International Helicopter Safety Team
US-JHSAT
CY2001 Analysis

Jim Grigg, FAA
Jack Drake, HAI
IHST/JHSAT Co-Chairs

Overview

- Analysis Process
- Differences in Analysis Method
- Report Structure
- Comparison to CY2000
- Preliminary CY2006 Analysis
- Conclusions

Analysis Process

- Review the NTSB accident file
  - Develop the event sequence
  - *Identify occurrence types
  - Identify problems (Standard Problem Statements)
  - Identify interventions (Intervention Recommendations)
- Roll-up the SPS – IR pairs
- *Prioritize by the number of accidents in which they occur
- *Develop recommendations by Occurrence Type

* New in CY2001 analysis

Differences in Analysis Method

- More mature process allows for faster analysis
- Building on the analysis tool developed by EHEST
  - Minor differences in SPS and IR due to Operational differences
  - Coded Intervention Recommendations
  - Comment field used more extensively
- “Occurrence” taxonomy (adapted from ICAO)
- Recommendations are based on number of accidents in which the recommendation was made rather than frequency of use.

Occurrence Types

- JHSIT requested analysis by accident type
  - 80% of CY2000 recommendations applied to all
  - Needed a way to prioritize implementation tasks
- CAST/ICAO Common Taxonomy Terms
  - Taxonomy developed for transport airplanes
  - EHEST proposal to incorporate rotorcraft terms
  - US JHSAT modified taxonomy
    - Finer detail in occurrence type for targeted recommendations
- Helicopter Taxonomy Working Group

Occurrence Types
Primary Category

ADRM – Airport	ICE
AMAN – Abrupt Maneuver	LOC – Loss of Control
ARC – Abnormal Runway Contact	LZ – Landing Zone
AUTO – Autorotation	RAMP
CFIT	SCF – System/Component Failure
DITCH	STRIKE
DATA	UNK – Unknown/Other
EXTL – External Load	VIS - Visibility
FIRE	WSTRW – Windshear/Thunderstorm
FUEL	

