



ACF 12-02 CG
RD 10-02-233 Removal of (ATC) Crossing Restrictions from STARS

Gary McMullin



Aeronautical Charting Forum
Block Altitudes – SIDS
October 23, 2012



Charting Altitudes

SAFETY



What do Pilot's and
ATC Need?

At or above 15000' (ATC)
At or above 11900' NORTHEAST BOUND
At or above 7400'

15000 (ATC)
7400

11900 (NE bound)

At or below 3000' (ATC)
At or above 302'

3000 (ATC)
302

At or above 1400'
At or below 5000' (ATC)

5000 (ATC)
1400

Between 14000' & 12000'

14000
12000

At 280 KT
Between FL210 & 17000'

FL210	280K
17000	



RDU SID

KRDU/RDU
RALEIGH-DURHAM INTL

JEPPESEN

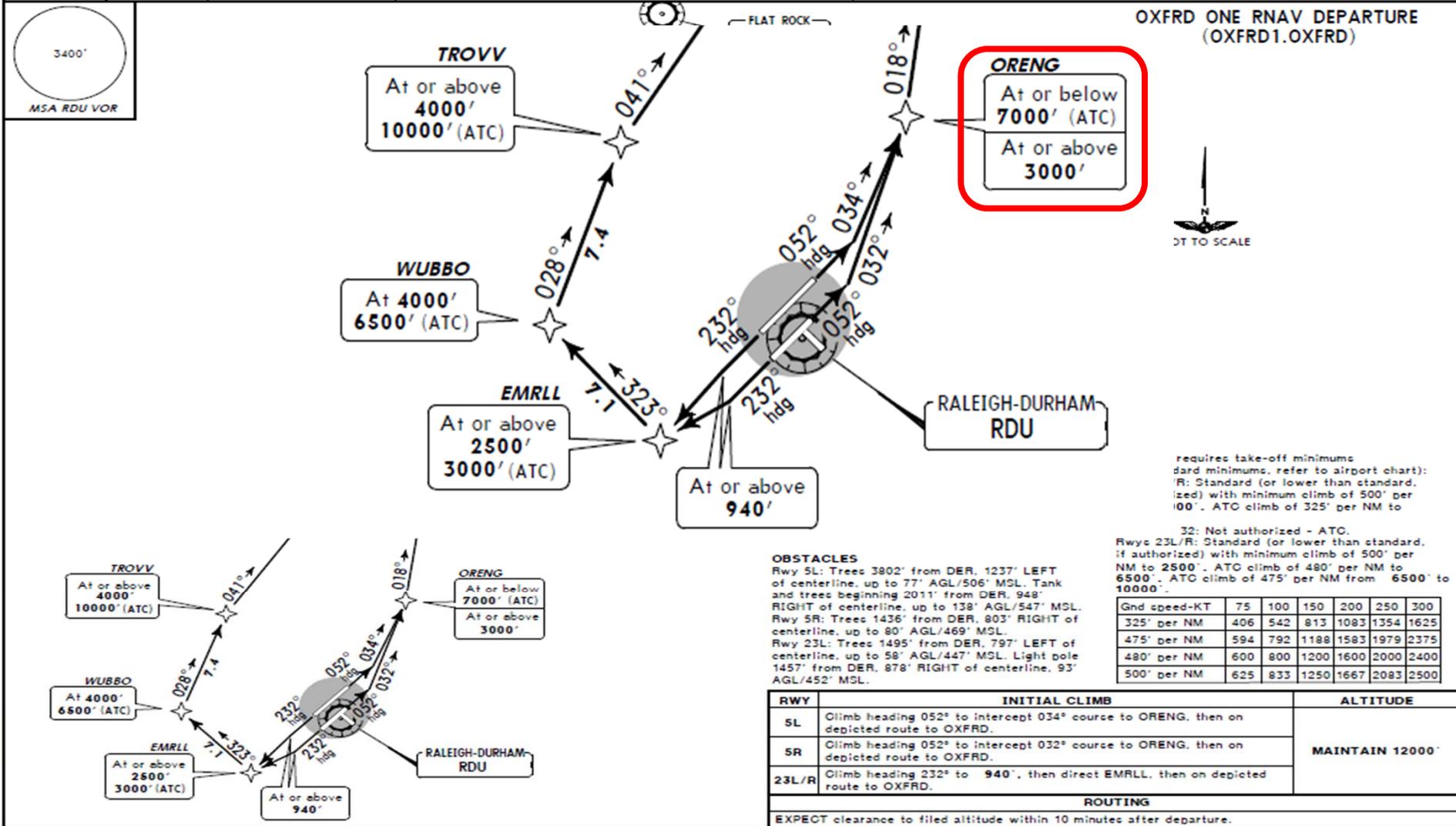
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RALEIGH/DURHAM,
N CAR

