



# *Who's a Hazard to Who?*

## *Some Facts About Instructional Accidents*

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# *Which looks safer?*





# To discuss instructional accidents, we need to know:

**What's an "accident?"**

**And what's an "instructional" flight?**

**You might think both answers are obvious. They're not.**



# Accident: 49 C.F.R. Part 830

**Aircraft must be occupied for the purpose of flight, and the event results in either**

- “substantial damage” to the aircraft,**
- or “serious injury” to some person.**

**Definition is somewhat arbitrary!**

**Same damage may or may not qualify.**



# What's an instructional flight?

**Anything logged as “dual received”**

**Checkrides – inherent part of process!**

## What about student solos?

- If authorized by CFI as part of curriculum

## Solos by certificated pilots?

- Long solo XC for commercial? W/ other business?
- Maneuver practice?
- Time-building?



# Types of flight instruction:

## Two dimensions:

- A) **Primary:** PUI holds no more than student certificate *in same category*  
vs. **Advanced:** PUI holds recreational or higher (has passed a checkride)
  
- B) Dual vs. solo



## Primary

## Advanced

Dual

Basic airmanship,  
TOLs,  
navigation,  
radio comm,  
PTS maneuvers

Instrument,  
commercial,  
ATP, CFI,  
transition,  
flight reviews

Solo

Traffic patterns,  
airwork in  
practice area,  
approved XCs

Required  
solo XCs,  
airwork,  
time-building –  
????

Almost impossible to identify  
in accident record!





# Since we fly, there has to be a third dimension ...

## Oh, yeah. Fixed-wing vs. helicopter!

### So who's more likely to crash?

- 23-hour student pilot flying solo in Robinson R22
- 23-hour student pilot flying solo in Cessna 172

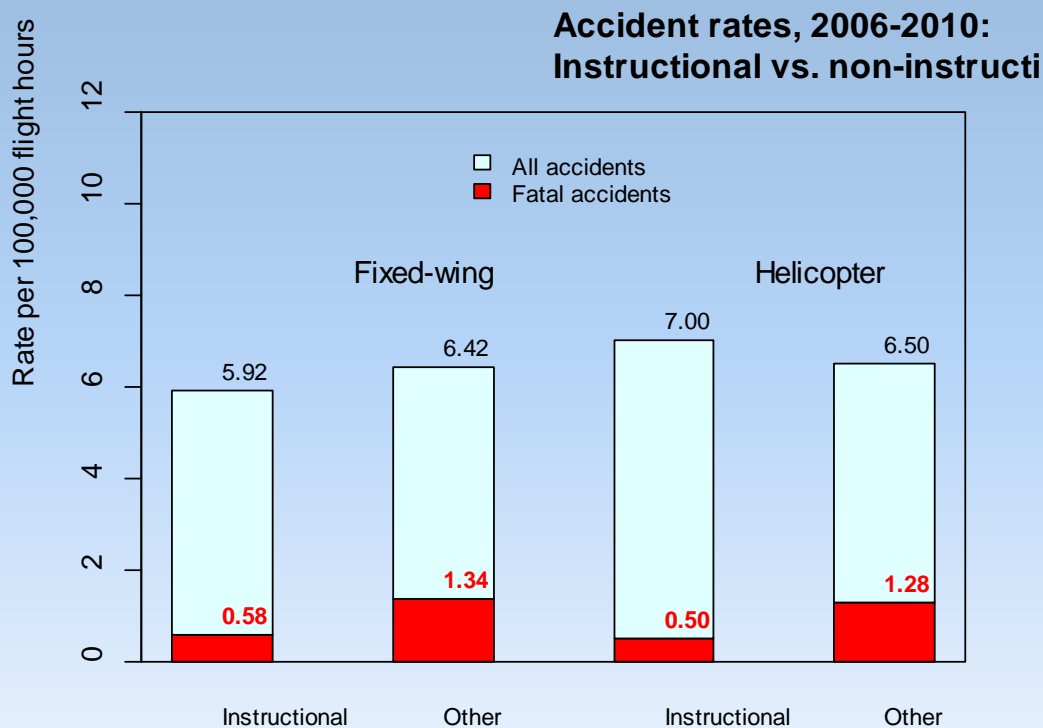
### And who's more likely to die?

- CFI-A flying with 55-hour student pilot
- CFI-A flying with 2,300-hour commercial pilot