Occurrence Types
Secondary Category Example

PM - Performance Management

TD - Tie-downs/hoses

DR - Dynamic Rollover

SP - Settling w/ power

Loss of Control

OL - Exceeding Operating Limits

GR - Ground Resonance

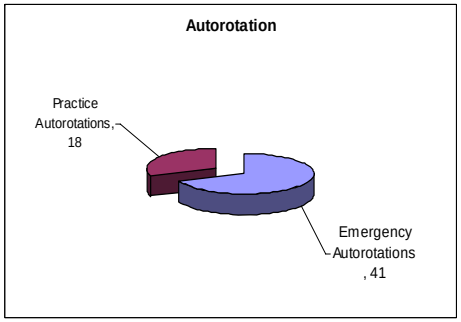
EP - Emergency Procedures

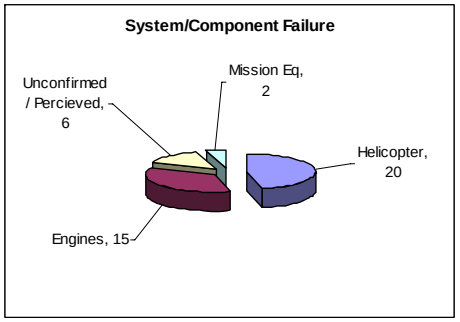
UNK - Unknown

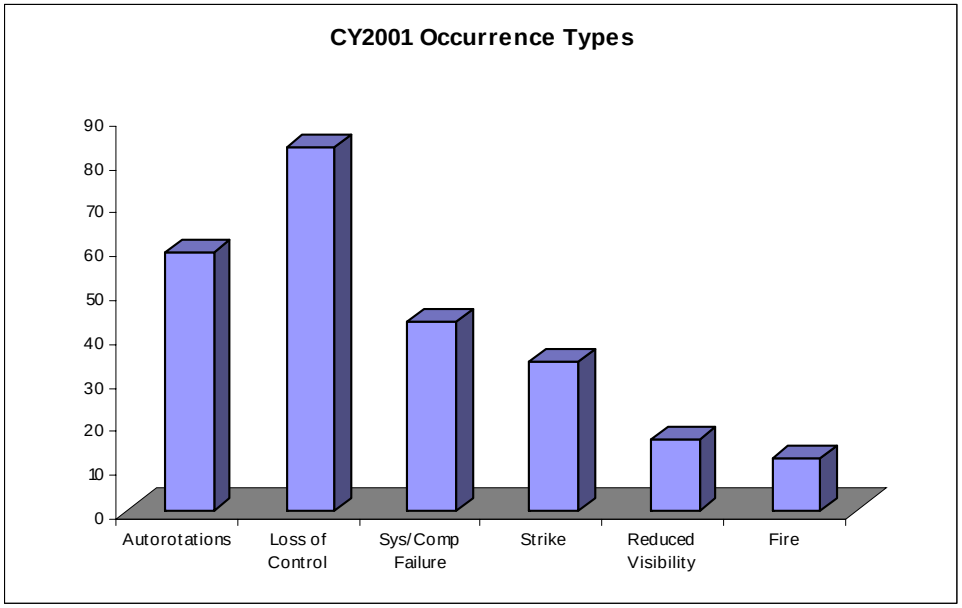
LTE - Loss of T/R Effectiveness

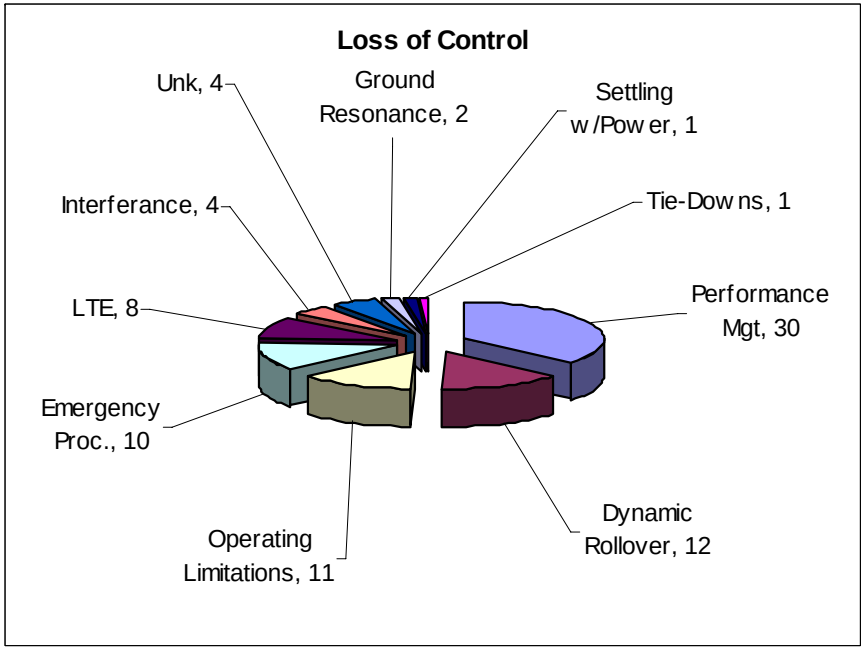
INT - Interference with Controls

CY2001 Occurrence Types









Report Structure

- Sections for each Occurrence Type
  - Definition
  - Characteristics
  - Standard Problem Statements
  - Intervention Recommendations
  - Relationships to other Occurrence Types
  - Comparison between CY2000 and CY2001
  - Conclusion
  - Recommendations
- Overall Comparison to CY2000
- Recommendations for CY2001
- Appendix D – Occurrence Category by Mission Summary

