



UAS Mishap Human Factors and Lessons Learned

3 May 2010

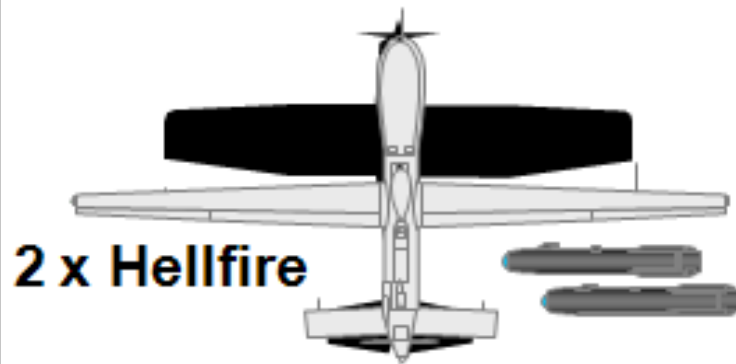
Robert Nullmeyer, PhD
711th Human Performance Wing
Human Effectiveness Directorate
Air Force Research Laboratory



Predator (MQ-1) / Reaper (MQ-9)

MQ-1

C-172 Size

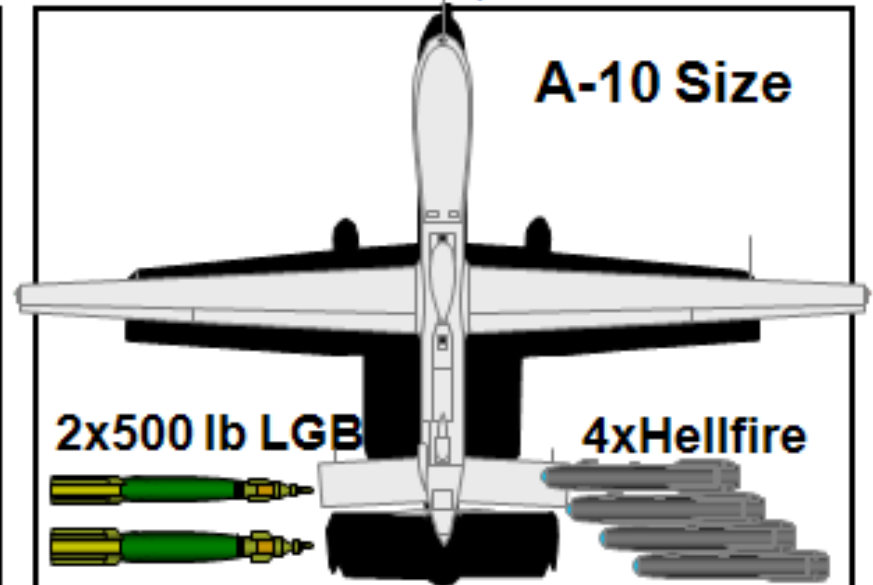


2 x Hellfire

Wingspan: 49 FT Length: 26 FT
Max Speed: 120 KT Endurance: 24 hrs
Max Altitude: 25,000 ft MSL
Payload: 300 lbs (2 hard points)

MQ-9

A-10 Size



2x500 lb LGB

4xHellfire

Wingspan: 64 FT Length: 36 FT
Max Speed: 240 KT Endurance: 15 hrs
Max Altitude: 50,000 ft
Payload: 3000 lbs (6 hard points)

Predator User Interface

Deleted FOUO

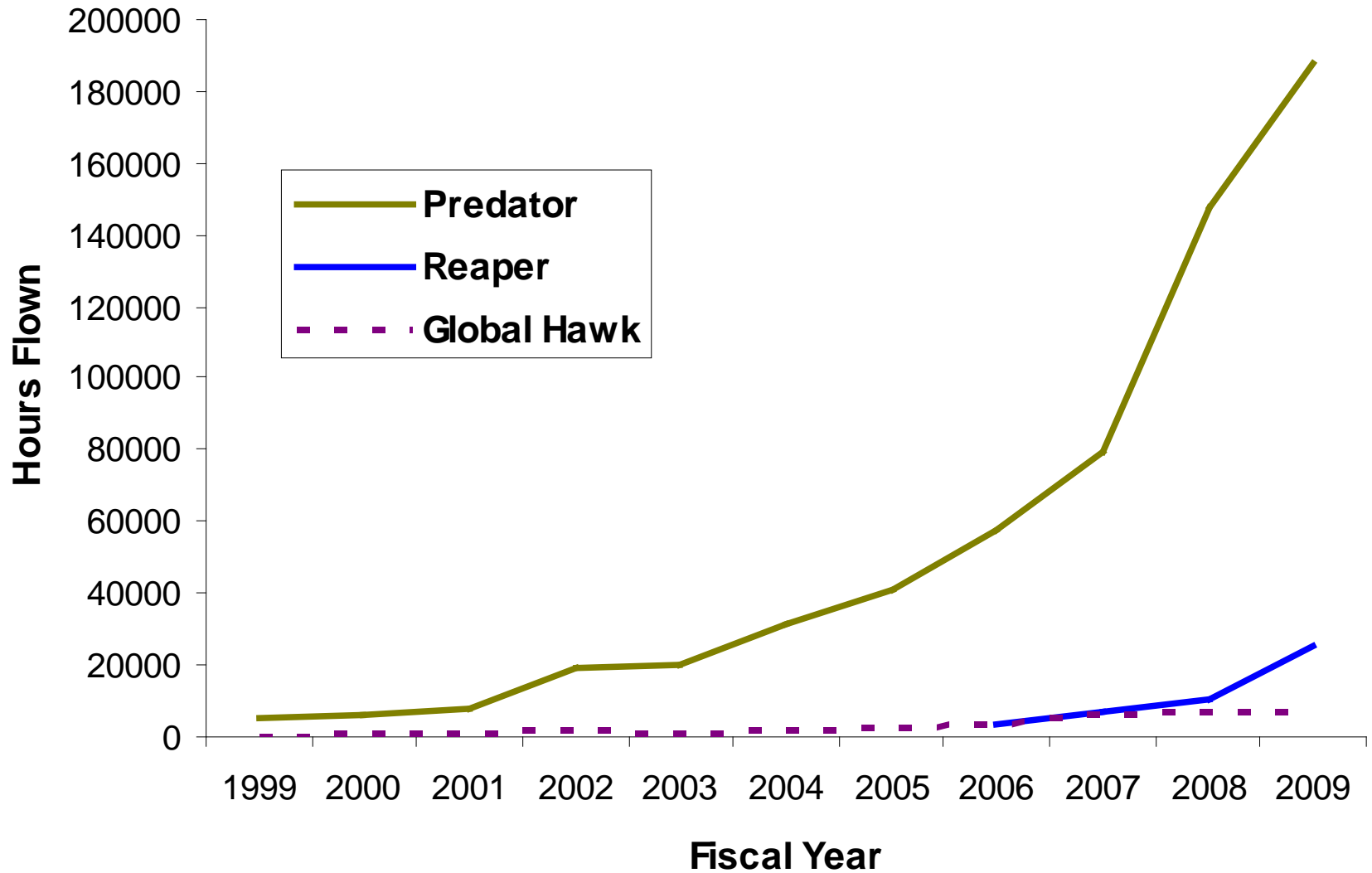
ONE MAN'S VISION

“We have just won a war with a lot of heroes flying around in planes. The next war may be fought by airplanes with no men in them at all . . . Take everything you’ve learned about aviation in war, throw it out of the window, and let’s go to work on tomorrow’s aviation. It will be different from anything the world has ever seen.”



