

Cloudy with a Chance of Confusion

Navigating Common IFR Pitfalls

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CFI • CFII • MEI • ABS RECOGNIZED INSTRUCTOR



■ BEFORE WE BEGIN

Disclaimer

This presentation is for **general educational and discussion purposes only** . It is not a substitute for formal flight instruction, the Pilot's Operating Handbook, or the avionics manufacturer's documentation. Every aircraft, avionics suite, and operating environment is different — your situation may not match the scenarios shown here.

Always work directly with a qualified flight instructor to understand and operate *your specific avionics* correctly *avionics* correctly before relying on them in flight.

The accidents discussed here are not presented to judge any pilot or operator. They are shared with respect with respect for those affected — so that we can learn from the chain of events and make ourselves safer ourselves safer pilots.

■ ABOUT ME

Kevin Crozier

KTronics Aero Services — Flight Instruction & Safety-Critical Software

DAY JOB

FAA Software DER — DO-178C DAL A full approval authority (Parts 23, 25, 27, 29). Aviation expert witness.

FLIGHT INSTRUCTOR

CFI · CFII · MEI · ABS Recognized Instructor. Air-to-air photo pilot & contract contract pilot.

IN THE COCKPIT

Caretaker of **N917DC** — a 1981 turbonormalized A36 Bonanza.

3,800+

TOTAL HRS

2,900+

BONANZA HRS
HRS

900+

DUAL GIVEN

CLOUDY WITH A CHANCE OF CONFUSION



N917DC · 1981 A36 BONANZA

K. CROZIER · KTRONICS AERO

■ A QUICK GUT CHECK

Is this talk for you?



STEAM GAUGES

Every needle has a personality.



FULL GLASS

More pixels than your living room.



A LITTLE OF EVERYTHING

Assembled one AMU at a time.

If you fly IFR behind any of these — **yes.** *The pitfalls live in the procedures — not the panel.*

■ PICTURE THIS — NIGHT, SINGLE-PILOT IFR

What would you do?

BRIEFED

LPV minimums — **DA 568 ft (250 AGL)** — for a night approach into 3T5, Fayette Regional.

ESTABLISHED

Weather is **700 ft overcast** . LPV confirmed at the IAF. Everything looks normal.

60 SEC
TO FAF

GTN 750

MESSAGE

LNAV
V

GPS

!

"GPS approach downgraded. Use
Use LNAV minima."

Glidepath's gone. You're 60 seconds from the fix. Now what?

■ TODAY'S AGENDA

Three Common IFR Pitfalls

Each one is a real, recent accident or incident.

01

GPS Downgrades

The Big Surprise

Your precision approach quietly becomes a non-precision one.

02

Obstacle Departure Procedures

The Silent Requirement

Nobody clears you for it — but the terrain doesn't care.

03

Advisory Glidepaths

The Great Impostor

It looks exactly like an ILS glideslope. It isn't one.

PITFALL ONE

GPS Downgrades

The Big Surprise

CASE
E

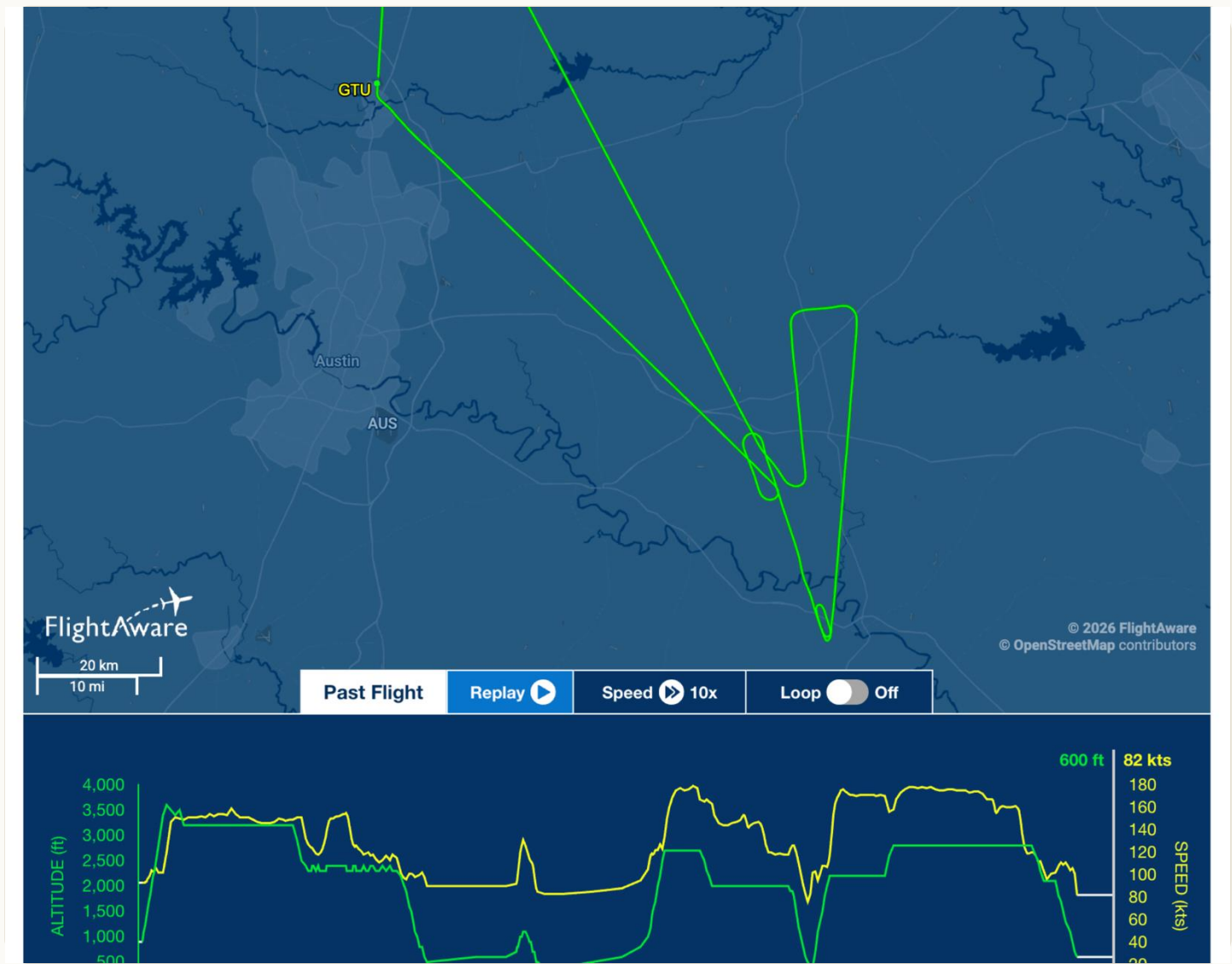
Solar Storm — January 2026 · Instrument proficiency flight, Central Texas

CLOUDY WITH A CHANCE OF CONFUSION

■ PITFALL 01 · THE FLIGHT

A routine proficiency flight

AIRCRAFT	1990 Beechcraft F33A · Garmin GTN 750
PILOT	Private, instrument-rated
INSTRUCTOR	Me
FLIGHT	Instrument proficiency, approaches at 3T5, GYB GYB & GTU — January 20, 2026



Practice area · Central Texas

■ WHAT WAS HAPPENING 93 MILLION MILES AWAY

A solar storm hits Earth

● JAN 18 · 1:09 PM EST

The eruption

A strong **X1.9** solar flare peaks from Region 4341.

● JAN 19 · 2:38 PM EST

Shock arrival

The CME strikes Earth's magnetic field — geomagnetic storm jumps to severe.

