



Charting Climb Gradients

ACF – April 2015

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Southwest Airlines



Topics

■ Charting

- Simplify the information for Charting of Climb Gradients

■ Criteria

- Return to approval by AFS for any climb gradient greater than 500' NM
- Altitude restrictions should be considered climb gradients.
- Use of block altitudes



Order 8260.46E

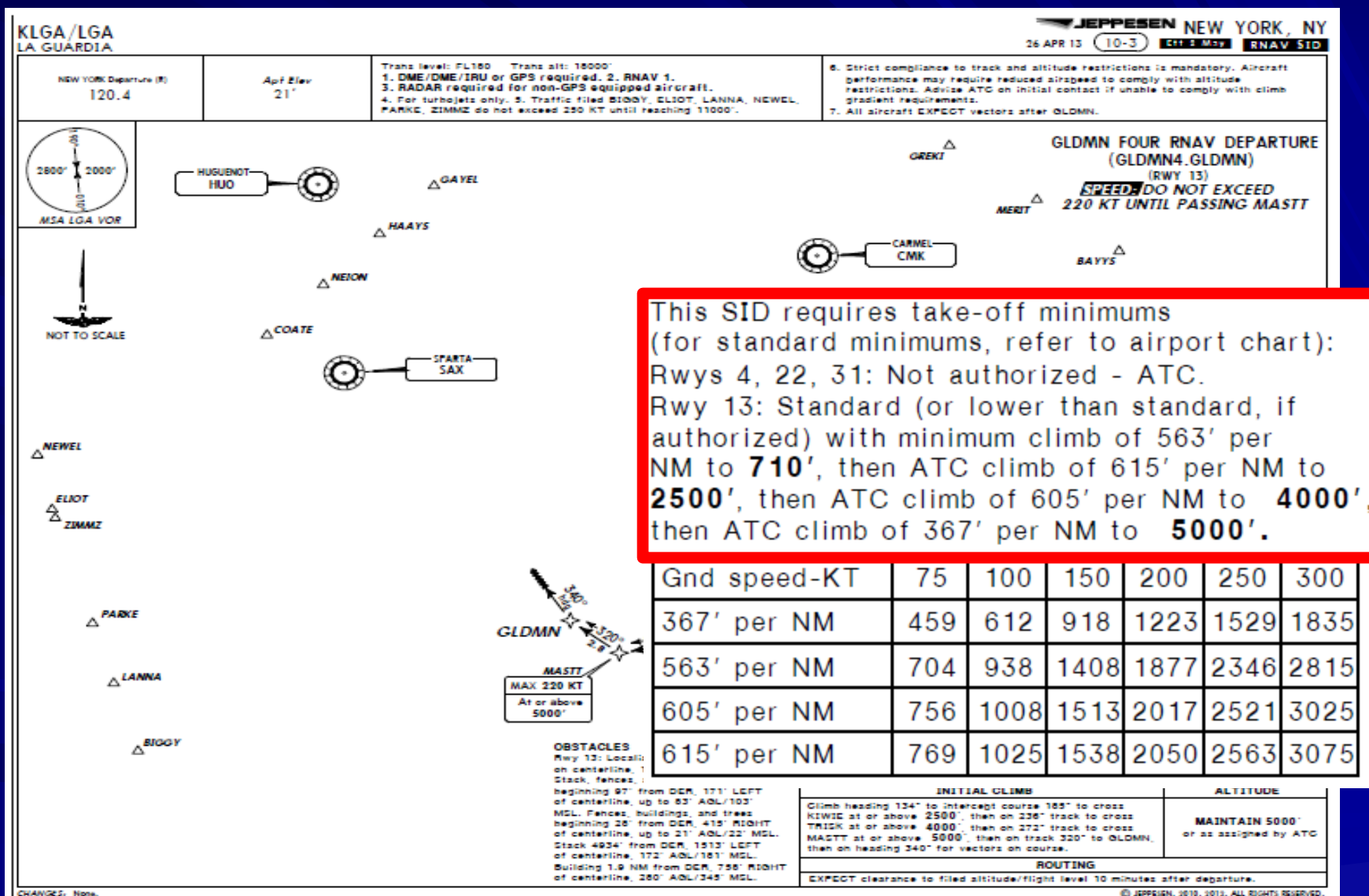
■ Paragraph 2-1-1 (D)2

- Flight Standards Service must approve DP's requiring a climb gradient in excess of 500 ft/nm.

