

Aftermath - Lessons Learned

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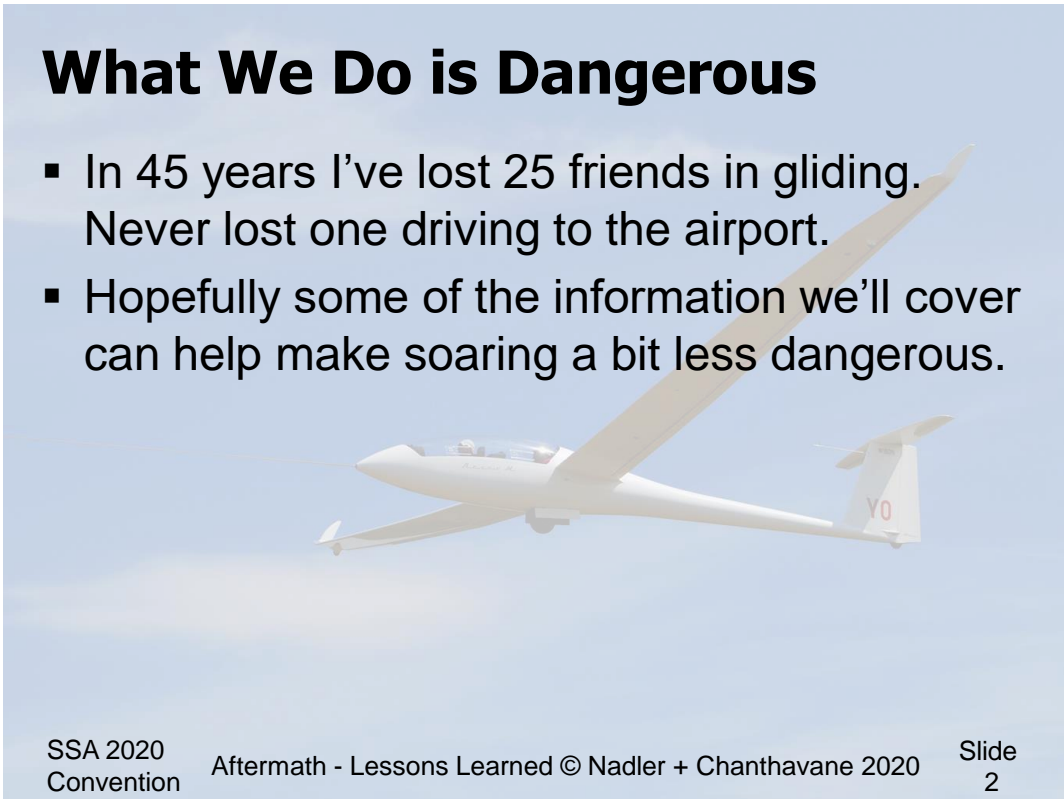
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Audience check; how many have:

- been in a glider accident?
- known someone who has?
- been involved in aftermath of an accident?

What We Do is Dangerous

- In 45 years I've lost 25 friends in gliding. Never lost one driving to the airport.
- Hopefully some of the information we'll cover can help make soaring a bit less dangerous.



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“Safer than driving to the airport” is oft-repeated – but dangerously wrong.

Accident Background - Pilots

- Dave Nadler, PIC:
 - 4500 hours in gliders, 2100 in motor-gliders
 - Most time in high-performance flying XC
 - Last 90 days 92 hours, Time-In-Type 312 hours
 - Flew ArcusM in 2016 Open Nationals at Nephi
- Spence Chanthavane, back-seat:
 - Cadet at the United States Air Force Academy
 - Member of the 94th Flying Training Squadron's Advanced Soaring Program
 - 100+ hours

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Last flight in ArcusM prior Nephi was Open day win at Perry, ~3mph faster than Concordia.

Last flight at Nephi before this visit was last day of 2016 Open Class Nationals, 6th place in 104mph, just ahead of Uys Jonker in JS-1c 21m.

Comfortable and current in type.

Accident Background - Aircraft

- ArcusM (and Duo) - good safety record
- ArcusM – tolerant of pilot
- Nimbus two seater predecessors:
 - 3D (3?): early problems with original vertical tail
 - No LOC of 3D I can find recorded
 - 4D: 100 built, 5 loss-of-control in-flight breakups (includes Don Engen and Bill Ivans fatal)
 - 4D mysterious LOC in thermal led to bail-out (Bitterwasser January 11th 2016)

ArcusM – Doesn't bite, even with unusual attitudes some of my copilots managed.