● JAN 20

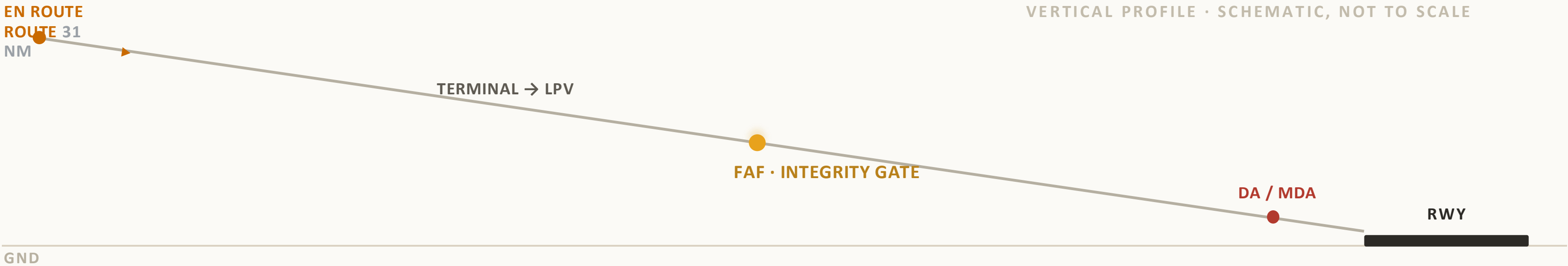
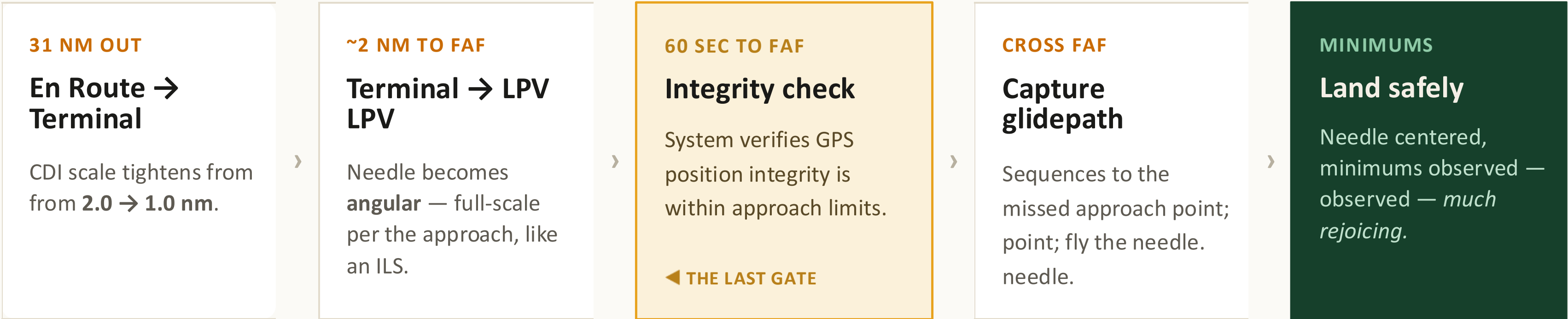
Our flight

We launch into a degraded GPS environment — and don't don't think twice about it.



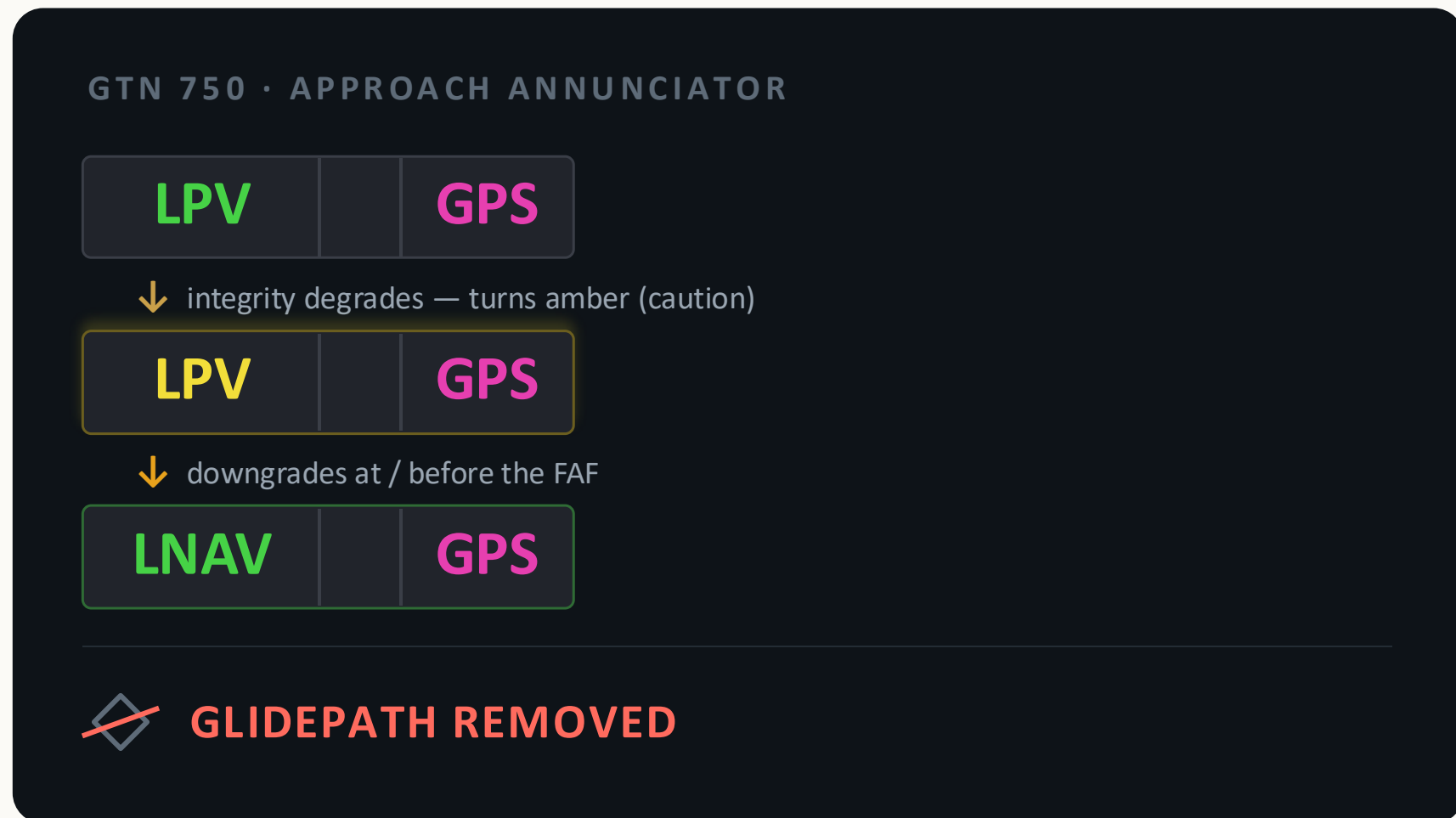
*Space weather degrades the accuracy
GPS & WAAS can guarantee.*

A WAAS LPV approach, step by step



■ PITFALL 01 · WHAT ACTUALLY HAPPENED

The surprise



- ◆ GPS integrity exceeds its horizontal and/or vertical limits.
- ◆ **LPV turns amber** as a caution then steps to **LNAV** and the glidepath diamond **disappears**.
- ◆ Ready or not, you continue with **LNAV non-precision precision minimums**

