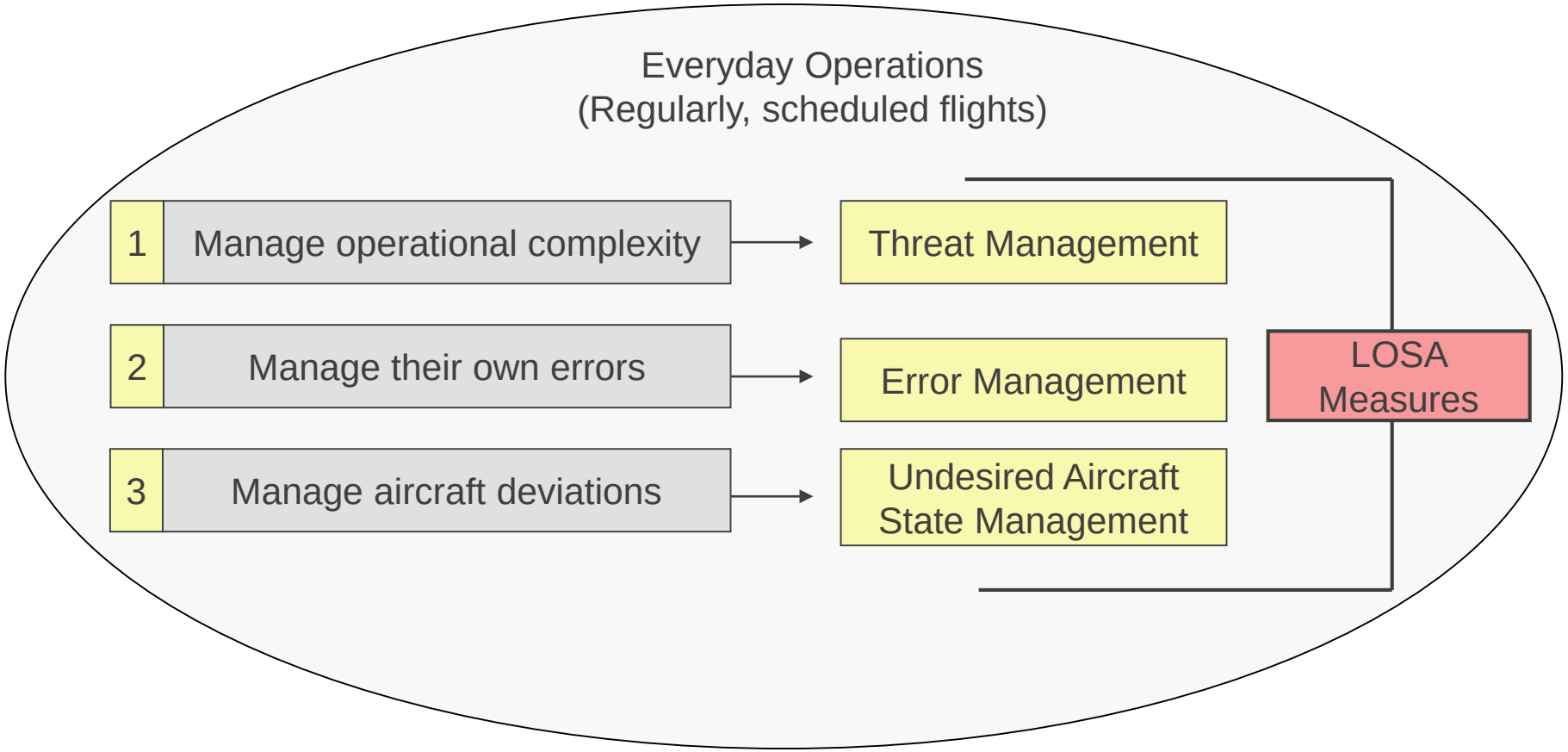
- **Blue Suit Action Phase**
  - **<u>Convene SIB (Safety Investigation Board)</u>**
  - **<u>SIB Analysis Out-brief</u>: to AMC/CC (Recommendations)**
  - **<u>Staffing/Approval Process</u>: Staff Adjudication of Recommendations**
  - **<u>Track Rec's to Closure</u>: AMC/CV Mishap Review Panel (MRP)**

Terms Defined

- Threat and Error Management (TEM)
- Threats
- Errors
- Undesired Aircraft States (UAS)

LOSA and TEM

What do flight crews do to “safely” fly from A to B?



Threat Types

Threats – External events or errors that occur outside the influence of the flight crew but require their attention to maintain adequate safety margins

Environmental Threats

- *Adverse Weather*
- *Airfield*
- *ATC*
- *Environ Ops Pressure*

Operational Threats

- *Aircraft*
- *Cargo / Passenger Compartment*

Crew Support Threats

- *Pilot*
- *Ground / Ramp*
- *Ground Maintenance*

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Error Types

Errors – Observable crew action or inactions that leads to a deviation from “organizational” or flight crew expectations

Aircraft Handling

- *Aircraft Handling*
- *Automation*
- *Flight Controls*
- *Systems / Radio / Instruments*
- *Taxi*

Procedural

- *Briefings*
- *Callouts*
- *Checklists*
- *Documentation*
- *Cockpit Crew Duty*
- *Cross-verification*
- *Other*

Communication

- *Pilot to External*
- *Within Cockpit Crew*

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Undesired Aircraft States (UAS)

Undesired Aircraft States – Crew-error induced aircraft state that increases risk and decreases safety margins

Aircraft Handling

- *Vertical, Lateral or Speed Deviation*
- *Unnecessary Weather Penetration*
- *Unstable Approach*
- *Long, Firm or Off-centerline Landings*

