

# A320 SKARDU OPERATION

Last Updated: 7<sup>th</sup> Sep 2023

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**Disclaimer:** "A320 SKARDU OPERATION" is a personal research work of the undersigned to develop flight procedures for airfields surrounded by high terrain. This document does not sanction any pilot to violate his/her Company's Standard Operating Procedures, Aircraft Manuals or Manufacturer's Recommendations. Terrain maps and elevation data are based on Google and FreeMapTools.com whereas TheAirlinePilots.com owns the photo images and graphics.

## DEPARTURE TO SKARDU

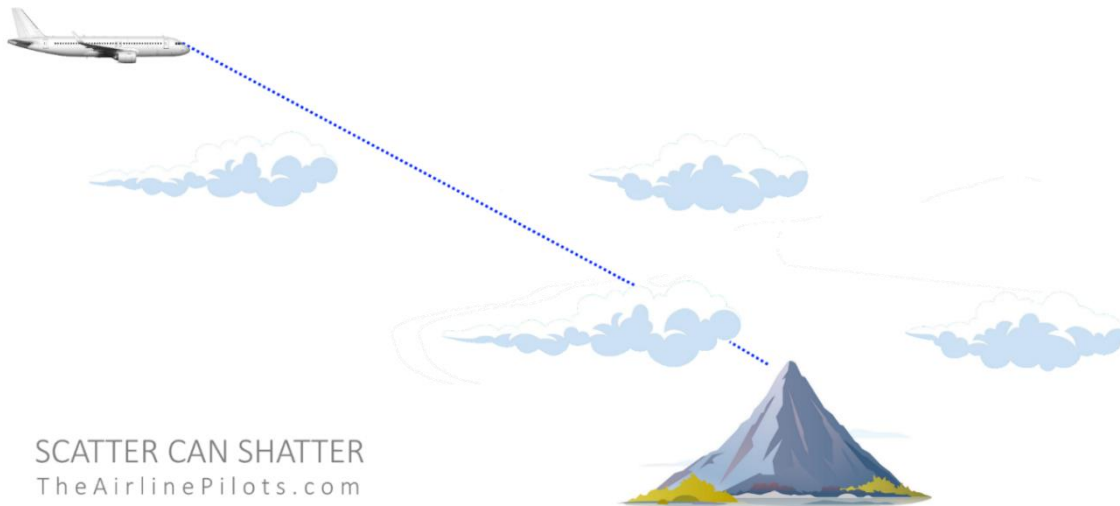
### PREFLIGHT

#### 1. Prerequisites:

- Man:
  - Last flight > 3 months: 1 observation flight recommended.
  - Last flight > 6 months: 1 training flight recommended.
- Machine:
  - APU: Serviceable if ground support at Skardu is not available.
  - HF: Serviceable as there are areas enroute with no VHF coverage.
  - Landing Weight: 65 Tons or less at Skardu due PCN limits.
- Environment:
  - Weather.

#### 2. Skardu Weather:

- Resources:
  - METAR: From Pakistan Meteorological Department website <https://rmcpunjab.pmd.gov.pk/rmclhr/asppages/selectMetar.asp>
  - Satellite Pictures:
    - SKYVECTOR: <https://skyvector.com>
    - Weather Underground: <https://www.wunderground.com/wundermap>
  - Live video and images (valley and overhead clouds):
    - Skardu Tower c/o Mr. Aqib: +92-322-9039692 (WhatsApp).
- Benchmarks:
  - Visibility: 6 KM or above.
  - Cloud Cover: 3-4 oktas (Scattered) to a maximum of 4-5 oktas (Partly Cloudy).
  - Cloud Layers: Note levels and location to visualize staggering for descent planning.