■ Paragraph 2-1-1 (E)2

- Do not establish CGs for crossing altitudes used to support airspace, environmental, or ATC operational limitations.

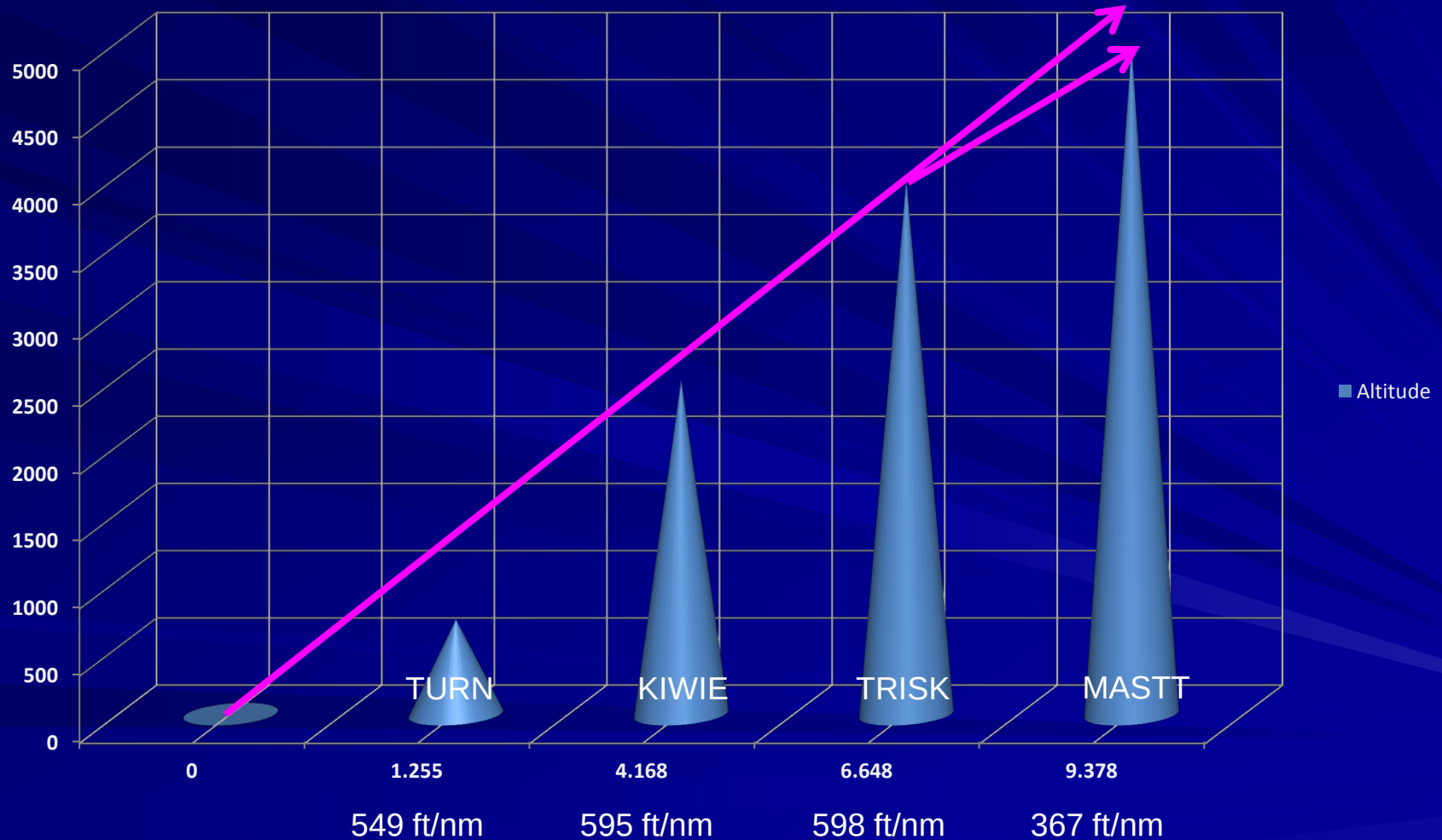
Climb Gradients





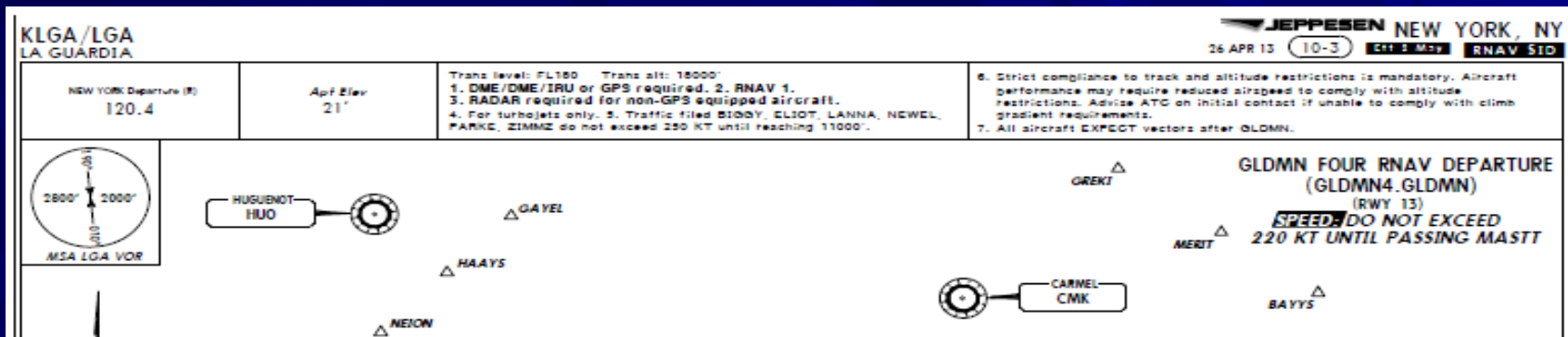
GLDMN Climb Gradients

Climb Gradient