LOC-PM Occurrence

- Occurred in 10 mission categories. Training and Personal flying had greatest involvement.
- Practice autorotations – improper airspeed and/or rotor rpm not maintained. CFI – late interventions.
- Abrupt/inappropriate control handling
- Planning - Inappropriate consideration of tailwind or density altitude (high, heavy, and hot)
- Decision-making – Hover out of ground effect
- Inadvertent descent

LOC-PM Recommendations

- Enhanced CFI initial/recurrent training with emphasis on best practices, power management, control handling, and decision-making cues for when to intervene
- Training emphasis on common operational errors and awareness of cues critical for safe flight
- Acquire and use simulators (or training devices) to improve training quality and reduce risk in training.
- Greater emphasis on power management in all training maneuvers – especially autorotations
- Provide risk awareness/management training, with focus mission risk. Provide SOP and oversight to reduce mission risk.

SCF Occurrence

- 37 confirmed part/system failure events (21% of all accidents).
- 29/37 accidents (78%) involved maintenance factors, most often non-compliance with instructions for continued airworthiness (ICA) and/or inadequate quality assurance.
- 8 events (7 airframe parts, 1 mission component) could have been prevented by a proper preflight inspection.
- 6 events could have been detected by vibration monitoring or power-available indicators.

SCF Recommendations

- More in-depth investigation of non-compliance with ICA. Better dissemination of information addressing underlying reasons of non-compliance with ICA.
- Improved maintenance QA and record-keeping.
- Better regulatory oversight of maintenance
- Implementation of maintenance data monitoring systems
- Safety training to ensure proper preflight inspections of aircraft and mission equipment
- Provide terminating action for ADs rather than recurrent inspections
- Establish higher standards for maintenance of public-use aircraft

Autorotation Occurrence

- 59 events (34% of all accidents).
  - Roughly half occurred on training or personal flights
  - Others in 12 different mission categories
- 41 emergency autorotations (following SCF, fuel contamination, or starvation)
- 18 practice autorotations (improper control/handling in descent, late/improper flare, and/or unsuitable terrain issues)
- Pilot judgment and situational awareness factors led pilot factors

