



Analysis & Implementation - the European Experience

IHSS 2009

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1. SETTING THE SCENE

2. METHODOLOGY

3. INTERIM RESULTS

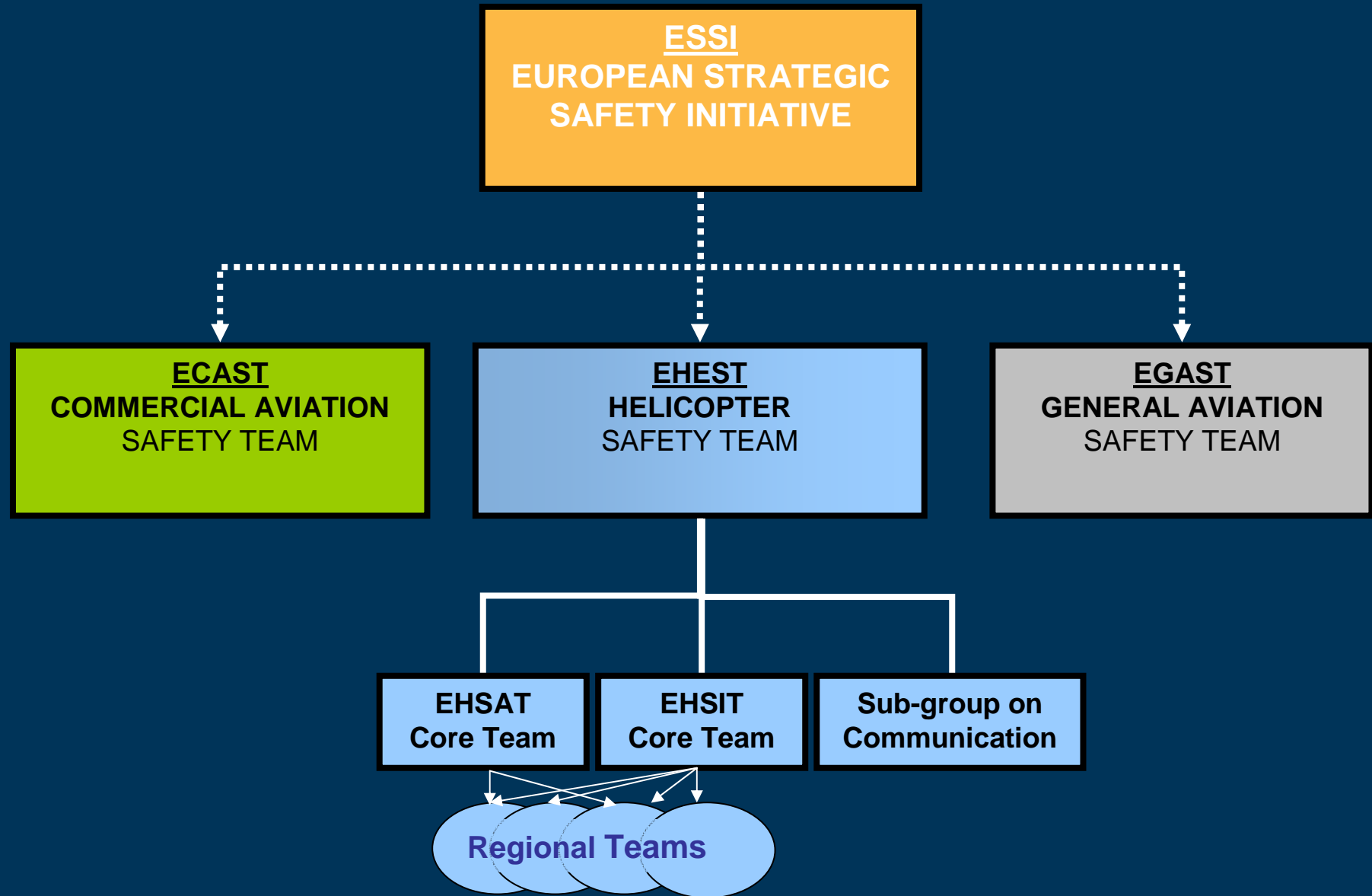
4. CONCLUDING REMARKS

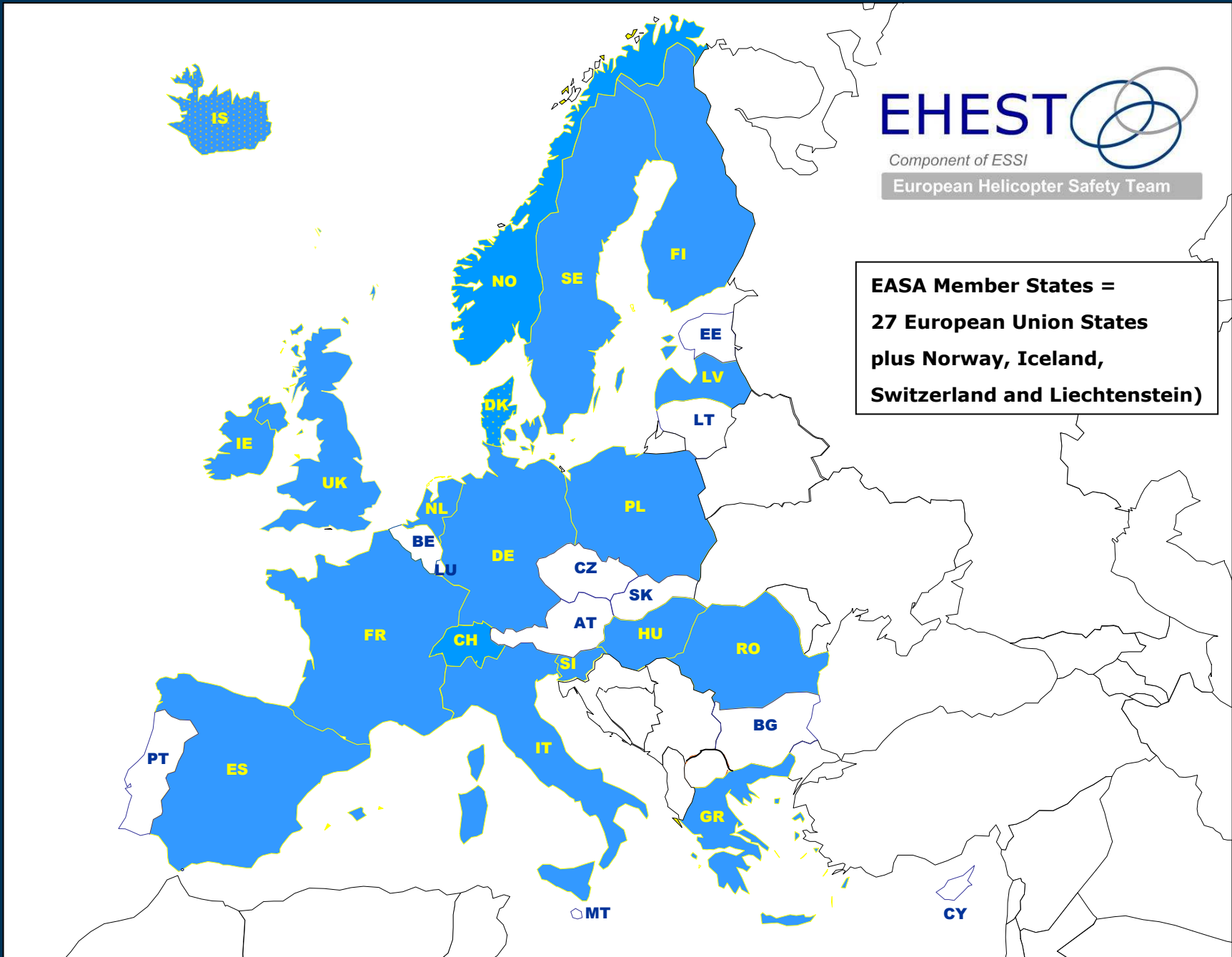


Photo Vasco Morao



EHEST is the helicopter component of ESSI
and the European branch of IHST





**EASA Member States =
27 European Union States
plus Norway, Iceland,
Switzerland and Liechtenstein)**

Why regional EHSAT analysis teams?

