Transport Airplane Performance Planning Group/ACF/AFS-410

Primary Part 25 Performance Subjects

Presented to: ACF October 2015

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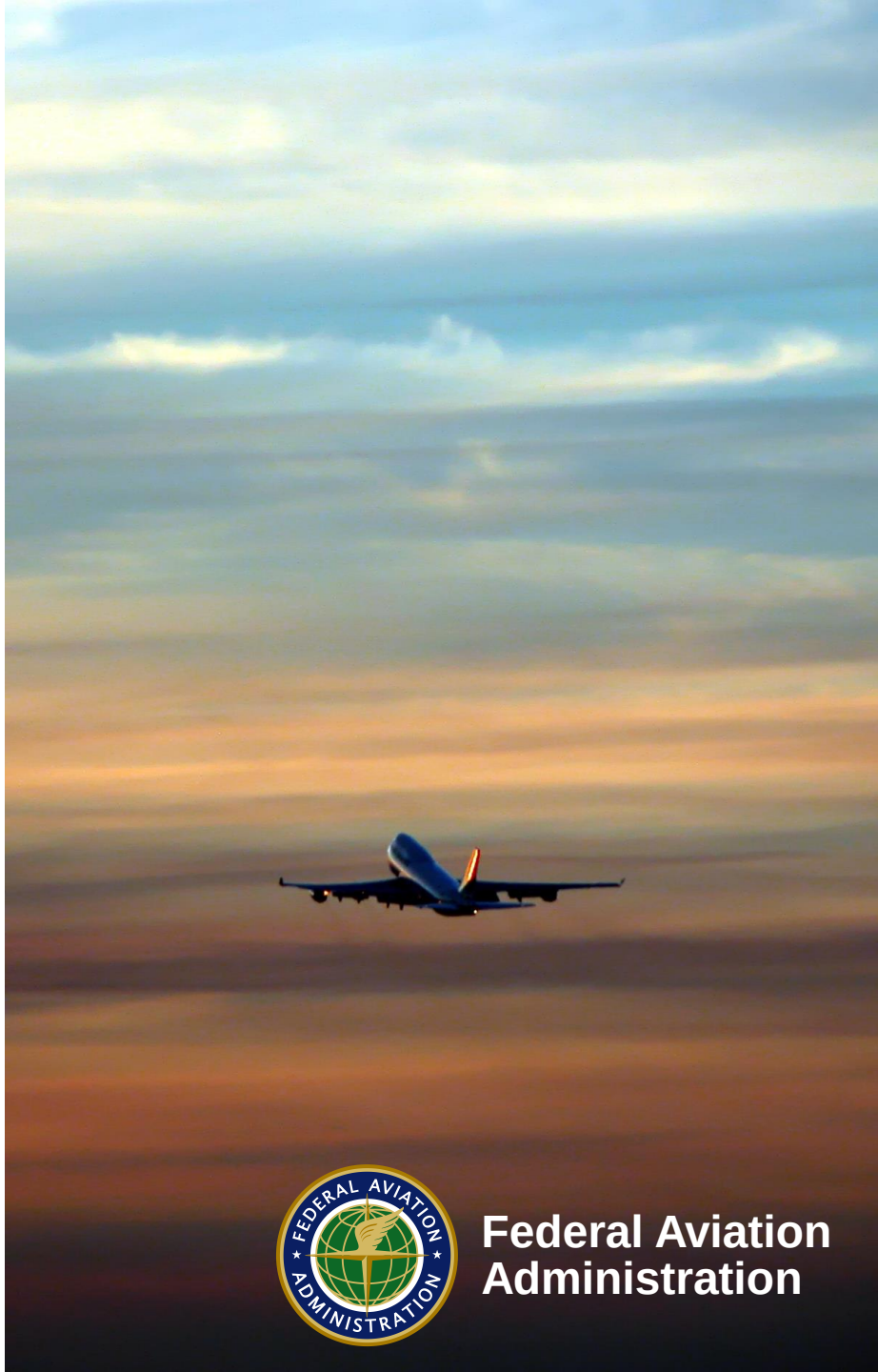


TAPP WG – Who are we?