Autorotation Recommendations

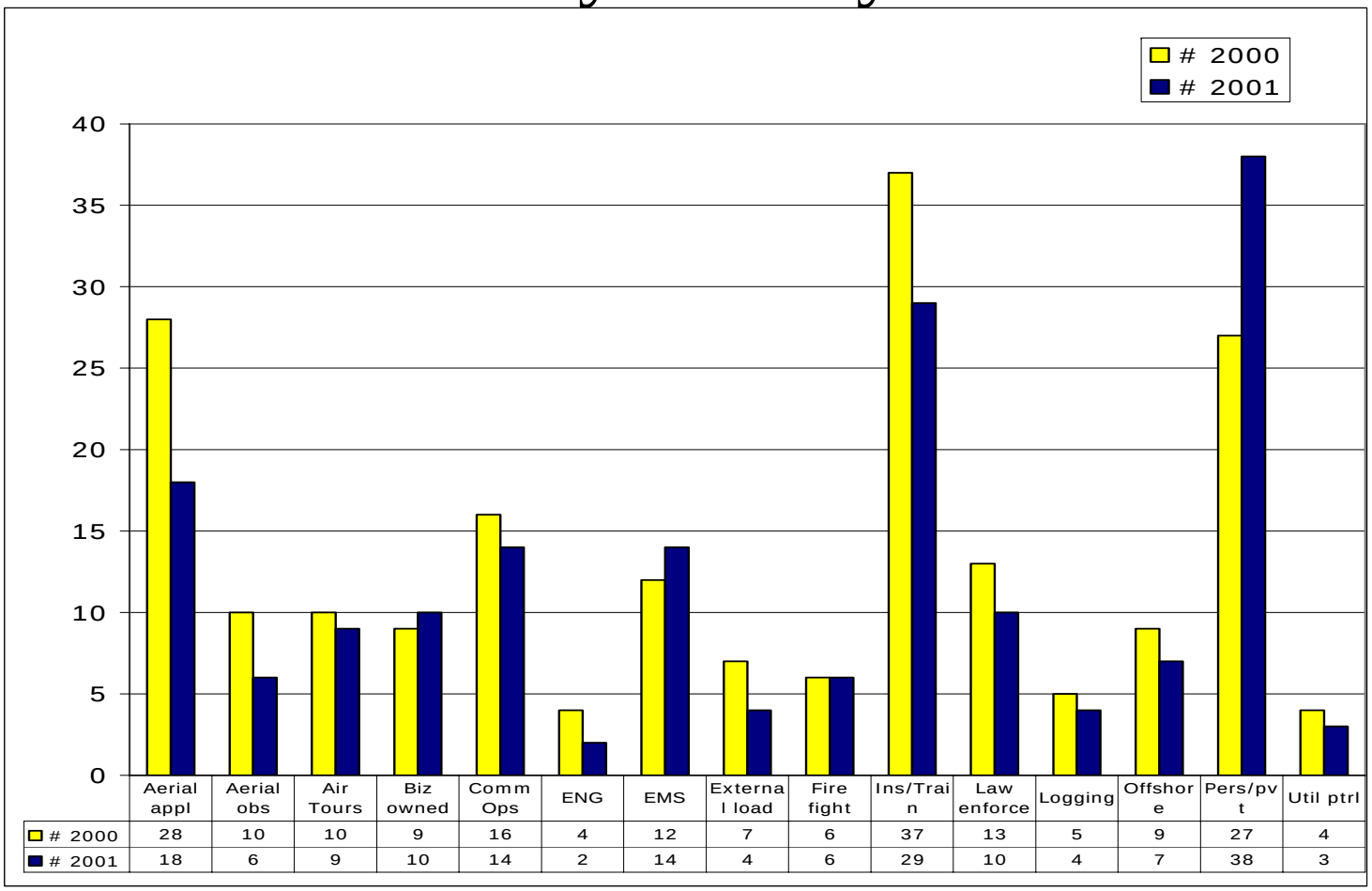
- Ensure that basic and advanced training programs address decision-making skills for selecting autorotation landing sites and control handling for optimum power management
- Ensure that pilots have the opportunity to maintain autorotation proficiency after completion of transition or mission training
- Improve training by making use of flight simulators to learn procedural skills coupled with knowledge of aircraft performance characteristics.

Comparison to CY2000
Data Set

- Definition of data set same as CY2000
  - U.S. civil registered helicopters
  - Type certificated (amateur built rotorcraft excluded)
  - Includes ‘Public Use’ and Restricted category
- CY2000 – 197 accidents
- CY2001 – 174 accidents
- CY2006 – 152 accidents