- Maximise usage of resources:
 - ✦ working on local data, less travelling
- Relations between partners already established
- Team aware of local context
- Implementations/action plans also have to be implemented on regional level
- Languages used in accident investigation reports

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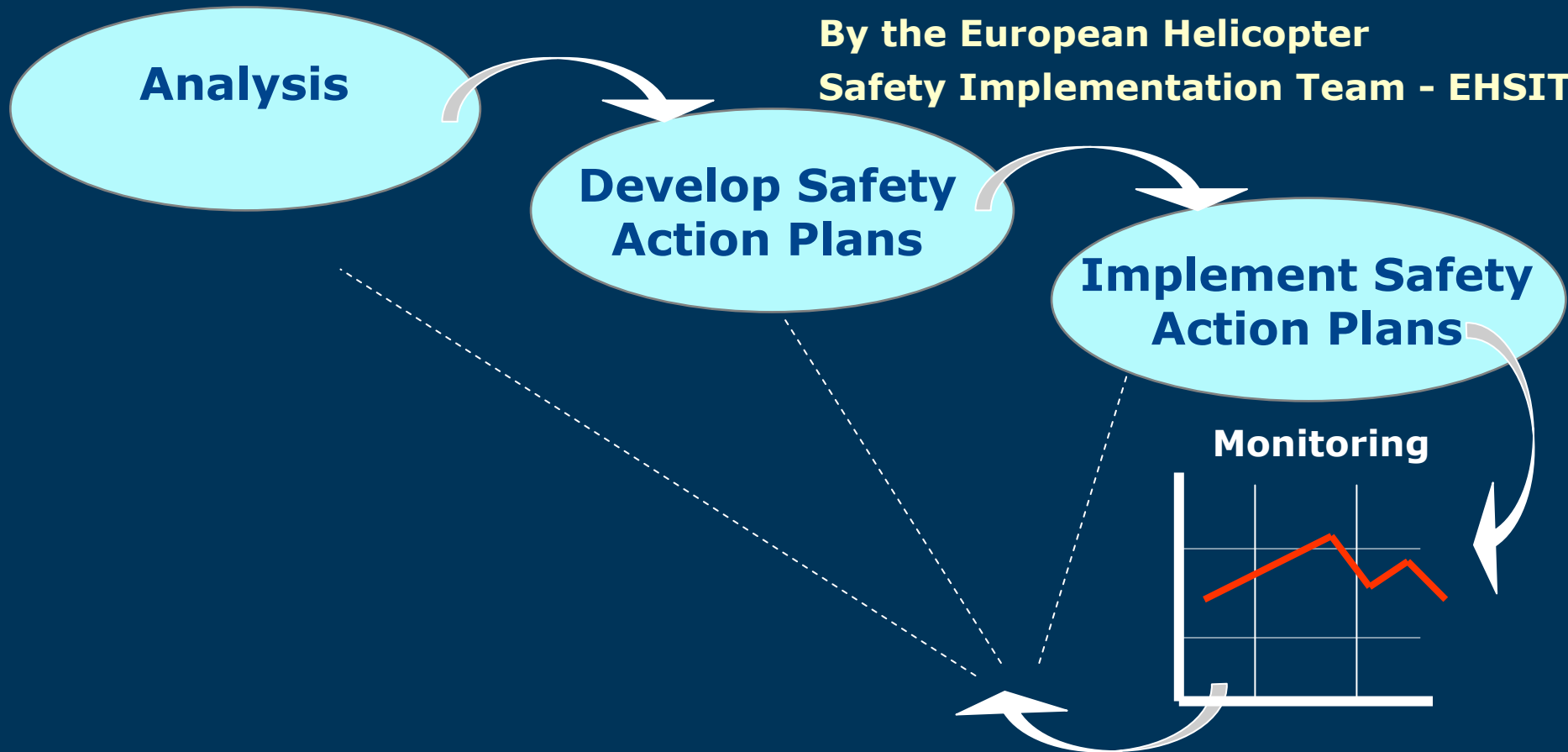


Photo Eurocopter

General Process

By the European Helicopter Safety Analysis Team - EHSAT

By the European Helicopter
Safety Implementation Team - EHSIT



Scope of analysis

- Helicopter Accidents (definition ICAO Annex 13)
- Date of occurrence period 2000 - 2005
- State of occurrence located in Europe
- Where an Accident Investigation Board final report is available

Approach

- Data driven approach
- Maintain international compatibility
 - ★ Reviewing accidents using a standard method adapted from IHST
 - ★ Added specific analysis on human factors (HFACS)
- Format allows comparison with data from other regions

Analysis Methodology EHSAT

1. Collect general occurrence information



2. Describe and analyse the accident



3. Assign standard codes to factors

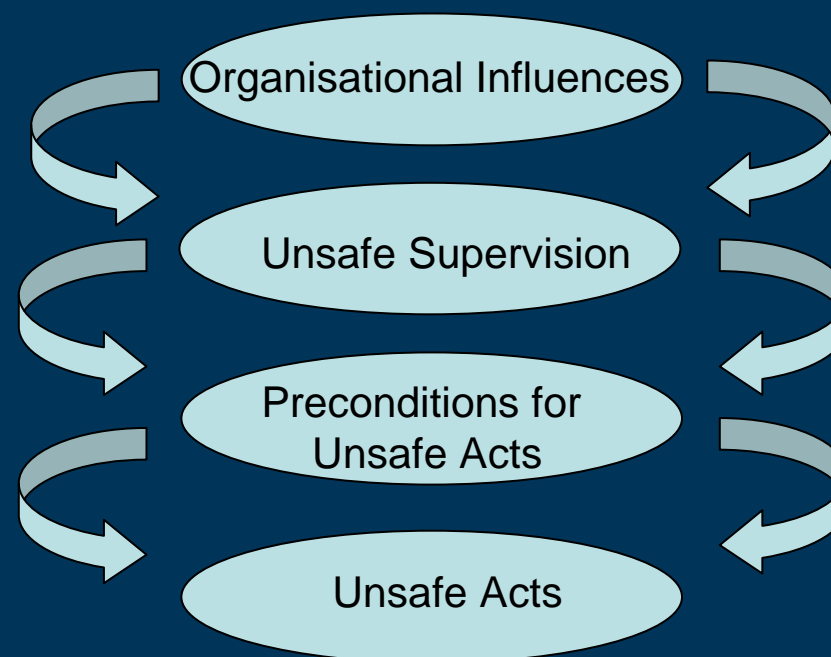
***Standard Problem Statements (SPS) and
Human Factors Analysis and Classification System (HFACS)***



4. Produce Intervention Recommendations (IR)

Human Factors Analysis and Classification System (HFACS)

- HFACS by Wiegmann and Shappell
 - ★ Proven tool for analysing unsafe acts / human errors and their causes
 - ★ Human error is the start of HFACS classification not the conclusion
 - ★ Over 170 codes in 4 areas



<http://hfacs.com/>

Benefits of using HFACS

- Human Factors (HF) need to be addressed if the objective of achieving an 80% reduction in helicopter accident rates by 2016 is to be realised
- HFACS is a well documented system based on a sound theoretical framework that addresses HF in a detailed and structured manner
- HFACS gives the opportunity to address errors and violations as well as organisational aspects
- Also gives the opportunity to address maintenance issues (HFACS ME)