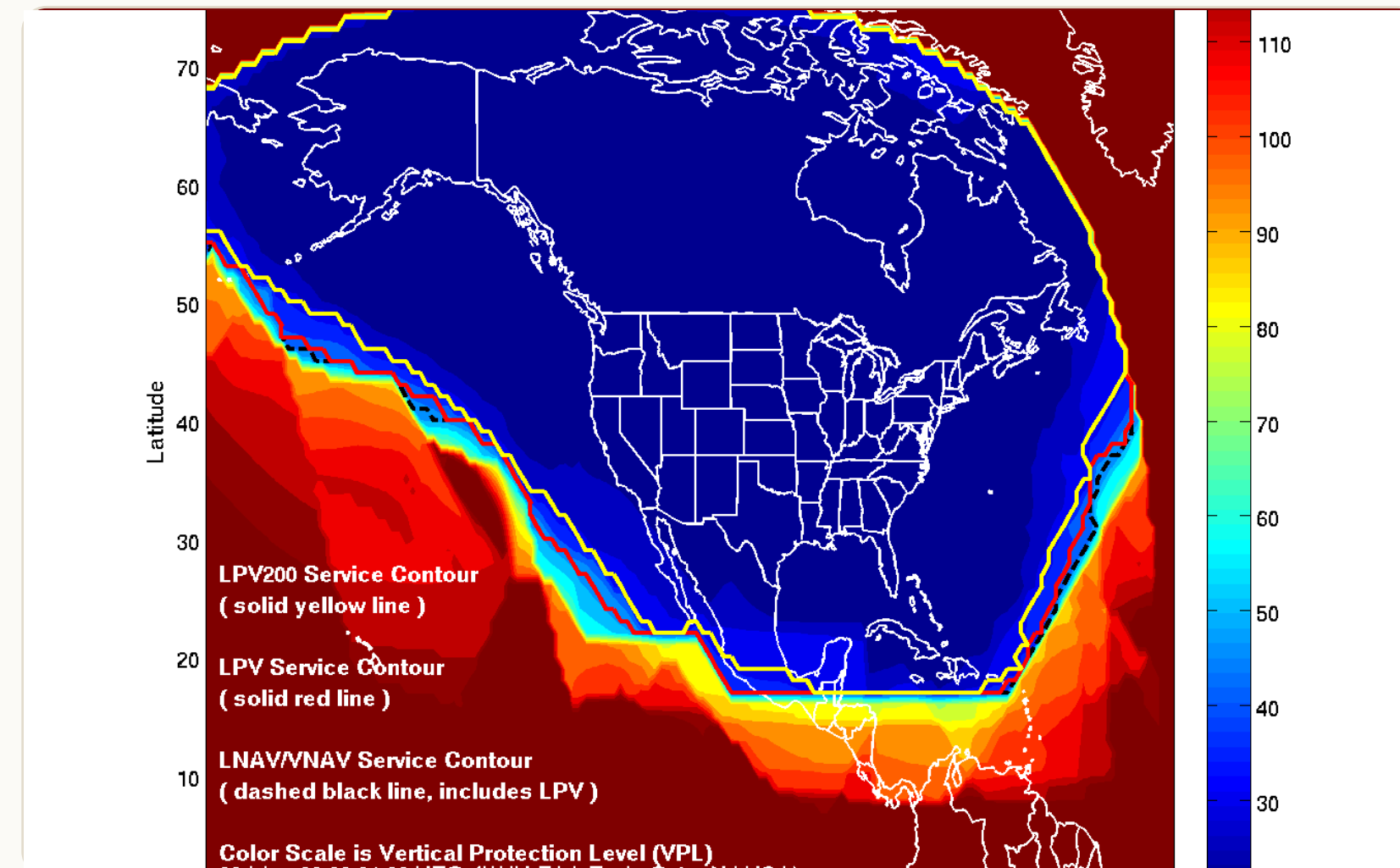
■ PITFALL 01 · WHY IT DOWNGRADED

WAAS coverage collapsed

Color = Vertical Protection Level. *Blue = LPV available; red = it isn't.*

● Normal day

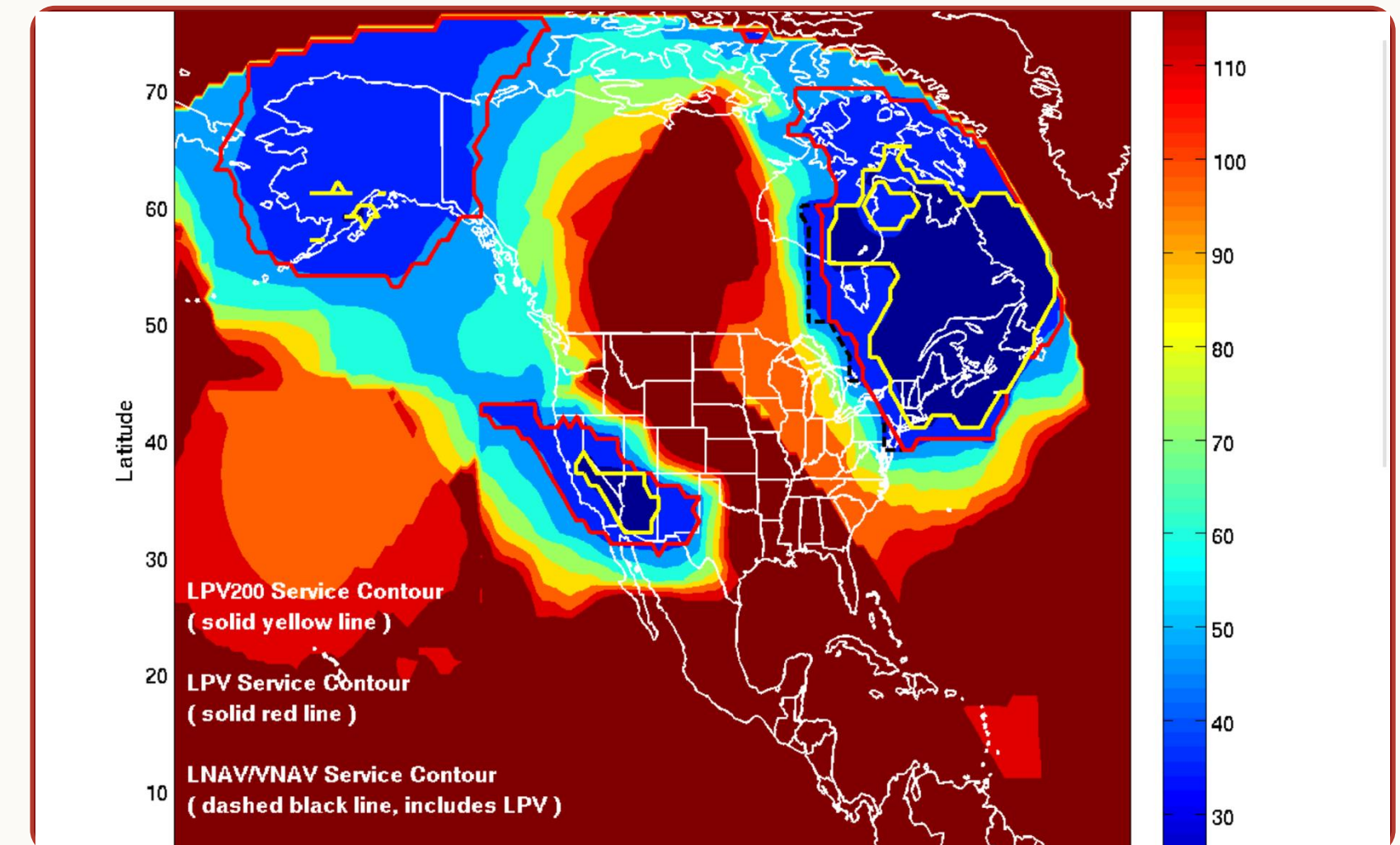
22 MAY 26



Deep blue coast to coast — LPV available virtually everywhere.