Climb Gradients

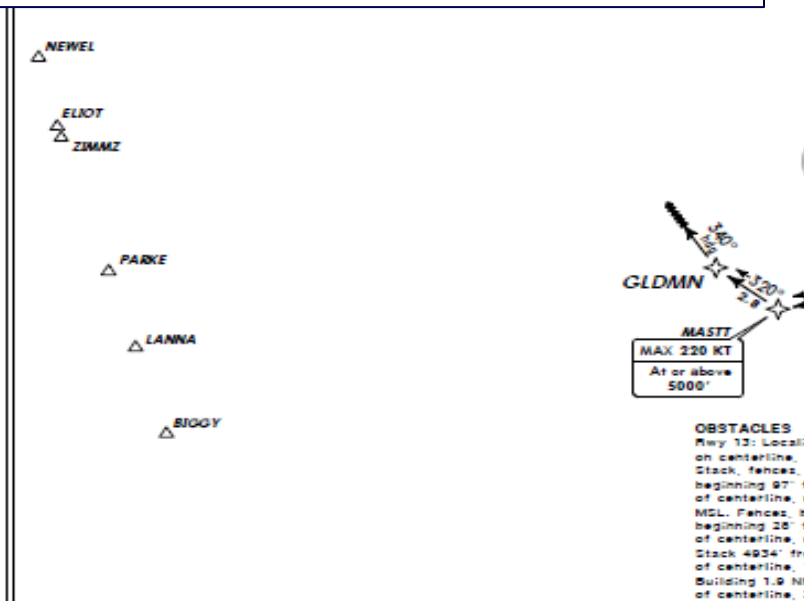


Rwy 13:

Minimum ATC climb gradient of 598' NM to 4000' then ATC climb of 367' per NM to 5000'.

This SID requires take-off minimums (for standard minimums, refer to airport chart):
Rwys 4, 22, 31: Not authorized - ATC.