Accident Event Sequence

- Approaching 17,000 in stable climb, looking at clouds, talking about roll-out soon.
- T0: Bottom rudder kicked back and threw foot of rudder pedal. Other than rudder stop, no noise. No sensation, no immediate change in rates or attitude.
- Pressed hard on bottom rudder – immovable.
- Assumed it must be back-seater - I hollered:
Don't fight me on the controls!

Accident Event Sequence

- Backseater Spence: ***It's not me!!***
- ~T3: Centered stick (forward, neutral aileron).
 - No response, no feel in stick.
 - Rudder pedal stuck high side (opposite turn)
- Spiral dive continued to accelerate
- ~T8: Opposite aileron
 - Still no response or feel in stick.
- Spiral dive continued to accelerate
- ~T16: Dave yelled ***Bail Out*** & opened canopy

Bailout Sequence

- Spence bail-out and landing
 - Heard “Don’t fight me on the controls!”
 - Did not hear bail-out call
 - Clean exit, but required enormous force
 - Not so great landing
- Dave bail-out and landing
 - Difficulties in cockpit
 - Knocked out in exit. Awoke looking at sky. **Pull!**
 - Chute opened less than 1 second before impact
 - Injuries impacting aircraft, landing

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Descent rate in free-fall 120mph, actually 140mph true

Chute opened at 150-200 feet travelling cross-wind

Sink rate ~20fps, <10 seconds to landing.

Grabbed toggles and turned into wind then steered to landing spot between trees and boulders.

Feet together, knees bent...

Impacted vertically, on spot, on rocks between obstacles.

No possibility to roll and absorb impact – hence cracked vertebrae

Cracked ribs, bump on head, black-and-blue face apparently from hitting aircraft on exit

Tracker gone...

Lessons Learned - I

- Chute – Strong 26' emergency
 - Density Altitude 11,000ft, 18% higher descent rate
17.5fps / 12mph -> 20.6fps / 14mph
40% more energy
 - Round chute best for emergency
- Static Line
 - Many cases of pilot knocked out, possible in unresolved fatalities
 - Would have helped Dave, unless chute fouls...
- Break wings to reduce G-load??



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Adjust reference sink rate (19fps for 200lb pilot + chute at sea level); multiply by:

- $\sqrt{\text{actual pilot weight}/\text{reference weight}}$
- $\sqrt{\text{sea-level air density}/\text{actual density}}$

Round emergency chute:

- Much more reliable deployment
- Faster deployment

Don't use ram-air or square chute when you don't have time or can't be sure of a clean deployment.

Larger available chute from Strong doesn't have lower descent speed (just higher weight and deployment speeds).

Spoilers reduce max G from 5.3G to 3.5G

Lessons Learned - II

- Parachute training mandatory!
- Don't delay after initial disbelief!
- Preflight brief must include chute + bailout
- Necessities on your body (phone, spare glasses, etc.)
- Dress to egress; know your environment
- Parachute preflight; when is the last time your equipment was certified?
- Adequate life support kit

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Tracker must not be simply clipped on chute! It will be gone!

Life support kit contents:

Spence's Landing Site



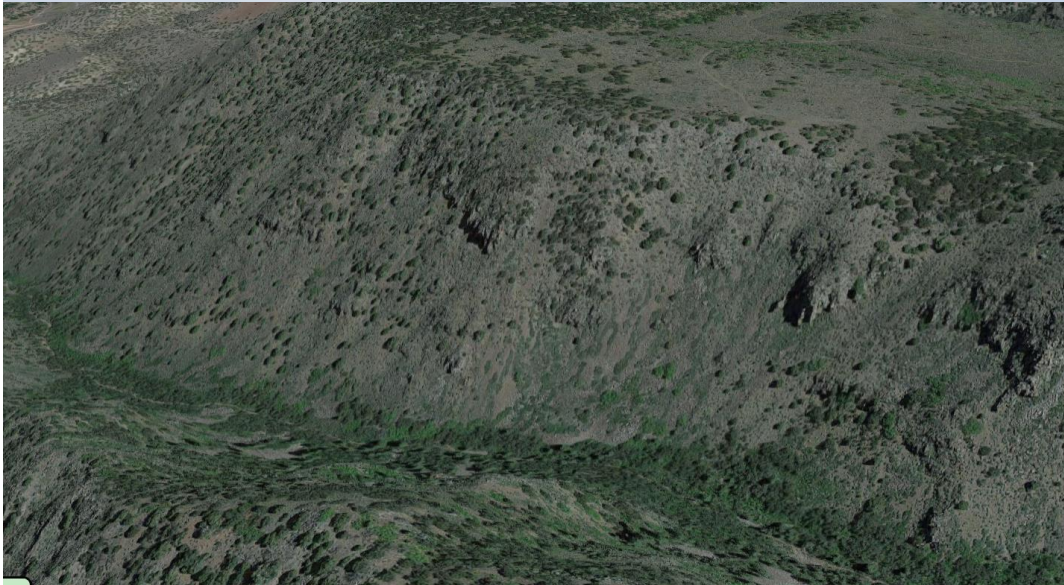
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Chute barely visible in center of photo.