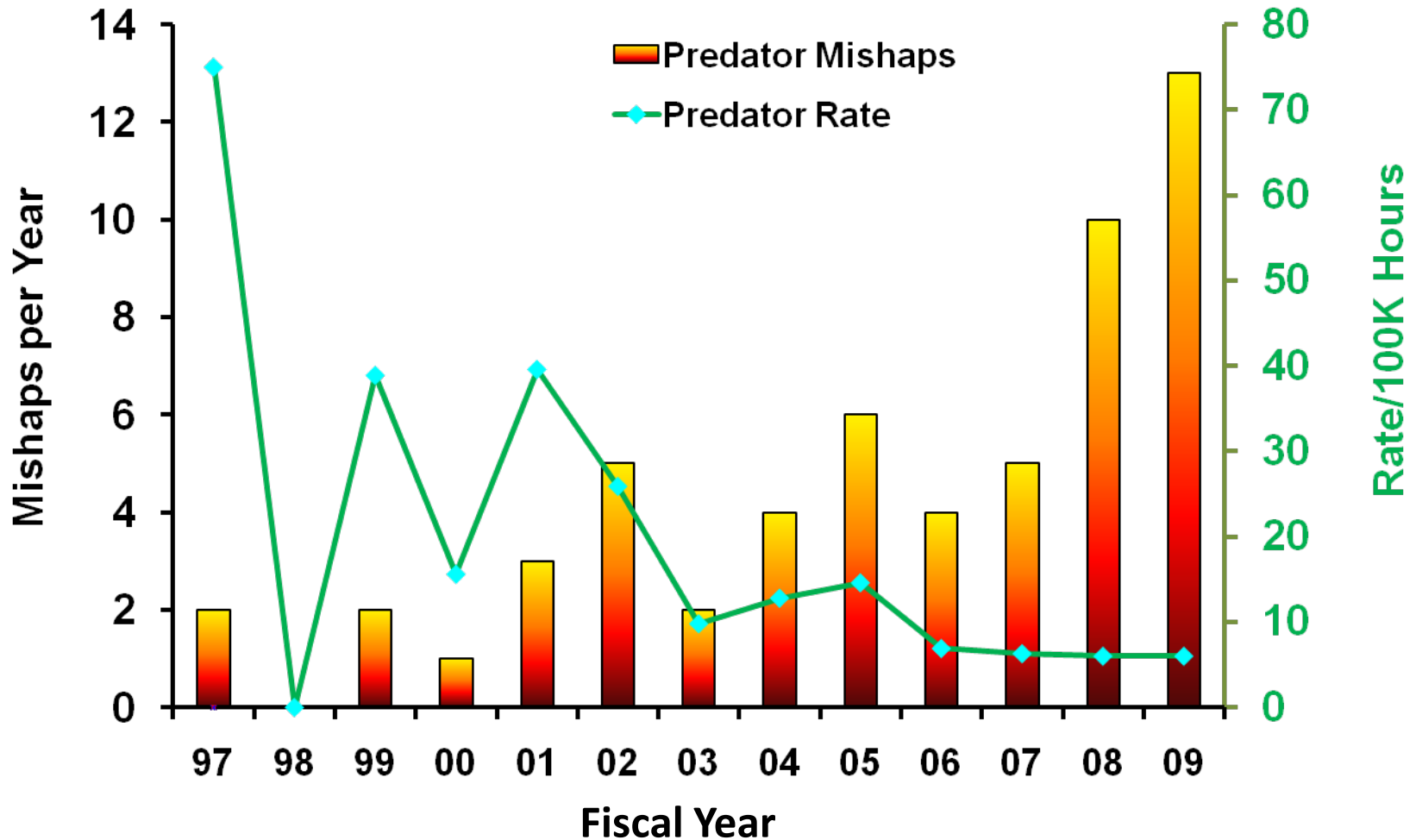
**Gen Hap Arnold, USAAF
VJ Day, 1945**

Annual UAS Hours Flown



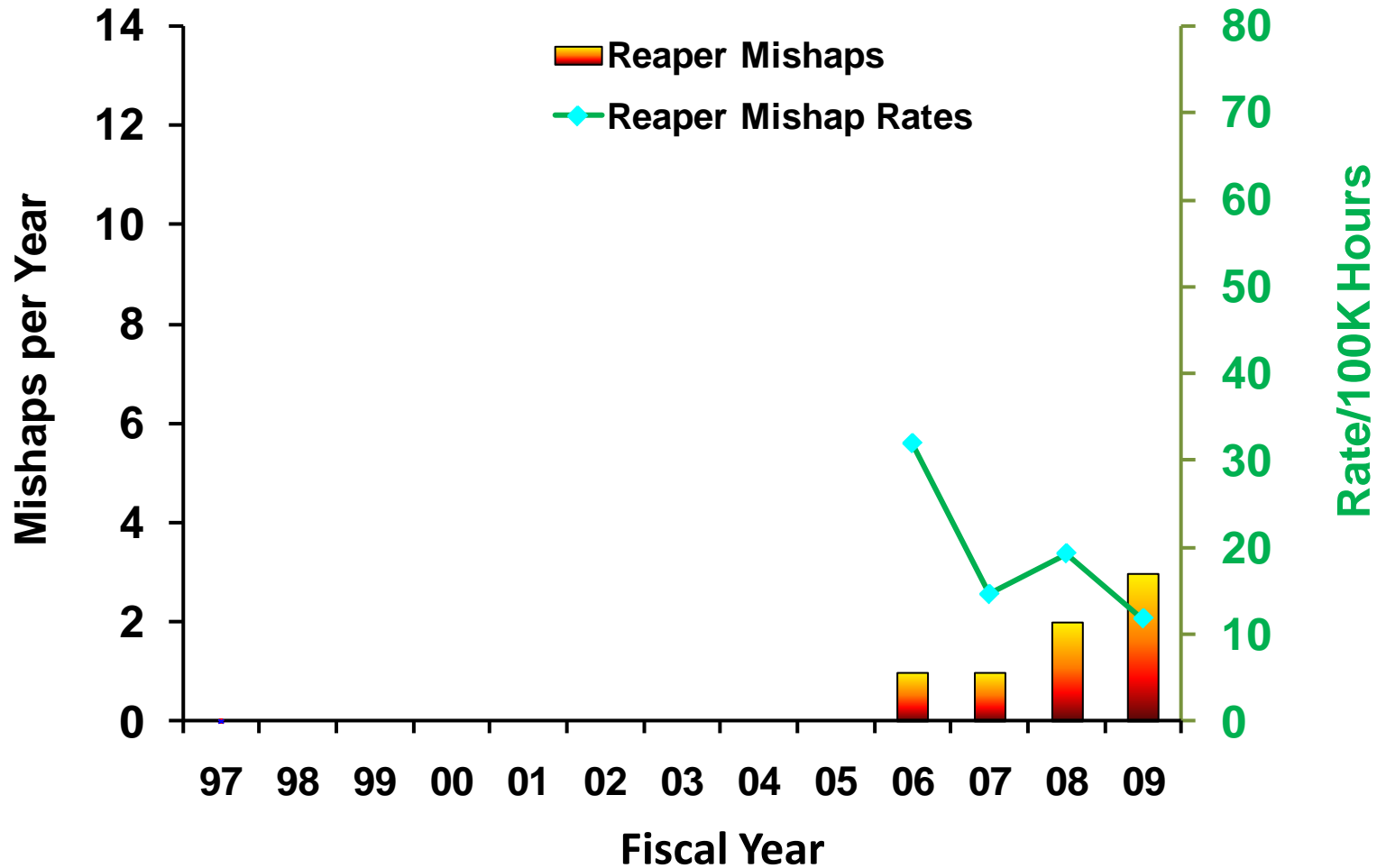
Source: <http://www.afsc.af.mil/>

US Air Force Predator Class A Mishap Reports