Ground Navigation

- *Runway, Taxiway Incursions*
- *Wrong Taxiway, ramp, gate, or hold spot*
- *Taxi Above Speed Limit*

Incorrect Aircraft Configuration

- *Automation*
- *Engine*
- *Flight Control*
- *Systems*
- *Weight & Balance Events*

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- ***Systems***
- *Weight & Balance Events*

Pilot Performance Comparisons

Airline Pilots and MAF Pilots

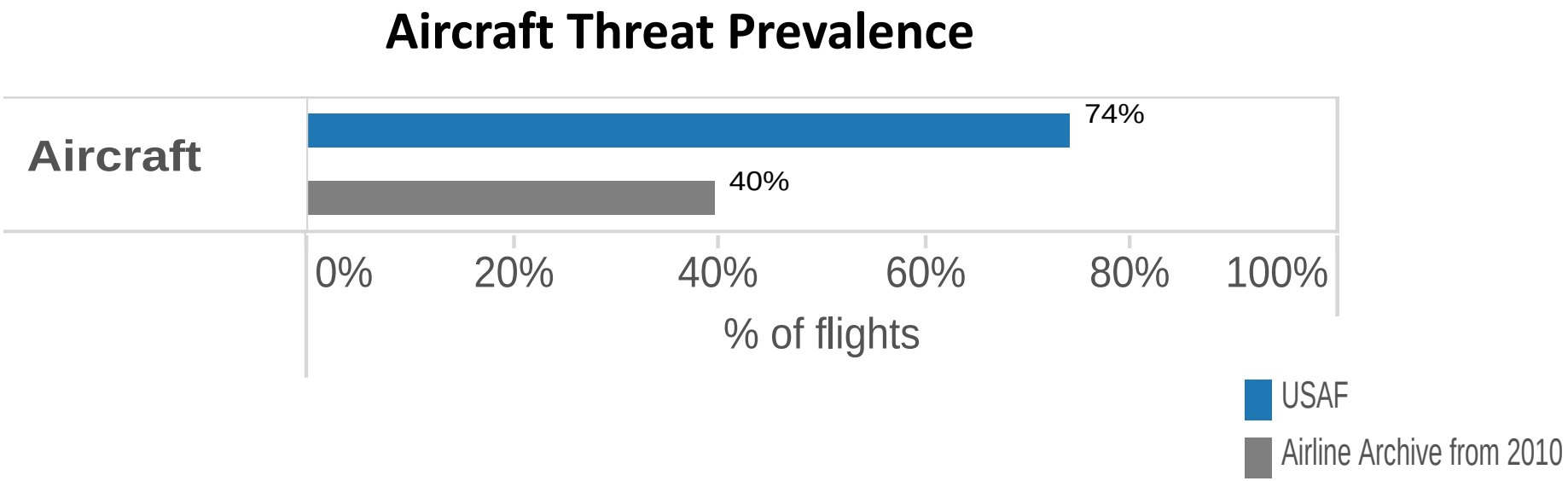
Threats

- Aircraft
- Weather

Aircraft Threats

Threat Prevalence

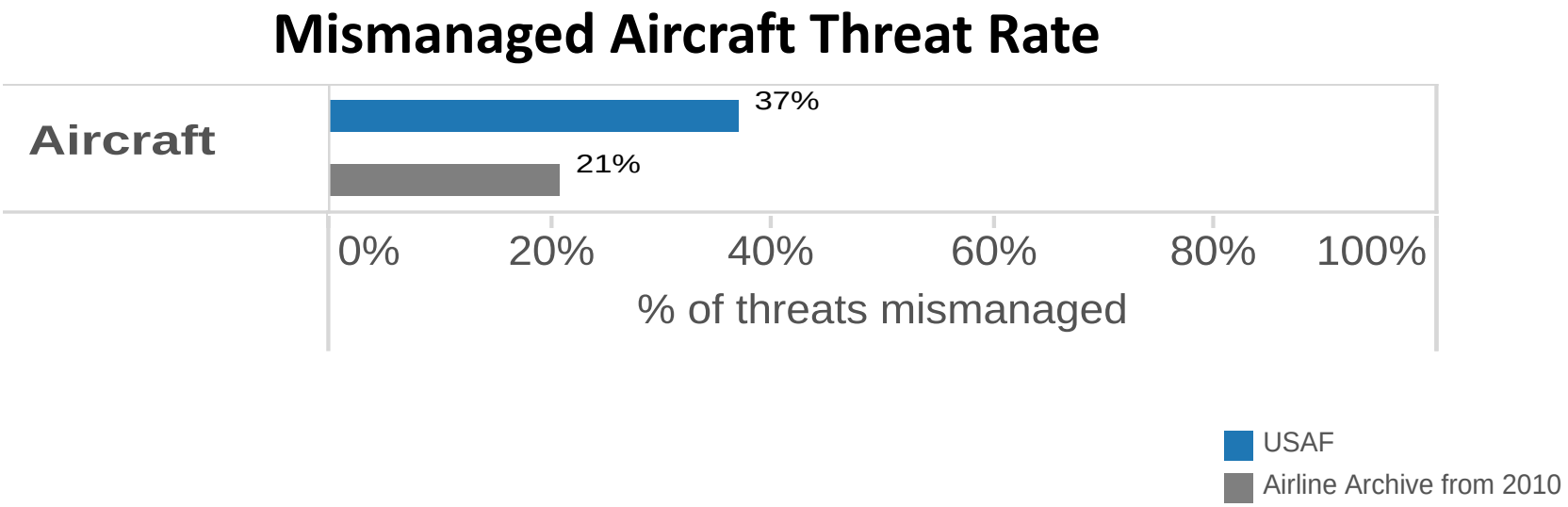
- Military – Approximately double the airline rate
- Pop Up Malfunctions - Most common across both archives