Rwy 13: Standard (or lower than standard, if authorized) with minimum climb of 563' per NM to **710'**, then ATC climb of 615' per NM to **2500'**, then ATC climb of 605' per NM to **4000'**, then ATC climb of 367' per NM to **5000'**.



Gnd speed-KT	75	100	150	200	250	300
367' per NM	459	612	918	1223	1529	1835
563' per NM	704	938	1408	1877	2346	2815
605' per NM	756	1008	1513	2017	2521	3025
615' per NM	769	1025	1538	2050	2563	3075

INITIAL CLIMB	ALTITUDE
Climb heading 134° to intercept course 185° to cross KIWIW at or above 2500', then on 236° track to cross TRISK at or above 4000', then on 272° track to cross MASTT at or above 5000', then on track 320° to GLODMN, then on heading 340° for vectors on course.	MAINTAIN 5000' or as assigned by ATC
ROUTING	
EXPECT clearance to filed altitude/flight level 10 minutes after departure.	

CHANGES: None.

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Climb Gradients

KDAL/DAL
DALLAS LOVE

JEPPIEN DALLAS, TEXAS
12 SEP 14 (10-3M) SID 18 502 RNAV SID

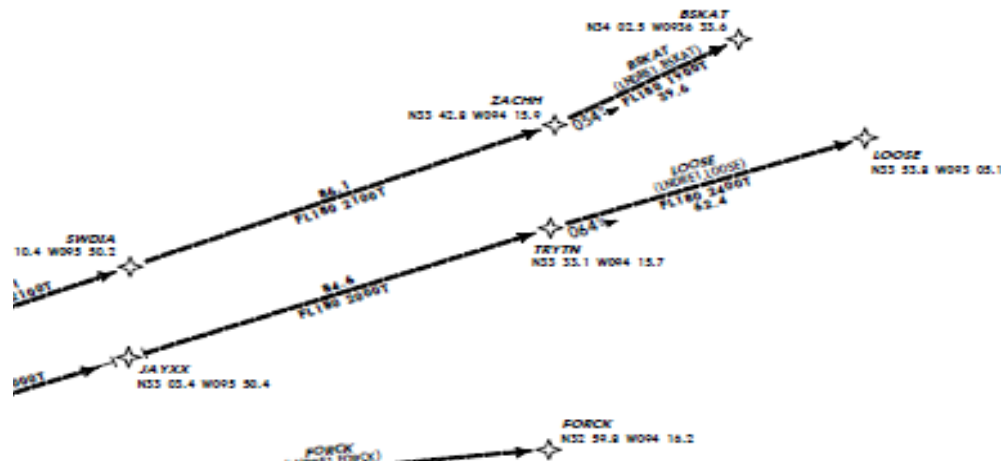
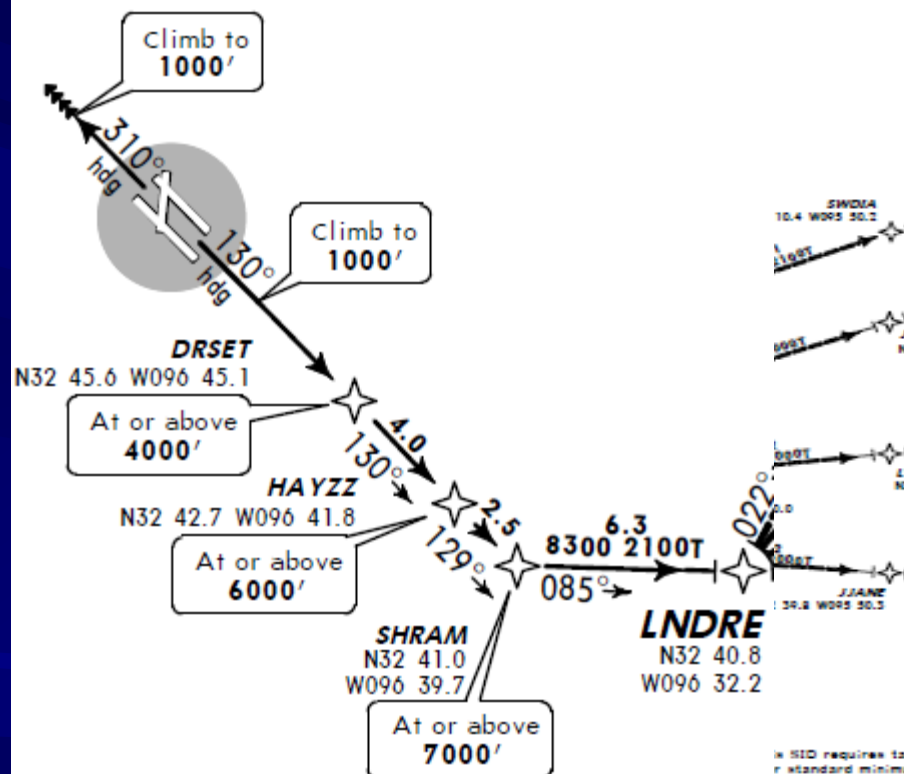
8000ft Departure (R)
118.55

