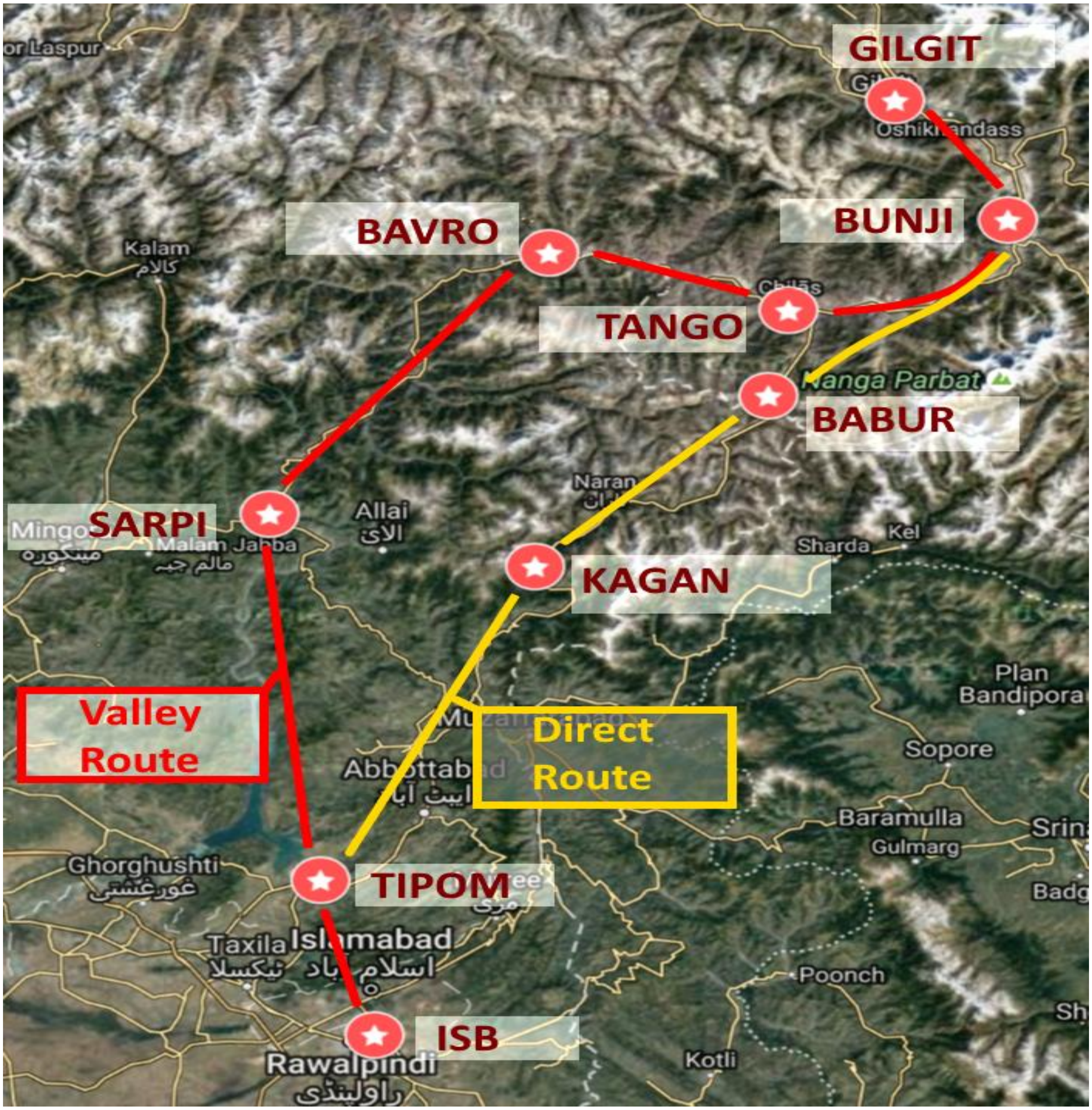
ATR – GILGIT OPERATION

*Last Updated: **6th October 2017***

ROUTE OVERVIEW:



GENERAL GUIDELINES:

- Cumulus cloud development encountered in summers is likely to intensify during the course of the day and the tops may rise very quickly. Triggering mechanism in this case being the orographic uplift (rising ground forcing the air upwards). Storms form when a general flow of moist unstable air passes over higher terrain, such as a ridge line or mountain range. Such storms often form in a line along the ground feature and are therefore more challenging to avoid than single cells.