- **Chartered through the FAA Aeronautical Charting Forum**
- **FAA & Industry Representation**
  - NBAA
  - Society of Aircraft Performance and Operations Engineers (SAPOE)
  - Airlines & Aircraft Manufacturers
  - FAA (Operations, Procedures, Aircraft Certification)

TAPP Objectives: https://www.faa.gov/tv/

The Transport Aircraft Performance Planning Group videos -- definitive U.S. technical work on the major subjects covered. Those include:

- Eliminating confusion among
  - Pt 25 Certification requirements
  - 121, 135, 91 K and other operating rules
  - Complying with TERPS climb gradient requirements
  - Other lesser known complicated subject areas
  - Close in obstacles
  - Useable runway distance vs. declared distances
  - 142 centers & 135 operators misapplying rules

The Immediate Problem

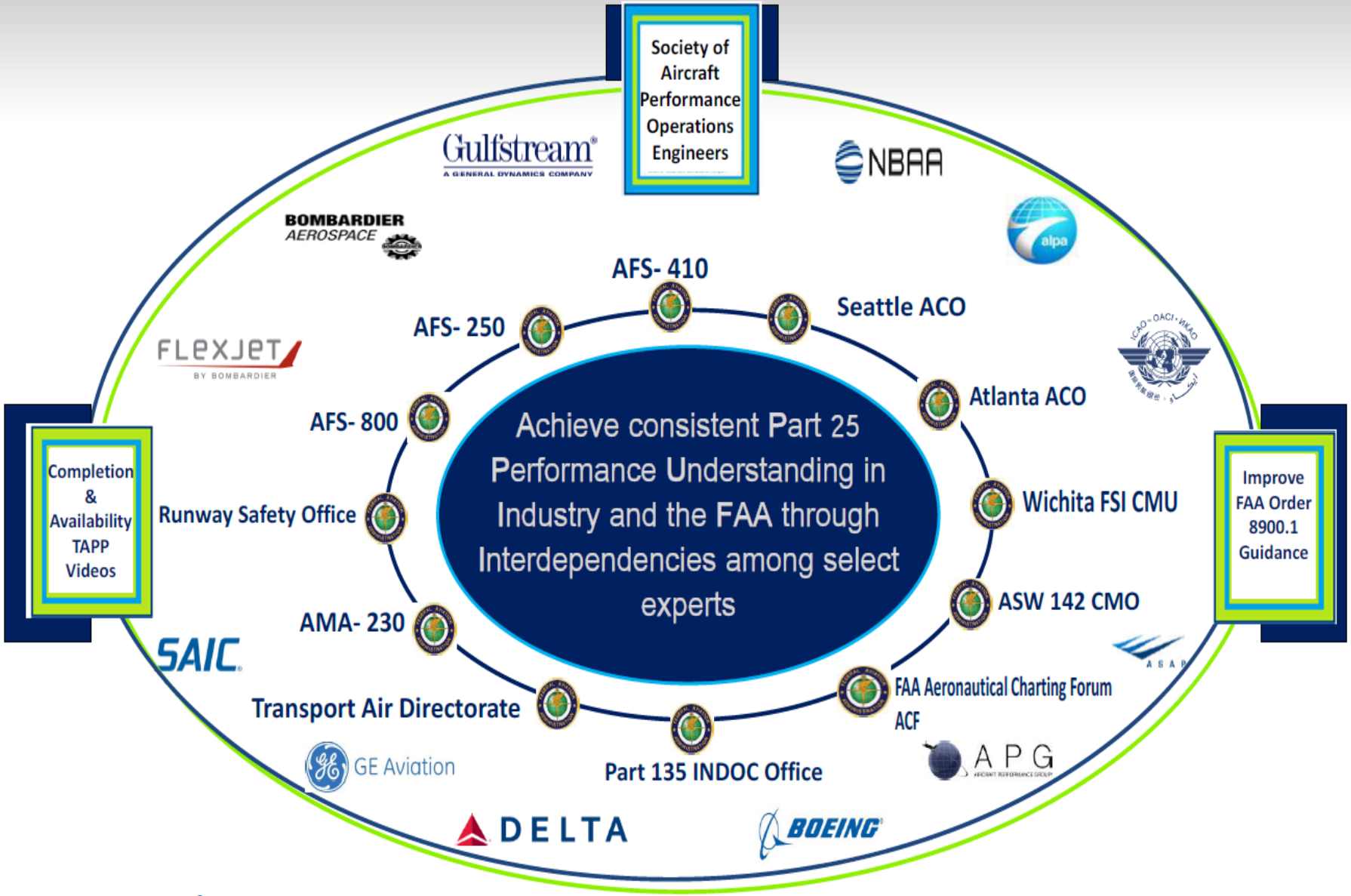
Recurrent 135 class in 142 center taught to use OEI AFM data to determine allowed takeoff weight for all engines operating departure

Issues

- **Pilot/Operator understanding of certification & operating rules with respect to one-engine-inoperative (OEI) takeoff obstacle clearance**

- **Compliance with a climb gradient published on an instrument flight procedure**
  - SID or ODP
  - Missed Approach

A proven track record of working across the FAA and Industry with established Interdependencies to improve FAA Part 25 Operations



Joint FAA/ NBAA Co-Chairs Launched the Transport Airplane Performance Planning Group (TAPP)

Accountable to the Aeronautical Charting Forum

TAPP Proposal to Aviation Rule Making Advisory Committee

- Amend Task 1.B. of Preflight Preparation to to include additional performance objectives and limitations:

e. one-engine-inoperative takeoff obstacle clearance - use of the close-in, and distant takeoff flight path data, transition segment data, and final segment flight path data to determine obstacle clearance with available obstacle data, or the use of airport runway analysis in determining takeoff weight limit required for obstacle clearance.

k. if applicable to the operating rules, minimum field length required at the destination and alternate airport, and the associated limit on maximum allowable takeoff weight.