# And how are we doing overall? Are training flights really safer?





**So: Overall accident rates were about the same.**

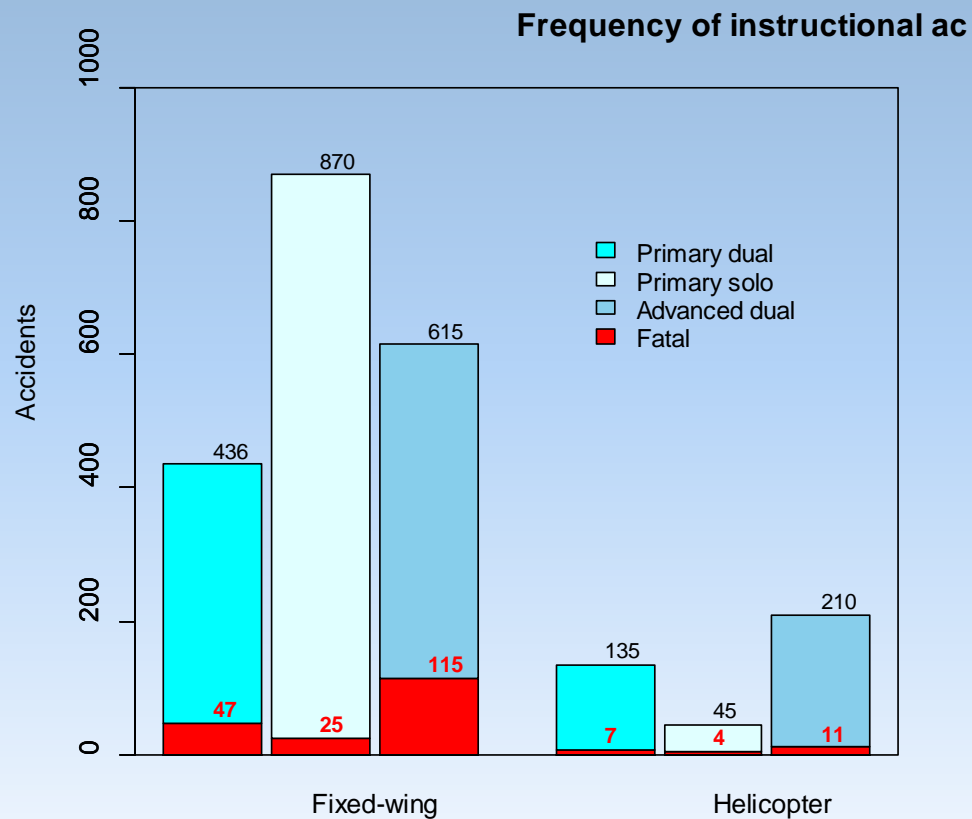
**A little higher in helicopters, a little lower in airplanes ...**

**but fatal accident rates were more than 50% lower.**

**Heli total rate was 18% higher, but fatal rate was 14% lower.**

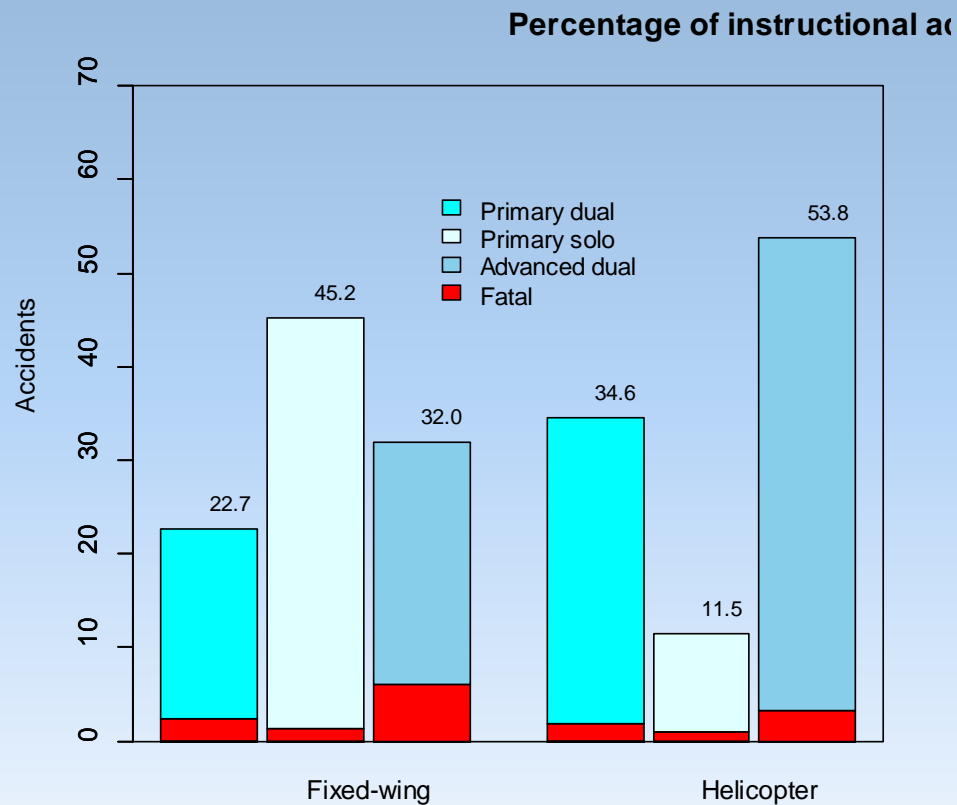


# Expanding these into three dimensions:





# In terms of percentages:





# Surprised? We were.

- Student solos accounted for ***two-thirds*** of all primary training accidents in airplanes – but only ***one-quarter*** of those in helicopters.
- More than 80% of all fatal accidents happened on dual lessons.
- 70% of the fatal accidents on dual flights occurred during advanced instruction.
- Dual accidents in airplanes were ***three times*** as likely to be fatal as those in helicopters.