Comparison to CY2000

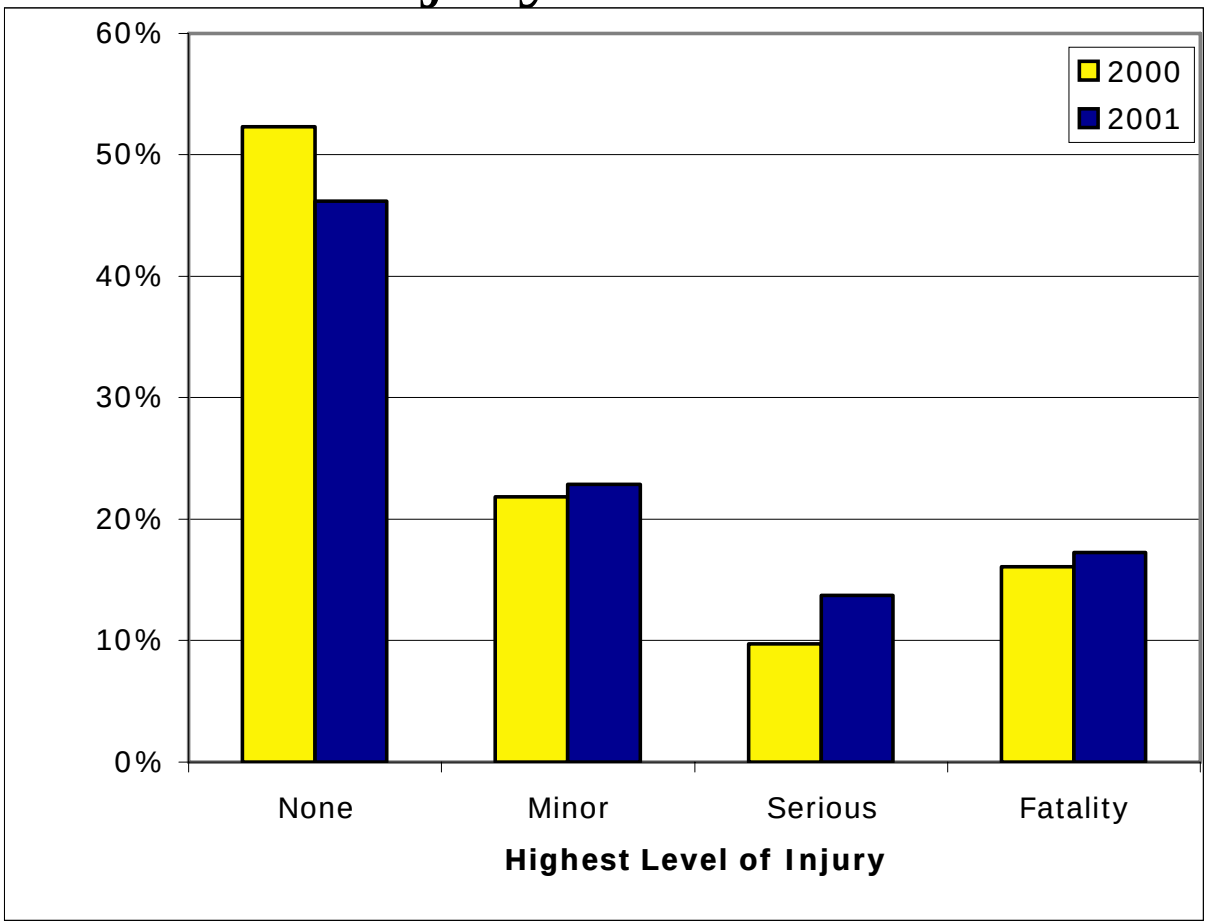
Accidents by Primary Mission



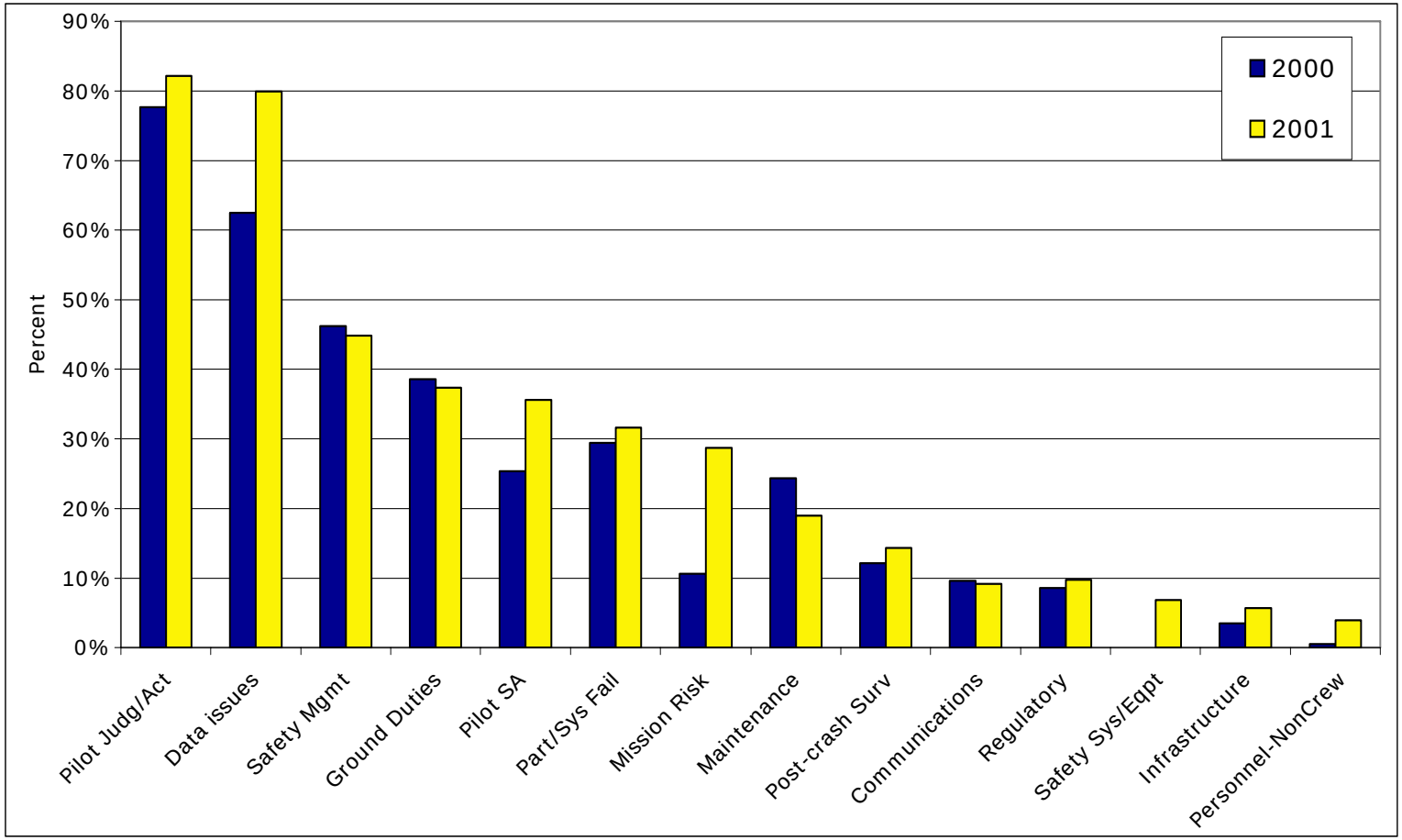
	Aerial appl	Aerial obs	Air Tours	Biz owned	Comm Ops	ENG	EMS	External load	Fire fight	Ins/Train	Law enforce	Logging	Offshore	Pers/pvt	Util ptrl
# 2000	28	10	10	9	16	4	12	7	6	37	13	5	9	27	4
# 2001	18	6	9	10	14	2	14	4	6	29	10	4	7	38	3