Aircraft Threats

Threat Mismanagement

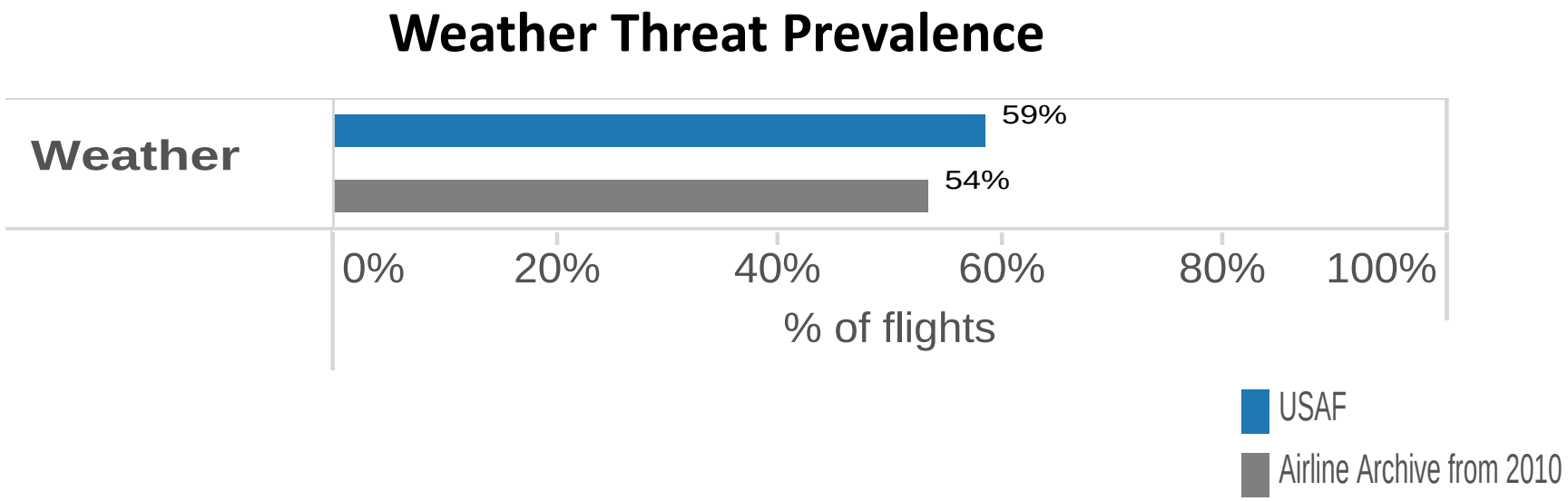
- Military mismanages Aircraft Threats at a greater rate
- Aircraft age, complexity and Mission Design contributing factors?



Weather Threats

Threat Prevalence

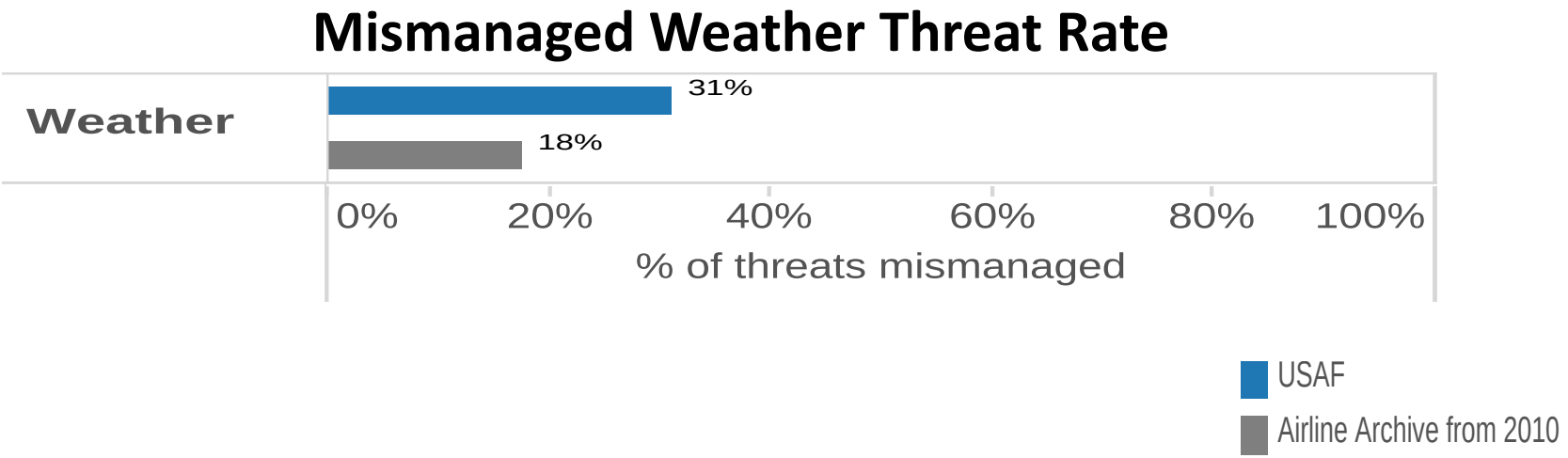
- Consistent across both archives –Positive indicator of methodology objectivity
- Icing and Snow – Most common Weather Threat - both regimes



Weather Threats

Threat Mismanagement – Differences Evident

- Military Pilots nearly twice as likely to mismanage
- Military Mission – Contributing factors?
  - Contingency Operations - Warfighter Support - Diplomatic Clearance restrictions