1. SETTING THE SCENE

2. METHODOLOGY

3. INTERIM RESULTS

General Data

SPS and HFACS Analysis

Intervention Recommendations

4. CONCLUDING REMARKS



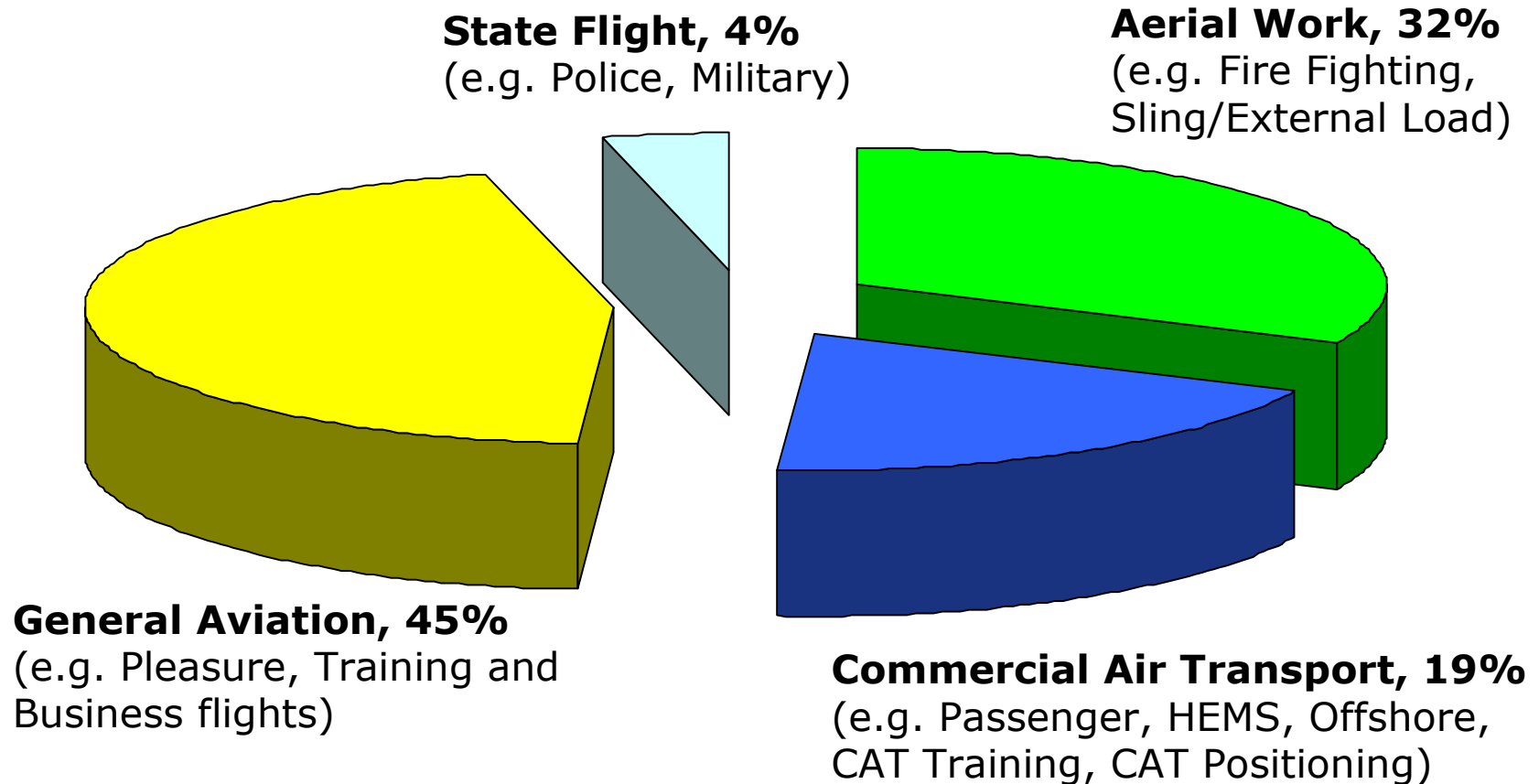
Photo AgustaWestland

Scope of interim dataset

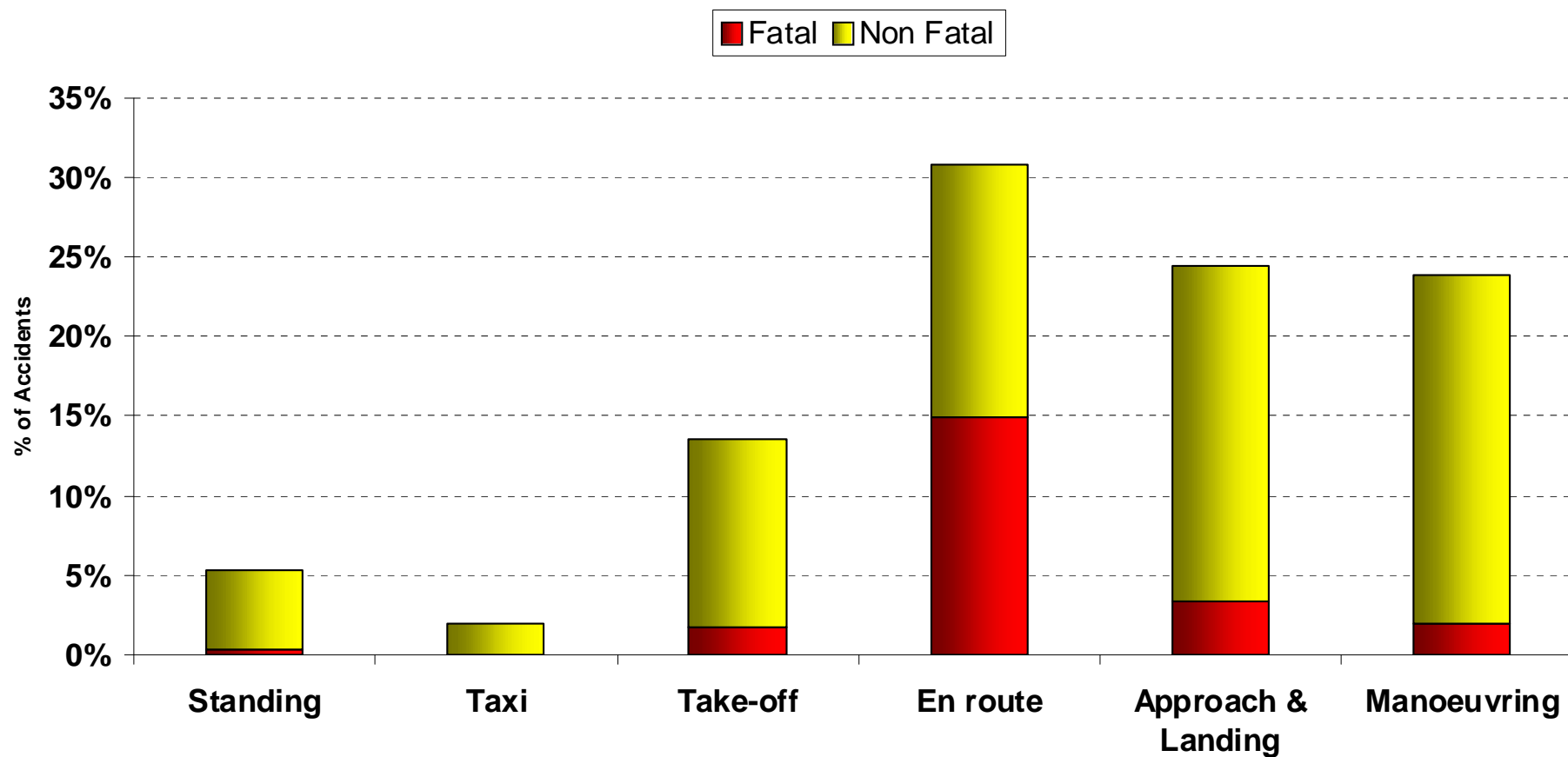
- Total of 303 accidents within timeframe 2000-2005 have been analysed (as of Aug 09)
 - ✦ Covers work from 11 Regional Teams across Europe
 - ✦ Estimated to be some 75% of the published reports available
- Standard Problem Statements
 - ✦ In total 1775 statements recorded
- HFACS
 - ✦ In total 818 factors recorded