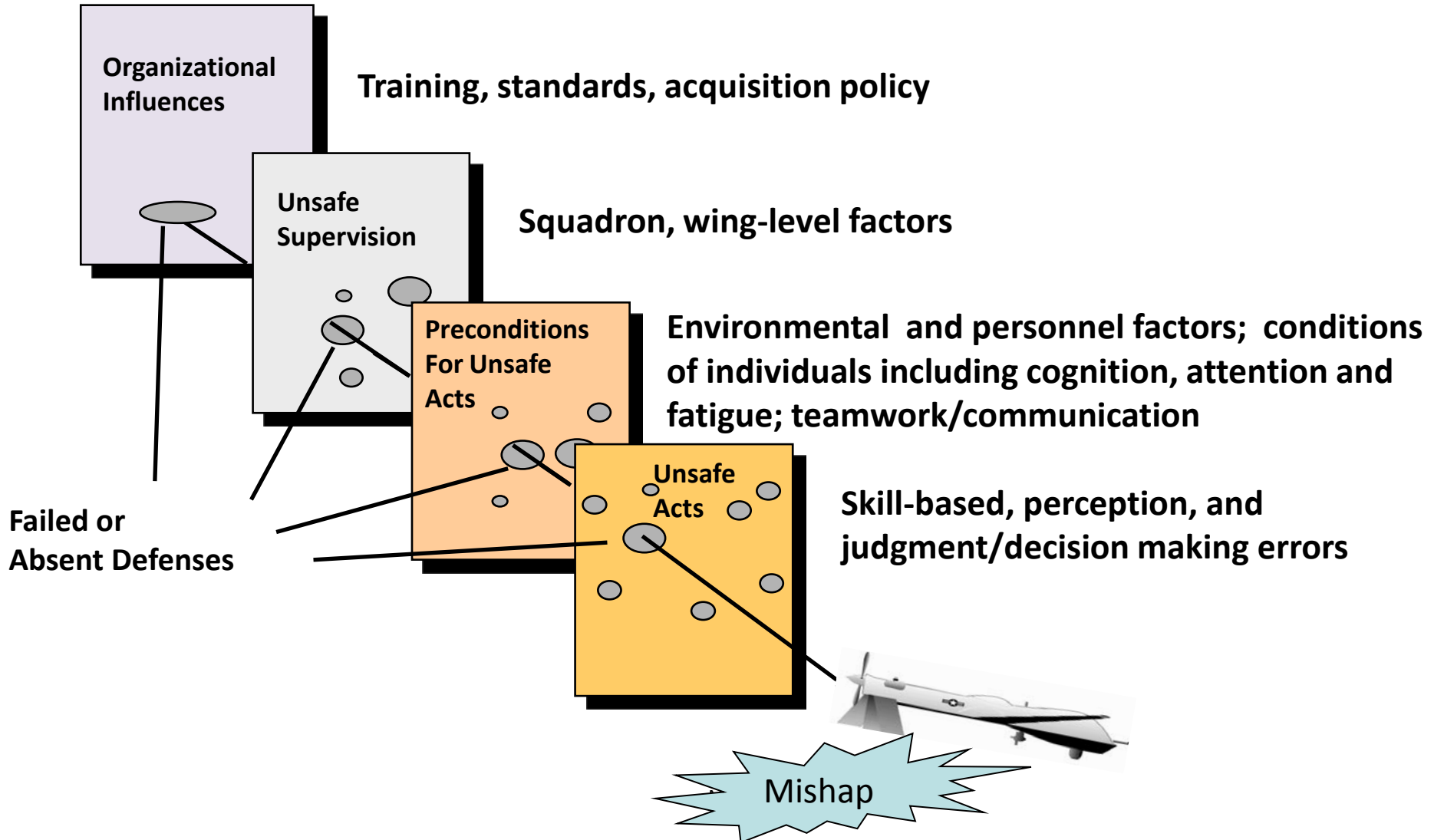


Source: US Air Force Safety Human Factors Team (2009). *USAF Aviation safety: FY 2008 in review*. Aero Space Medical Association Annual conference, Los Angeles CA.