Apt Elev
487'

Trans level: FL180 Trans alt: 18000'
1. RADAR required. 2. RNAV 1.
3. DMC/DMC/INU or GPS required.

4. For use by turbojet aircraft only. 5. Profile and EXPRCT WYLF or HUBBARD Departure. 6. For aircraft requesting FL180 or above. 7. Turbojets requesting 17000' and below EXPRCT OAKLAND Departure. 8. BODAY Transition ATG assigned only.

LNDRE ONE RNAV DEPARTURE
(LNDRE1.LNDRE)



This SID requires take-off minimums (for standard minimums, refer to airport chart):
Rwys 13L/R: Standard (or lower than standard, if authorized) with minimum climb of 500' per NM to 1200'.
Rwys 31L/R: Standard (or lower than standard, if authorized) with minimum climb of 500' per NM to 1000'.

Gnd speed-KT	75	100	150	200	250	300
500' per NM	625	833	1250	1667	2083	2500

OBSTACLES

EXPRCT filed altitude 10 minutes after departure.

CHANGED: New procedure at this airport.

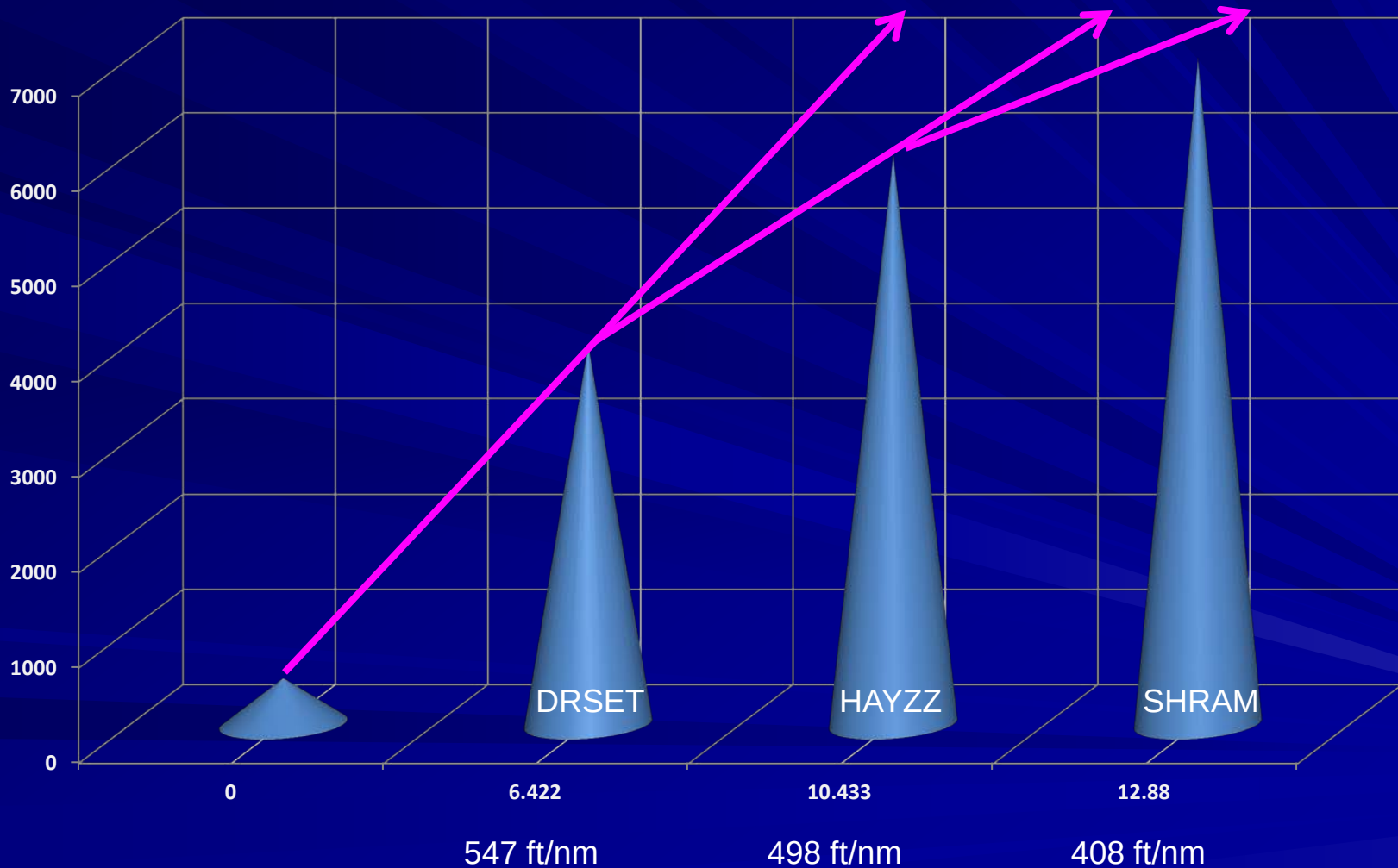