Accident Distribution over Type of Operation

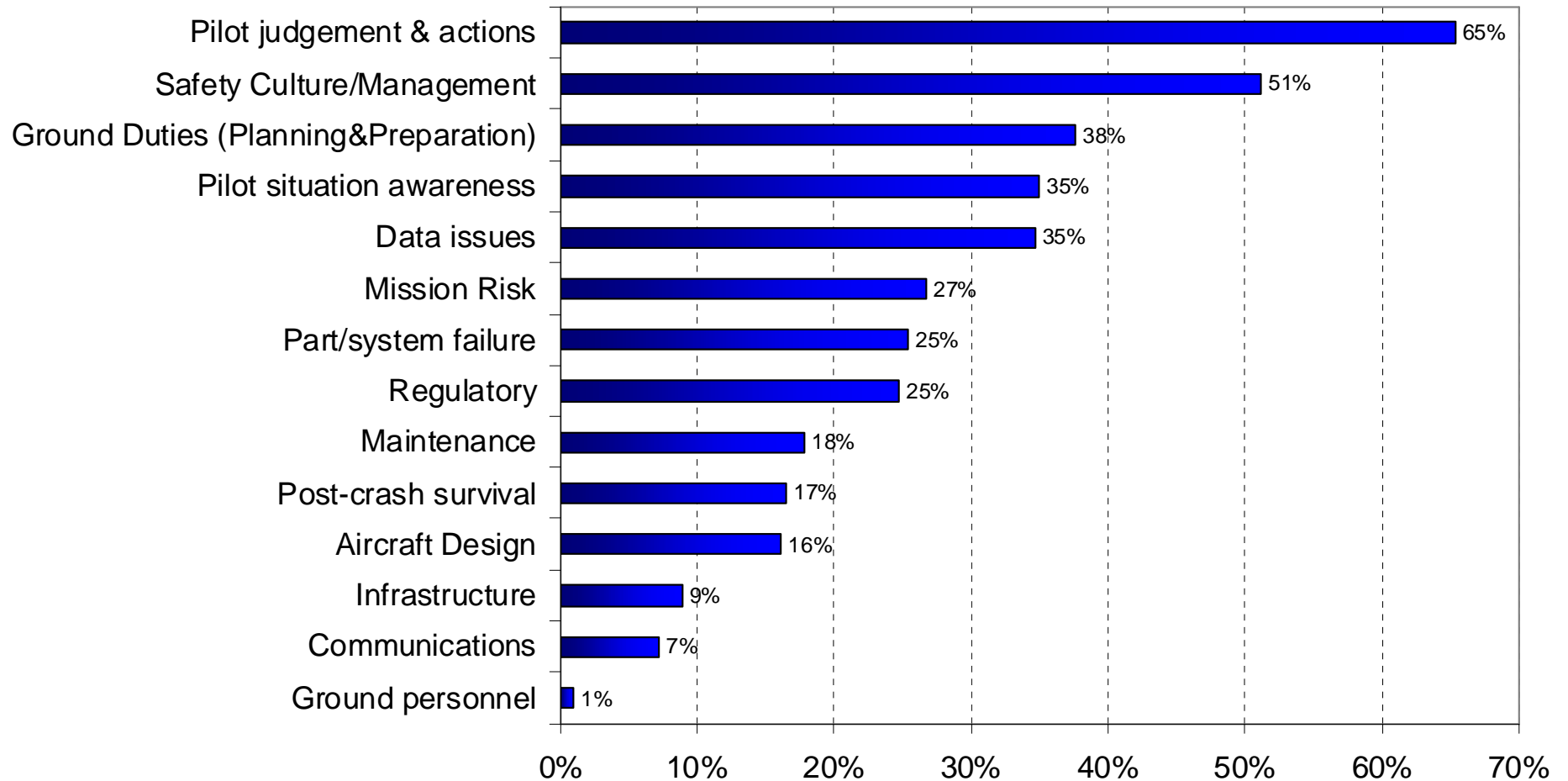
EHSAT Dataset



Accident Distribution over Phase of Flight EHSAT Dataset

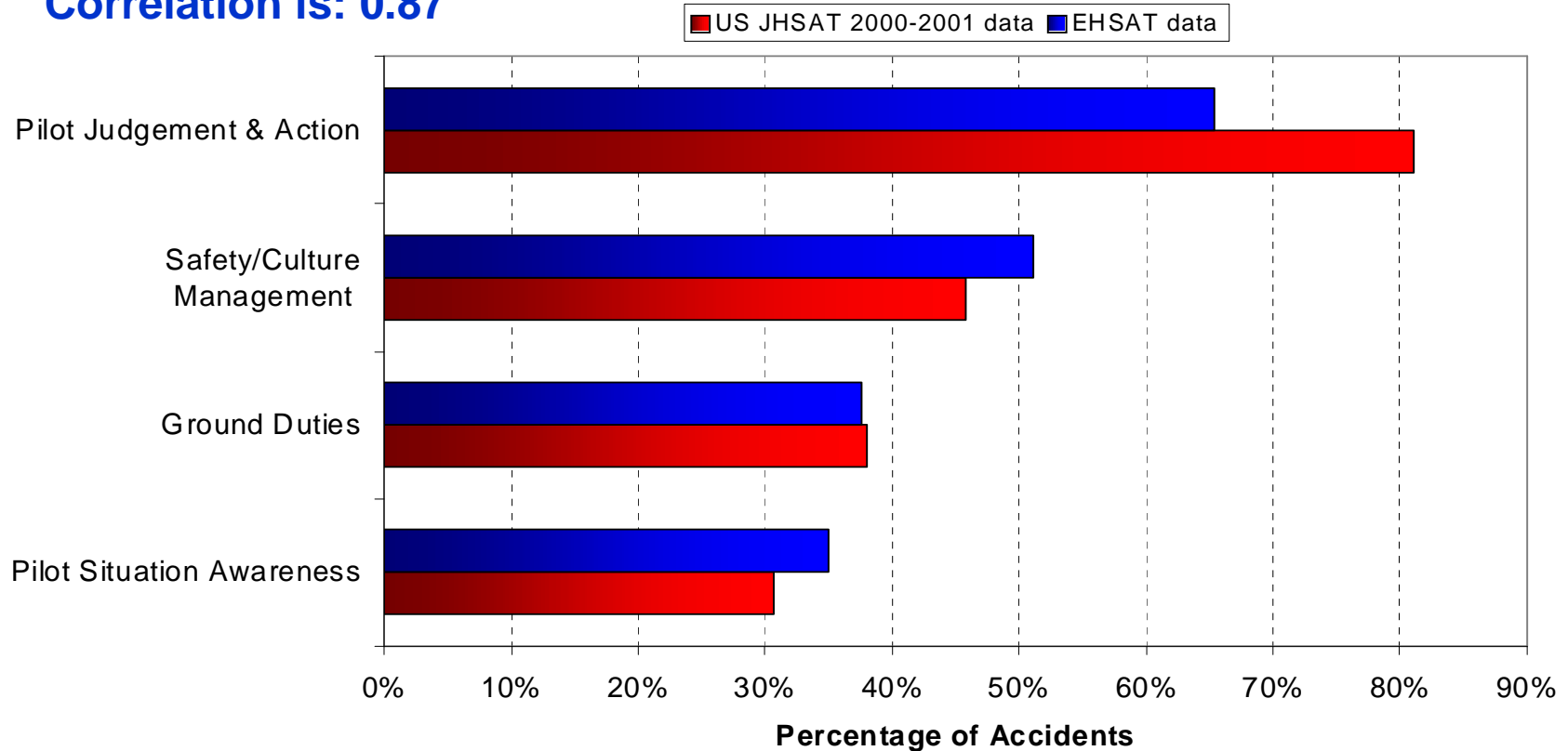


% of Accidents where SPS level 1 has been identified at least once EHSAT Dataset



Comparison of EHSAT data with US JHSAT data SPS level 1, Top 4

Correlation is: 0.87



- High correlation with US results on SPS level 1
- Lower levels SPS show some differences

Example scenarios

- Example accident scenarios presented for
 - ✦ Commercial Air Transport
 - ✦ Aerial Work
 - ✦ General Aviation – Pleasure Flight
 - ✦ General Aviation – Training
- Scenarios illustrate the most identified SPS statements and HFACS codes for the types of operation

An example Commercial Air Transport scenario

- During a HEMS mission after the patient had been loaded the helicopter crew decided to continue the mission in deteriorating weather conditions.
- The decision to continue was taken because an ambulance was waiting to transfer the patient to hospital.
- During the take-off in poor visibility and falling snow the right front skid of the helicopter struck the surface and as a result it nosed over uncontrollably and impacted the ground.