● Our flight — G4 storm

20 JAN 26 · 22:12Z



CONUS turns red — LPV vertical guidance no longer guaranteed.

■ PITFALL 01 · TWO MESSAGES, TWO OUTCOMES

Which one do you get?

Same box, same approach — the message depends on how badly integrity is degraded.

■ CAUTION
N

"GPS approach downgraded. Use LNAV minima."

Integrity still meets the **non-precision** limits.

YOUR MOVE

Continue with LNAV minimums — *if you briefed them.*
them.

⊗ ABORT
T

"Abort Approach. GPS approach is no longer longer available."

Integrity can't even meet the **horizontal** non-precision limits.
limits.

YOUR MOVE

Go missed. The approach is over.

Takeaways

01 WAAS doesn't always look like WAAS

Coverage and integrity vary — space weather can degrade or remove vertical guidance **without warning**.

02 The annunciations are the airplane talking to you

Treat MSG, LOI and mode changes as **alerts** . Know what your box does on downgrade — LPV→LNAV LNAV with no +V (Garmin).
no +V (Garmin).

03 Brief LNAV mins — be ready to fly without a glidepath

Every WAAS approach has a fallback line of minimums. Brief it **before you start down** so the transition is a non-event.
event.

If anything stops making sense down low:

Go missed.

PITFALL TWO

Obstacle Departure Procedures

The Silent Requirement

**CASE
E**

Beechcraft G36 CFIT — Aspen/Pitkin County (KASE) · July 3, 2021

A clearance, declined

AIRCRAFT	Beechcraft G36 Bonanza · N36JJ
PILOT	58 y/o ATP, ~12,000 hrs · 1st Class Medical · Medical · ferry pilot
PASSENGER	PP-ASEL, right seat — had just purchased the purchased the airplane
WEATHER	Winds 120@6 · Vis 10 SM · Clear · OAT 25 °C

13:53 — ON THE GROUND AT ASE

Landed Aspen for fuel & lunch, then filed IFR to Des Moines (DSM).

DENSITY ALT 25 °C @ 7,820 ft field elev → DA ≈ 10,900 ft

THE DEPARTURE CLEARANCE

LINDZ ONE departure
departure

JEPPESEN · KASE

Climb & maintain 16,000 ft, meeting the published climb gradient — the procedure minimum for terrain clearance.

TAKE-OFF OBSTACLE NOTES: See TAKE-OFF OBSTACLE NOTES page (10-30B1).							
TAKE-OFF MINIMUMS: Rwy 15: Not authorized-Terrain. Rwy 33: 400-1 with minimum climb of 465 FT/NM to 10600.							
Gnd speed-KT	75	100	150	200	250	300	
465 FT/NM	581	775	1163	1550	1938	2325	
INITIAL CLIMB						TOP ALTITUDE	
Climb heading 343° to 9100, then climbing LEFT turn to 16000 on heading 273° to intercept IPKN NORTHWEST course outbound to LINDZ. Then on assigned transition, MAINTAIN 16000. EXPECT clearance to filed altitude 10 minutes after departure.						16000	

Take-off minimums & initial climb — the gradient required to make 16,000.

↓ Pilot would not accept the climb gradient — or 16,000 ft.
16,000 ft.

THE DECISION

Cancelled IFR. Departed VFR.

And with that, obstacle clearance became entirely his to provide.

■ PITFALL 02 · WHAT HAPPENED NEXT

The accident

● TAKEOFF & INITIAL CLIMB

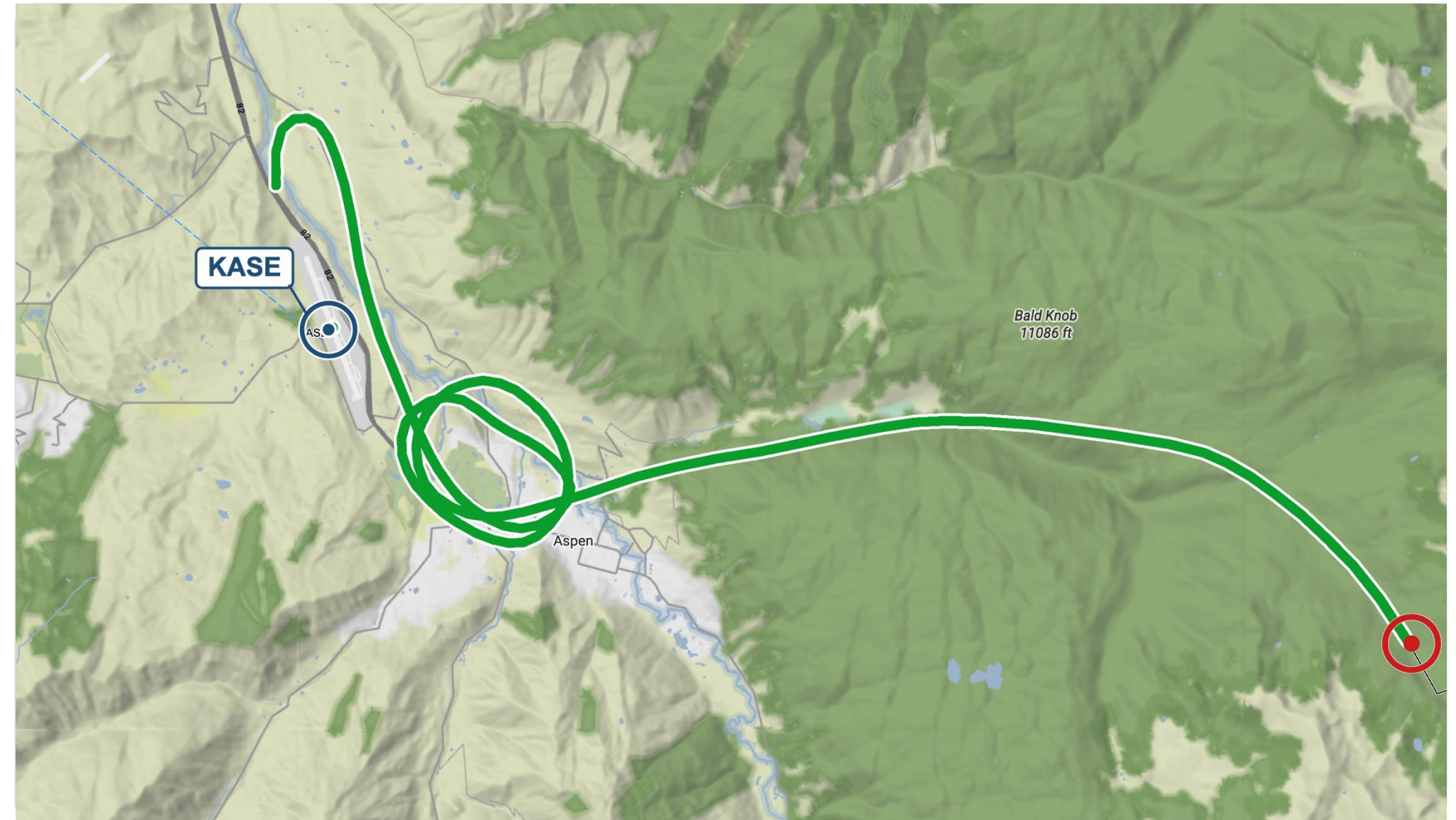
Circled near the airport, climbing through 10,000 ft.
10,000 ft. GS 110–120 kt, climb **340–360 ft/min.**
ft/min.

● 18:36 — CLIMB EAST, RATE DECAYING

Turned east; terrain rose, climb rate decreased.
10,820 ft (~600 AGL) , climbing just 150–250 ft/min.