Knowledge Gap Driving change

- The TAPP has both anecdotal and documented evidence of a significant knowledge gap and misapplication of requirements for Part 25 aircraft operators that has persisted for over 30 years

Current Examples of Knowledge Gap

- 142 faulty training to use OEI 2nd segment
- Misunderstandings within FAA inspector ranks leading to misapplication of performance reqs
- 142 schools requiring 60% rule at time of landing
- Lack of technically accurate training anywhere but in the 121 air carrier community
- FMS rwy length data contrary to declared distance reqs
- Failure to factor close in obstacles not covered by TERPS
- Misunderstanding flight test landing vs. operational factors

Change PTS- Principles to Include in Training

- Departure Planning (Aspen)
- Understanding Declared Distances
- Wet Runway Takeoff Performance
- Effect of Slope on Takeoff Performance
- Divergent Departure Procedures
- Landing Distance Assessments
- One engine inoperative extraction procedures
- Use of AC 120-91
- Effects of grooved runways and PCV
- Use of “unbalanced” field calculations
- FMS data base potential shortcomings
- SID climb gradient requirements

The Draft INFO to Address the Confusion

- **The FAA is aware that inappropriate takeoff and climb performance training is being provided to operators and pilots of part 25 certificated turbine-powered airplanes. This InFO provides guidance to pilots and operators of these airplanes to correct misunderstandings and misuse of the part 25 airplane performance data…**

INFO Supplement Example

TERPS departure procedure design criteria begin with the assumption that the aircraft will cross the departure end of the runway (DER) at a height of 35 feet, and thereafter, maintain a minimum (standard) climb gradient of 200 feet per NM until the minimum IFR altitude is reached (see Figure 1).

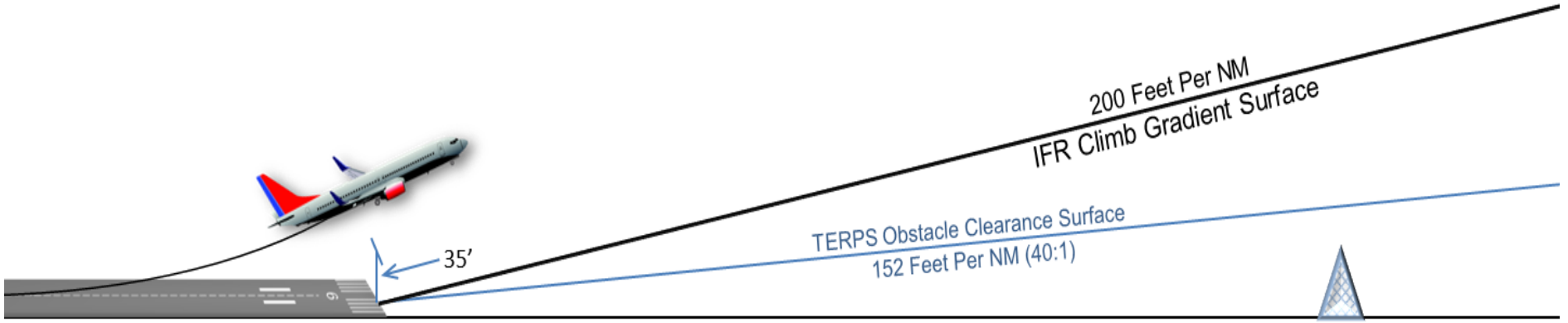


Figure 1 – Departure Procedure IFR Climb Gradient Surface – Standard Climb Gradient

The obstacle environment beyond the runway may require a climb gradient greater than 200 feet per NM to a specified altitude to achieve the required obstacle clearance as specified in TERPS (see Fig 2).