### 3. FMC Considerations:

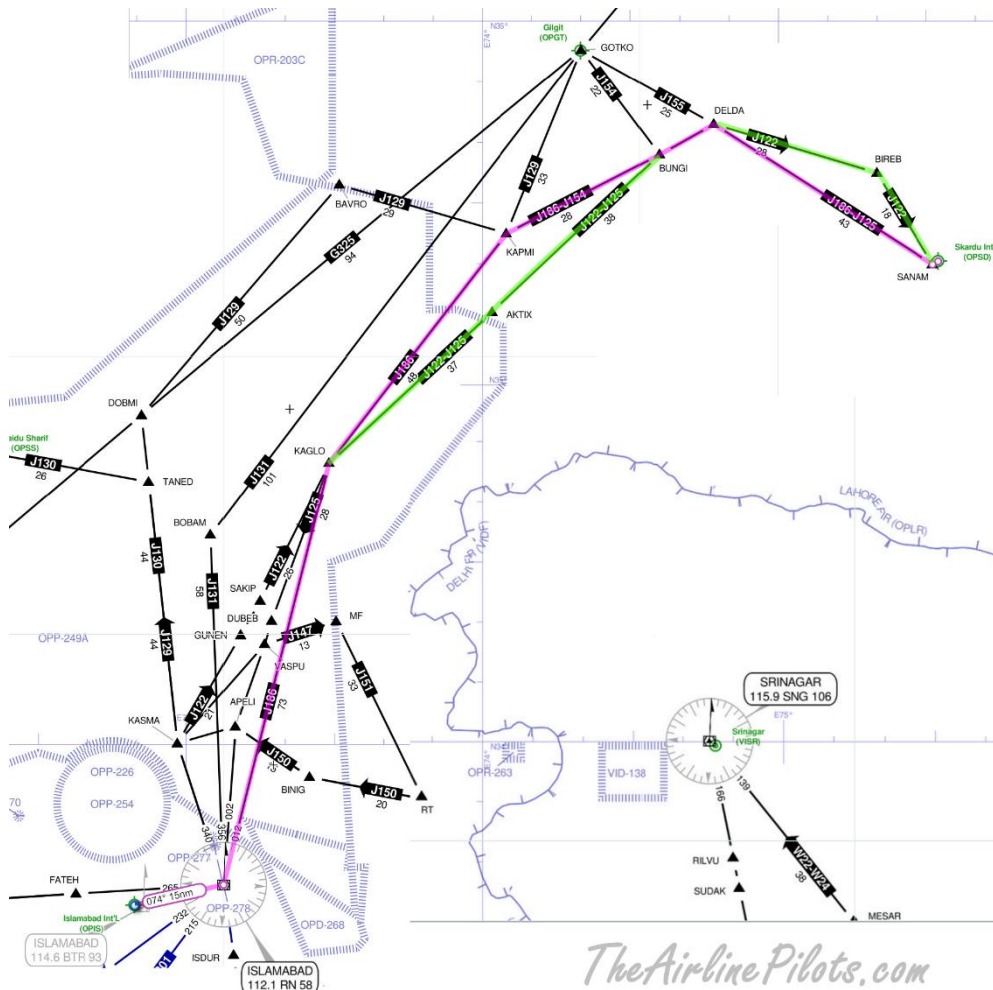
- Fuel: Add next sector (KDU-XXX) fuel as reserve fuel since there is no refueling in Skardu.



PIA:454 CAPTAIN: K HAROON **SECTOR:KDU-LHE** REG: AP-BLV  
 SDEP: 04.40 SARR: 06.00 BLK-TIME: 01.20 FLT-TIME: 01.01  
**TTL.FUEL: 6682** TRIP: 2632 FOD: 3850 HOLD: 989 ALT: 1948  
 EST.TOGW: 54982 EST.LGWT: 52350 RESERVE FUEL: 2937

- Speed / Height constraints for descent:
  - DELDA (N3543.0 E07447.0) – Speed 250 kts.
  - BIREB (N3535.0 E07520.0) – Height 21,500 feet.
  - SD/SANAM (N3519.9 E07531.3) – Speed 170, Height 15,500.
- Route Modifications:
  - Add a waypoint 4NM before BIREB.
  - Add a waypoint 0.1NM before CF RW14.
  - Add a 5NM leg from SD on a Track of 089°.

### IFR ROUTING: J186 / J122



# VFR ROUTE – KAGLO TO SKARDU



## VFR ROUTE – KAGLO (KAGHAN) TO KAPMI (CHILAS) OR AKTIX (BABUSAR)



## VFR ROUTE – KAPMI (CHILAS) OR AKTIX (BABUSAR) TO DELDA



## VFR ROUTE – BUNGI TO DELDA



### ENROUTE CRUISE LEVELS

- **Minimum Level:** From KAGLO to DELDA the highest peak closed to the route is Malika Parbat which is approx. 17,350 feet located 10nm east-northeast of KAGLO. Average height for rest of the terrain is approx. around 14,500 feet. Giving due consideration to pressure altimeter errors and 2,000 feet clearance to Malika Parbat, FL195 and FL205 should be considered as minimum northeast and southwest levels on this route.
- **Recommended Level:** Ideal level after KAGLO is the one that keeps you below the cloud layers. Considering the flight time from your departure airport to Skardu, you will be much higher than your minimum safe level on this route. In case of stratus cloud layers covering the area after KAGLO, it is recommended to stay below the layers so that you have the terrain in view all the time to cater for an unrestricted descent. This has an advantage over the option of flying IFR till KAPMI (Chilas) and then changing to VFR. Cloud coverage is sometimes so extensive that if you are not VFR early enough for your descent, you might not be able to find the opportunity later to switch from IFR to VFR and therefore will have no choice but to divert back. Considering the terrain after DELDA and the descent phase, FL215 is the lowest recommended after KAGLO as this can be maintained right up till BIREB from where you can start your final descent to Skardu.
- **Engine Inoperative Ceiling:** While in cruise determine once to have a ballpark figure for planning.