● 18:38 — IMPACT

At 11,300 ft, turned into a semicircular bowl with
with peaks near **13,000 ft** , banked left 28°–39°, and
39°, and struck terrain.



Track: circling off ASE, then the turn **east into rising terrain** toward Bald Knob (11,086 ft).

Three kinds of instrument departure

Only one is built purely to keep you off the rocks.

SID

Standard Instrument Departure Departure

Always **graphic** . Reduces pilot/controller pilot/controller workload and streamlines streamlines the system — and also provides provides obstacle clearance.

- ATC clearance required

THE ONE THAT MATTERED HERE

ODP 

Obstacle Departure Procedure

Built for **obstacle clearance** via the least-least-onerous route to the en route structure. Textual or graphic — look for the for the "T" **triangle** on the charts.

- No clearance needed*

VCOA

Visual Climb Over Airport

In VMC at/above the specified vis & ceiling, ceiling, fly **climbing turns over the field** to **field** to the published "at or above" altitude. altitude.

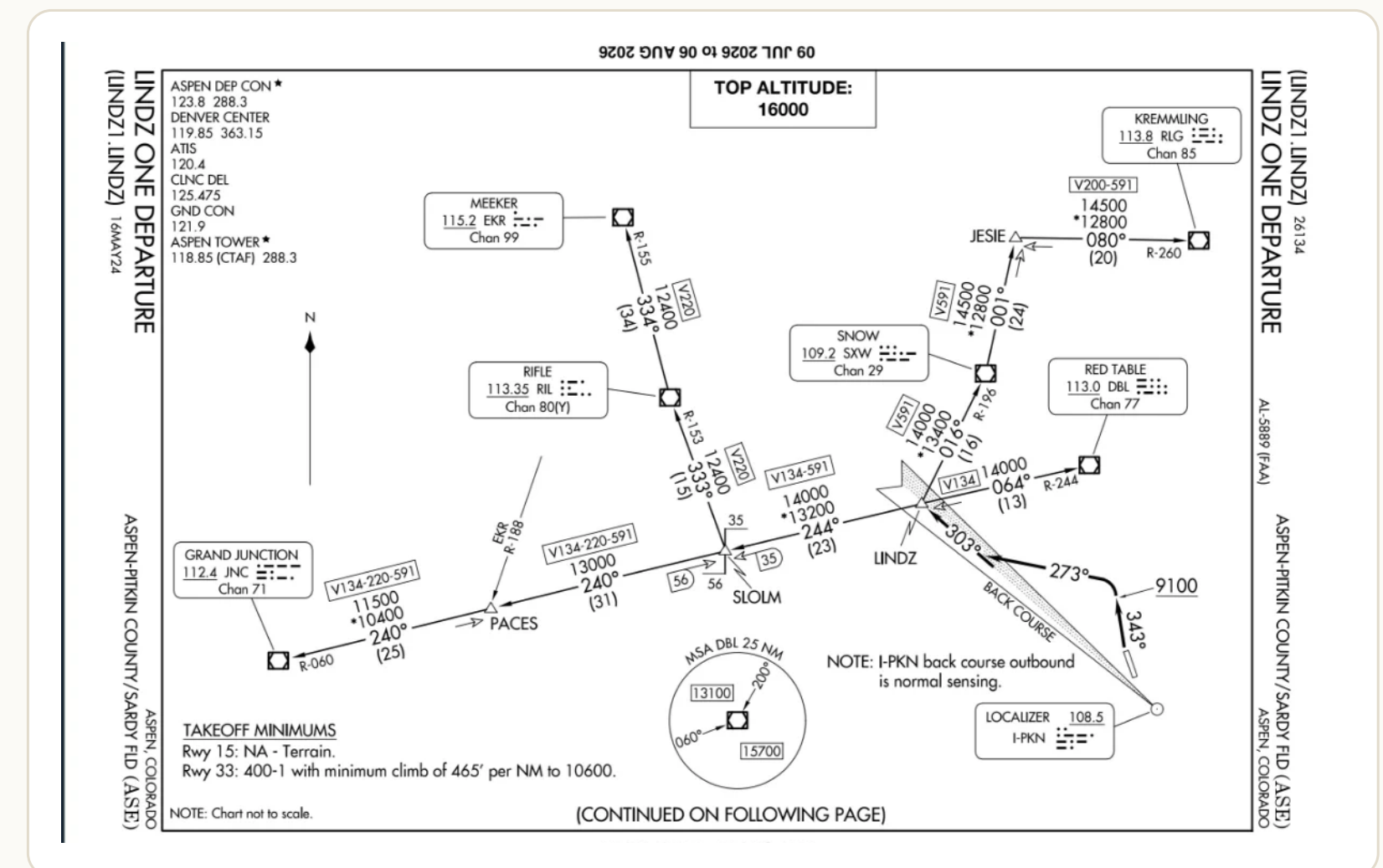
- Advise ATC early

* Unless ATC assigns a SID or radar vectors.

SID — Standard Instrument Departure

Always graphic · workload + obstacle clearance · ATC clearance required.

- ◆ **Always graphic.** Built to reduce pilot/controller workload and streamline the system — and to provide obstacle clearance.
- ◆ **ATC clearance required** before you fly it.
- ◆ RNAV SIDs say **(RNAV)** in the title — e.g. *SHEAD TWO DEPARTURE (RNAV)* . Load it in the box and brief it.



A real graphic SID — the LINDZ ONE departure from Pitfall 02.

ODP — Obstacle Departure Procedure

Built only to keep you off the obstacles — and Aspen published one.

- ◆ Obstacle clearance via the **least-onerous route** to the en route structure.
- ◆ Textual or graphic — look for the **“T” triangle** in the takeoff-minimums section.
- ◆ May be flown **without ATC clearance** (unless assigned a assigned a SID or vectors). Encouraged at night & in IMC. in IMC.

Flown as published, the SARDD THREE keeps you above you above the terrain — the accident chain skipped it. skipped it.

■ TEXTUAL ODP

SIMPLEST FORM FORM

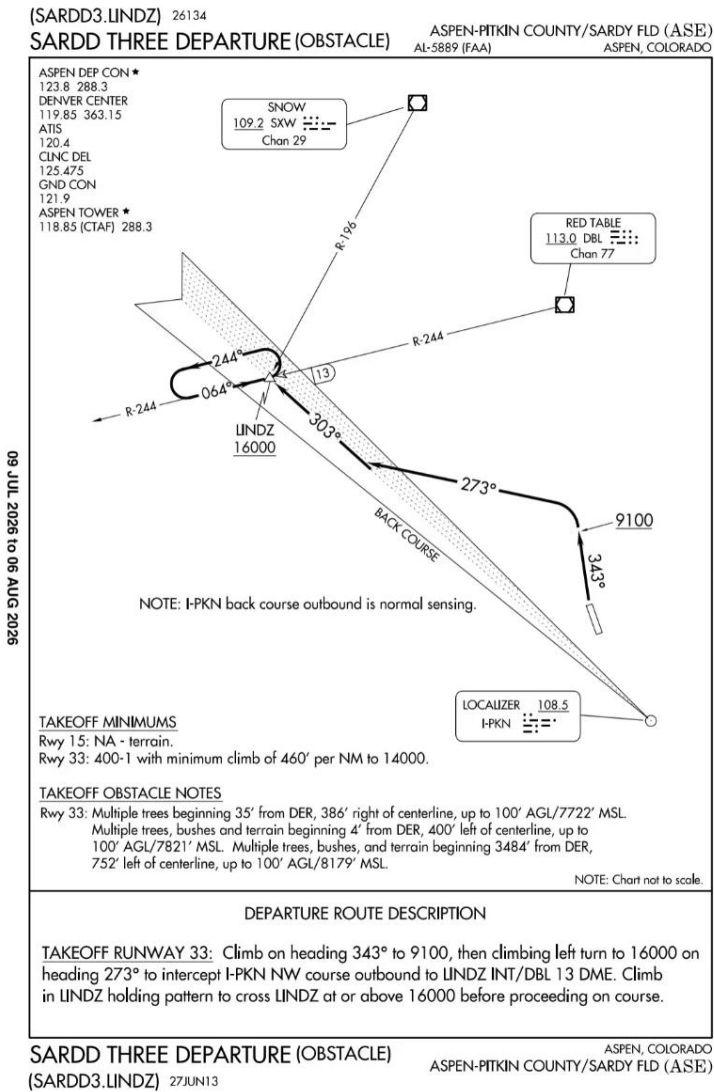
LLANO, TX
LLANO MUNI (AQO)
TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES
ORIG-A 12JUN25 (25163) (FAA)
TAKEOFF MINIMUMS:
Rwys 13, 31, NA-Environmental.
DEPARTURE PROCEDURE:
Rwy 35, climb on heading 354° to 1900 before proceeding on course.