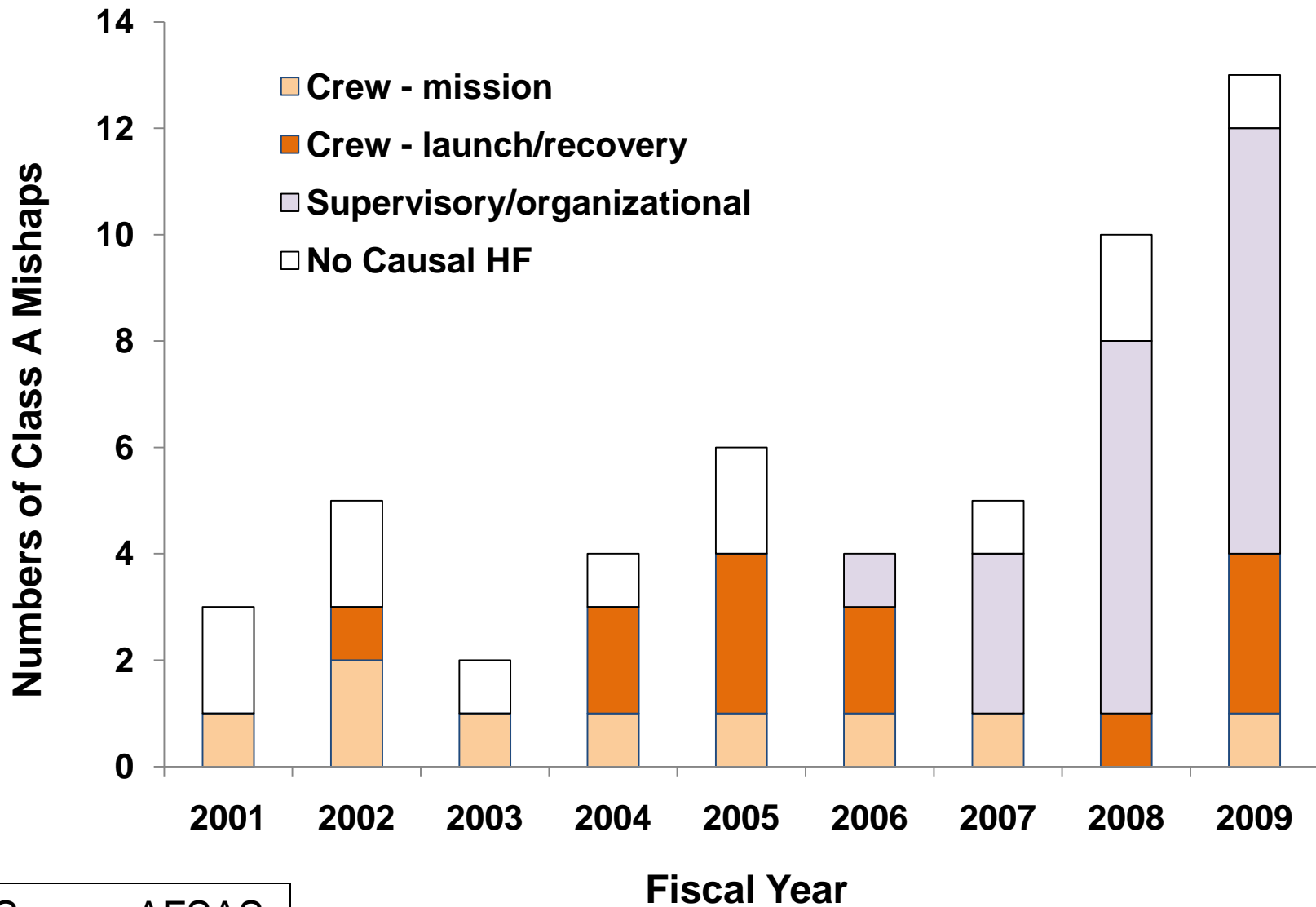
US Air Force Reaper Class A Mishap Reports