Comparison to CY2000

Injury Level

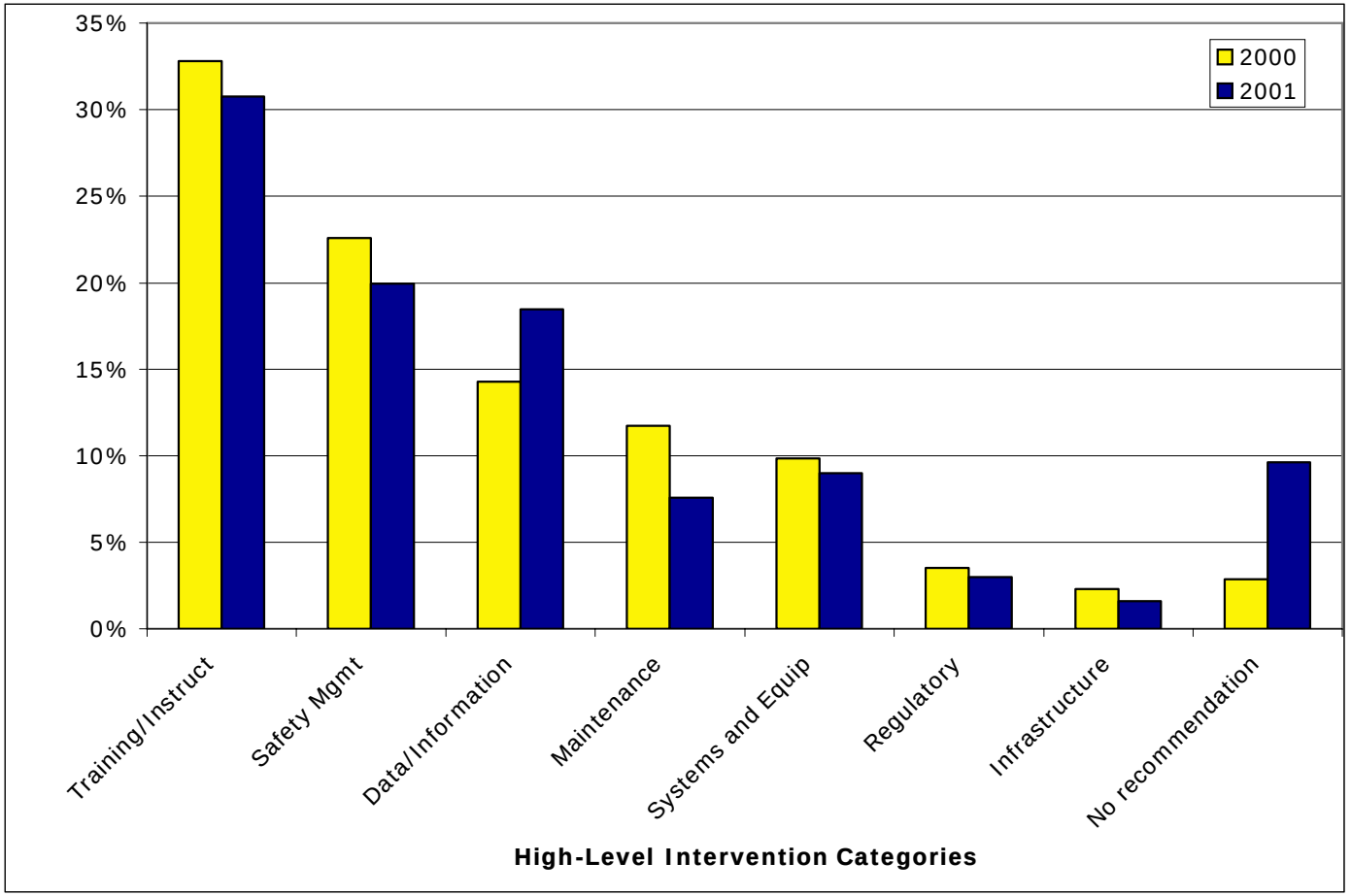


Comparison to CY2000
Standard Problem Statements



Comparison to CY2000

Intervention Categories



Top 20 IR List from CY2001 (abbreviated)

- D2010 - Install Cockpit Recording Devices, 98
- D010 - Improve Quality and Depth of NTSB Investigation and Reporting, 81
- T2010 - Autorotation Training Program, 30
- S8050 - Personal Risk Management Program, 27
- M3010 - Follow Instructions for Continued Airworthiness (ICA) Procedures with Confirmation of Compliance, 19
- T2060 - Simulator Training – Advanced Maneuvers, 19
- T3030 - Certified Flight Instructor (CFI) Judgment and Decision Making Training to Follow Students More Closely, 18
- T1050 - In-flight Power/Energy Management Training, 17
- T6019 - Training Emphasis for Maintaining Awareness of Cues Critical to Safe Flight, 17
- T2040 - Dynamic Rollover Training, 14
- S9010 - Establish Risk Assessment Program to Eliminate Culture of Non-Compliance, 14
- S1030 - Improved Supervisory and Operational Oversight, 13
- T6007 - Flight Training on Common Operational Pilot Errors, 12
- S7020 - Establish Oversight to Ensure Compliance with Published Procedures in Approved Flight Manual (AFM), 12
- M1010 - Better Maintenance/Quality Assurance Oversight to Ensure Adherence to the Instructions for Continued Airworthiness (ICA) and the Maintenance Manual, 12
- T1020 - Enhanced Aircraft Performance & Limitations Training, 11
- M1030 - Improve Preflight and/or Maintenance inspections, 11
- T3070 - Increase Certified Flight Instructor (CFI) Training on Cues for Low RPM, Airspeed Issues, 11
- S8020 - Use Operational Risk Management Program (In-flight), 11
- T6014 - Pilot Judgment Training Risk Assessment, 11