Llano, TX — climb hdg 354° to 1,900, then on course.

OUR ACCIDENT AIRPORT · GRAPHIC ODP

ASPEN-PITKIN CO. (KASE)

SARDD THREE (OBSTACLE)



Rwy 33 — 400-1 or std., min. climb 460 ft/NM to 14,000 before proceeding on course.

VCOA — Visual Climb Over Airport

Climb in visual conditions over the field.

- ◆ For when a normal climb gradient won't clear terrain: stay in stay in **VMC** and climb in turns over the airport.
- ◆ Climb to the published "**at or above**" **altitude** , then proceed on course.
- ◆ **Advise ATC as early as possible** of your intent to fly the VCOA.

FAA d-TPP — STEAMBOAT SPRINGS (SBS)

STEAMBOAT SPRINGS, CO

STEAMBOAT SPRINGS/BOB ADAMS FLD (SBS)

TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES

AMDT 2 30JAN20 (21112) (FAA)

TAKEOFF MINIMUMS:

Rwy 14, std. w/min. climb of 657' per NM to 8900 or 3700-3 for VCOA.

Rwy 32, std. w/min. climb of 519' per NM to 9600 or 3700-3 for VCOA.

DEPARTURE PROCEDURE:

Rwy 14, climbing right turn to 14000 on heading 220°, thence. . .

Rwy 32, climb on heading 323° to 7500, then climbing left turn to 14000 direct BQZ VOR/DME, thence. . .

. . .on BQZ R-172 to SBURG and hold, continue climb-in-hold to 14000 (hold south right turns, 352° inbound).

VCOA:
All Rwy's, obtain ATC approval for VCOA when requesting IFR clearance. Climb in visual conditions to cross BQZ VOR/DME at or above 10400, continue climb to 14000 on BQZ R-172 to SBURG INT/BQZ 11.35 DME and hold, continue climb-in-hold to 14000 (hold south, right turns, 352° inbound).

TAKEOFF OBSTACLE NOTES:

Rwy 14, tree 171' from DER, 144' left of centerline, 6887' MSL.

Rwy 32, tree 1.6 NM from DER, 3107' right of centerline, 100' AGL/7169' MSL.

Trees beginning 1.7 NM from DER, 2988' right of centerline, up to 30' AGL/7219' MSL.

VCOA: cross **BQZ ≥ 10,400** , climb-in-hold to 14,000.

■ PITFALL 02 · WHEN THE NUMBERS DON'T WORK

What if you can't make the gradient?

The hard truth at Aspen: at 25 °C the field sat at $\approx 10,900$ ft density altitude — this G36 couldn't meet the published gradient.

REQUIRED

460 ft/NM to 14,000

=

THE MATH · AT 120 KT GS

≈ 920 fpm — sustained

THIS G36 RECORDED

340–360 fpm

01 Run the numbers on the ground

Required fpm = gradient $\times$ groundspeed $\div$ 60. Compare to POH climb at your **weight and density altitude** — before engine start.

02 Change the conditions conditions

Depart in the cool of the morning. Take less fuel, fewer people — or split the trip. **Performance you can buy back.**

03 Stay visual — by design 3 design

Day VMC, terrain in sight, a briefed valley route with a **hard turn-back point back point** — or a published VCOA where one exists.

04 Change the plan plan

A lower-elevation fuel stop costs minutes — and buys a departure the the airplane **can actually fly.**

THE DECISION POINT

No clearance and no procedure can change physics. This call is made on the ground.

Takeaways

01 You own departure obstacle clearance

AIM 5-5-14(a): the pilot weighs terrain & obstructions, decides whether to clear them visually or by procedure, and checks whether a DP/ODP exists.

02 Part 91 doesn't mandate ODPs — fly them anyway

91.175(f) only requires ODP use for Part 121/125/129/135 — but the ODP is the safest path off that runway. If one exists and ATC hasn't assigned an alternative, fly it.

03 Know how to actually fly an ODP

Pull up the textual or graphic ODP **before takeoff**. Brief headings, altitudes and the required climb gradient — and have it loaded in the box if it's RNAV.

Can't meet the climb gradient or the procedure minimum?

Don't go.