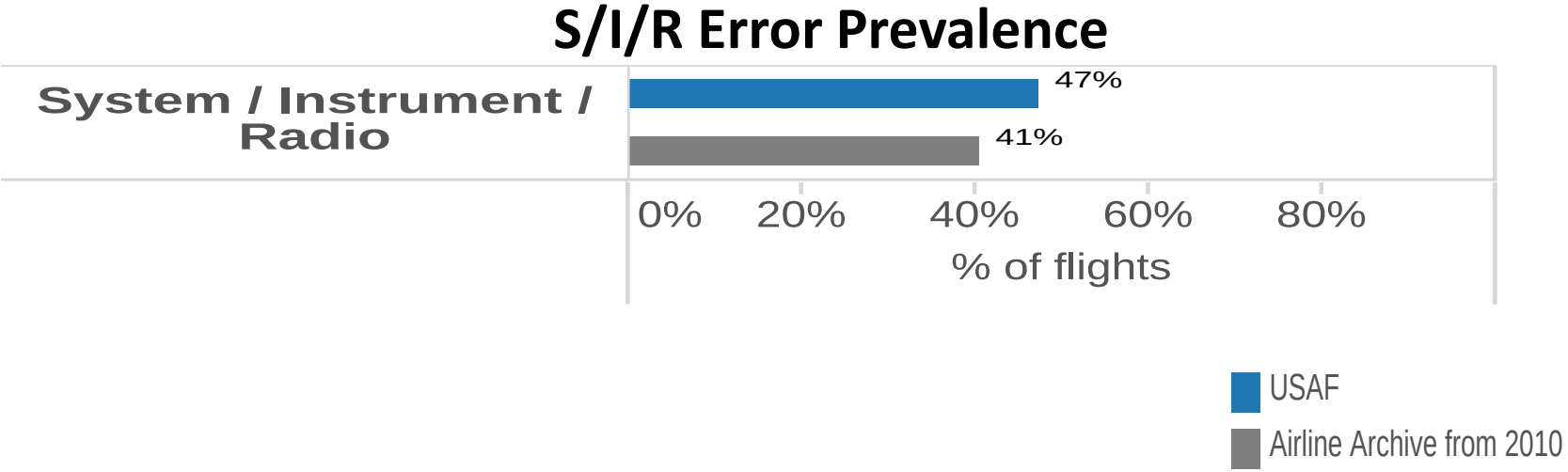
Errors

- System / Instrument / Radio
- Checklist
- Callout
- Intentional Non-Compliance

System / Instrument / Radio Errors

Error Prevalence - Similar across archives

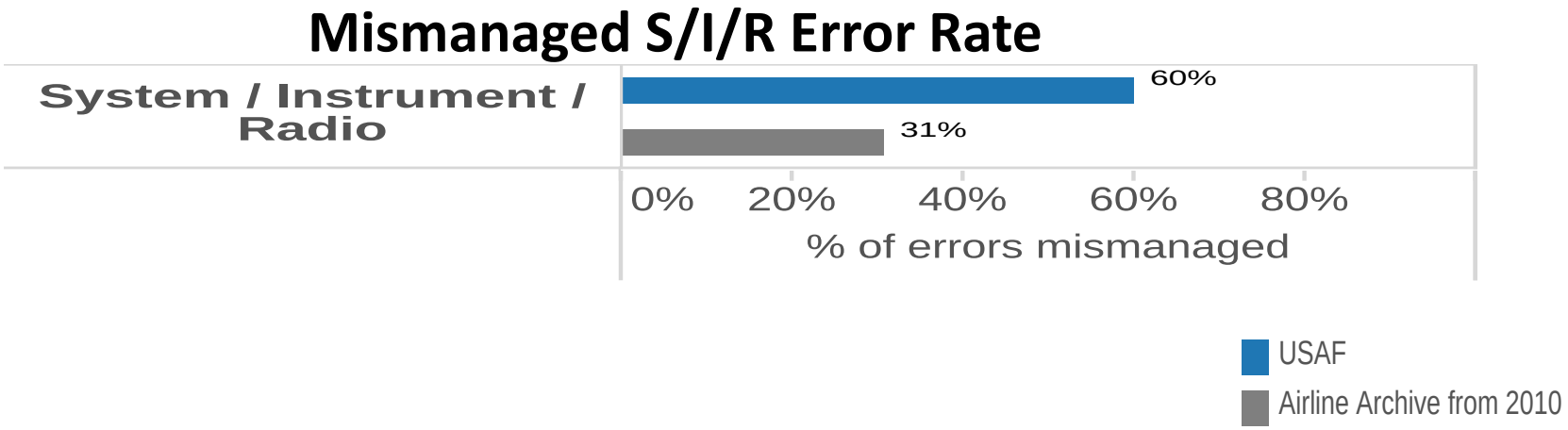
- Military Errors – Aircraft specific
- Airline Errors - Most frequently involve exterior aircraft lighting
- Common Connection…linked Checklist Errors?