### ENROUTE COMMUNICATION – KAGLO ONWARDS

- VHF1 – Standard ATC communication.
- VHF2 – Standard guard frequency monitoring on 121.5.
- VHF3 – Position reporting to all northern area traffic on 123.4.
- HF1 – Position reporting to Skardu on 5601.

## DESCENT

There are two descent phases involved in this flight. Phase 1 is before DELDA while phase 2 is after DELDA. On the basis of terrain clearance, the first phase before DELDA is less critical as compared to the second phase after DELDA. Therefore, manage workload accordingly so that flying and terrain clearance has priority over other tasks during the critical descent phase.



Normally Islamabad control gives you descent up till FL215 and expects further clearance by Skardu on HF due to lack of VHF coverage. Sometimes HF reception is also poor and you are unable to get further clearance. This delay in descent clearance positions you high on your descent profile. In order to avoid this situation, request Islamabad control to coordinate with Skardu and give you unrestricted descent so that in case you are not in contact with Skardu you are still able to continue your descent.



Be wary of your speed while maintaining the descent profile. You must reduce speed before DELDA to reduce the radius of turn as there are some very high peaks north of DELDA e.g., Haramosh peak which is approx. 24,300 feet is just 8nm north of DELDA as shown in the image above.

- **DESCENT BEFORE DELDA**

There are four main tasks that should be completed latest by DELDA. These tasks can be recalled with the ABCD mnemonic:

- **A**PU.
- **B**alked Landing.
- **C**hecklist.
- **D**eceleration.

**(A)** While descending towards DELDA (below 25,000 feet), start the APU if ground support at Skardu (GPU/Start cart) is not available. If unsuccessful, try again at a lower altitude. If still unsuccessful then divert. **(B)** Carry out the approach climb and landing performance assessment. **(C)** Though you typically carry out the 10,000 feet checks (Lights, Seatbelts, Nav Accuracy checks etc.) when you are 10,000 feet AGL from your destination, which will not be the case at DELDA, but nevertheless carry out the 10,000 feet checks at DELDA to reduce your workload in the upcoming critical descent phase. Carrying out the 10,000 feet checks at 15,000 feet might not hurt as much as delaying the checks (to be done exactly at 10,000 feet) and creating a distraction from the main task. **(D)** While approaching DELDA, start reducing speed in order to be not more than 250 knots at DELDA.

- **DESCENT AFTER DELDA**

Even with an IAS of 250 kts at DELDA your GS will be quite high. It will of course vary with TAS and wind direction but typical figures seen after DELDA are generally around 330-345 kts. Winds from the north (typically seen around DELDA) keeps your GS under control while heading towards DELDA but same winds add a tailwind component and increase your GS while proceeding away from DELDA towards BIREB. It is recommended to keep the GS around 320-325 kts to keep your descent under control (this will be discussed later in this document). Therefore, adjust your IAS to have GS of 320-325 kts and reduce it accordingly even if it drops to the “Green Dot” minimum clean speed, which will of course be the lowest IAS limit to fly.

DELDA is the point where the critical phase of this flight starts. From this point onwards you will be in your descent phase into high terrain. In order to have correct situational awareness and terrain clearance you need to have a clear idea about the terrain around you especially if you want to make a 180° turn for diversion or for side stepping into Shigar valley due to weather or conflicting traffic.

From DELDA to BIREB you will be in the Indus valley on an east-southeast heading towards Skardu. On your left (North) you will have the Haramosh peak (approx. 24,300 ft). Right (South) side will lead you to BUNGI from where you came. Highest peaks on a direct track from DELDA to BIREB are 14,777 feet (18 nm from BIREB) and 14,173 feet (11 nm from BIREB) approximately, shown in the image below as A and B respectively. That means this direct leg can easily be flown in NAV mode at FL195 all the way from DELDA to BIREB. However, there are peaks around this track which are as high as this level. About 19.5 nm short of BIREB (when you are abeam Nanga Parbat), you will have the Dofana peak (19,483 feet) on your right (South) and a peak about 19,680 feet on your left (North). In case of a significant navigational cross track error there will not be enough terrain clearance at FL195. Therefore, the recommended FL215 is the optimum level as it caters for terrain clearance on track and terrain clearance for cross track errors.