An example Commercial Air Transport scenario

- During a HEMS mission after the patient had been loaded the helicopter crew decided to continue the mission in deteriorating weather conditions.
Loss of Visual Reference
- The decision to continue was taken because an ambulance was waiting to transfer the patient to hospital.
Inadequate decisions
- During the take-off in poor visibility and falling snow the right front skid of the helicopter struck the surface and as a result it nosed over uncontrollably and impacted the ground.
Pilot felt pressure

An example Commercial Air Transport scenario

SPS

Pilot decision making

Self induced pressure

Failed to follow procedures

Flight profile unsafe

Inadequate oversight

Reduced visibility

Selection of inappropriate landing site

Management – Failure to enforce company SOPs

HFACS

Decision Making - Operation

Risk assessment – Operation

Skill-based errors

Whiteout/Vision restricted

Channelized attention

Communication critical information/Planning

Pressing

Procedural Guidelines

An example Aerial Work scenario

- A Pilot had been tasked to carry out aerial application of a field using the helicopter.
- Prior to commencing the aerial work task the pilot did not carry out an inspection of the intended operating area.
- During the course of the sortie the wind direction changed and the pilot was forced to adjust his spraying pattern.
- As result his new flight path brought him into conflict with some trees.
- While trying to manoeuver to avoid the trees the pilot struck a power line and as a result the helicopter lost control and crashed.

An example Aerial Work scenario

- A Pilot had been tasked to carry out aerial application of a field using the helicopter.
Inadequate pre flight preparation
- Prior to commencing the aerial work task the pilot did not carry out an inspection of the intended operating area.
Distracted by presence of trees
- During the course of the sortie the wind direction changed and the pilot was forced to adjust his spraying pattern.
Pressure to complete task
- As result his new flight path brought him into conflict with some trees.
- While trying to manoeuver to avoid the trees the pilot struck a power line and as a result the helicopter lost control and crashed.

An example Aerial Work scenario

SPS

Mission involves flying near hazards

Mission requires low/slow flight

Inadequate consideration of obstacles

Pilot decision making

Diverted attention, distraction

Selection of inappropriate landing site

Customer/company pressure

HFACS

Risk assessment - Operation

Decision making – Operation

Channelized att./Inattention

Misperc. of operational cond.

Mission Planning

Excessive motivation to succeed

Fatigue

Supervision inadequate

Doctrine

An example General Aviation – Pleasure flight scenario

- The helicopter was on a Visual Flight Rules flight. En route, it entered an area of rising terrain and low cloud base.
- Radar tracking indicates that the helicopter slowed down, and then made a sharp turn before disappearing off the screen.
- Shortly after the loss of radar contact the helicopter suffered an in-flight collision with terrain.

An example General Aviation – Pleasure flight scenario

- The helicopter was on a Visual Flight Rules flight.
No weather forecast obtained
low cloud base.

- Radar tracking indicates **No flight plan filed**
slowed down, and then made a sharp turn before
disappearing off the screen.

- **No contact established with ATC**
Shortly after the loss of radar contact the
helicopter suffered an in-flight collision with

Inadvertent IMC

Limited experience

An example General Aviation – Pleasure flight scenario

SPS

Pilot inexperienced

Mission planning

Pilot decision making

Inadequate standards and regulations

Wilful disregard for rules and SOPs

Inadvertent entry into IMC

Failed to recognise cues to terminate course of action

HFACS

Risk assessment – Operation

Overcontrol/Undercontrol

Procedural error

Violation – Lack of discipline

Mission planning

Overconfidence

Vision restricted by meteorological conditions

Limited total experience

An example General Aviation - Training scenario

- The dual exercise was for the student to practise emergency and autorotational landings.
- The landing area selected for the exercise was muddy with a forecast wind speed of 26 kts.
- As part of the exercise the flight instructor simulated an engine failure without any prior warning.
- During the subsequent autorotation the instructor allowed the rotor RPM to drop below the minimum.
- The helicopter contacted the ground with a high sink rate and rolled over.

An example General Aviation - Training scenario

- The dual exercise was for the student to practise emergency and autorotational landings.

Mission planning regards terrain and weather

- The landing area selected for the exercise was muddy with a forecast wind speed of 26 kts.

Insufficient briefing of the student on the training plan

- As part of the exercise the flight instructor simulated an engine failure without any prior warning.

Student control inputs uncoordinated

- During the subsequent autorotation the instructor allowed the rotor RPM to drop below the minimum.

The flight instructor interacted too late

- The helicopter contacted the ground with a high sink rate and rolled over.

An example General Aviation - Training scenario

SPS

Inadequate and untimely CFI action to correct student action

Pilot decision making

Perceptual judgment errors

Inadequate mission planning:
Weather and wind

Training program management: CFI preparation and planning

Inadequate landing procedures

HFACS

Risk assessment – Operation

Procedural error

Overcontrol/Undercontrol

Overconfidence

Necessary action – Delayed

Mission briefing

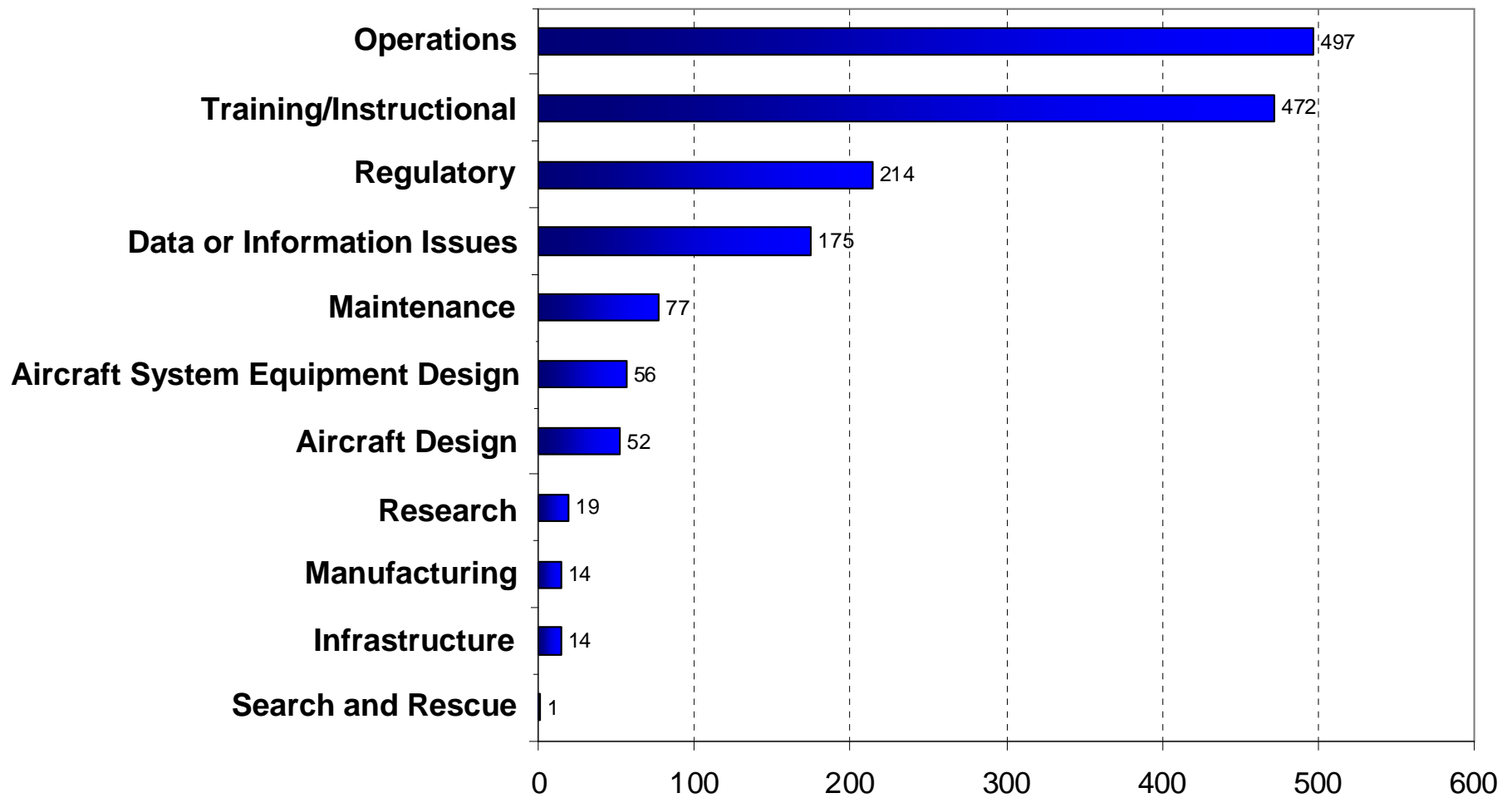
Leadership/Supervision/
Oversight inadequate