System / Instrument / Radio Errors

Error Mismanagement

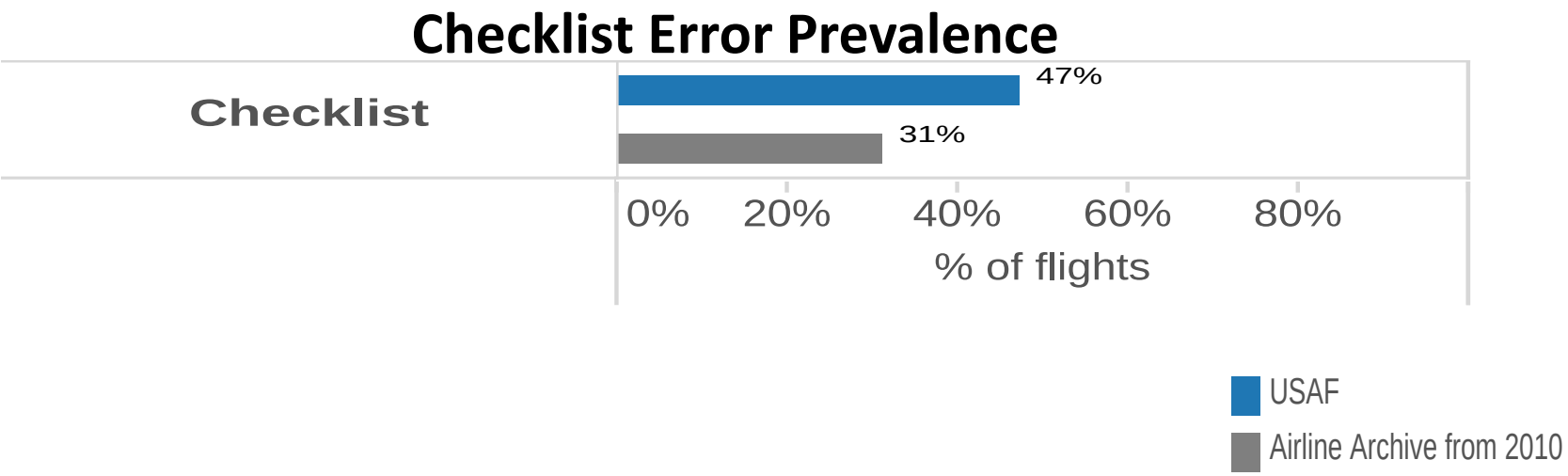
- Military S/I/R rate is double the airline rate
- ADD BULLET



Checklist Errors

Error Prevalence – Higher for Military Pilots

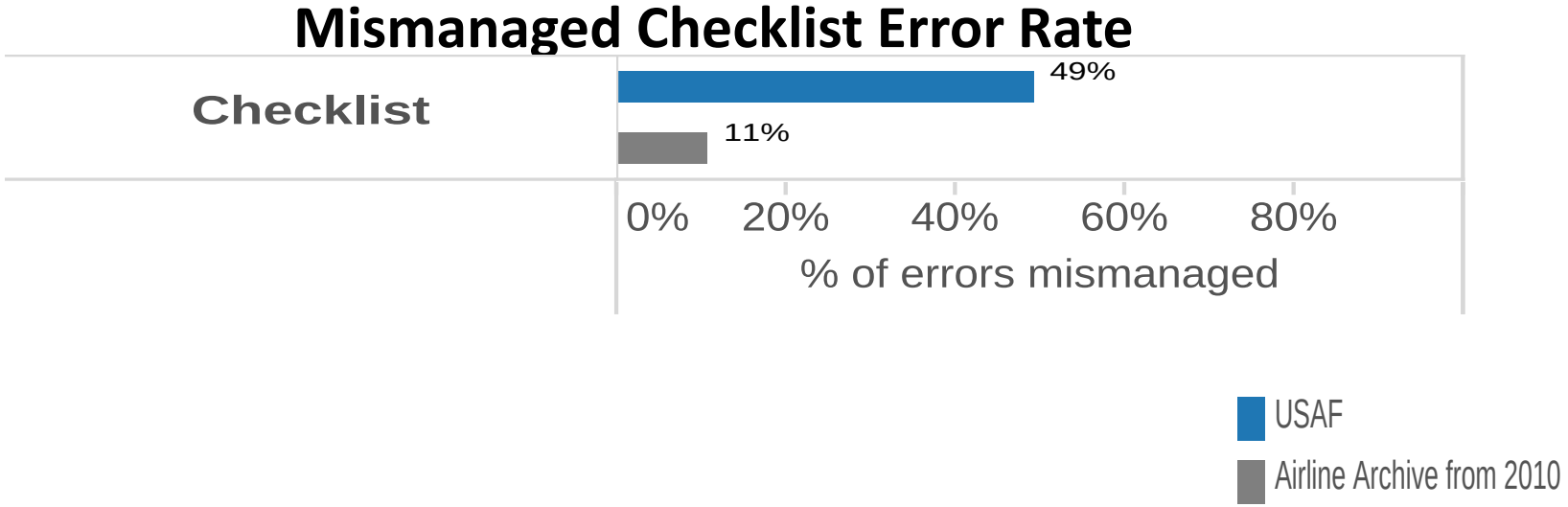
- Military Errors – Aircraft specific, related to System Instrument Radio Errors
- Airline Errors - Most frequently involve Checklist Performed from Memory