RNAV SID

1. DME/DME/IRU or GPS required. 2. RADAR required for non-GPS equipped aircraft.
3. For Turbojets only. 4. Accelerate to 250 KT. If unable, advise ATC. 5. RNAV 1.
6. If unable to accept climb gradients and crossing restrictions, advise ATC on initial contact. 7. Transponder code will be issued via PDC or Raleigh Clearance Delivery. 8. For non-GPS equipped aircraft: RDU and LIB DMEs must be operational for take-off/R.

RALEIGH Departure (R)		Apt Elev 435'	Trans level: FL180	Trans alt: 18000'
230°-024° 132.35	025°-229° 125.3			





Criteria Change

8260-46D

When an “at or below” altitude is published a “at or above” altitude must also be specified.



RNAV Procedure Design

- All RNAV SIDS are considered All Engines Operating.
- RNAV SIDS use existing ATC terrain clearance procedures (DVA's) and altitude restrictions that meet or exceed all MVA's.
- Climb gradients are used to “climb the aircraft” to terrain clearance altitudes.



Procedure Design

- Altitude Restrictions
 - Terrain
 - Airspace
 - Separation



Lost Communication

■ Route

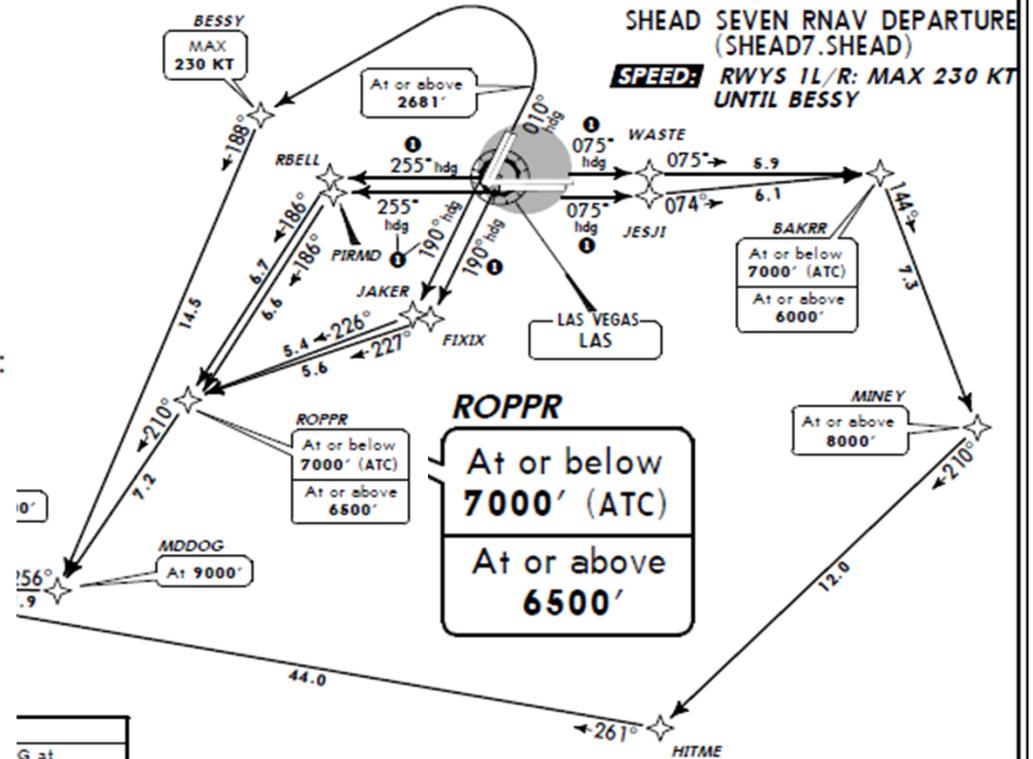
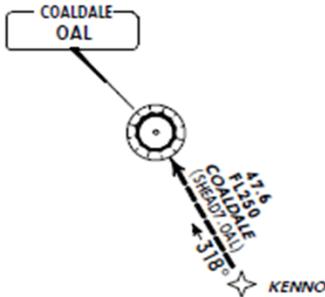
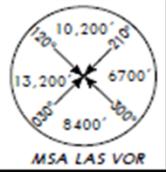
- As assigned
- Direct to a fix, waypoint, or airway (radar vector)
- As expected
- As filed