The recommendation is based on flying in NAV mode in order to pass through a transient thin layer of clouds in some emergency situations like smoke in the aircraft, uncontrollable engine fire, medical emergency etc. where one is committed to land. However, as a routine VFR flight in VMC conditions you can fly the valley in HDG mode at a lower than recommended level, instead of flying a direct track from DELDA to BIREB in the NAV mode. Depending on your height at DELDA, you can manage your descent accordingly. The minimum recommended level in this case is FL175.



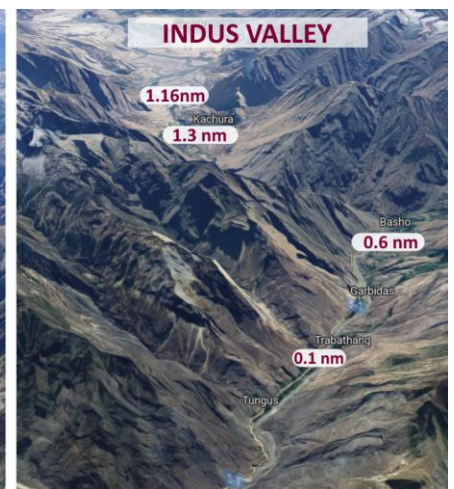
Continuing further towards BIREB from point B (approx. 11 nm short of BIREB), you will be abeam the starting point of Hurimal valley on your left (North). The mountain range that separates Hurimal valley from Indus Valley starts off with peaks approx. around 17,000 feet and ends with peaks around 14,000 feet. Hurimal valley meets the Indus valley at BIREB.



At BIREB you turn Southeast in the Indus valley to approach Skardu. BIREB is also the point where you are abeam the starting point of Shigar valley on your left (Northeast). Shigar valley runs Southeast to Shigar parallel to Indus valley that runs Southeast to Skardu. Both valleys meet together at the end.



Due to conflicting traffic or weather conditions, you can sidestep from Indus into Shigar valley for approaching Skardu. After overflying Shigar, you can turn right on a westerly heading to approach Skardu. However, be wary of the high terrain that separates these two valleys. Mountain range after BIREB between Indus and Shigar valley have peaks that range from 15,000 feet to 19,000 feet approx. with B21 peak as the highest one around 19,121 feet. Therefore, if you anticipate or plan to sidestep into Shigar valley then do not descend below FL215 after DELDA – Change valleys after BIREB and then continue with your descent. Shigar valley has an advantage over Indus valley in a sense that it is wider and straighter than Indus valley which is narrower and has an “S” shaped bend in it (commonly known as the “Zulu Bend” among the local pilots). However, there are no waypoints in the navigation database that can be used for navigating the Shigar valley. Errors in creating your own waypoints inflight can have serious repercussions and is not recommended. There is no room for errors in these valleys.