Higher Than Normal SID Climb Gradient Requirement

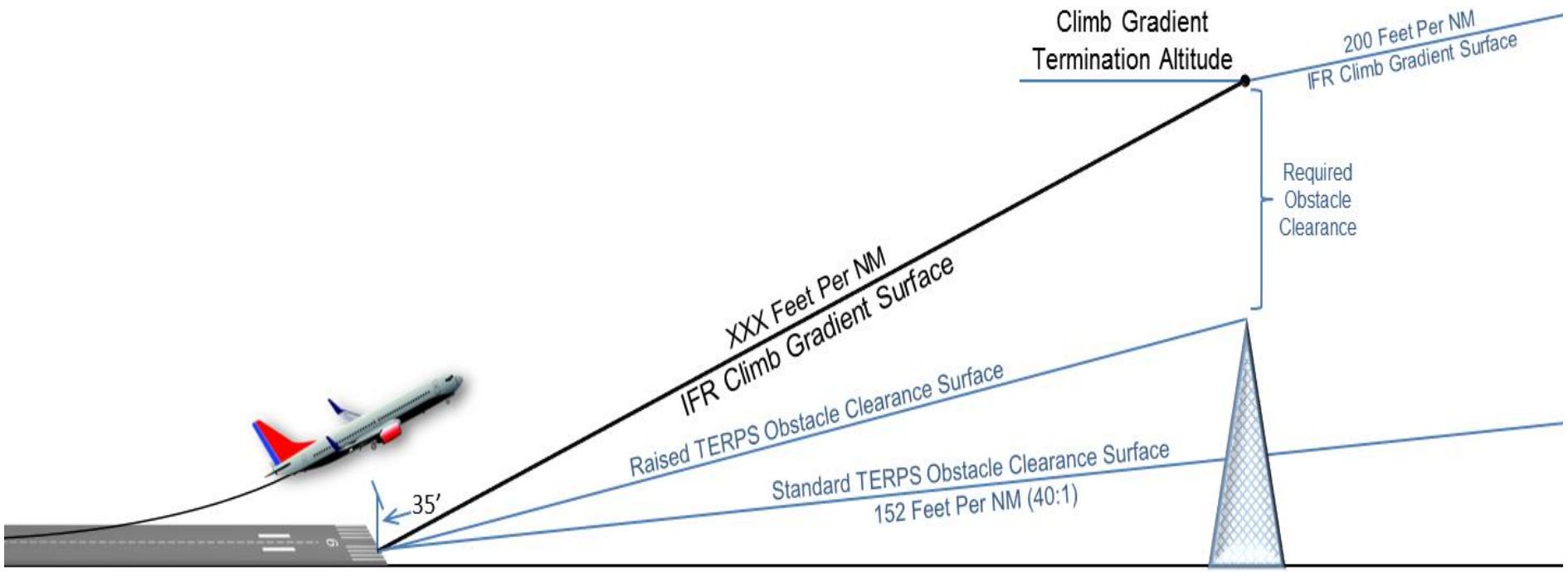


Figure 2 – Departure Procedure IFR Climb Gradient Surface – Higher Than Standard Climb Gradient

TAPP Produced 4 Major Videos

- **Planning for Takeoff Obstacle Clearance**
- **Declared Distances**
- **Wet Runway Takeoff Performance**
- **Landing Distance Assessment**

3 Major Subject Areas Impact Part 25 Aircraft Performance

- **Part 25 Certification Requirements**
- **TERPS Regulatory Aircraft Performance Requirements**
- **121/135 Regulatory Aircraft Performance Requirements**