■ Altitude

- As assigned
- Minimum altitude for IFR operations
- As expected



SHEAD SEVEN SID



This SID requires take-off minimums (for standard minimums, refer to airport chart):
 Rws 1L/R: 1100-3 with minimum climb of 500' per NM to **6000'**, then 345' per NM to **13000'** (ATC).

Rws 7L/R: Standard (or lower than standard, if authorized) with minimum climb of 400' per NM to **8000'**.

Rws 19L/R: Standard (or lower than standard, if authorized) with minimum climb of 483' per NM to **9000'**.

Rws 25L/R: Standard (or lower than standard, if authorized) with minimum climb of 470' per NM to **9000'**.

	Altitude	Altitude
7L	7000' (ATC)/at or above 6000', then on track 144° to cross MINNEY at or above 8000', then on track 210° to HITME, then on track 261° to cross SHEAD at or above 14000'.	low
7R	Climb heading 075° to 2681', then direct JESJI, then on track 074° to cross BAKRR at or below 7000' (ATC)/at or above 6000', then on track 144° to cross MINNEY at or above 8000', then on track 210° to HITME, then on track 261° to cross SHEAD at or above 14000'.	low
19L	Climb heading 190° to 2681', then direct FIXIX, then on track 227° to cross ROPPR at or below 7000' (ATC)/at or above 6500', then on track 210° to cross MDDOG at 9000', then on track 256° to cross TARRK at 11000', then on track 256° to cross SHEAD at or above 14000'.	low
19R	Climb heading 190° to 2681', then direct JAKER, then on track 226° to cross ROPPR at or below 7000' (ATC)/at or above 6500', then on track 210° to cross MDDOG at 9000', then on track 256° to cross TARRK at 11000', then on track 256° to cross SHEAD at or above 14000'.	low
25L	Climb heading 255° to 2681', then direct PIRAND, then on track 186° to cross ROPPR at or below 7000' (ATC)/at or above 6500', then on track 210° to cross MDDOG at 9000', then on track 256° to cross TARRK at 11000', then on track 256° to cross SHEAD at or above 14000'.	low
25R	Climb heading 255° to 2681', then direct RBELL, then on track 186° to cross ROPPR at or below 7000' (ATC)/at or above 6500', then on track 210° to cross MDDOG at 9000', then on track 256° to cross TARRK at 11000', then on track 256° to cross SHEAD at or above 14000'.	low

ROUTING	ALTITUDE
From SHEAD via transition. EXPECT filed altitude 10 minutes after departure.	MAINTAIN FL190