# Getting back to our earlier questions ...

## These data suggest that

- A student pilot soloing an airplane is almost **three times** as likely to crash as a student soloing a helicopter.
- A CFI flying with a certificated pilot is **twice** as likely to die in an accident as one teaching a student pilot.

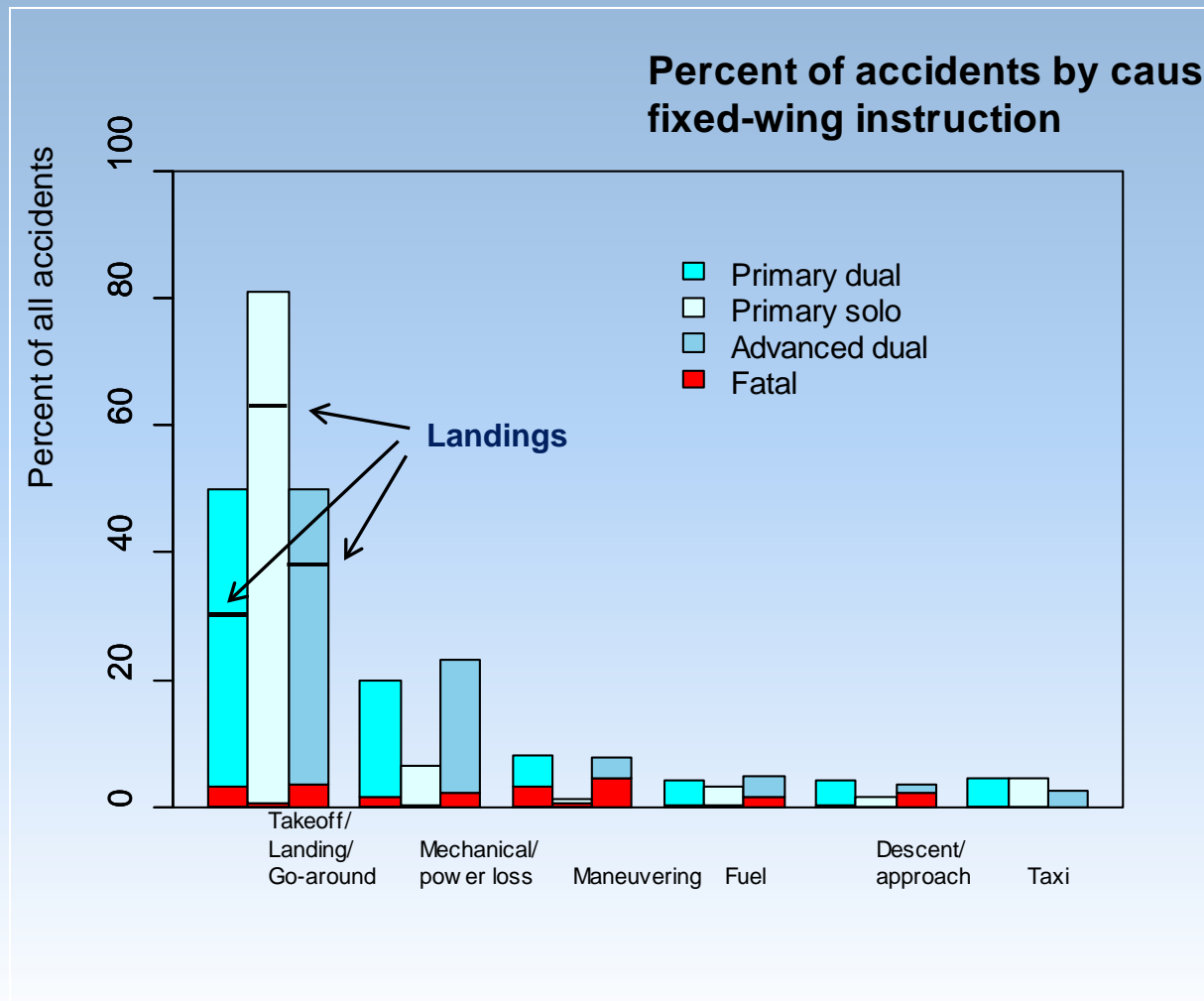


# A few more surprises:

- **45% of all fixed-wing training accidents were on student solos – just 12% of helicopter accidents.**
- **More solo crashes means that 68% of fixed-wing accidents were in primary training vs. 46% of helicopter.**
- **9% of solo helicopter accidents were fatal compared to 3% in airplanes.**