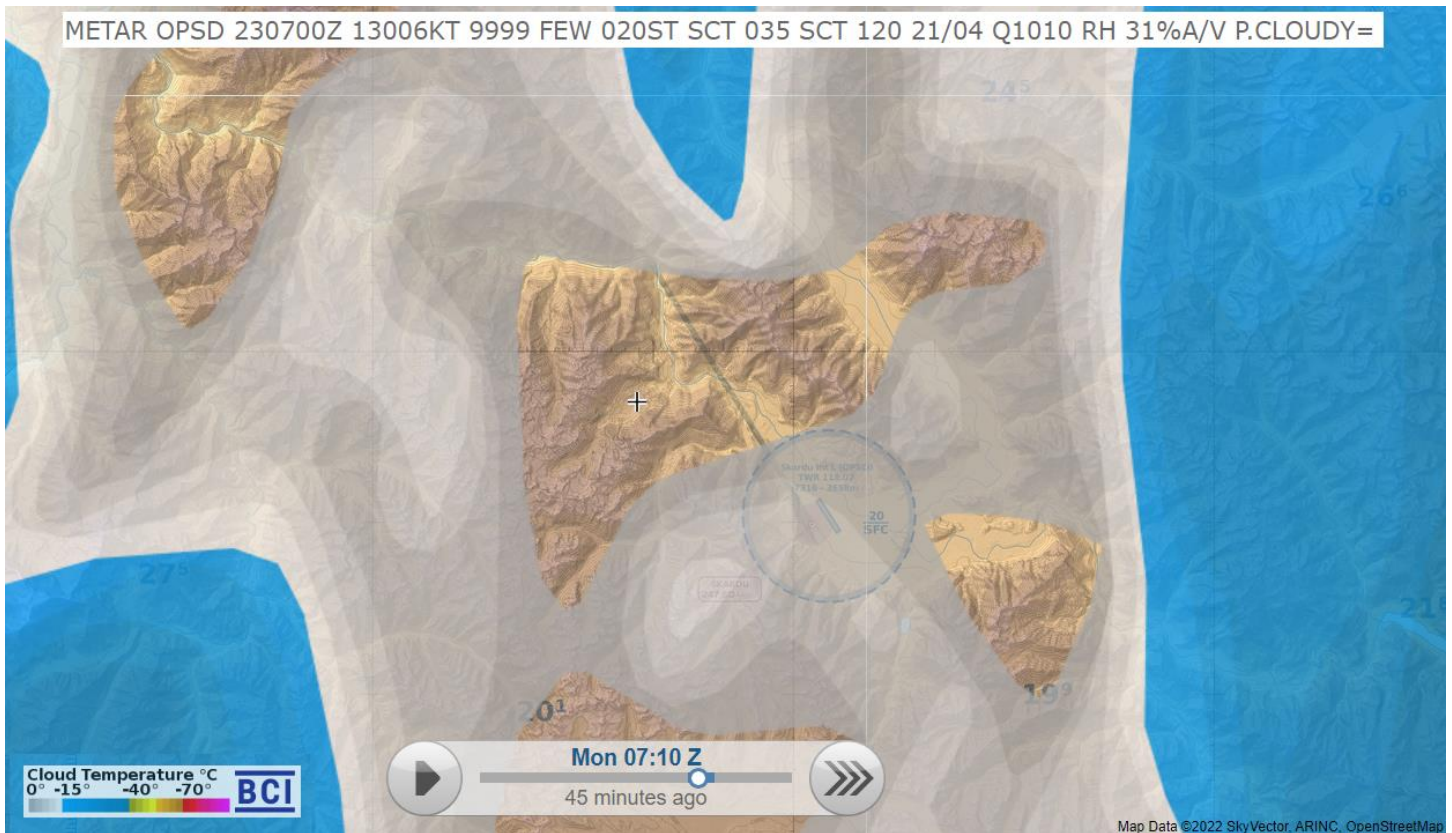


## APPROACH AND LANDING

Skardu can be approached from Shigar or Indus Valley. Shigar is a straight and wide valley involving no special procedures except getting into this valley from Indus valley at a higher level due to high terrain separating the two valleys. If you are approaching from Indus valley then activate approach phase and complete your approach checklist latest by position BIREB except setting the QNH if you are maintaining a level up till BIREB. Reason for doing this is Skardu QNH which is generally seen to be always higher than QNE. In a level flight, setting QNH higher than QNE makes your true altitude lower than indicated which reduces the terrain clearance. Transitioning to QNH can be done once descent is initiated or in case of a level flight once you reach the point where terrain is not a threat which in this case is the point approx. 7 nm short of OPSD Runway 14 (2 nm before CF RWY14 since CF is a 5nm leg). At this point onwards to OPSD there is no terrain below you. Visual ground reference for this point is the famous Kachura lake. This point will now be denoted as “K” in this document.



Approach valley is not clear of clouds all the time. Often there is a stratus layer overhead Skardu. In case you are maintaining a higher level up till BIREB with Skardu airfield in sight, your preference should be to get below the layer as soon as possible in order to avoid getting stuck above the layer and losing sight of the airfield.



Normally (in perfect VMC conditions which may not be the case every time) you start reducing your speed to be at the approach speed by position BIREB. The main purpose for speed reduction is to reduce the radius of turn due to terrain. However, if turning is not a factor then increasing the speed a little bit to adjust for your descent profile will not jeopardize safety. Therefore, in case of a cloud layer over approach valley and Skardu, prefer a steeper descent angle over speed reduction as turning is not factor in this case. Increasing speed and getting below the layer will be more rewarding than reducing speed, decreasing your rate of descent and end up getting stuck above the cloud layer. Speed up till 250 knots in a clean configuration is easily manageable until approaching Skardu where you can level off and reduce to the desired F speed (using speed brakes or gears to increase deceleration if required) for further maneuvers. Reducing to green dot speed earlier than required will give you the least rate of descent as this is your best L/D speed. Taking speed brakes while descending on green dot speed to increase your rate of descent will increase your VLS rapidly. Flaps 1 will restrict your speed to its placard limit of 230 knots and will not allow further pitching down which is sometimes required to stay below the clouds. All these factors have to be considered along with weather conditions to decide which speed and profile would be the most optimum. So be flexible and fly an approach that is pragmatic and not dogmatic.

By position BIREB you will also be in VHF range so you can contact tower on 118.075 for further clearance.

The descent strategy after BIREB depends upon your height over BIREB. Since we were discussing the advantages of FL215 up till BIREB, we will now discuss the descent strategy assuming our level to be FL215 and assuming that we have to pass through a transient thin layer of clouds (that blocks the VMC view momentarily) in some emergency situation like smoke in the aircraft, uncontrollable engine fire, medical emergency etc. where one is committed to land.