OBSTACLES

Rwy 1L: Building 1508' from DER, 463' LEFT of centerline, 71' AGL/2146' MSL. Pole 453' from DER, 283' LEFT of centerline, 38' AGL/2118' MSL. Sign 1042' from DER, 694' LEFT of centerline, 35' AGL/2124' MSL.
 Rwy 1R: Sign 1331' from DER, 448' RIGHT of centerline, 60' AGL/2120' MSL. Vents 604' from DER, 539' RIGHT of centerline, up to 17' AGL/2095' MSL.
 Rwy 7L: Trees 761' from DER, LEFT and RIGHT of centerline, up to 42' AGL/2074' MSL. Pole 747' from DER, 442' RIGHT of centerline, 25' AGL/2057' MSL.
 Rwy 7R: Tower 1457' from DER, 847' RIGHT of centerline, 65' AGL/2096' MSL.
 Rwy 19L: Multiple buildings, trees and poles 1394' from DER, 251' RIGHT of centerline, up to 96' AGL/2284' MSL. Sign 2181' from DER, 1062' RIGHT of centerline, 36' AGL/2236' MSL.
 Rwy 19R: Trees 1563' from DER, 329' LEFT of centerline, up to 55' AGL/2236' MSL. Multiple buildings, signs and poles 197' from DER, 59' RIGHT of centerline, up to 75' AGL/2291' MSL.

Direct distance from McCarran Intl
 (Rws 1L/R) to: BESSY 7 NM
 (Rwy 7L) to: WASTE 4 NM
 (Rwy 7R) to: JESJI 4 NM
 (Rwy 19L) to: FIXIX 5 NM
 (Rwy 19R) to: JAKER 5 NM
 (Rwy 25L) to: PIRAND 5 NM
 (Rwy 25R) to: RBELL 5 NM

Rwy 25L: Multiple poles, sign and buildings 1003' from DER, 145' LEFT of centerline, up to 97' AGL/2291' MSL. Tree 2837' from DER, 1008' LEFT of centerline, 72' AGL/2230' MSL. Railroad 2564' from DER, 773' LEFT of centerline, 66' AGL/2223' MSL.
 Rwy 25R: Multiple poles and trees 533' from DER, 1' LEFT of centerline, up to 271' AGL/2457' MSL. Building 1822' from DER, 652' LEFT of centerline, 59' AGL/2238' MSL. Roads 669' from DER, 17' RIGHT of centerline, up to 29' AGL/2208' MSL.