# Why? Let's start by looking at accident causes for airplanes

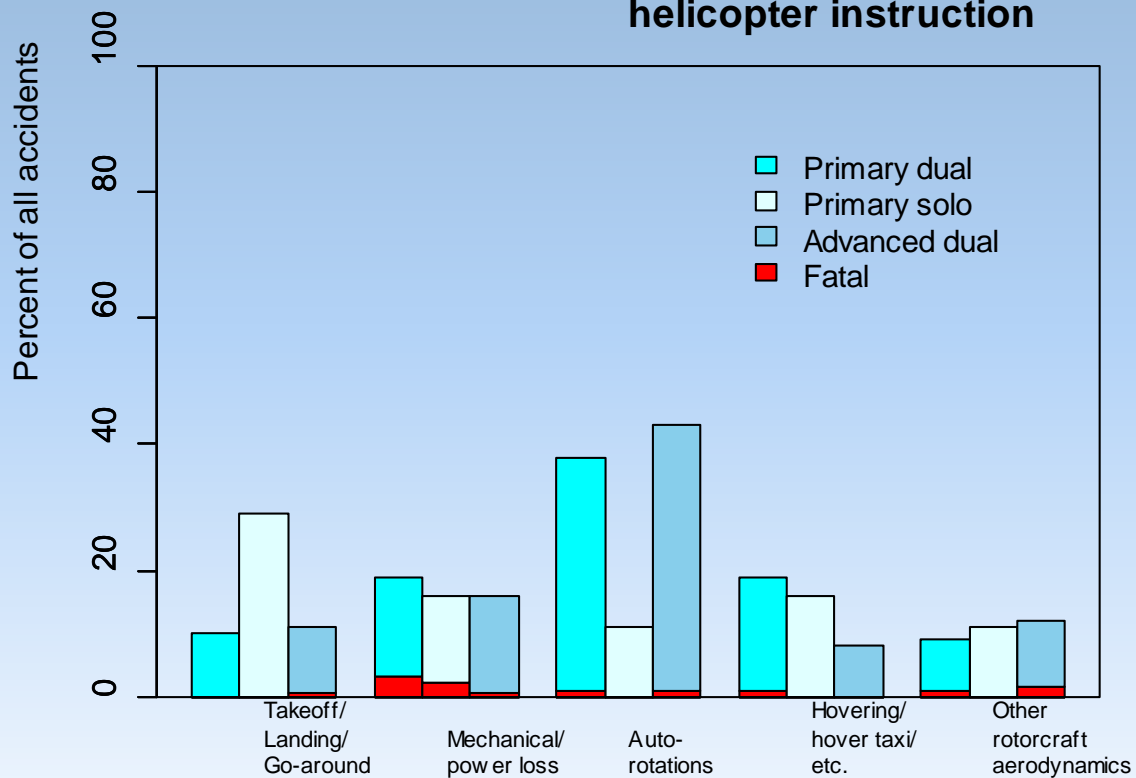






# ... vs. helicopters:

**Percent of accidents by cause  
helicopter instruction**





# Some interpretation:

**FW students should *NOT* be allowed to get anywhere near the ground!**

- 50% of dual, 80% of solo accidents during TLGs
- 65% of solo accidents were landings gone wrong

**Altitude helps heli students, too.**

- TLGs also leading cause of solo accidents – but less than 30% vs. 80% for fixed-wing
- Another 15% involved hovering, hover taxis, pedal turns, and other low-altitude maneuvers



# Leading causes of fatal accidents

## **In airplanes, it's airmanship:**

- **Low-altitude maneuvering (25%)**
- **Takeoffs, landings, and go-arounds (21%)**
- **Mechanical causes a distant third at 11%**

## **In helicopters, it's mostly the machine:**

- **Power loss / mechanical failures (27%)**
- **Mast bumping, dynamic rollover, LTE, etc. (18%)**
- **Collisions – wire strikes, mid-air, etc. (18%)**



# Another way to look at it ...

Due mostly to volume, airplanes had **5** times as many training accidents ...

... but **19** times more on student solos

... including **54** times more solo accidents during TLGs

... and **110** times more solo landing accidents!!



# Why? (Or, what do the rotorcraft guys know that fixed-wing CFIs don't?)

## Some of it's physics:

- Airplanes lose control authority throughout the flare, touchdown, and landing roll – but touch down relatively fast (50+ knots)
- Helicopters touch down with full control authority at near-zero ground speed

## But some of it's training philosophy

- Most FW curricula are geared toward early solo
- SFAR 73 requires 20 hours dual in R22, R44 first