Department of Defense Human Factors Analysis Classification System

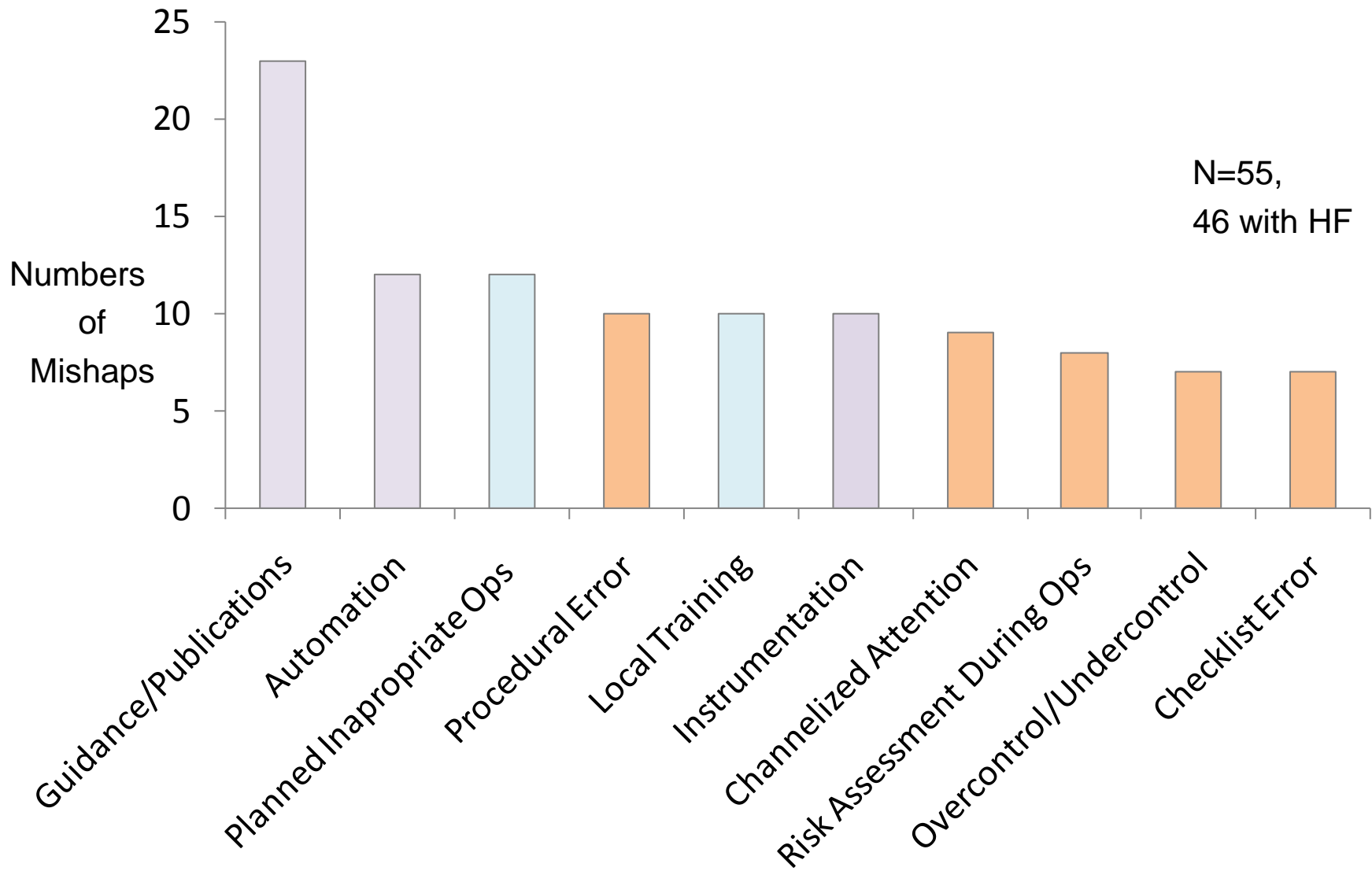


Predator Class A Causal Human Factors

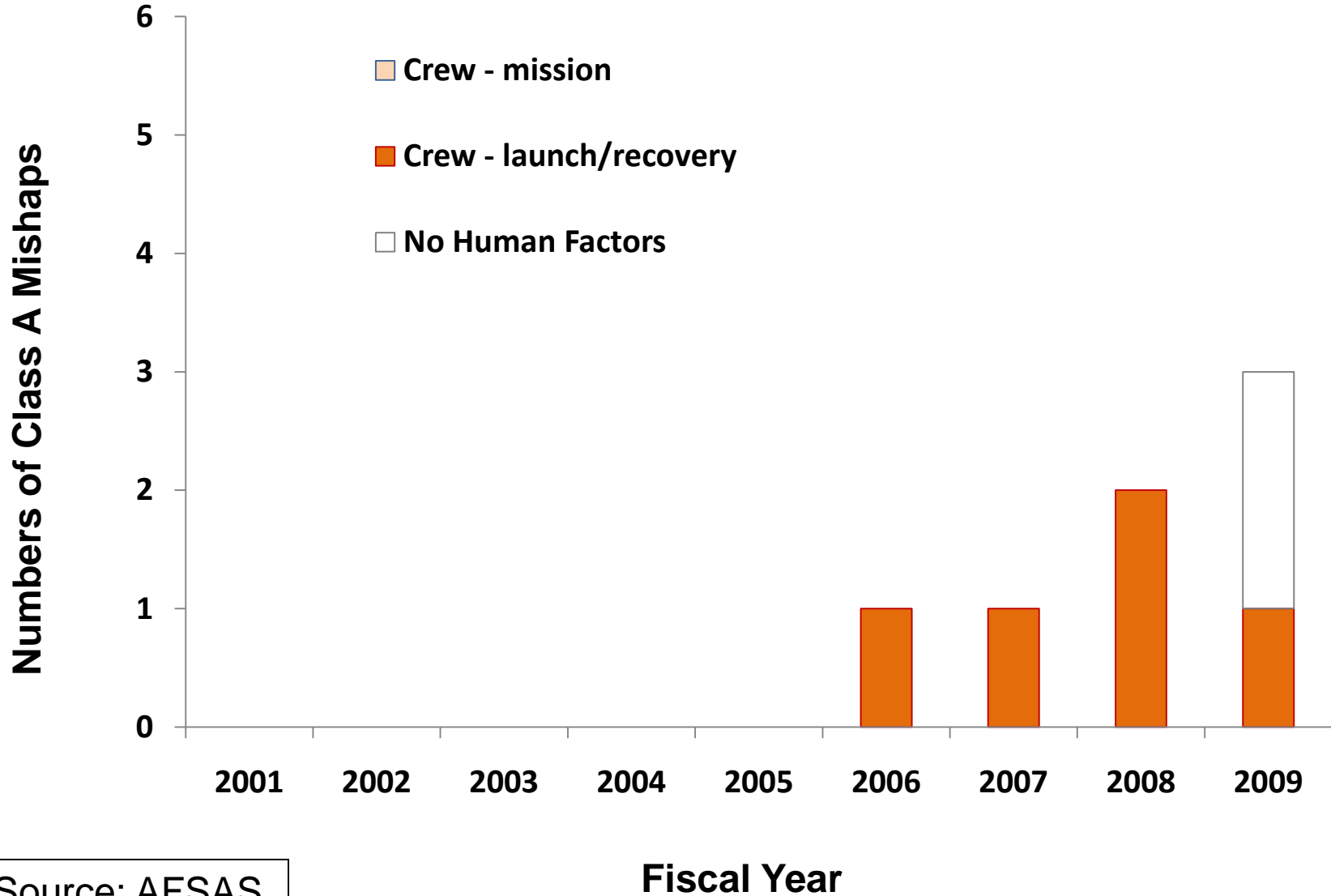