Discussion

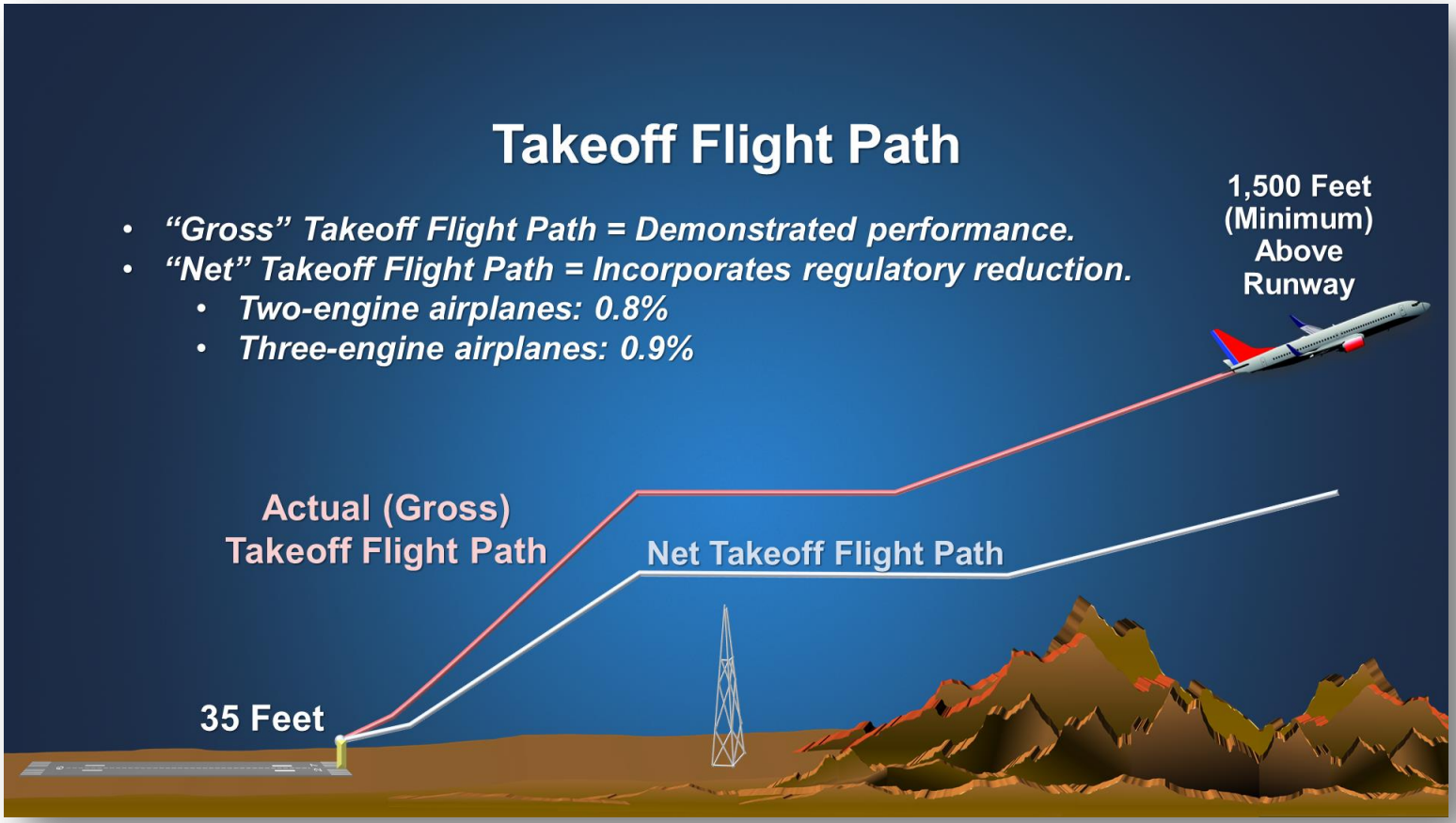
and

Questions

EXTRA

SLIDES

Part 25 Takeoff Flight Path



Part 135 Takeoff Obstacle Clearance Operating Rules

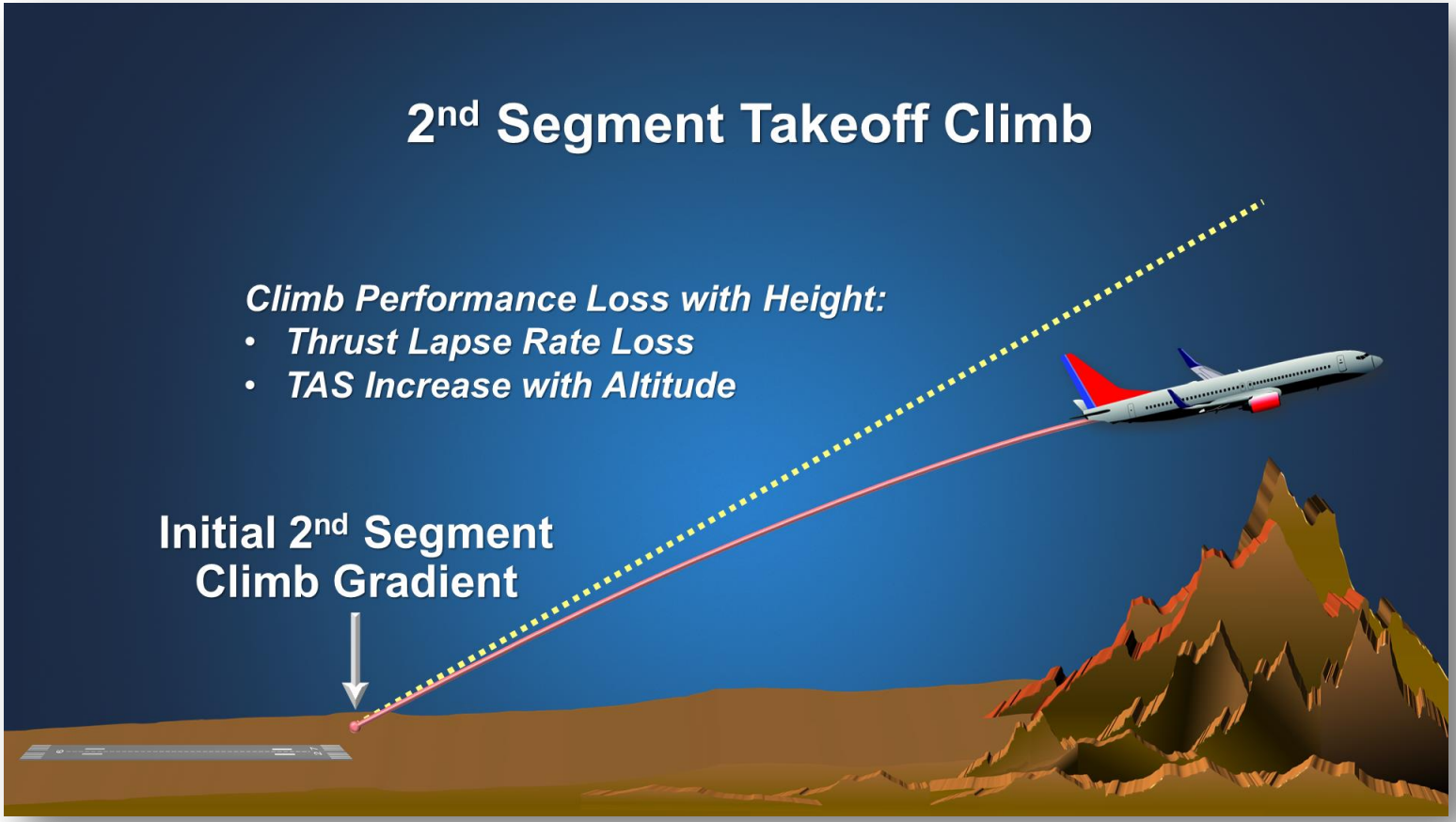
§135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(d) No person operating a turbine engine powered large transport category airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual—