Training Program/Guidelines

Intervention Recommendations

- In total 11 Intervention Recommendation categories identified
- The categories help identify areas for working groups of EHSIT
- Note: some categories overlap but this suggests areas for additional focus

Total number of Intervention Recommendations (Level 1)



EHSIT data preparation

- Refinement of the Intervention Recommendations
 - ★ Level 2 categorisation has been created
 - ★ 1591 IRs undergoing consolidation by EHSIT Plenary
- Specialist teams on SMS/Operations and Training launched so far



Photo Martin Bernandersson

Consolidated IRs – SMS/Operations

- SMS: Should be adopted and applied by all operators
- SOPs: Should be prepared and applied for all activities
- RISK ASSESSMENT/PRE-FLIGHT PREPARATION: Emphasise the importance of Risk Assessment in mission planning

Consolidated IRs – SMS/Operations

- SAFETY CULTURE: Develop an engagement/communication plan to promote adherence to:
 - ★ the core principles of basic airmanship
 - ★ risk assessment
 - ★ rule compliance
- AIRCRAFT PERFORMANCE: Reinforce familiarity with Flight Manual through awareness campaign and consider formal examination during annual flying check

Consolidated IRs - Training

- **INEXPERIENCED PILOTS:** Training syllabus for ab-initio pilots should cover in more detail:
 - ✦ Mission planning
 - ✦ Vortex Ring / LTE
 - ✦ Autorotation and other emergencies
 - ✦ Passenger management
- **DEGRADED FLIGHT CONDITIONS:** Specific training to improve decision making process for pilot before and after inadvertent entry into IMC

Consolidated IRs - Training

- TRAINING PSYCHOLOGY/HUMAN FACTORS:
Enhance instructor training in:
 - ✦ Monitoring students
 - ✦ Application of human factors principles
 - ✦ Instructor intervention criteria

Concluding remarks

- The top 4 identified SPS areas are:
 - ✦ Pilot judgment & actions
 - ✦ Safety culture/management
 - ✦ Ground duties/Mission preparation
 - ✦ Pilot situation awareness
- High correlation with US results on SPS level 1
- Differences can be observed for the various types of operation
- HFACS enhances the analysis of human factor issues

Concluding remarks

- Work continues within EHSIT:
 - ✦ The first two specialist teams (SMS/Operations and Training) were launched in September 2009
 - ➔ Data driven analysis
 - ➔ ECAST SMS and various safety culture material available for consideration
- Attention on communication with stakeholders
 - ✦ Private pilots, organisations, regulators...
 - ✦ EHEST Communications Sub-Group established
 - ➔ Liaising with EGAST (common challenges)

EHEST

Component of ESSI

European Helicopter Safety Team

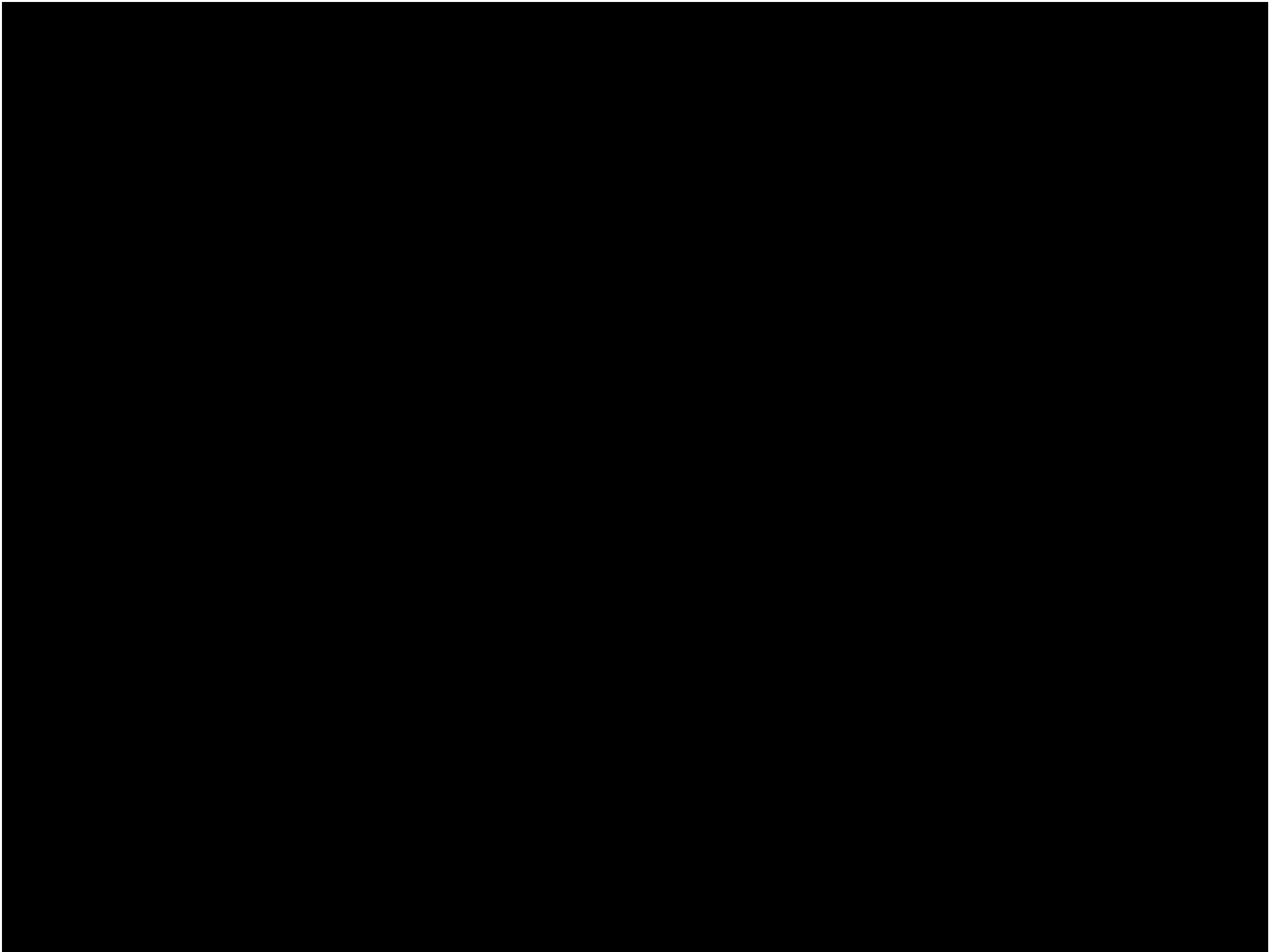


The challenge now is to develop, implement and monitor effective measures to meet the 80% accident rate reduction target

Thank you for your attention

Questions?