		Aerial Application	Aerial Observation/Patrol	Air Tour	Business	Commercial	Electronic News Gathering	Emergency Medical Services	External Load	Firefighting	Instructional/Training	Law Enforcement	Logging	Offshore	Personal/Private	Utilities Patrol/Construction		Total
Accidents		18	6	9	10	14	2	14	4	6	29	10	4	7	38	3		174
ARDM-F		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0		1
ARDM-M		0	0	1	0	0	0	0	0	0	0	0	0	0	2	0		3
ARDM-P		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0		1
AMAN		0	0	1	1	0	0	0	0	0	3	0	0	1	2	0		8
ARC		1	1	0	1	2	1	0	0	0	9	3	0	0	4	0		22
AUTO-E		4	1	3	2	2	0	4	2	2	4	4	2	2	8	1		41
AUTO-P		0	0	0	0	0	0	0	0	0	14	2	0	0	2	0		18
CFIT		0	0	0	0	2	0	0	0	0	0	0	0	0	0	0		2
DITCH		0	0	0	1	1	0	0	0	0	0	0	0	4	0	0		6
EXTL		0	0	0	0	0	0	0	1	2	0	0	3	0	0	2		8
F-NI		1	0	1	1	0	0	1	0	0	0	0	0	0	0	0		4
F-POST		0	0	1	0	1	0	1	0	1	2	0	0	0	2	0		8
FUEL		1	1	0	0	1	0	3	1	0	0	1	0	1	5	0		14
ICE		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0		1
LOC-DR		1	1	1	0	1	0	1	0	0	3	0	0	0	3	1		12
LOC-EP		1	0	1	0	1	0	1	0	1	0	1	1	0	3	0		10
LOC-GR		0	0	0	0	0	0	1	0	0	0	0	0	0	1	0		2
LOC-INT		0	0	0	0	1	0	0	0	0	3	0	0	0	0	0		4
LOC-LTE		1	0	0	2	1	0	0	1	0	0	1	0	1	1	0		8
LOC-OL		2	1	1	0	1	0	1	1	1	0	1	0	1	1	0		11

Preliminary CY2006 Analysis

- 152 Accidents in data set (down from 174 and 197 in ’01 an ‘00)
  - 132 completed (87%)
- Initial analysis quite similar to CY00 and CY01
  - Mission Categories with highest number of accidents:
  - Personal/Private, Training, *Aerial Observation vice Aerial Application*
- Top 3
  - Occurrence Categories:
    - Loss of Control, Autorotation, System/Component Failure
  - Standard Problem Statements:
    - Pilot Judgment and Action, Data Issues, Safety Management
  - Interventions Recommendations:
    - Training, Data Issues, Safety Management

Preliminary CY2006 Analysis

- NTSB report quality
  - Data collection reports (CA) - probable cause determination based on operator reports (no investigation)
  - 31% of CY2006 are CA Reports
  - Probable cause determination does not lead to accident prevention – need the root cause
- Compiling recommendations for investigators

Photo

Conclusion

- Raw count of accidents are down.
- Analysis is similar between the years.
  - Similar Problem statements by percentage
  - Similar Interventions by percentage
- Continued necessity to concentrate on training, safety management, data collection and investigation
- Integrated FDM programs have greatest potential to improve safety

Questions?