Checklist Errors

Error Mismanagement

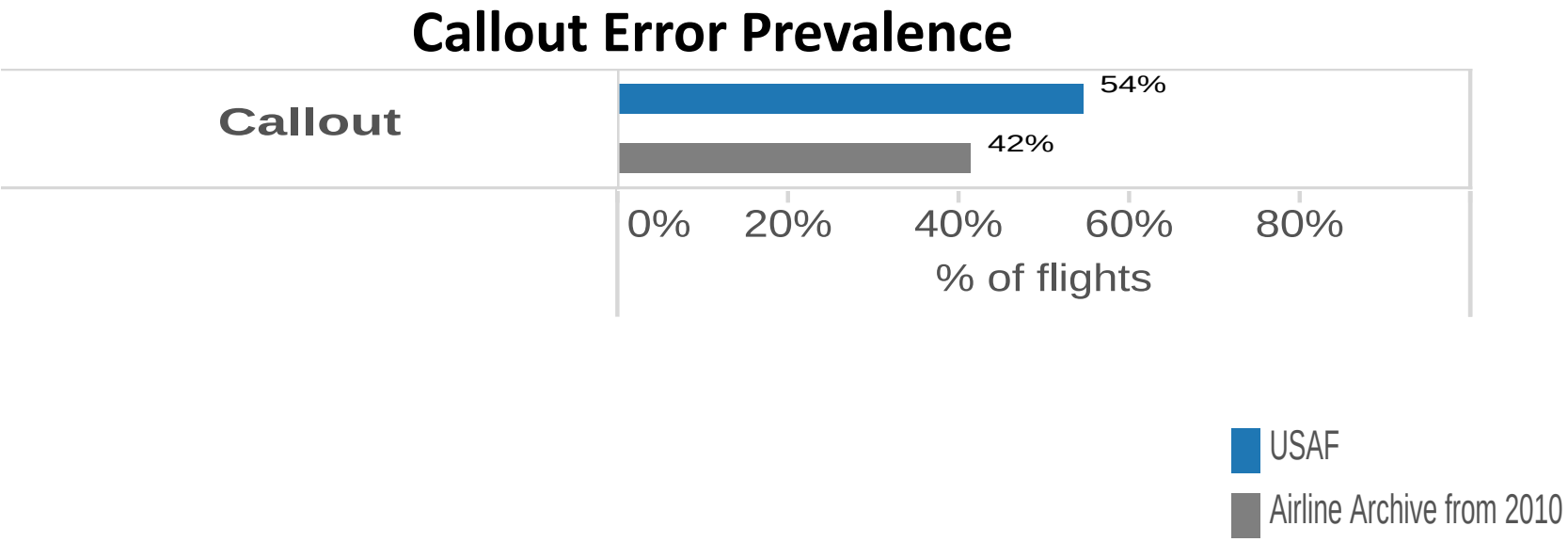
- Military Checklist rate is nearly 5 times the Airline rate
  - Military “Read + Do” versus Airline “Flow”
  - Result - Higher UAS rates due to failure to trap incorrect switch positions



Callout Errors

Error Prevalence – Military only marginally higher

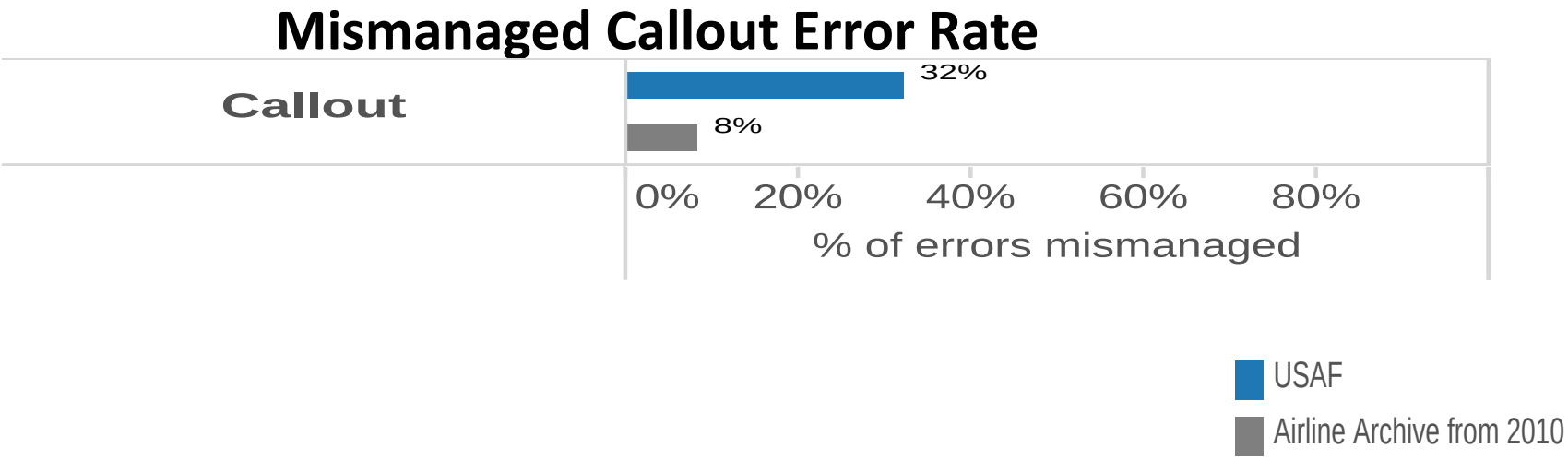
- Most Frequent across both Archives - 1000’ to Level Off Call
- Possible Predictor to Procedural Drift