PITFALL THREE

Advisory Glidepaths

The Great Impostor

CASE
E

Epic E1000 CFIT — Steamboat Springs (KSBS) · February 2026

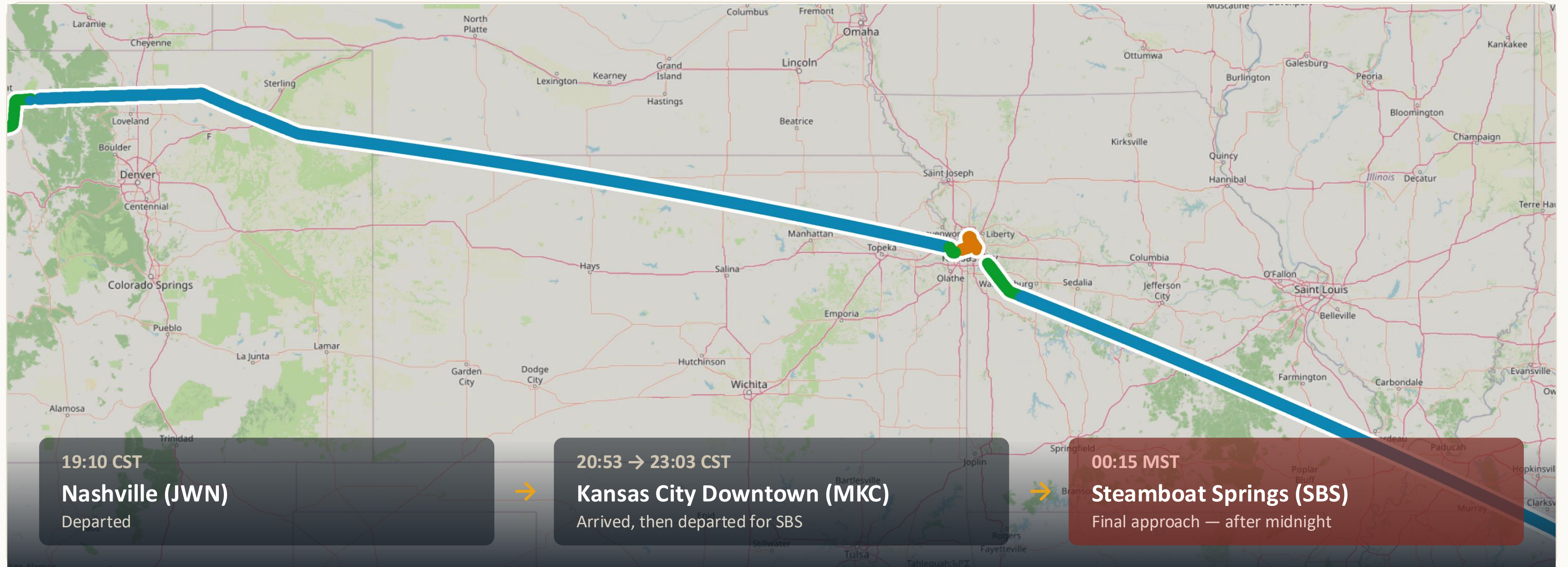
CLOUDY WITH A CHANCE OF CONFUSION

■ PITFALL 03 · THE FLIGHT

A long day, ending after midnight

AIRCRAFT 2024 Epic E1000 · Garmin G1000

PILOT Commercial, Instrument-rated · 1,150 hrs



WX @ SBS 00:15 Wind calm · Vis 10 SM · SCT 500 · BKN 1,600 · OVC 2,400 ft AGL

CLOUDY WITH A CHANCE OF CONFUSION

PITFALL 03 · ADVISORY GLIDEPATHS

■ PITFALL 03 · "CLEARED FOR THE RNAV APPROACH"

Which RNAV approach?

CONTROLLER

"Cleared for the RNAV approach to SBS."

PILOT READ BACK



"RNAV 32 to Steamboat Springs."

FLOWN — NA AT NIGHT

RNAV (GPS) Z RWY 32

LNAV / Circling

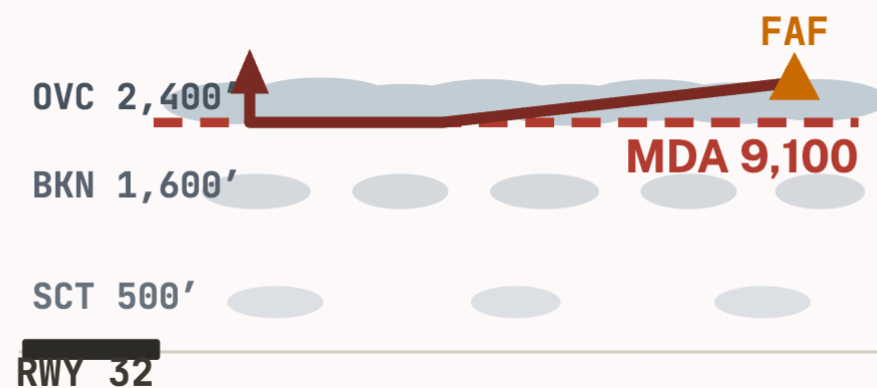
Straight-in & circling RWY 32

NA at night

MDA
A

9,100 MSL (2,300 AGL)

PROFILE · LNAV "DIVE & DRIVE"



■ Levels off right at the overcast

■ The loaded waypoints matched this approach.

RNAV (GPS)-E

Circling only

Circling

NA NE of 14-32

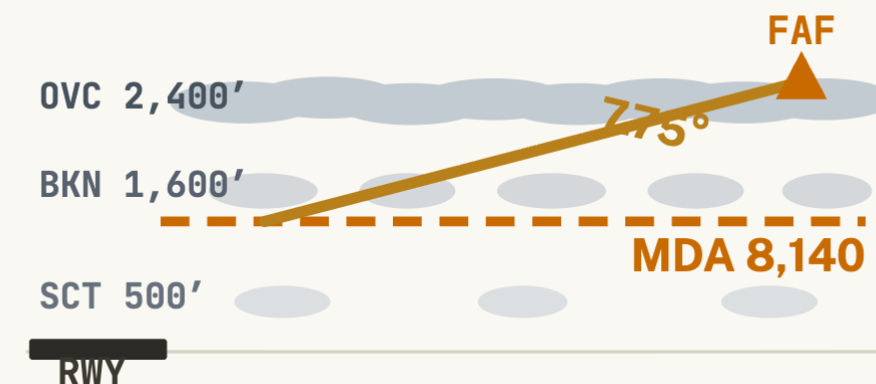
Glidepath

7.75° steep
steep

MDA

8,140 MSL (1,300 AGL)

PROFILE · 7.75° STEEP GLIDEPATH

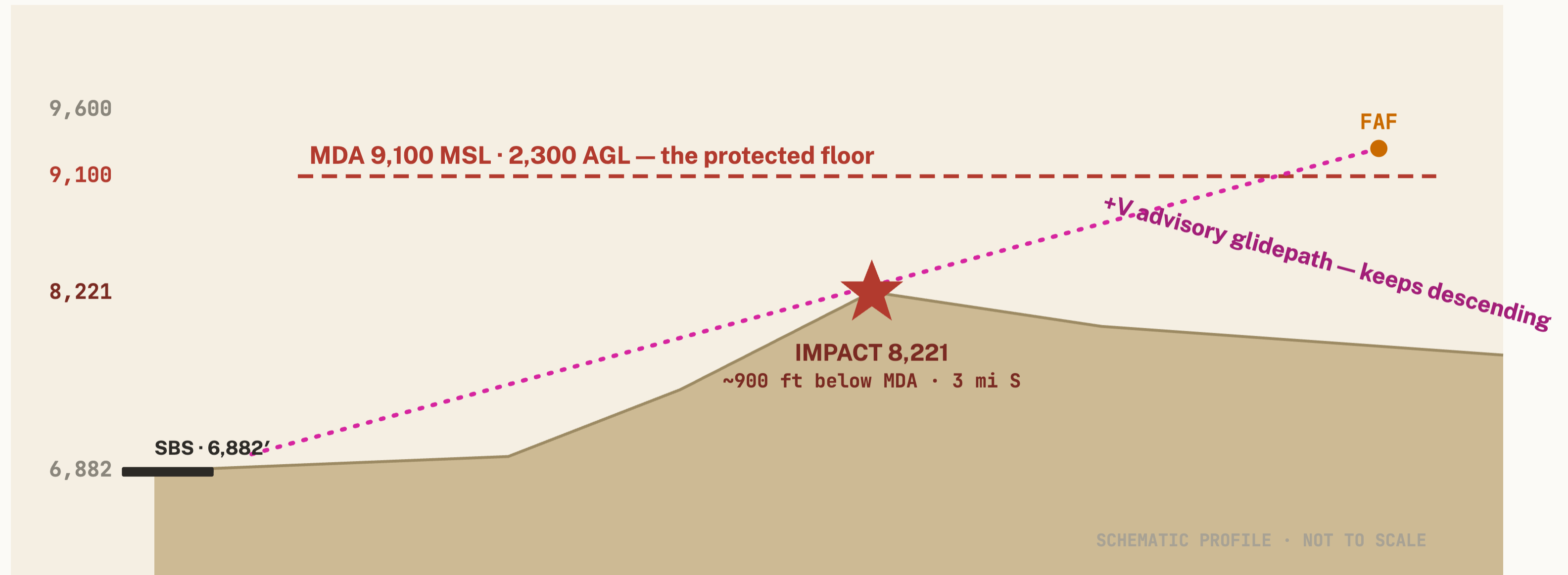


Lower MDA, steeper path — but **circling only** , and not the one flown.

■ PITFALL 03 · RNAV (GPS) Z RWY 32 — PROFILE

The floor he flew through

The MDA is the protected floor. The +V advisory ignores it.



THE POINT

Flown to MDA, the approach keeps you **900 ft above the ridge**. Coupled to +V below MDA, the same approach flies you into it. you into it.