Mailbox: ehest@easa.europa.eu

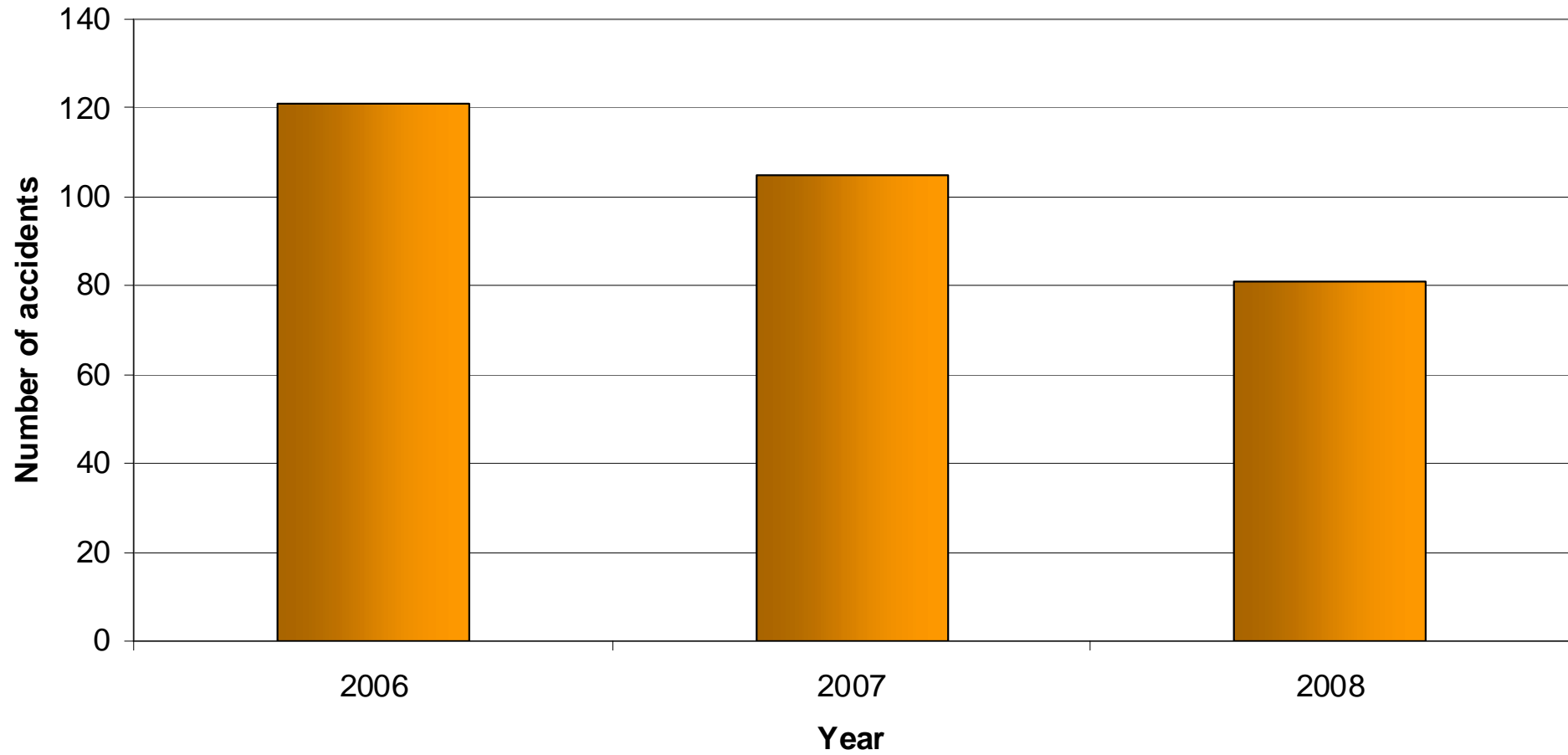


Annex

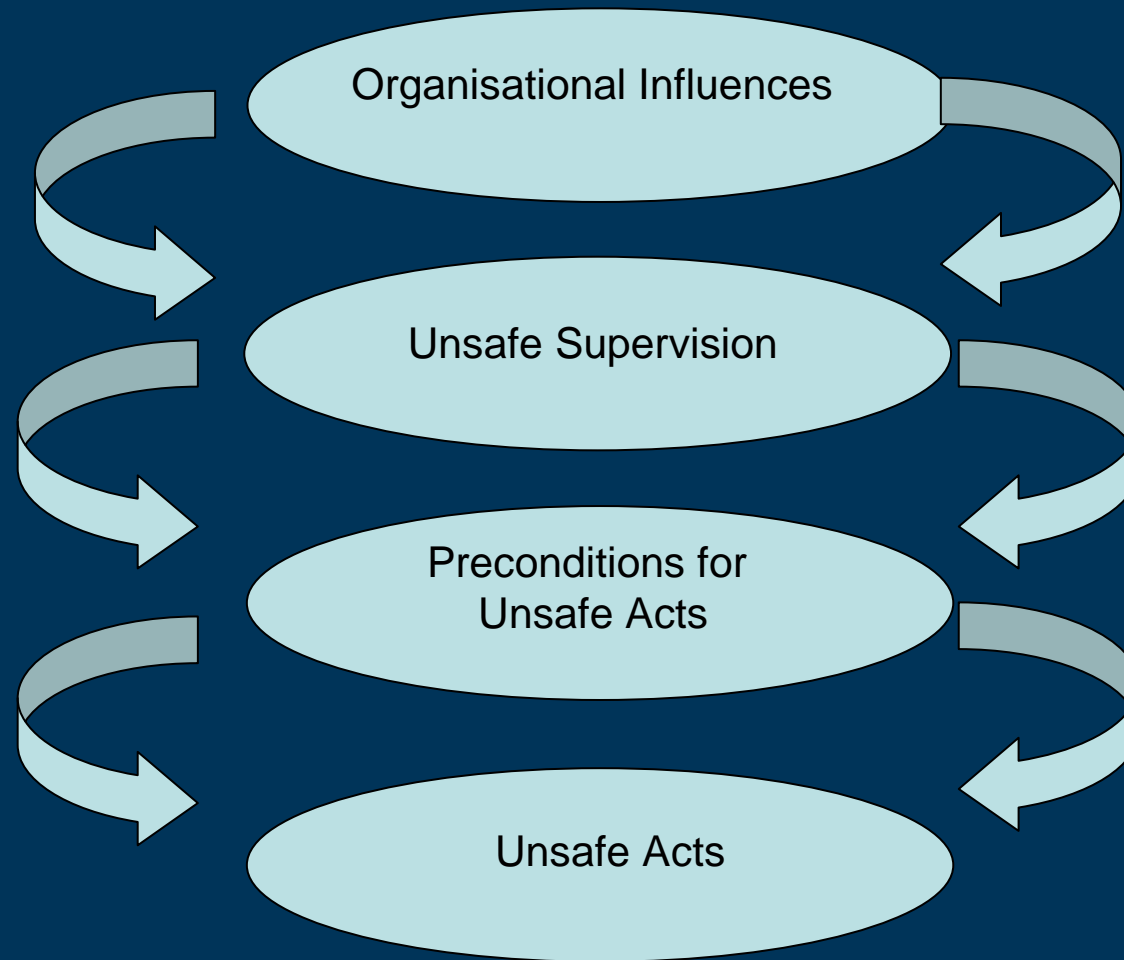
Number of Helicopter Accidents per Year

EASA MS Registered, CAT+AeW+GA

Source: EASA Annual Safety Review

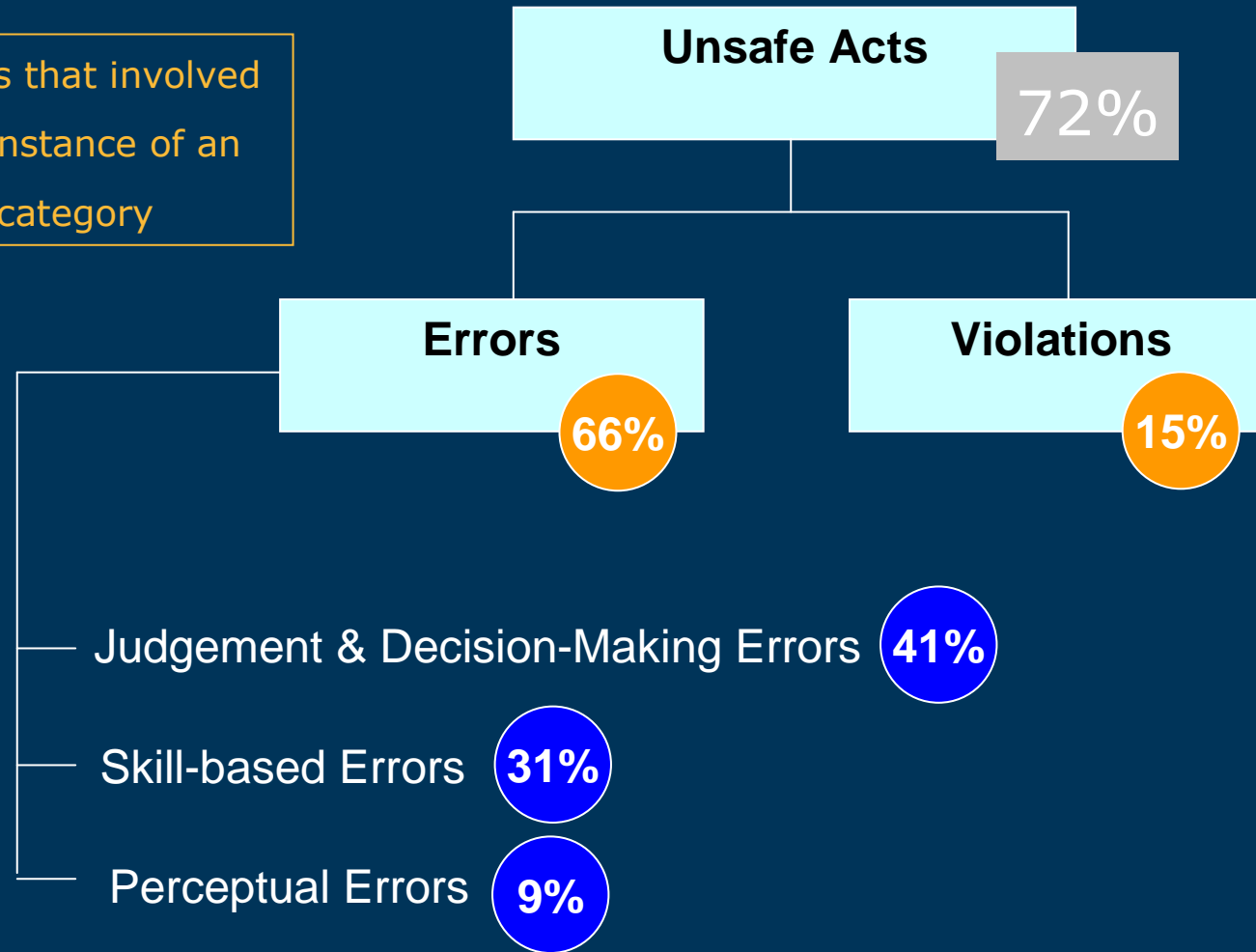