Source: AFSAS

Frequently Cited Human Factors in Predator Class A Mishaps

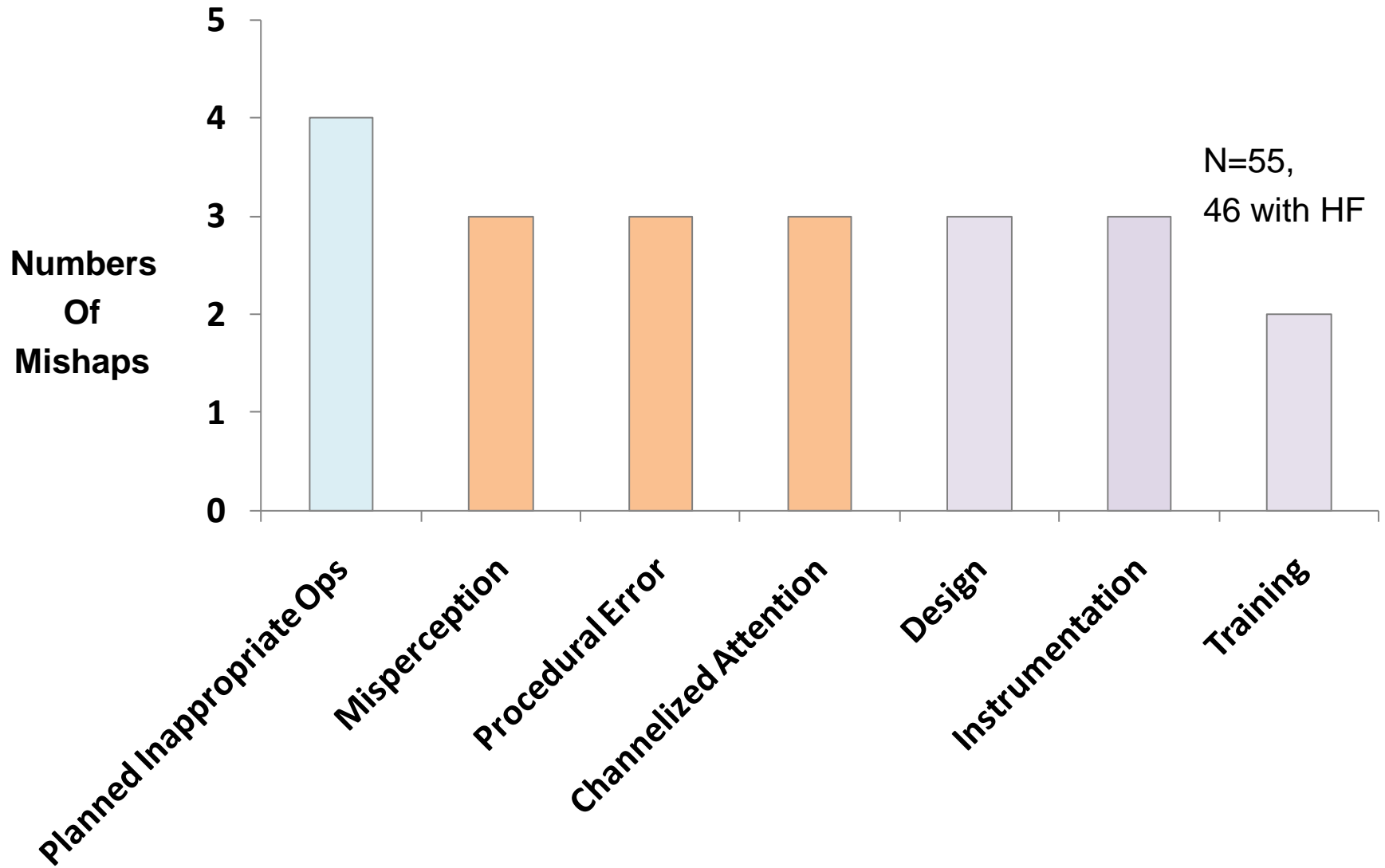


Reaper Class A Causal Human Factors



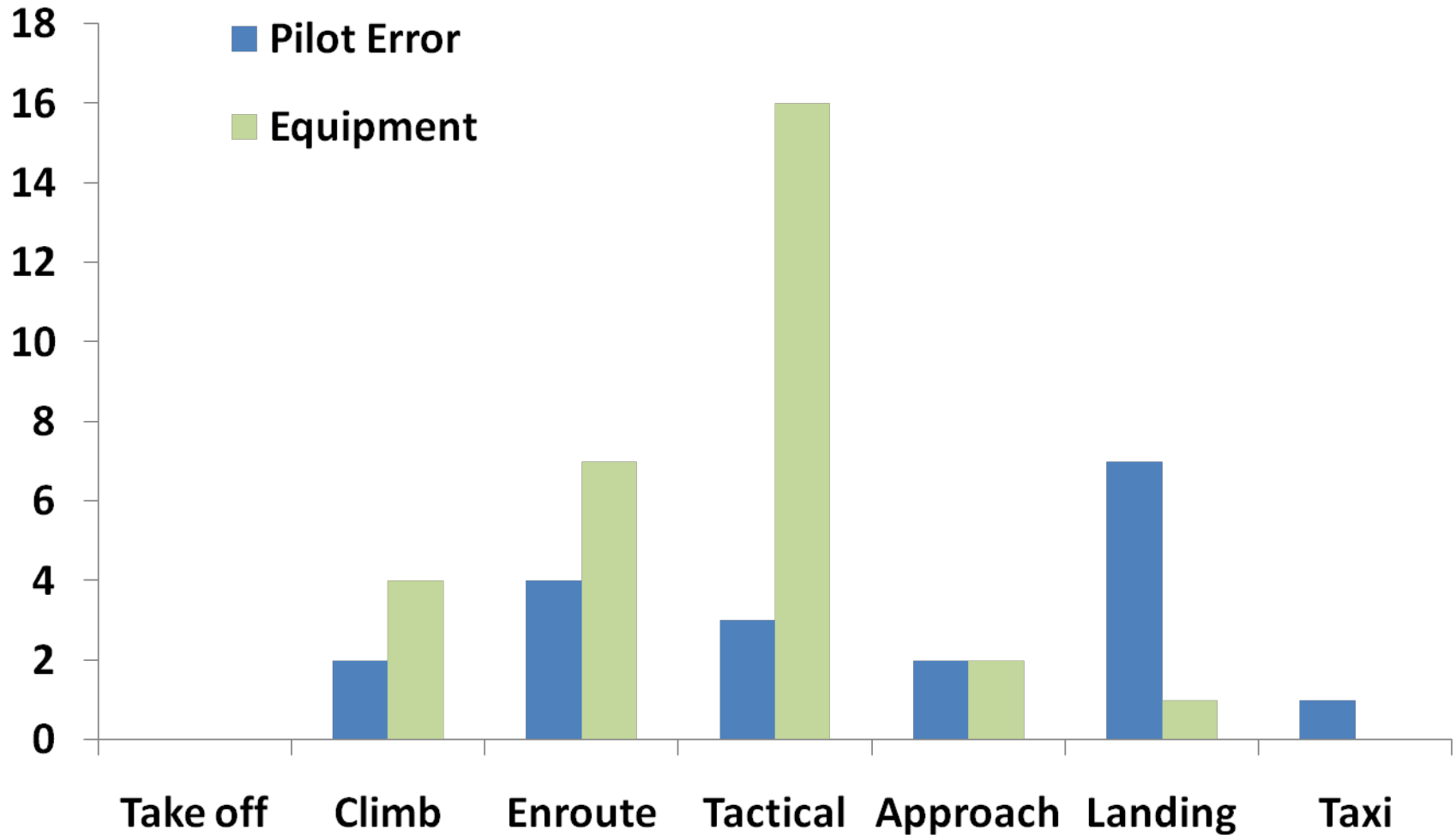