(2) For an airplane certificated after September 30, 1958 (SR422A, 422B), that allows a net takeoff flight path that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries.

Identical to the Part 121 Rule
for Turbine-Powered Transport Category Airplanes

OEI Climb Gradient



Gradient vs. Flight Path

The Part 25 OEI takeoff is not a constant gradient.

OEI takeoff flight path and net flight path slope downward with height gain.

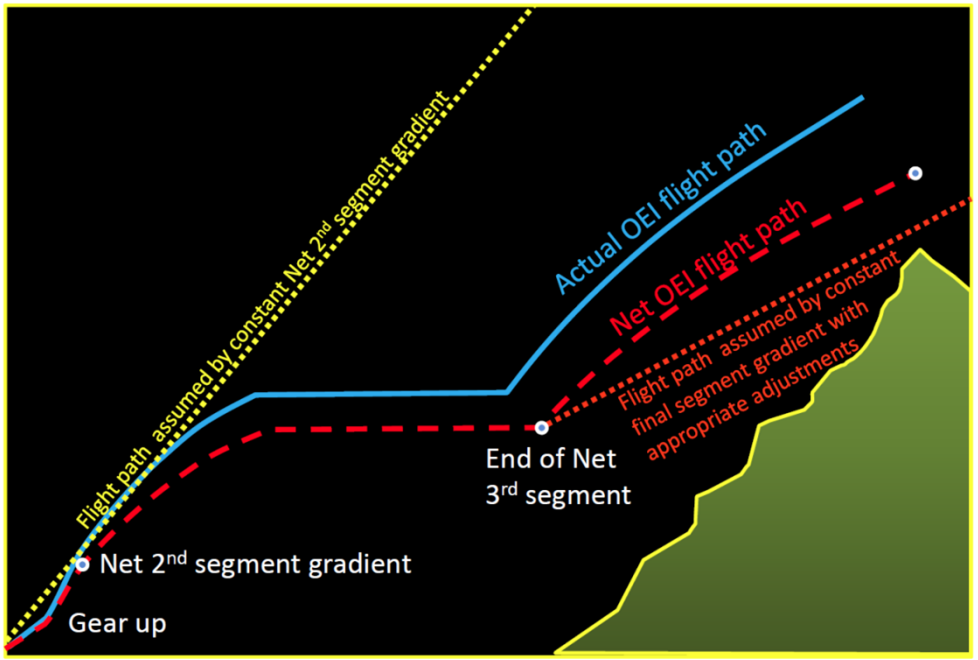
1st, 2nd, transition, & final segments flight path composed of individual segments, synthesized into complete path.

"Ad-Hoc" rise v. run obstacle clearance check does not account for:

Segmented flight path resulting from configuration/speed/thrust changes.

Rise v. Run acceptable only when changes configuration/speed/thrust are complete.