Callout Errors

Error Mismanagement

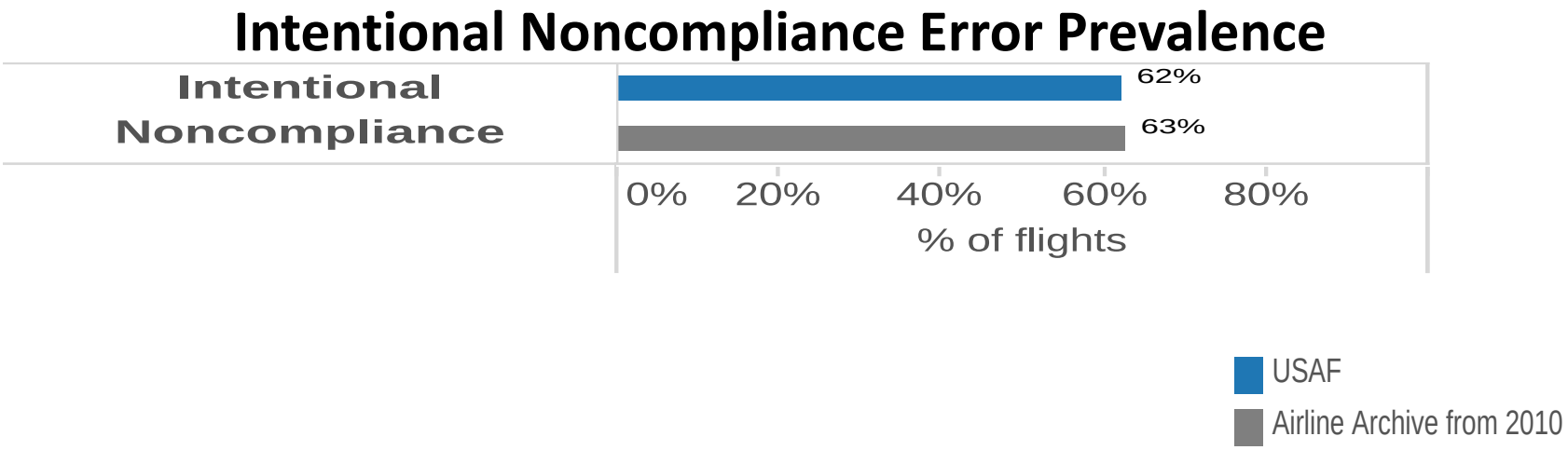
- Large disparity – Military 4 times greater
- Military missed Callouts - Often cascade to Additional Error or UAS
- Automation technology and Mission complexity contributory?



Intentional Noncompliance (INC) Errors

Prevalence - Nearly Identical

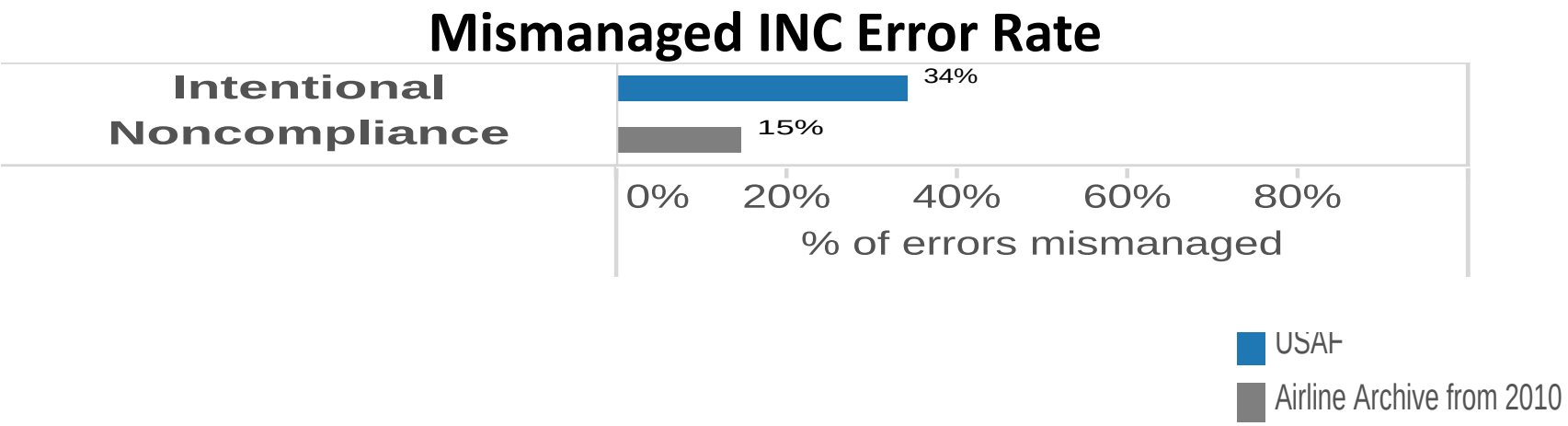
- “Pilots will be Pilots”
- Airline most Frequent - Checklist Performed From Memory
- Military most Frequent - Omitted Stable Approach Callouts



Intentional Noncompliance (INC) Errors

Error Mismanagement – Military 2X higher -- Implications

- Crew Self-Management of INC
- INC Mismanagement relationship to Unstable Approaches and Callouts