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Rwys 31L/R: Standard (or lower than standard, if authorized) with minimum climb of 500' per NM to 1000'.
Gnd speed-KT 75
500' per NM 625

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LNDRE Climb Gradients

Climb Gradient





Climb Gradients

Climb from runway 13R to:

Waypoint	Miles	Gradient
DRSET	6.422	547 ft/nm
HAYZZ	10.433	528 ft/nm
SHRAM	12.88	506 ft/nm

Climb waypoint to waypoint: (TAS 285 KTAS)

13R to DRSET = 547 ft/nm

DRSET to HAYZZ = 498 ft/nm

HAYZZ to SHRAM = 408 ft/nm



Climb Gradients

All Engine Climb Gradient (FT/NM)

Altitude FT	Normal Climb Profile			Flaps Up Maneuver Speed to 10K	V2+20 to 3K AGL, then Flp Up Man Spd to 10K
	CLB 2	CLB 1	CLB	CLB	CLB
2000	690	760	840	840	1110
2500	550	630	710	710	1060
3000	500	570	650	650	1030
3500	490	570	650	650	1000
4000	470	550	630	660	910
4500	440	520	600	670	820
5000	420	490	570	670	770
5500	410	490	570	680	730
6000	420	490	570	680	730
6500	420	490	570	680	720
7000	420	490	580	680	720