**But it's not all roses in rotorland ...**

**Those practice autorotations don't just *look* exciting!**

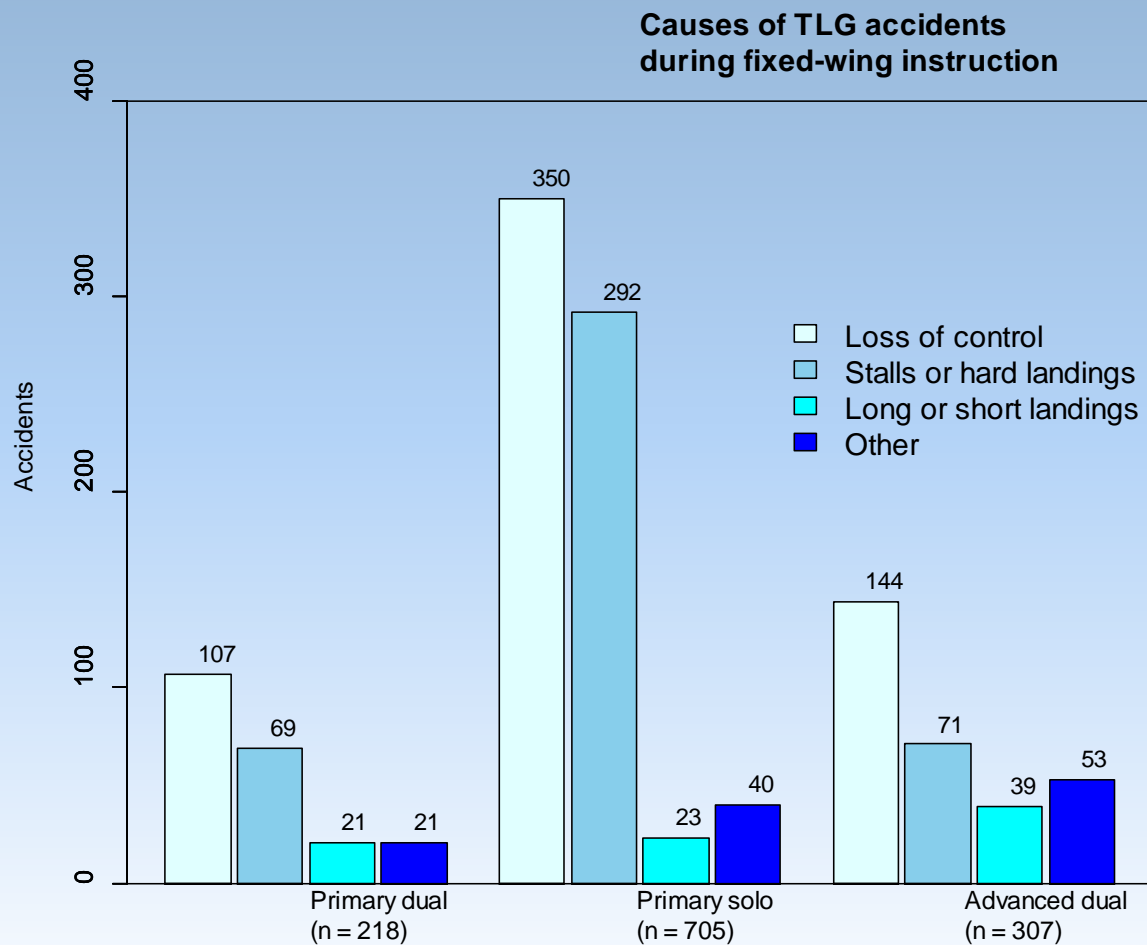
- **40% of all accidents during dual instruction, both primary and advanced**
- **Still, only three fatalities in ten years**
- **Students discouraged from trying them solo**

**Other problem areas:**

- **Rate of mechanical accidents ~40% higher than FW**
- **Advanced training suffers disproportionate number of crashes peculiar to “rotorcraft aerodynamics”**



# So what's actually going wrong?





# Fixed-wing TLG accidents

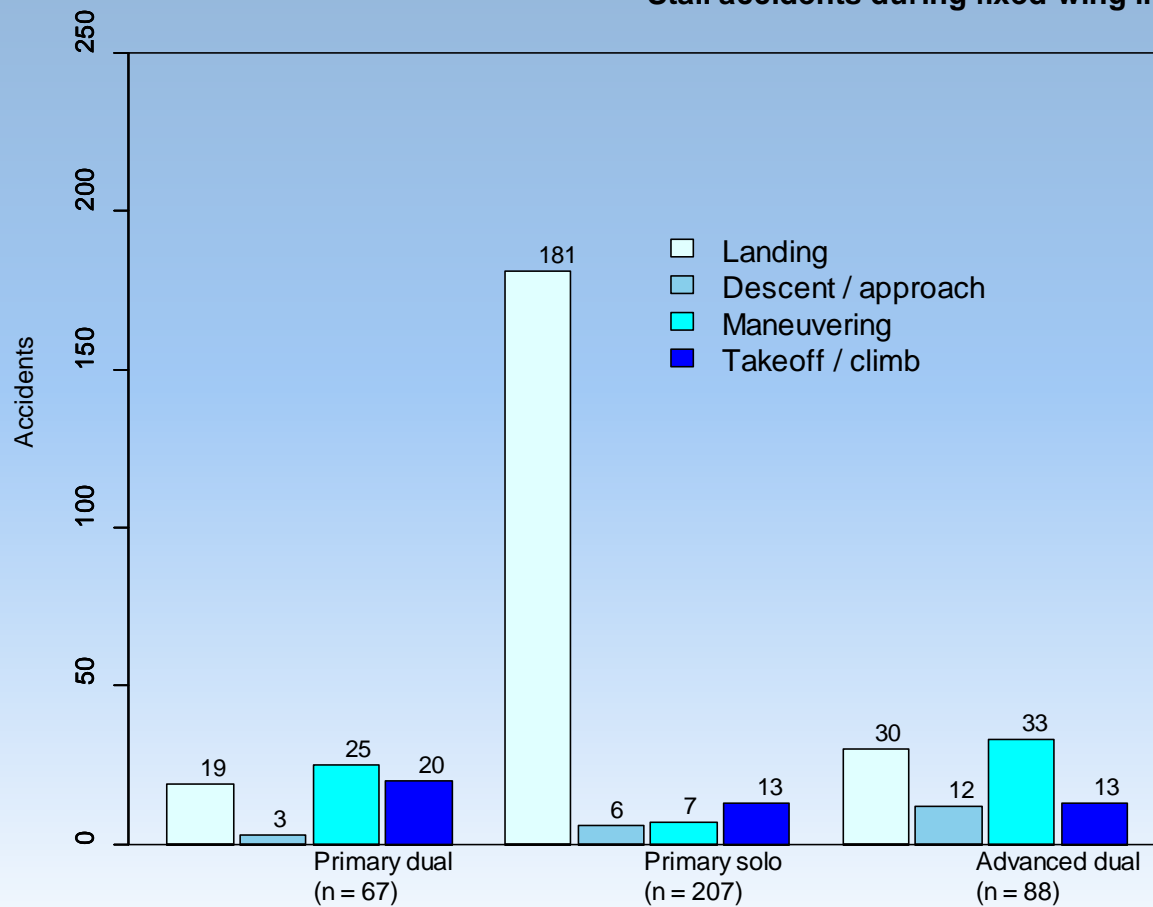
- **Losses of control (mostly directional) are the leading cause in all categories (almost 50%)**
- **Solo students are especially prone to stalls and hard landings (> 40% vs. 25-30% of dual)**
- **Overruns and undershoots relatively rare (3-13%)  
– but most common during advanced dual (47%)**
- **“Other” category includes**
  - **Contaminated runways (water, ice, snow)**
  - **Gear-up landings / premature retractions**
  - **Collisions with animals, vehicles, objects**
  - **Excessive weight and/or density altitude**