■ PITFALL 03 · WHAT HAPPENED

900 feet below minimums

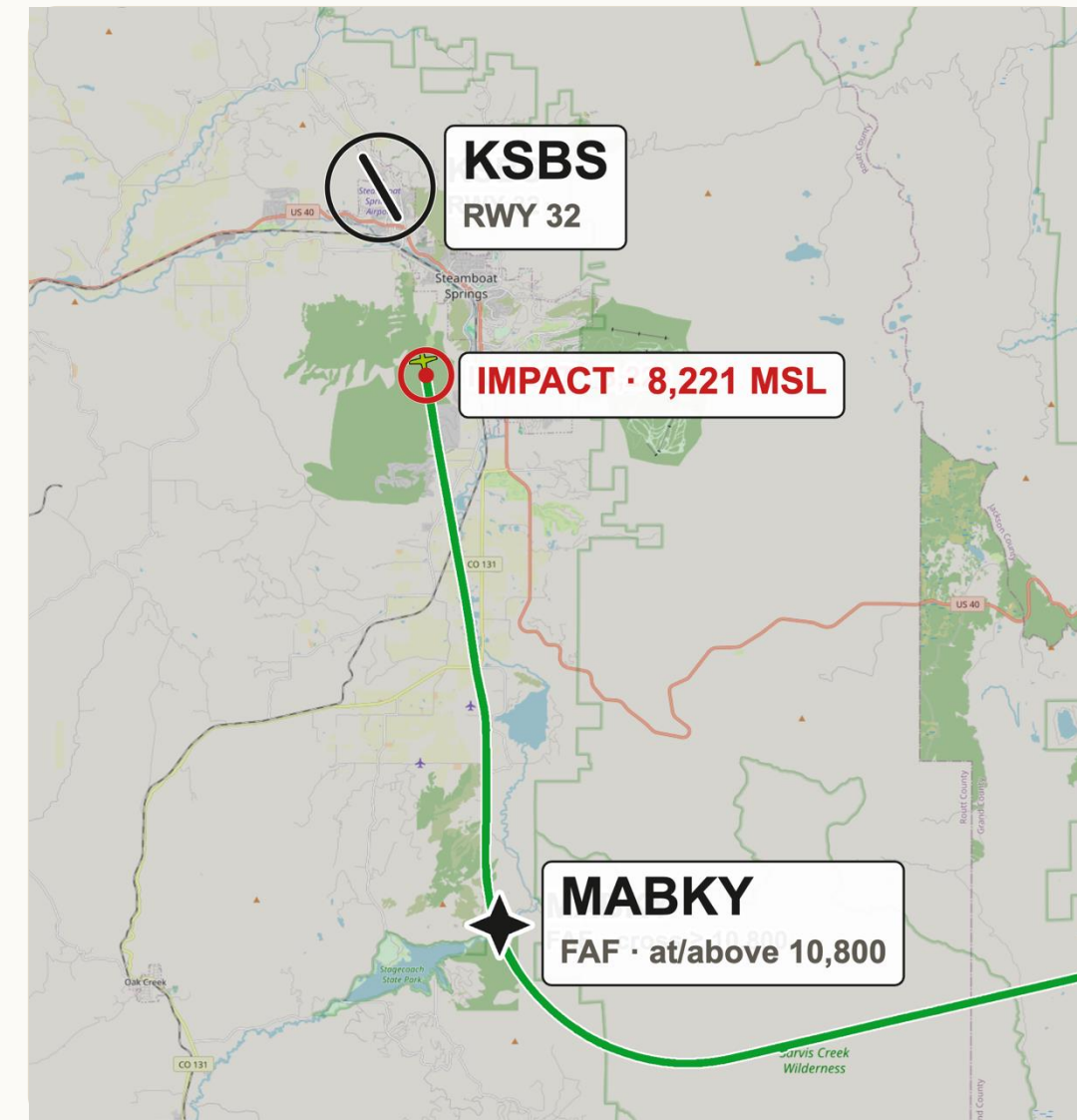
00:19 MST · 3 MI SOUTH OF SBS

8,221 vs **9,100**
LAST ALT · MSL S PUBLISHED MDA

≈ 900 ft below the MDA — autopilot engaged.

- ◆ Flight-plan waypoints matched the **RNAV Z RWY 32** approach.
- ◆ Descent continued through the MDA on autopilot until impact.

CLOUDY WITH A CHANCE OF CONFUSION



Final from the south — terrain impact 3 mi short of the airport.

PITFALL 03 · ADVISORY GLIDEPATHS

■ PITFALL 03 · THE GREAT IMPOSTOR

Same picture. Different protection.

On the PFD — and to the autopilot — these look identical.



SPOT THE DIFFERENCE

Identical magenta diamond. The only clue is the little annunciation — LPV vs LNAV+V.
Miss it, follow +V below MDA, and the glidepath leads you into obstacles or terrain.

Advisory means advisory

THE DEFINITION

*"Non-precision approaches ... appended with a +V suffix provide **advisory vertical guidance** from the FAF to the runway the runway threshold."*

THE LIMITATION

*"...this guidance **must not be flown below the published MDA** without having met the conditions prescribed in 14 CFR § prescribed in 14 CFR § 91.175."*

THE AUTOPILOT TRAP

*"When coupled to advisory vertical guidance in Approach Mode, the autopilot **will not automatically stop a descent** at any **descent** at any published altitude restrictions."*

It's never just one thing

The advisory glidepath was the last hole — not the only one.

01

Wrong approach

The RNAV (GPS) Z RWY 32 is **Not Authorized at night** — yet it was the one one flown.

02

MDA above the clouds

BKN 1,600 · OVC 2,400. The runway environment was **never going to be in sight** at minimums.

03

Tired, late, high terrain

A long flying day, **well past midnight** , **midnight** , single pilot, in the mountains. mountains.

Takeaways

01 Set minimums

Set the MDA in your EFIS minimums — **not** the altitude preselect. preselect.

03 MDA is a hard deck

No sinking below it. Lower only if **14 CFR § 91.175(c)** criteria are criteria are met.

02 Level off early

Start 50–100 ft before MDA and add power (≈5" MP in the Bonanza).

04 Flying a +V? Start the missed at the VDP

At the VDP: power up, climb, clean up — no turns before the MAP. the MAP.

An advisory glidepath is a convenience only!

■ BRINGING IT HOME

Three flights, one lesson

PITFALL 01

GPS Downgrades

A downgrade is designed into the system — system — **brief the LNAV mins.**

PITFALL 02

Obstacle Departures

You own terrain clearance. **Find the ODP**
ODP and fly it.

PITFALL 03

Advisory Glidepaths

The MDA is a hard deck. **+V is doesn't**
doesn't ensure terrain clearance.

THE COMMON THREAD

Nothing failed in any of these airplanes. Each accident began with an uncommon event or a misunderstood IFR procedure — and in every case, the published procedure was the protection. protection.

References

NTSB ACCIDENT REPORTS

Epic E1000 N98FK

CEN26FA115 — Steamboat Springs (preliminary)

data.nts.gov

Beech G36 N36JJ

CEN21FA305 — Aspen (factual)

data.nts.gov

AVIONICS

Garmin GTN 750 Xi Pilot Guide

LPV approach sequence

static.garmin.com

Garmin Aviation Service Alerts

LNAV+V advisory glidepath

support.garmin.com

REGULATIONS & GUIDANCE

14 CFR § 91.175

Takeoff & landing under IFR

ecfr.gov

FAA AIM

5-2-9 ODP/SID/VCOA · 5-5-14 Pilot/Controller

faa.gov

QUESTIONS?

Let's go flying.

- ☎ 408-910-1191
- ⊕ www.ktronicsaero.com
- ✉ kevin@ktronicsaero.com



SCAN FOR THE WEBSITE