Average
Climb
Gradient

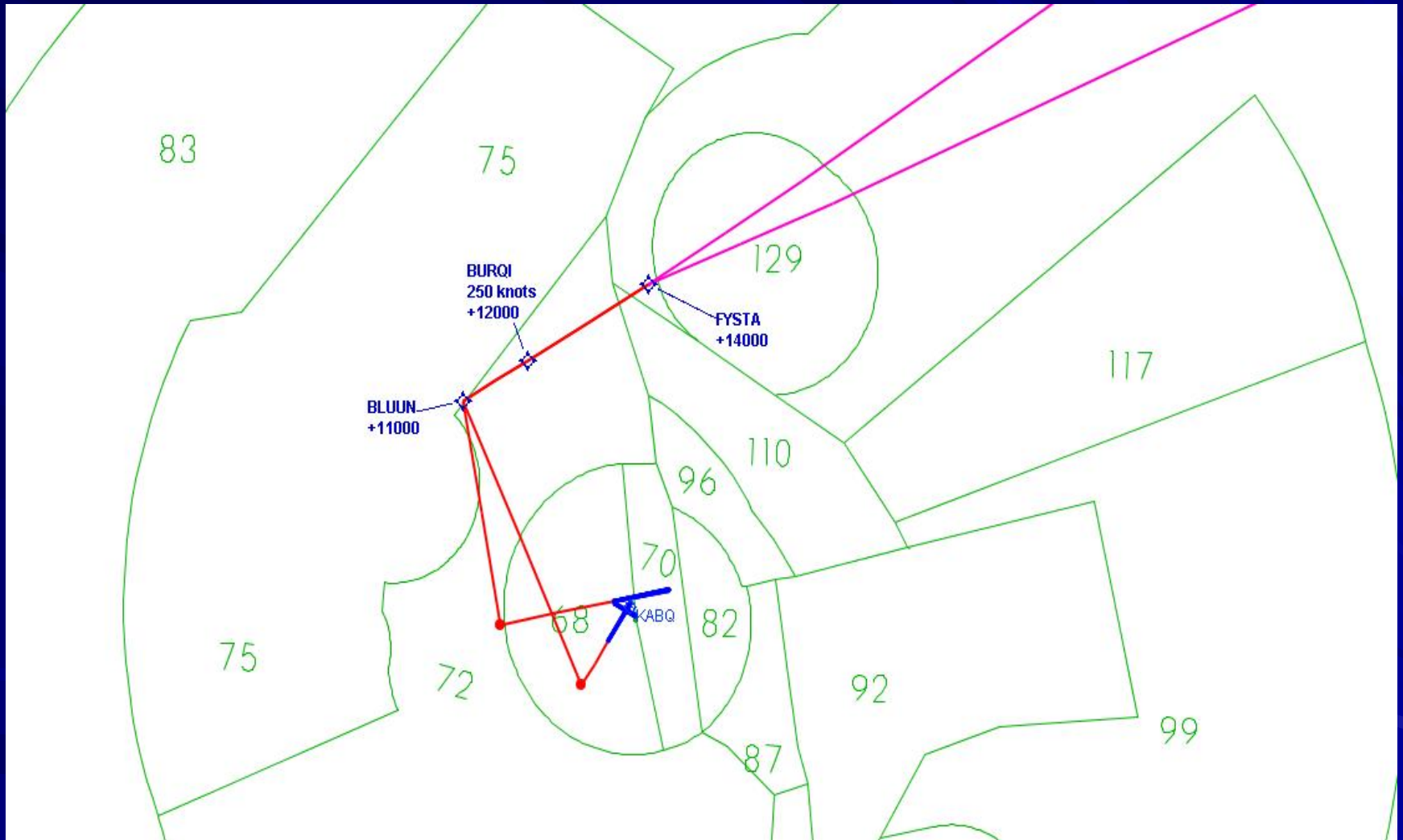
FT/NM

Close





ABQ DP Altitudes





ABQ Climb Gradients

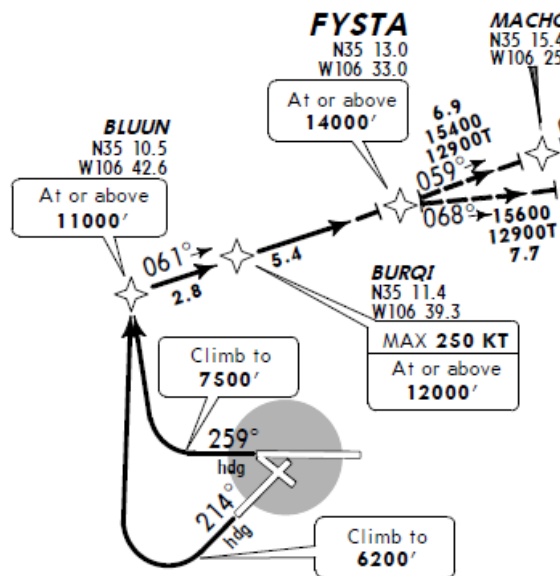
This SID requires take-off minimums (for standard minimums, refer to airport chart):
 Rwy 21: Standard (or lower than standard, if authorized) with minimum climb of 500' per NM to 12900'.
 Rwy 26: Standard (or lower than standard, if authorized) with minimum climb of 500' per NM to 13100'.