# Stall accidents

Stall accidents during fixed-wing instruc





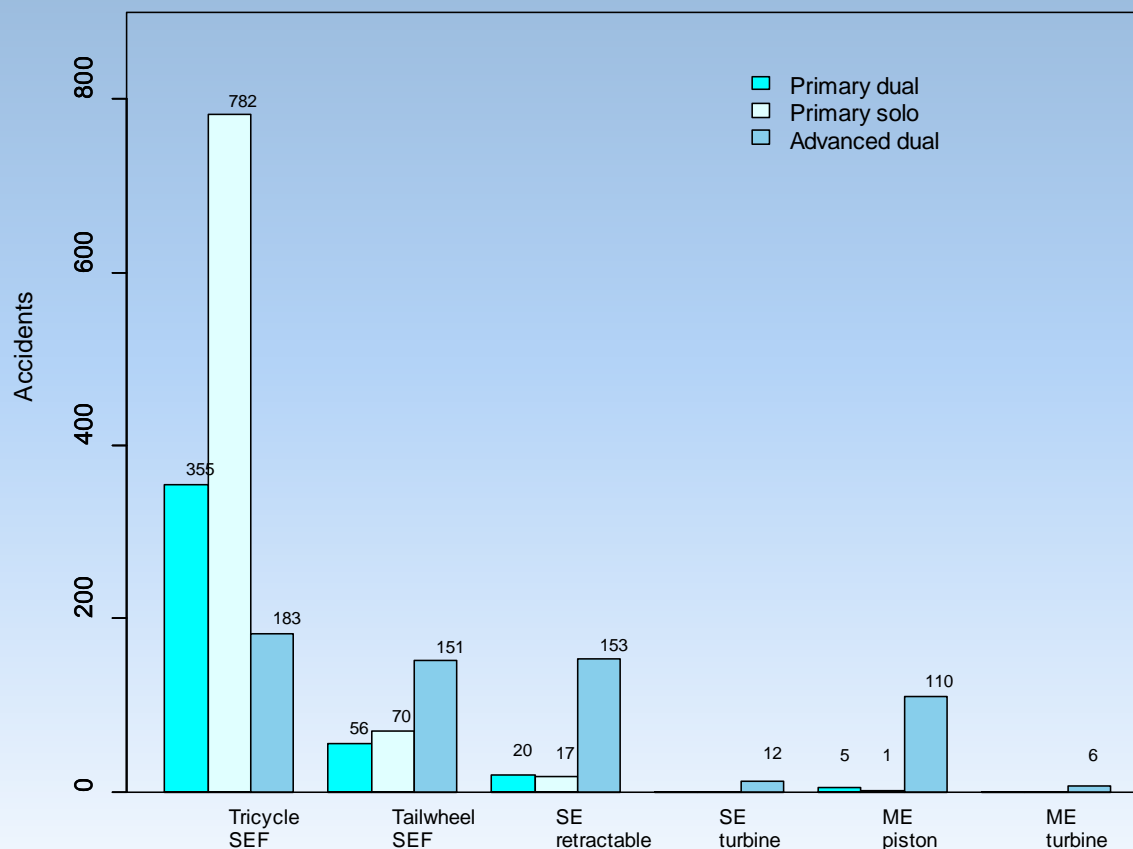
# Always an area of concern!