Normal routing to OPSD is from BIREB, but if you turn 4nm short of BIREB and proceed directly to CF RWY14 then you have more terrain clearance. However, proceeding directly to CF RWY14 will sequence your destination and your flight plan will be erased. To get the final leg of the approach along with its descent guidance, destination can be reinserted by creating a new active flight plan or by activating the secondary flight plan if it had a copy of the original plan but this involves heads down activity during approach which should be avoided. In order to prevent the flight plan from getting erased it is recommended to keep the discontinuity before CF RWY14. To achieve this, create a point 0.1NM (or earlier) before CF and connect it to SD or SANAM while keeping the discontinuity.

Depending on the FMS type installed on the aircraft some would allow while some would not allow creating a point from CF in the typical way like CF/-0.1 so you might have to use the point BIREB for this. There can be two methods:

1. BIREB / DISTANCE
2. BIREB / BEARING / DISTANCE

Distance between BIREB and CF is 12 nm. If you use the first method then BIREB/11.9 will be a point 0.1 nm before CF but the system does not accept this value so you will have to create a point earlier than this like e.g., 11.7. For creating a point exactly 0.1 nm from CF you will have to use the second method. The track between BIREB and CF is  $141^\circ$  so you will enter BIREB/141/11.9 to create that point.



Plan your descent from F215 with a ground speed (GS) of 320 knots and vertical speed (VS) -1800 fpm if descending from BIREB or VS -1500 fpm if descending from 4nm short of BIREB. This will bring you at 15,500 feet overhead SD. Normally the stratus layers that obstruct the ground view are around 16,000 to 17,000 feet. If you are 100% VMC at 15,500 feet, you can descent further and land otherwise climb back to FL215 and divert. Procedure after approaching SD will be discussed next but first a few words about the math involved in determining the required vertical speed while descending from FL215 to 15,500 feet and terrain clearance obtained with this descent rate.

#### **BIREB – 1BC (0.1 NM Before CF) – SD**

- Vertical Speed
  - Distance from BIREB to 1BC RWY14 = 11.9 nm.
  - Distance from 1BC to SD = 6.3 nm.
  - Total distance = 18.2 nm.
  - GS 320 knots = 5.33 nm/min (320 / 60).
  - Time from BIREB to SD = 3.41 min (18.2 / 5.33).
  - Height to lose = 21500 – 15500 = 6000 feet.
  - Gradient (6000 feet in 18.2 nm) = 5.42% or 3.1°.
  - Required VS = 1760 fpm (6000 / 3.41).
  - Rounding off the VS to **1800** fpm for usability and being conservative.
- Terrain Clearance
  - Highest peak directly under BIREB to 1BC = 14,515 feet.
  - Distance of highest peak from BIREB = 5.8 nm.
  - Time to highest peak = 1.08 min (5.8 / 5.33).
  - With VS 1800 fpm, height loss in 1.08 min = 1944 feet (1800 x 1.08).
  - Height above the highest peak on BIREB to 1BC = 19,556 feet (21,500 - 1944).
  - Clearance above the highest peak on BIREB to 1BC = **5041** feet (19,556 – 14,515).

#### **4BB (4 NM Before BIREB) – 1BC – SD**

- Vertical Speed
  - Distance from 4BB to 1BC = 15.4 nm.
  - Distance from 1BC to SD = 6.3 nm.
  - Total distance = 21.7 nm.
  - GS 320 knots = 5.33 nm/min (320 / 60).
  - Time from 4BB to SD = 4.07 min (21.7 / 5.33).
  - Height to lose = 21500 – 15500 = 6000 feet.
  - Gradient (6000 feet in 21.7 nm) = 4.5% or 2.59°.
  - Required VS = 1474 fpm (6000 / 4.07).
  - Rounding off the VS to **1500** fpm for usability and being conservative.
- Terrain Clearance
  - Highest peak directly under 4BB to 1BC = 12,139 feet.
  - Distance of highest peak from 4BB = 9.1 nm.
  - Time to highest peak = 1.7 min (9.1 / 5.33).
  - With VS 1500 fpm, height loss in 1.7 min = 2550 feet (1500 x 1.7).
  - Height above the highest peak on 4BB to 1BC = 18,950 feet (21,500 - 2550).
  - Clearance above the highest peak on 4BB to 1BC = **6811** feet (18,950 – 12,139).

Following images show the terrain clearance (calculated above) over the Zulu bend.



Following Images show how terrain clearance appears visually when you fly the above-mentioned descent profile over the Zulu bend.