Spence's Landing Site



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ATV trail at bottom of Rock Creek Canyon!

Extrication - Spence

- Landed on side of cliff
- We were near Richfield
- Started working west
- Saw ATV trail, hiked out
- Met people 3 hours later ~6PM, Called 911
- Met Sheriff's department, 1.5 hours ground search didn't find Dave (who was in next Canyon), then dispatched helicopter



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Lessons Learned - III

- Notice your environment, mark it somehow for SAR, memory can be clouded
- Keep track of time!
9PM sunset approaching
- 30 minutes from helicopter launch to sunset
- Write down everything about the incident ASAP; important facts tend to be forgotten

Dave's Landing Site...



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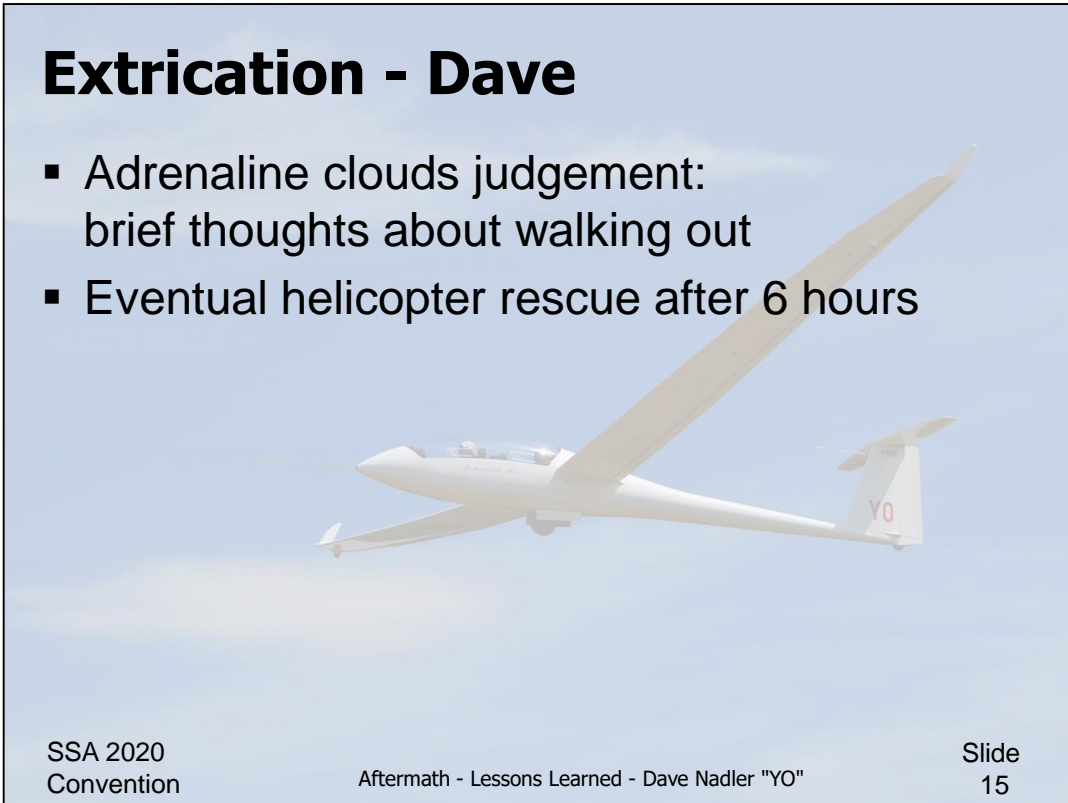
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No trail in Water Creek Canyon; overgrown with Cottonwood trees.