- Solo students stall a *lot* – but almost always (~90%) directly onto the runway from 5-6 feet agl.
- “Maneuvering” and “Takeoff” categories include most of the fatal stall accidents.
- “Descent / approach” category includes both instrument procedures and VFR pattern entry.
- Fatalities are still relatively rare.
- Almost none of these happened while actually practicing stalls / stall recoveries!



# Types of aircraft:

Fixed-wing instructional accidents by ai





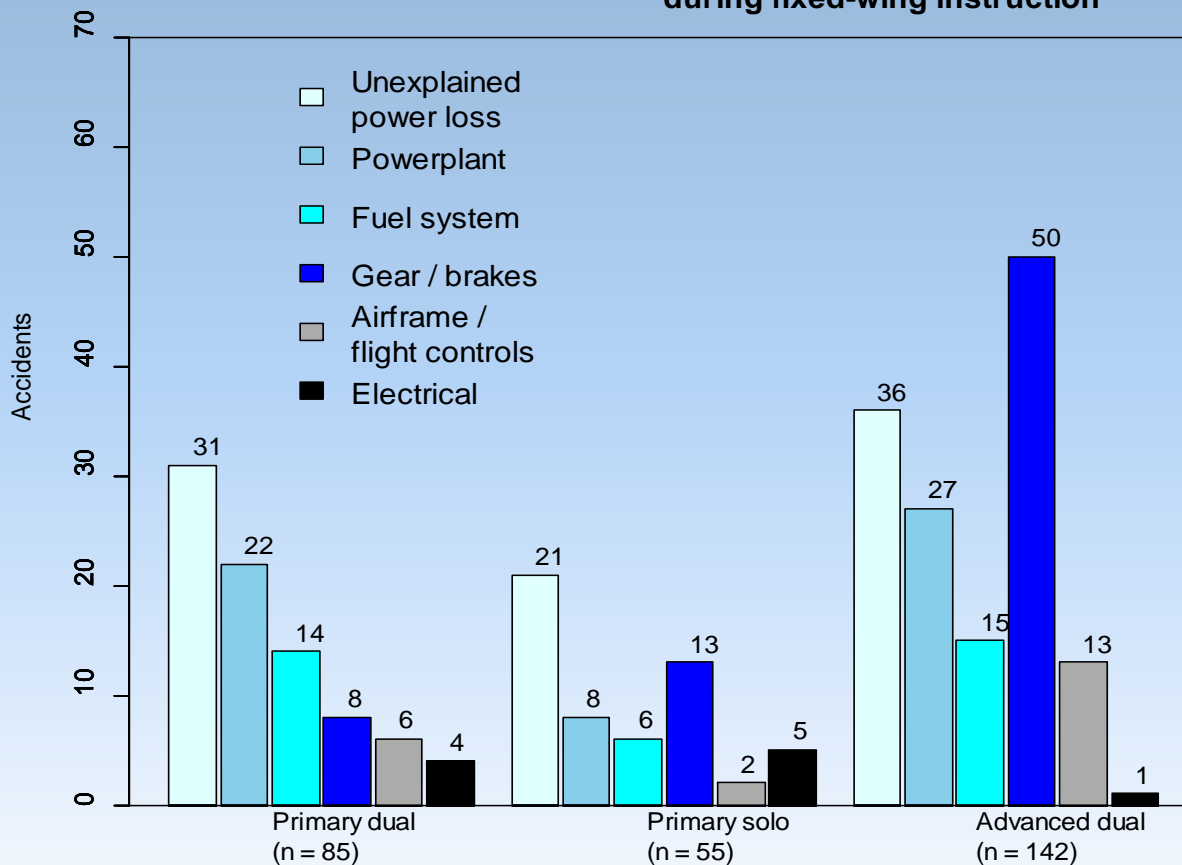
# Not many surprises ...

- Almost all primary training is in fixed-gear singles.
- With tricycle gear, 2.20 solo accidents for every one on a dual flight vs. 1.25 in taildraggers –
  - *Are tailwheel students more proficient by the time they're signed off to solo, or are their CFIs just less successful in preventing accidents?*
- Almost 55% in advanced instruction also involved fixed-gear singles – 83% of all training accidents.
- but 87% of accidents in complex, ME, and turbine airplanes occurred in advanced instruction.
- Just 6% involved multiengine airplanes.



# That helps explain the data on mechanical failures ...

**Mechanical and power loss accidents during fixed-wing instruction**





# Mechanical failures ... or not ...

- Leading cause overall (and in primary training) is ***unexplained*** loss of engine power:
  - No anomalies found other than impact damage
  - Intact engines successfully test-run afterwards
- Engines that quit when nothing's wrong with them account for 30% of this category!
- Almost as many as known powerplant and fuel system failures combined (33%).
- Landing gear and brake failures are leading cause during advanced instruction (35%).
- Two-thirds of airframe or flight control failures were during advanced dual.