As mentioned earlier, from Katchura lake (K) onwards towards OPSD there is no terrain. Just for interest, below is the terrain clearance at K:

### BIREB to K

DATA	TERRAIN CLEARANCE
<ul style="list-style-type: none"> <li>BIREB to K Distance = 10 nm</li> <li>GS 320 = 5.33 nm/min</li> <li>Time to K = 1.87 min (10 / 5.33)</li> <li>VS = <b>1800</b> fpm (calculated earlier)</li> </ul>	<ul style="list-style-type: none"> <li>VS @1800 fpm, height loss in 1.87 min = 3366 feet (1800 x 1.87)</li> <li>Height above K = 18,134 feet (21500 - 3366)</li> <li>Elevation of K is approx. 7700 feet at this point</li> <li>Clearance above K = <b>10,434</b> feet (18,134 – 7700)</li> </ul>

### 4BB to K

DATA	TERRAIN CLEARANCE
<ul style="list-style-type: none"> <li>BIREB to K Distance = 13.5 nm</li> <li>GS 320 = 5.33 nm/min</li> <li>Time to K = 2.53 min (13.5 / 5.33)</li> <li>VS = <b>1500</b> fpm (calculated earlier)</li> </ul>	<ul style="list-style-type: none"> <li>VS @1500 fpm, height loss in 2.53 min = 3795 feet (1500 x 2.53)</li> <li>Height above K = 17,705 feet (21500 - 3795)</li> <li>Elevation of K is approx. 7487 feet at this point</li> <li>Clearance above K = <b>10,218</b> feet (17,705 – 7487)</li> </ul>

Therefore, the above-mentioned descent profile which we have discussed in detail would give you a safe terrain clearance in all respect. However, be careful about VS and GS relation. If you are planning your descent at GS320 then make sure it remains 320 by altering your indicated speed else VS will have to be altered to achieve the desired target i.e., to be FL155 over SD in this case.

### APPROACHING SD:

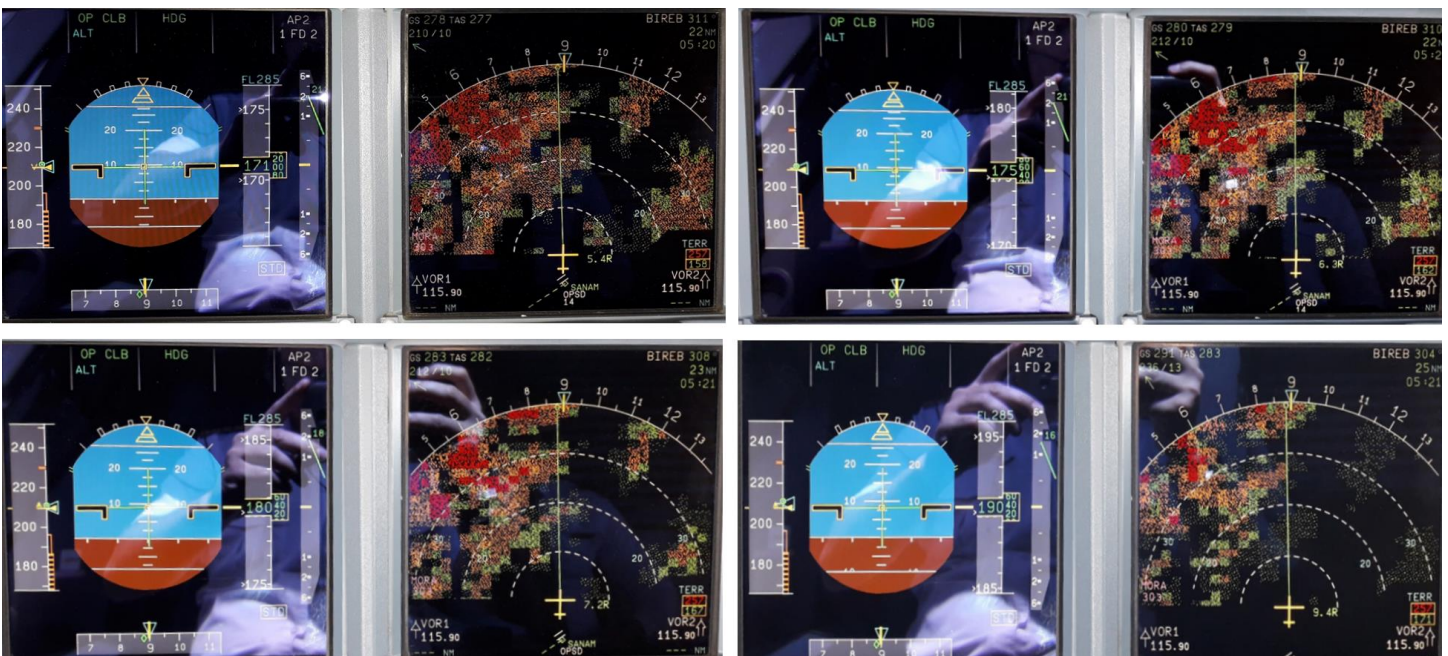
- Level off.
- Flaps – Flaps 1
- Speed – F or Green Dot (as required).