Gnd speed-KT	75	100	150	200	250	300
500' per NM	625	833	1250	1667	2083	2500

OBSTACLES

Rwy 21: Terrain beginning 159' from DER, 77' RIGHT of centerline, up to 5315' MSL. Terrain beginning 199' from DER, 100' LEFT of centerline, up to 5311' MSL.

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Direct distance from Albuquerque Intl Sunport to:
 BLUUN 9 NM

RWY	INITIAL CLIMB
21	Climb heading 214° to 6200', then RIGHT turn direct BLUUN, cross BLUUN at or above 11000', then on track 061° to BURQI, cross BURQI at or above 12000', then on track 061° to FYSTA, cross FYSTA at or above 14000'.
26	Climb heading 259° to 7500', then RIGHT turn direct BLUUN, cross BLUUN at or above 11000', then on track 061° to BURQI, cross BURQI at or above 12000', then on track 061° to FYSTA, cross FYSTA at or above 14000'.
ROUTING	
From FYSTA, on transition. MAINTAIN FL200, EXPECT filed altitude 10 minutes after departure.	

ALBUQUERQUE
 Departure (R)
 127.4

KABQ/ABQ
 ALBUQUERQUE
 RNAV SID

ALBUQUERQUE, N MEX
 RNAV SID

1. aircraft.
 C on initial contact.
 .FYSTA)
 ING BURQI



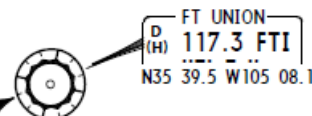
ABQ Climb Gradients

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OBSTACLES

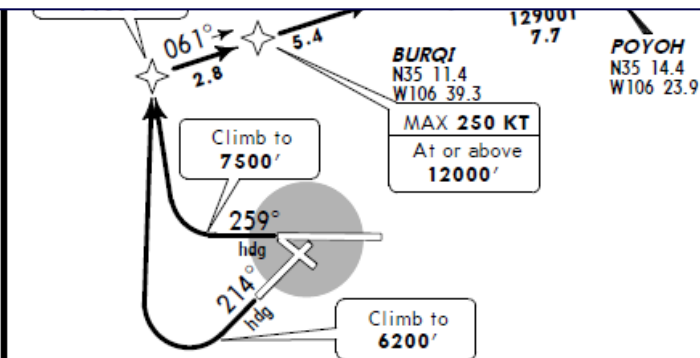
Rwy 21: Terrain beginning 159' from DER, 77' RIGHT of centerline, up to 5315' MSL. Terrain beginning 199' from DER, 100' LEFT of centerline, up to 5311' MSL.
 Rwy 26: Sign 38' from DER, 431' LEFT of centerline, 14' AGL/5314' MSL.



FT STA T
SPEED DO

KABQ/ABQ	ALBUQUERQUE	Departure (R)	127.4	Apt Elev	5355'	1.
ALBUQUERQUE INTL SUN						4.
						5.

Rwy 21 and Rwy 26:
Minimum Terrain climb gradient of 500' NM to 12,000', then Terrain climb gradient of 372' per NM to 14,000'



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ROUTING	
From FYSTA, on transition. MAINTAIN FL200, EXPECT filed altitude 10 minutes after departure.	

al contact.	QUE, N MEX
	RNAV SID



Recommendations

- Any climb gradient greater than 500 ft/nm requires AFS approval.
- Use a linear slope calculation not a point to point calculation.
- Simplify the text to assist with performance analysis.
- Specify both ATC and Obstacle requirements.
- Allow altitude restriction compliance with MVA-MIA requirements versus TERPS requirements.
- Use the least number of climb gradients.
- Remove block altitudes from SID criteria.