Extrication - Dave

- Adrenaline clouds judgement:
brief thoughts about walking out
- Eventual helicopter rescue after 6 hours



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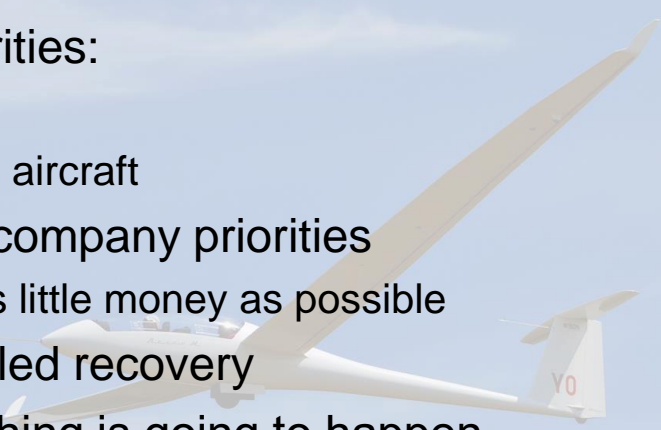
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Lucky it was the longest day of the year!

Lessons Learned - IV

- Unless you're **sure** you're OK and near help, stay with the visible chute
- Chute pouch for tracker: No Velcro!
- ELTs do not work
- Again, note environment
- Write notes ASAP

After the Accident

- NTSB priorities:
 - Fatals
 - Common aircraft
 - Insurance company priorities
 - Spend as little money as possible
 - Initial bungled recovery
 - NTSB: Nothing is going to happen...
Unless wreck coordinates/photos provided.
- 

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NTSB accident priorities: fatals, common aircraft
non-fatal accident with only a handful of the aircraft flying in USA – not so high.

Finding the Wreck

- Thanks to everyone who helped.
- Research with Google Earth
- Glider overflight
- CAP overflight
- Hike to wreck, photos
- 2nd recovery, almost 3 months after accident

Difficult Terrain...



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Wreck Located



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Closer View of Wreck



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Lessons Learned - V

- Protect the wreck if possible.
- Recover all flight recorders ASAP.
 - § 830.10 Preservation of aircraft wreckage
Preserve the flight recorders!!
- Photograph wreck
- Photograph surrounding area, especially tree and ground scaring
- Understand wreck will likely be removed on a 4' x 4' utility trailer after sawn into small bits.

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Remind FAA and law enforcement of FAR requiring preservation of wreckage:
preservation means removing for safekeeping flight recorders!
Before they're removed by souvenir seekers or destroyed by weather!!

Recovery of the wreckage will be done by insurance co. for lowest cost.
It will likely destroy important evidence.

Forward Fuselage



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Aft Fuselage



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Speculation, A Smoking Gun?

- Upper Rudder Hinge?



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Prompting an Investigation

- Duo accident similarities
- Investigation interrupted by longest government shutdown in history
- NTSB work resumed after 2nd shutdown, with large backlog of high-priority work (accidents during shutdown)

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No further investigation was to be performed.
Inadequate priority even with fuselage recovered.

Investigation

- February 2019 meeting, 8 months later.
Included NTSB composite and structures experts and SH expert.
- Upper rudder hinge failure caused by rudder hitting tree during impact
- Could not find cause of accident.
- ...proving why speculation is unhelpful

Summary

- Thanks to all that helped!
- We were extremely lucky...
- Review your equipment
- Review your pre-flight preparation routine
- After an accident, get and protect info ASAP

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Thanks to:

- Strong parachute and packers.
- Don Mayer of Parachute Shop for chute training ~35 years ago!
- countless people that helped with my extrication, the investigation, and ongoing recovery.

Extraordinary luck:

- We were at around ~17000 MSL, ~9000 AGL
- I came to soon enough (less than 1 second before impact)
- Longest day of the year (I was recovered at 9PM)
- P2 Spence got out clean and knew how to use the chute
- Spence landed near an ATV trail
- Neither of us impaled ourselves on a Joshua tree
- Spence found help after only 3 hours

Questions

- Please, No speculation about cause.
This discussion is about safety lessons.



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No speculation here. Maybe later if you buy me a beer.