HFACS Overall Picture



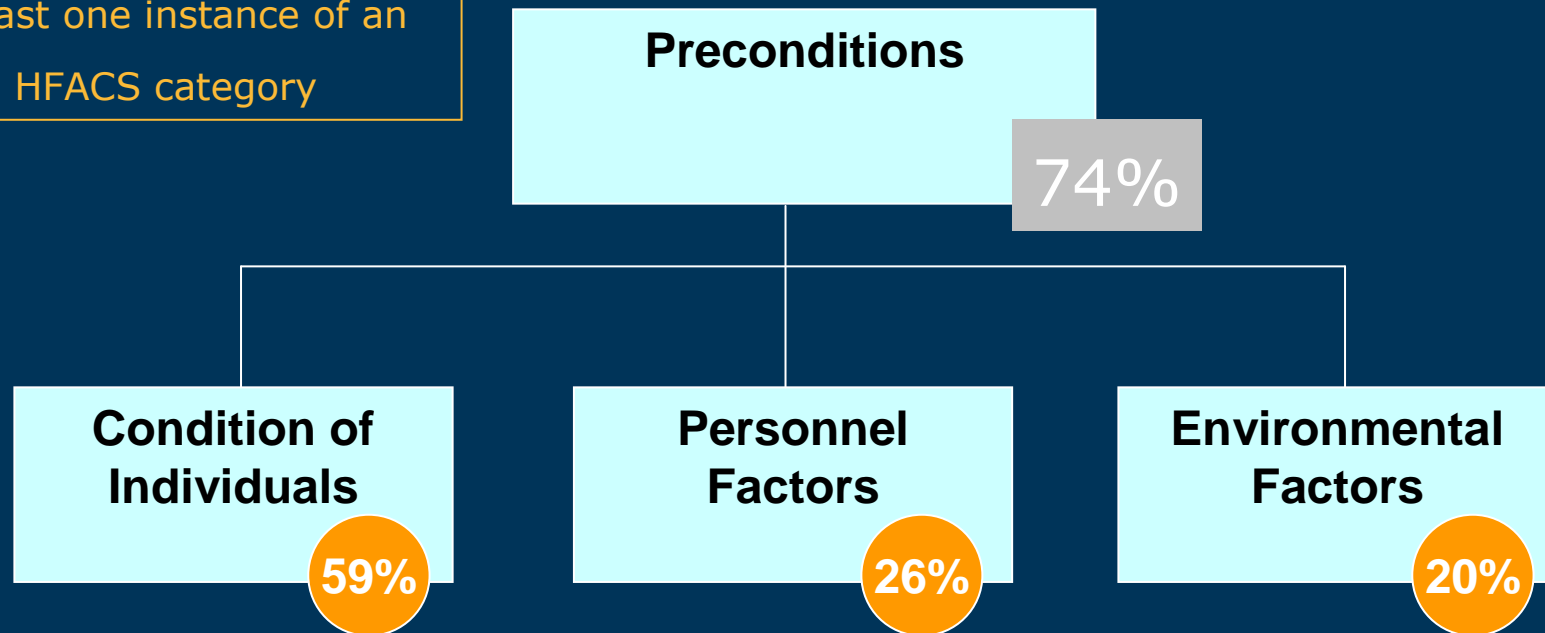
HFACS model – upper levels

% of Accidents that involved at least one instance of an HFACS category



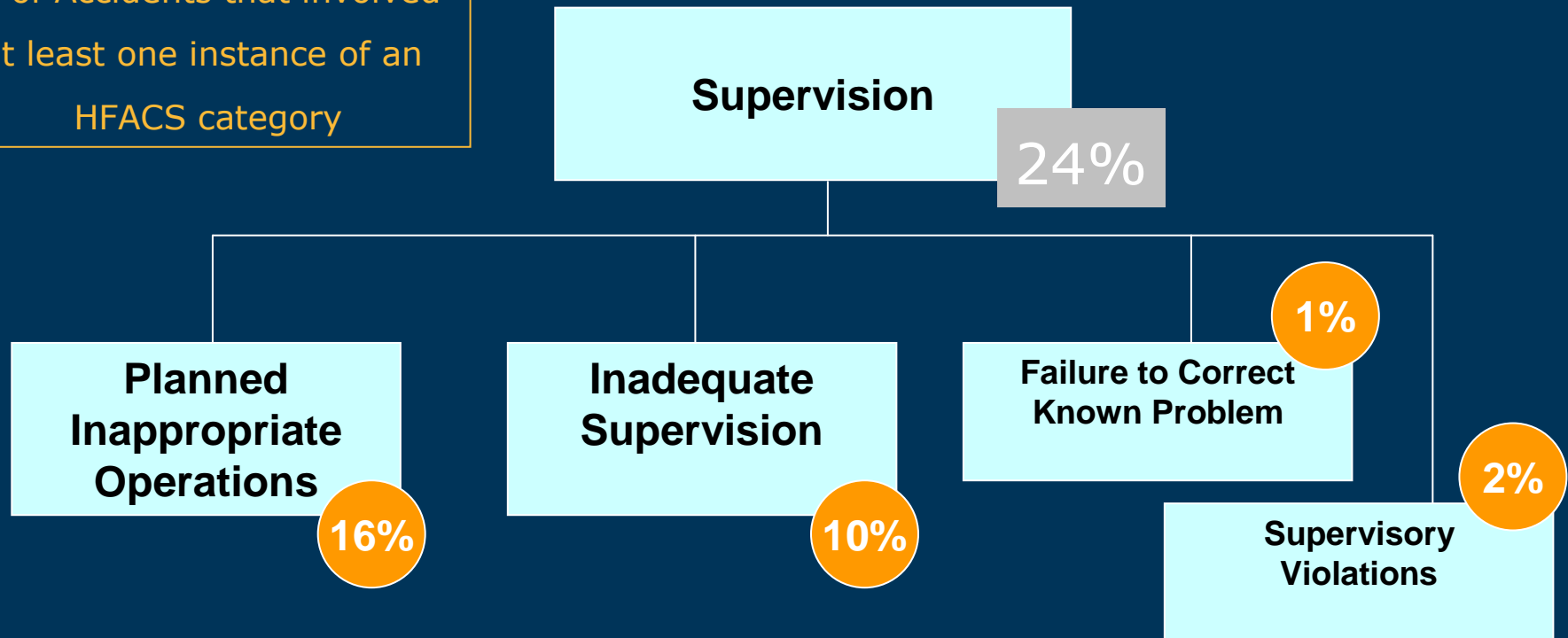
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