- **Final Segment**

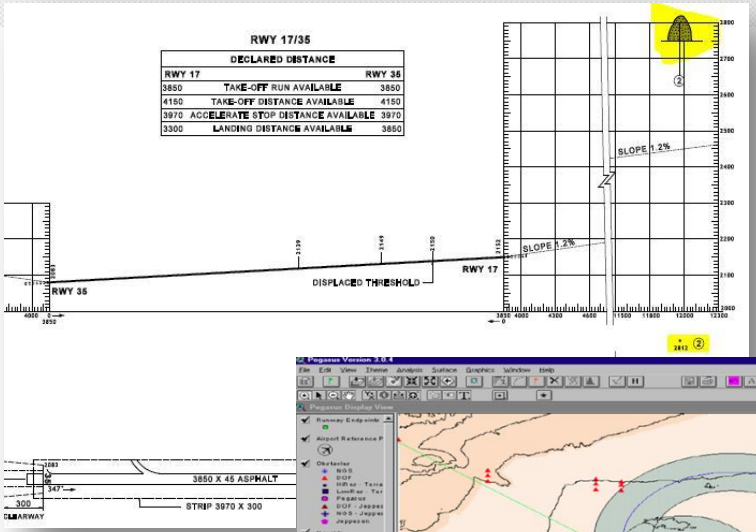


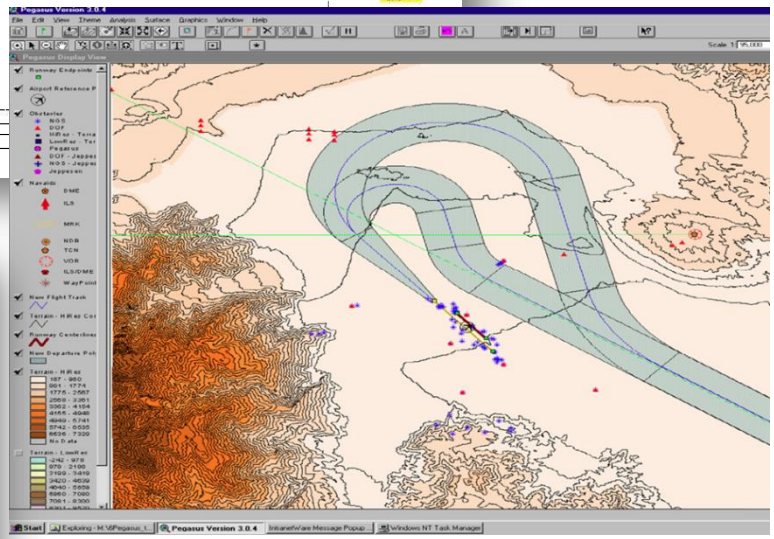
Many Part 25 Aircraft have no AFM all engine climb data beyond 1500 ft AGL because Part 25 does not require it

AC 120-91Airport Obstacle Analysis

Defines The Obstacle Assessment Area Where Obstacles Must Be Cleared Vertically By The Net Takeoff Flight Path

Performance Engineer





EOSID Obstacle List

1st Turn

Start at (m)	6148
Loss of gradient	0.0046
Full length (m)	23100

2nd Turn

Start at (m)	37248
Loss of gradient	0.0105
Full length (m)	10400

3rd Turn

Start at (m)	55748
Loss of gradient	0.0135
Full length (m)	25500

4th Turn

Start at (m)	
Loss of gradient	
Full length (m)	

Obstacle	Elevation (ft)	Distance from BR (m)	Distance flown in last turn (m)	Height (ft)	Height increase (ft)	Corrected height (ft)	Remark
1	4666	7240	1092	279	16.4811192	295.4811192	
2	4700	13455	7307	313	110.2816282	423.2816282	
3	5000	13853	7705	613	116.288483	729.288483	
4	5050	37000	0	663	348.63906	1011.63906	
5	5400	38560	1312	1013	393.838116	1406.838116	
6	5450	80970	25222	1063	1824.094917	2887.094917	
7	5600	81347	25599	1213	1840.7935665	3053.7935665	
8	5650	83573	0	1263	1836.40851	3099.40851	
9	5800	83782	0	1413	1836.40851	3249.40851	

IFR Departure Procedures (SID & ODP)