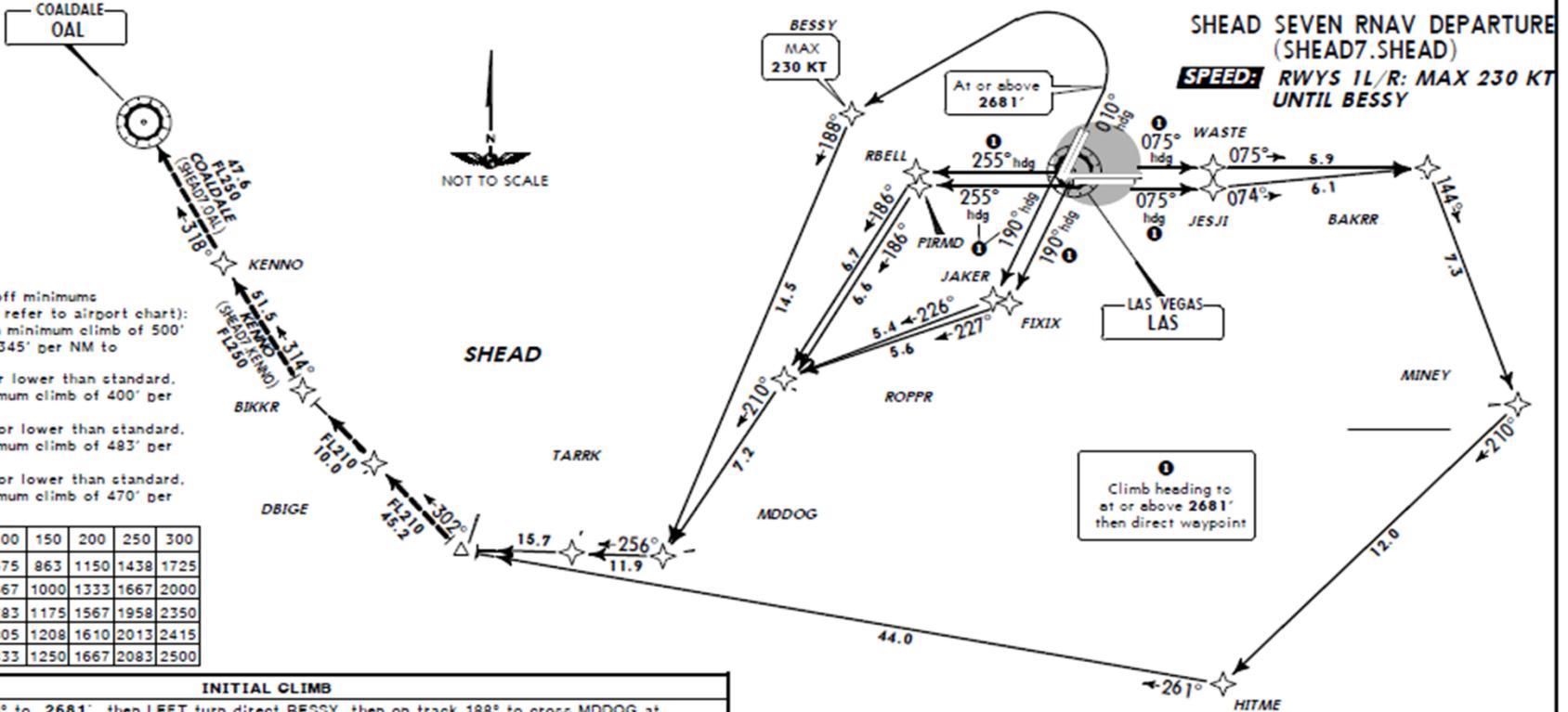


Clearance

- Pre-departure Clearance
 - SWA 123, climb and maintain 7000', expect FL390 5 minutes after departure.



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Gnd speed-KT	75	100	150	200	250	300
345' per NM	431	575	863	1150	1438	1725
400' per NM	500	667	1000	1333	1667	2000
470' per NM	588	783	1175	1567	1958	2350
483' per NM	604	805	1208	1610	2013	2415
500' per NM	625	833	1250	1667	2083	2500

RWY	INITIAL CLIMB
1L/R	Climb heading 010° to 2681', then LEFT turn direct BESSY, then on track 188° to cross MDDOG at 9000', then on track 256° to cross TARRK at 11000', then on track 256° to cross SHEAD at or above 14000'.
7L	Climb heading 075° to 2681', then direct WASTE, then on track 075° to cross BAKRR at or below 7000' (ATC)/at or above 6000', then on track 144° to cross MINEY at or above 8000', then on track 210° to HITME, then on track 261° to cross SHEAD at or above 14000'.
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Pilot Issues

- Unlike Descents, No climb path indication
- Difficult to determine which altitude to compute.
- Confusion has produced reduced climb rate
- High workload for aircraft with low levels of automation (Non-VNAV)
- Procedures are too complex (DCA)



Aircraft Issues

- No climb path indications
- Several FMS' will try to fly through center of the window
- Many aircraft are not VNAV equipped
- Many aircraft have no autothrottles
- No timely warning an altitude restriction may be missed



Recommendations

■ Recommendations

- Continue use of the climb gradient for terrain clearance
- Use “at”, “at or above”, and “at or below” altitudes to comply with ATC requirements
- Remove block altitudes mandate in 8260-46D



Questions