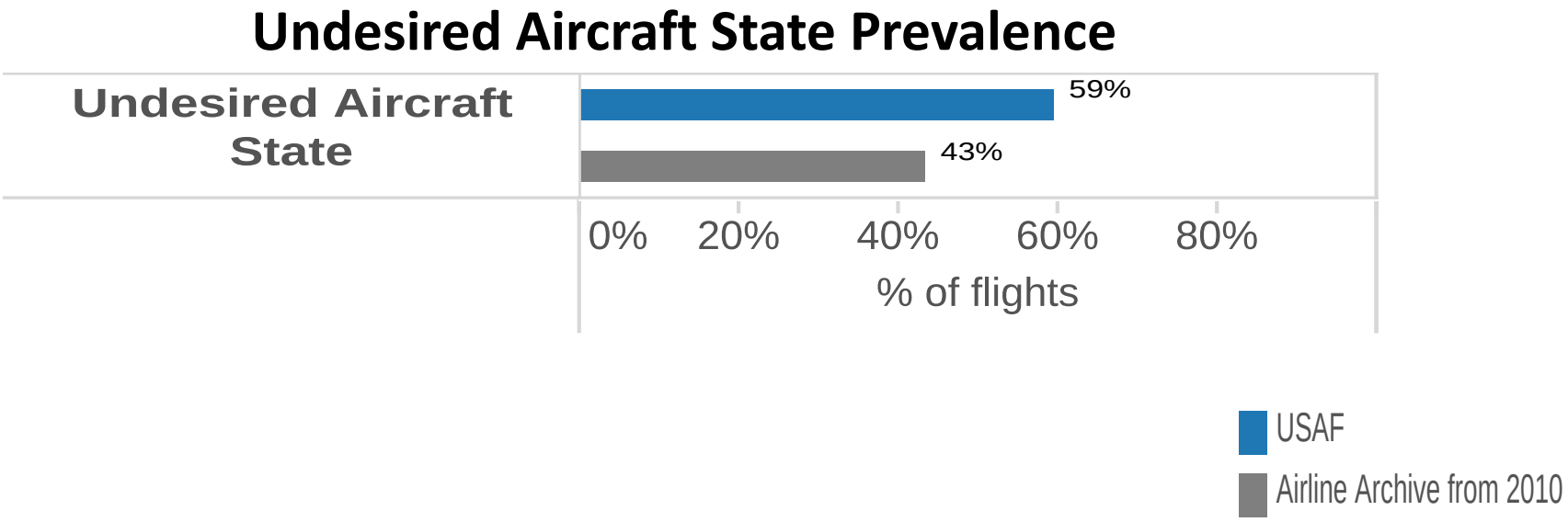
Undesired Aircraft States

- Mismanagement
- Unstable Approach

Undesired Aircraft States

Prevalence - Slightly higher in Military versus Airline

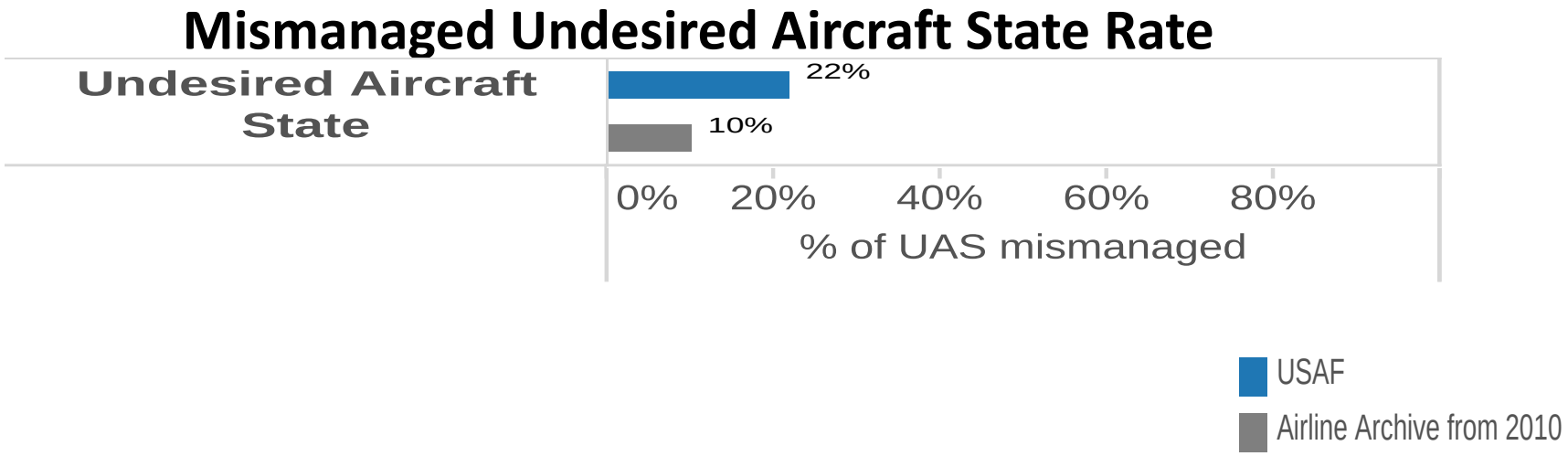
- Most frequent in both Archives - Incorrect Aircraft Systems Configuration
- Checklist Errors and Management become driving factors?



Undesired Aircraft States

Mismanagement – Double the rate for the Military

- Unstable Approach rates identical across the Archives
- Both groups - consistent 4% Unstable Rate Requiring a Go-Around



Discussion Topics

- Why the large disparities between the groups?
  - Not Black & White
  - As we peel the Onion
- Do you have a unique mission set in your organization?
  - Complex System(s)
  - Complex Operations & Environments
- Barriers to change?
  - Bureaucratic Red Tape: Ops Manual/Checklist Change's
  - Proactive Safety Culture: Promotes Change

Questions?

Unintentional vs. Intentional Noncompliance

- Unintentional Errors = Honest Slips, Lapses, Mistakes

To be coded intentional, the event must meet one of the following four conditions:

1. Pilots discussed they were going to break away from SOP
2. Procedural shortcut performed to save time and/or effort
3. Piloting risk when more conservative options or time was available
4. Error that happens multiple times within one phase of flight (log this event as one intentional noncompliance)

Effects of Intentional Noncompliance

TEM Indicator	Flights with zero Intentional Noncompliance errors	Flights with one Intentional Noncompliance error	Flights with two or more Intentional Noncompliance errors
% of observations	56%	24%	20%
Average number of threats per flight	4.4	4.7	4.8
Average number of errors per flight	1.9	3.7	6.6
% of flights with a mismanaged threat	23%	37%	50%
% of flights with a mismanaged error	27%	45%	65%
% of flights with an UAS	25%	42%	59%

Flight Crews With at Least One Intentional Noncompliance Error are 2-3 Times More Likely to Mismanage Threats and Errors

Background

The University of Texas Human Factors Research Project

- Early LOSA / TEM Research
- FAA funded (AAR-100) (presentations and publications)
- Early research on LOSA & TEM
- Publications on LOSA
- Formation of The LOSA Collaborative
- ICAO Document 9803 and FAA Advisory Circular 120.90