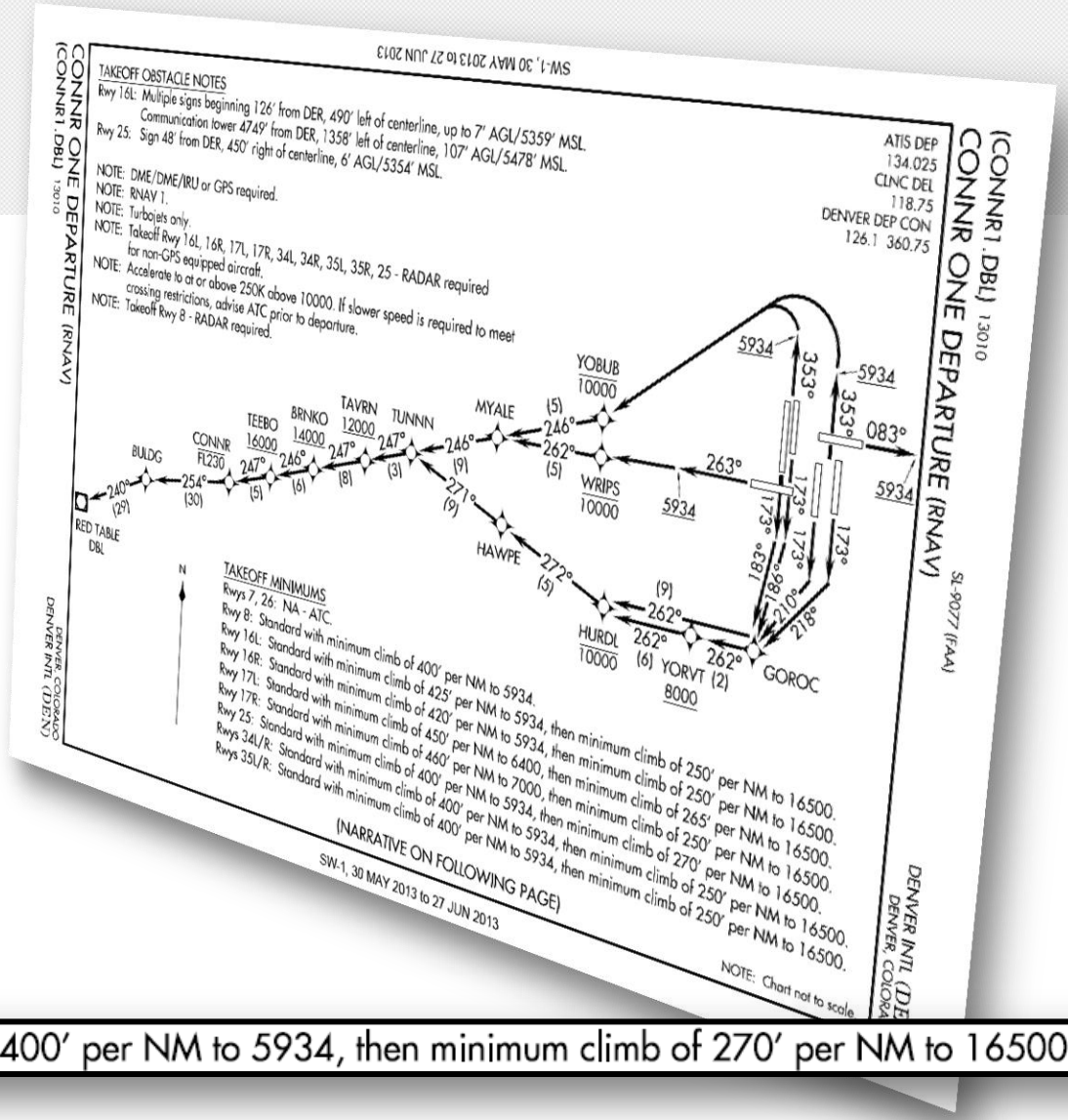
Assume normal aircraft operations – All engines operating.

SID climb gradient may be for:

- **Obstacle clearance.**
- **Procedure criteria.**
- **NAVAID reception.**
- **ATC requirements.**
- **Airspace.**

ODP climb gradient is for:

- **Obstacle clearance.**
- **Procedure criteria.**
- **NAVAID reception**
- **Airspace.**



Rwy 25: Standard with minimum climb of 400' per NM to 5934, then minimum climb of 270' per NM to 16500.

TAPP WG ACTIONS

TAPP WG Performance Videos

- **4 Videos:**
  - Planning for Takeoff Obstacle Clearance
  - Declared Distances
  - Wet Runway Takeoff Performance
  - Landing Distance Assessment
- **Video of TAPP WG workshop at NBAA BACE 2013**
  - TAPP WG SME Q&A
- **Hosted on NBAA's website:**

http://www.nbaa.org/ops/safety/climb-performance/videos/

- **Soon to be hosted on FAA TV's website**

TAPP on FAA/TV (www.faa.gov/tv)

FAA TV: Planning for Takeoff Obstacle Clearance

Now Playing

Planning for Takeoff Obstacle Clearance

July 30, 2015 | Running time 45:04

This video reviews the part 25 takeoff performance certification rules applicable to one-engine-inoperative (OEI) takeoff climb performance and obstacle clearance. It addresses the OEI takeoff obstacle clearance rules applicable to part 121 and part 135 operators and the FAA-approved means by which an operator ensures compliance. It compares these rules to the all-engines-operating IFR takeoff requirements applied to Standard Instrument Departures (SIDs) and Obstacle Departure Procedures (ODPs).

Share This Video

http://www.faa.gov/tv/?mediaId=1131 (?mediaId=1131)

Landing Distance Assessment (?mediaId=1134)
Play Now

Wet Runway Takeoff Performance (?mediaId=1133)
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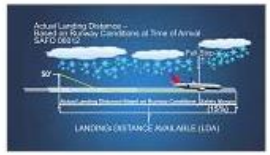

Declared Distances (?mediaId=1132)
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Planning for Takeoff Obstacle Clearance (?mediaId=1131)
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