# Hazards of advanced instruction

**You'd think it would be safer – but in more than 60% of fatal fixed-wing accidents, the “students” already held pilot certificates.**

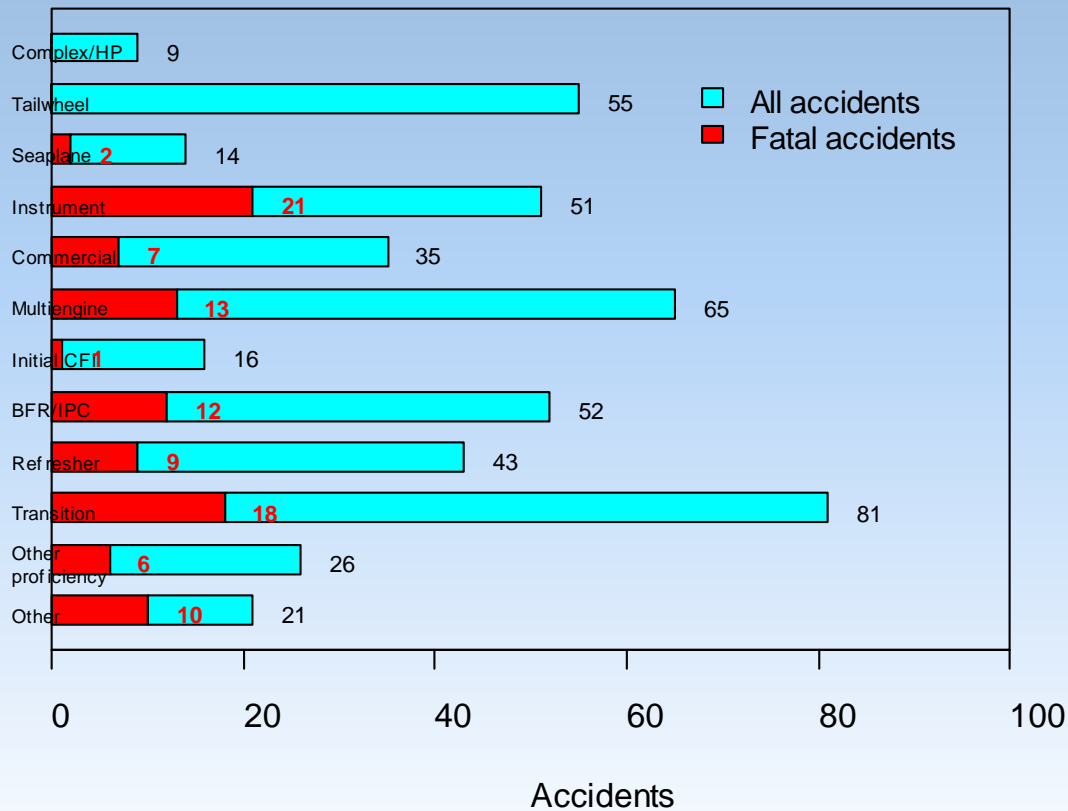
**Only a handful – about 10% of the total – involved specialized training such as crop-dusting, aerobatics, or upset recovery.**

**Here, too, the risks aren't where you might expect.**



# What are the problem areas?

## Types of advanced fixed-wing conducted on accident flights







# Unexpected dangers

- ASI review identified type of training in 76%, including 86% of fatal accidents.
- Less than 40% were during instruction for new certificates or ratings (IFR, ME, Comm, CFI, ATP).
- **Surprise!** Despite benign flight profile, instrument training had highest number, proportion fatalities.
  - Only 3 of 21 fatals due to faulty execution of approaches.
  - Included 5 of the 9 mid-air in all advanced instruction.
  - Hood-to-VFR transition was a problem area (stalls, CFIT).
- **Single largest number (17%) – and second-highest number of fatals (18%) – came during make-and-model check-outs.**



# Advanced training (continued)

- Flight reviews, IPCs, and general refresher training accounted for a combined 20%.
- Second largest category was multiengine, 20% of which were fatal.
- Complex, HP, and tailwheel endorsements made up a combined 14% but caused **no** fatalities.
- Only one fatal accident during initial CFI training.
- “Other proficiency” includes required Part 135, public agency, flight school, CAP line checks.
- “Other” is special-topic training: aerobatics, upset recovery, ag and mountain flying, etc.



# Suggestions:

- 1) **Revise FW curriculum to encourage later solo. – perhaps after at least one dual cross-country?**
- 2) **Think twice before agreeing to do a flight review, IPC, or other refresher training in an unfamiliar model (especially one the client owns).**
- 3) **Be even warier during practice autorotations. CFIs should err on the side of intervening early.**
- 4) **Give more attention to scanning for traffic during hood work. Don't relax after the hood comes off.**
- 5) **Remember: “Familiar” doesn't equal “safe.”**  
***Keep your head in the game!***



# The best of both worlds?





**Resources: Go to  
[www.airsafetyinstitute.org](http://www.airsafetyinstitute.org)!**

***Accidents During Flight Instruction:  
A Review***

***Instructor's Guide to the Pre-Solo  
Written Test***

***Accident Case Study:  
Everyone's Problem***

***Real Pilot Story: Fire in the Cockpit***