Source: AFSAS

Frequently Cited Human Factors in Reaper Class A Mishaps



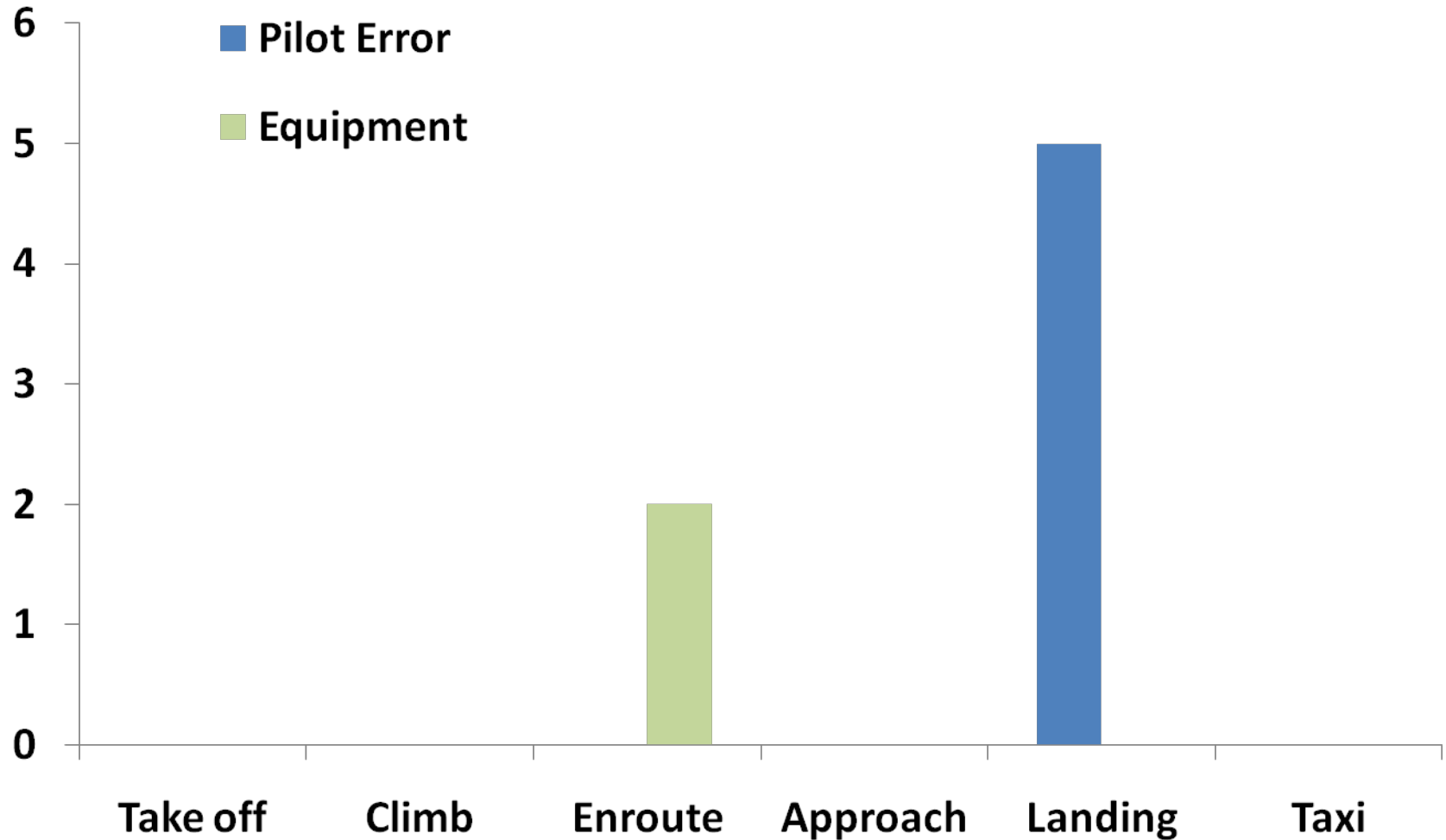
Predator Class A Mishaps by Mission Phase

(FY 2000-2009)