After crossing SD, you can discontinue approach and divert or continue to land.



## DISCONTINUING APPROACH AFTER CROSSING SD:

- Track 089° towards 2<sup>nd</sup> kidney hill
  - For initial turn, NAV mode will prevent overshooting SD and will keep you in center of the valley.
- Select Open Climb to FL225 or higher.
- Climb at green dot speed and retract flaps.
- Check gears up and speed brakes retracted.
- After FL175 turn right towards SD. Due poor climb performance you can also enter the “TASU Valley” located south-east of the 3<sup>rd</sup> kidney hill (as shown in the image below) to gain height.
- Proceed via Indus or Shigar valley as required.
- Above procedure is based on discontinuing at 15,500 feet. If altitude is significantly lower, you might have to orbit in the valley for height before setting course. See go around procedure for additional info.



## CONTINUING TO LAND AFTER CROSSING SD:



- Adjust HDG/TRK as required to keep you between kidney hills and terrain on your right.



- Select Flaps 2 and Speed 160-170 knots. Without a significant wind factor, this speed is sufficient for safely orbiting or turning in the Skardu valley.
- Select Open Descent to 9300 feet (required for left downwind RWY 14). If required to increase the rate of descent, select gears down or extend speed brakes.
- Height to lose = 6200 feet (15,500 - 9300).
- Without a significant wind factor, lose 3000 feet on your easterly heading and at 12,500 feet (15,500 - 3000) make a 180° turn towards SD and lose the remaining 3000 feet so that you are 9300 feet on downwind.

- However, while descending to 9,300 feet make sure to clear the kidney hills with sufficient margin. Level off momentarily if you think you will be too close to them. Heights of 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> kidney hills are 8780 feet, 9292 feet and 10,410 feet respectively. Turning back to SD at 12,500 feet would safely clear all hills.



- Join left downwind RWY14 at 9300 feet, select gears down and flaps 3. Fly the F speed.



- Approaching the end of downwind i.e., abeam the end of the ridge on your right-hand side.
  - Turn right approx. HDG 330° towards Qomera village, then further right approx. HDG 350° when clear of the ridge.
  - Flaps Full.
  - VS-700 fpm.
  - Landing Checklist.



- Approaching Qomera village:
  - AP OFF
  - FDs OFF
  - Bird ON



- Over Qomera village: Turn left for finals with a bank angle of  $30^\circ$  and tail of the bird on the horizon.



- Roll out on finals so that you are close to 8300 feet. Minimum is 8300 feet (1000 feet AGL).





- Runway:
  - Elevation: 14L = 7256 feet, 32R = 7301 feet.
  - Direction: 14L (145°). 14R not available for civil aircrafts. 32R not used due terrain constraints.
  - Length: 11,998 feet (3657m).
  - Width: 98 feet (30m) – Narrow runway.
  - PCN: 40/R/C/X/T Bitumen. Aircraft weight limited to Max 65 tons (including 5% overload allowance).
  - Fire-fighting category: 6.
  - Refueling or Deicing facility: Nil.
  - Flight rules: VFR day operation only.
  - Tower Frequency: VHF 118.075.
  - New runway 14R/32L has a PCN of 50/F/C/X/T with not weight restriction on runway or its associated taxi tracks and apron. Width is 150 ft (not narrow runway)

## GO AROUND

- Initially maintain runway heading.
- Then turn left to track between kidney hills and terrain on the right.
- Climb to 11,500 feet and accelerate to 160-170 knots for maneuvering in the valley.
- If unable to turn due to poor climb performance, then maneuver between kidney hills rather than flying over them to keep clear of the terrain. Keep orbiting until a safe altitude is attained.
- To make a 180° turn towards SD between 1<sup>st</sup> and 2<sup>nd</sup> kidney hill, climb to 9500 feet before initiating the turn so that the 2<sup>nd</sup> kidney hill is cleared safely in case radius of turn increases.
- To make a 180° turn towards SD between 2<sup>nd</sup> and 3<sup>rd</sup> kidney hill, climb to 10,500 feet before initiating the turn so that the 3<sup>rd</sup> kidney hill is cleared safely in case radius of turn increases.



## TOPICS TO BE COVERED NEXT

### EMERGENCIES

- ENGINE FAILURE WHILE HEADING TOWARDS KDU
- PRESSURIZATION FAILURE WHILE HEADING TOWARDS KDU
- SINGLE ENGINE GO AROUND

### DEPARTURE FROM SKARDU

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