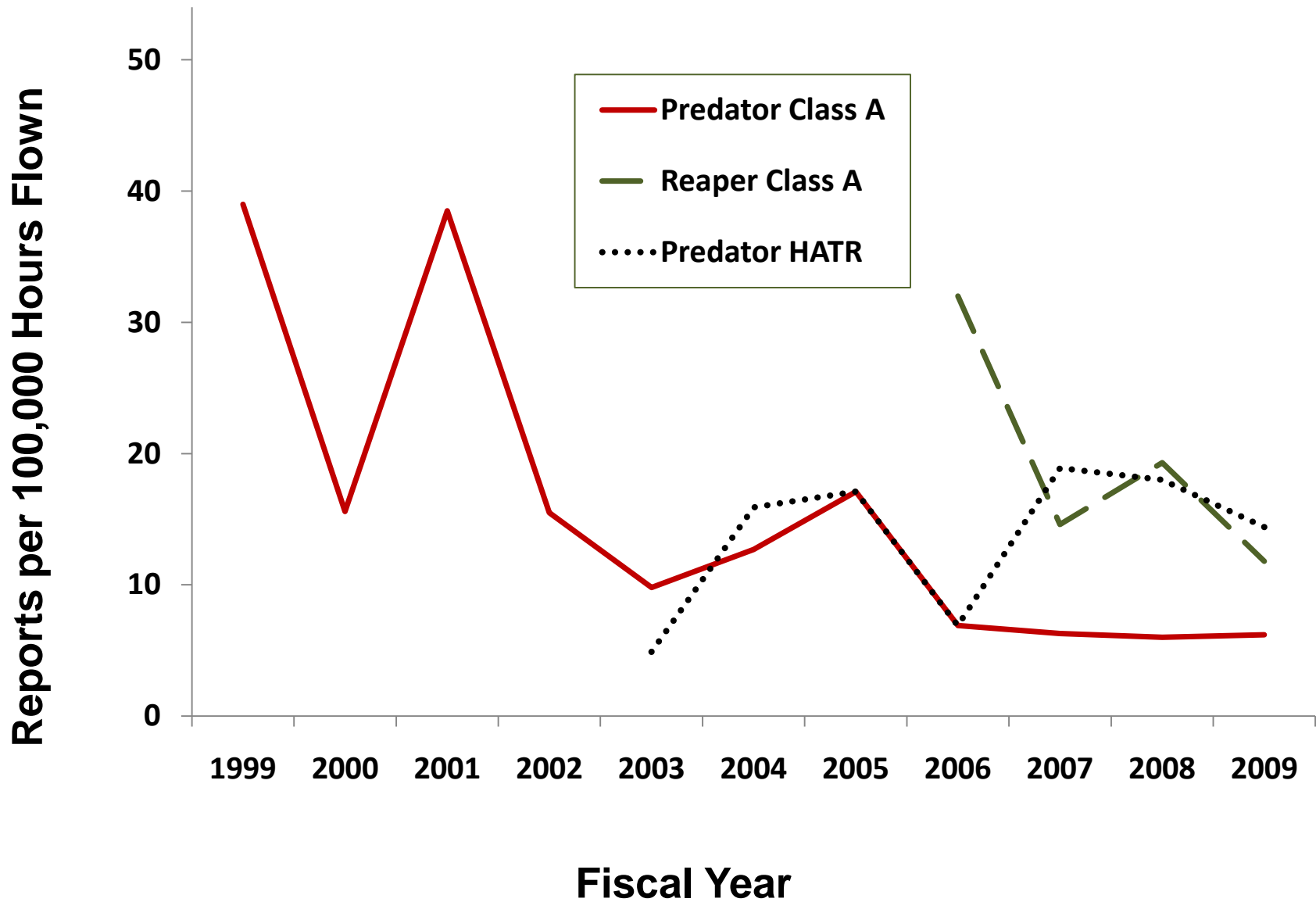


Reaper Class A Mishaps by Mission Phase

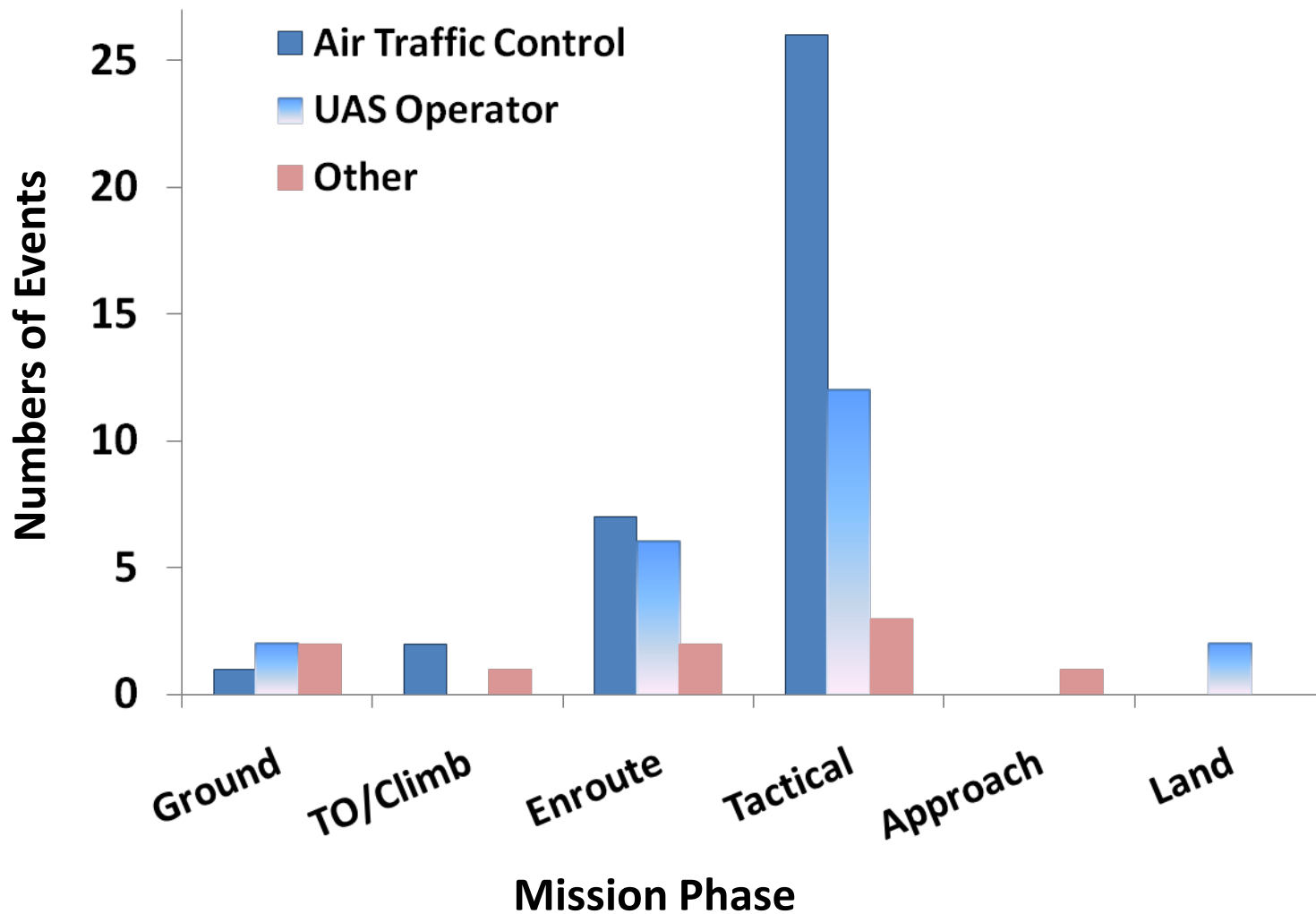
(FY 2000-2009)



AFSAS Class A and Near Miss Rates



Hazardous Air Traffic Reports by Mission Phase



Predator Mishap Trends

- **Increasing counts, decreasing rates**
- **Some areas improved (1999-2006 vs. 2007-2009)**
 - *Proportions of mishaps with causal crew errors down from (deleted FOUO)*
 - *Proportions of maintainer error down from (deleted FOUO)*
 - *Inappropriate plans (supervision) down from (deleted FOUO)*
 - *Automation/controls/instrumentation down from (deleted FOUO)*
- **Current challenges**
 - *Continuing shortfalls in guidance and publications (deleted FOUO)*
 - *Air traffic control in shared, congested tactical airspace given limited ability of UASs to sense and avoid*
 - *Keeping current with evolving tactics, techniques, procedures*

2008 – A New Challenge from CSAF

- Demand for unmanned reconnaissance planes is high and growing
- Air Force UAS pilot pipeline currently undergoing major revisions
 - *Initially, experienced Air Force pilots flew UASs*
 - *Undergraduate pilot graduates now going to UASs*
 - *Exploring impacts of candidates with no flying experience*
- Opportunity and need to improve training effectiveness and capacity

Beta Test Initial Findings

- **Beta trainees all graduated from IQT/CMR training**
- **Beta students as a group tended to underperform relative to other student groups**
 - **Training standards not met on milestone missions**
 - **Sorties needed for course completion**
 - **Phase 1 Combat Mission Ready training days**
- **Individually, Beta students were spread across the entire spectrum of performance**
- **Current data sources are insufficient to confidently assess specific performance**

UAS Road Ahead

- **Mishap trends suggest a correcting system - problems are solved as they become known**
- **Improve command and control**
 - *Coordination in larger 55-person Predator team*
 - *Sharing airspace with manned platforms*
 - *Coordinating with Air and Space Operations Center*
- **Increase use of simulation in training**
- **Revisit policies, guidance and training**
 - *Personnel selection and career progression*
 - *Effective and efficient ab initio training*
 - *UAS value added in network centric warfare*
 - *Operator interface issues*

Questions?