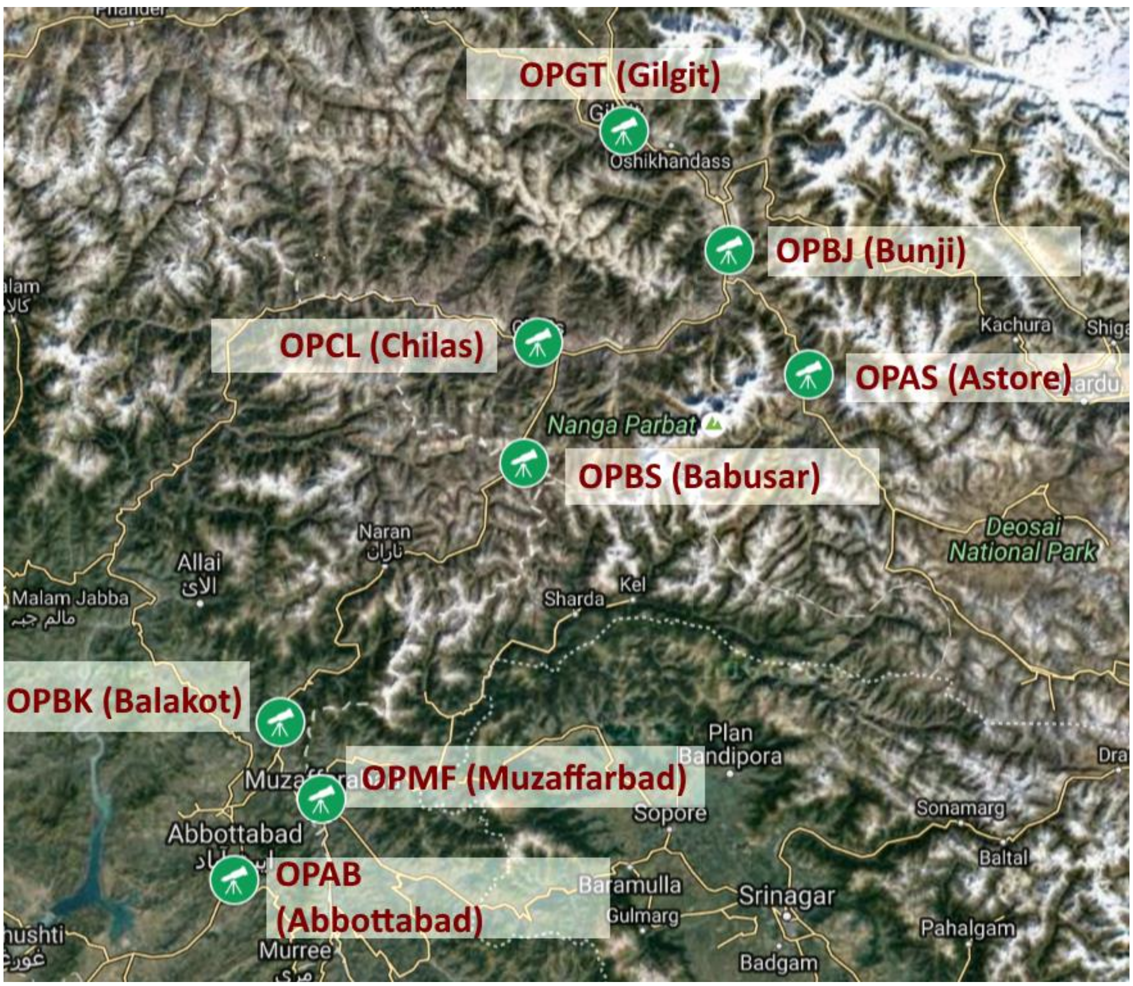
- Stratified clouds in winters are likely to lower and settle on the mountain tops and the valley.

- Surface temperature during summers is known to increase rapidly after sunrise. Be careful in assessing the temperatures used for calculations of approach climb weights and TOGW for subsequent departures.

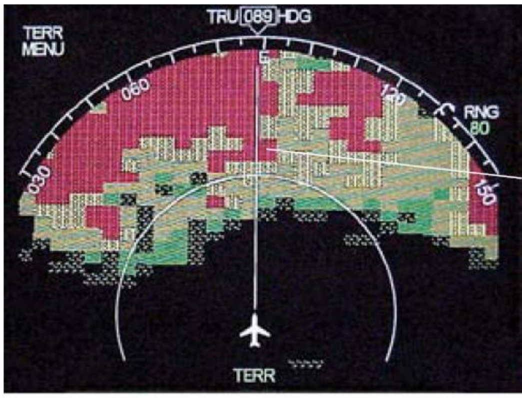
PRE REQUISITES:

- VFR Operation, with visual ground contact at all times.
- Operation above overcast layer of clouds over high terrain is not allowed.
- Do not depart if:
  - Destination visibility is less than or is anticipated to be less than 5 km on arrival.
  - Destination ceiling (overcast) is 6000 AGL or lower.
  - There is drizzle or rain at destination with hill tops not visible.
  - Cloud base at BUNJI is broken or overcast at 8000 feet AGL or lower.
- HF radio serviceability is mandatory since VHF contact is not available on entire route.
- All efforts should be made to obtain BUNGI, CHILAS and BABUR weather from GILGIT or Pak Met Site (www.pmd.gov.pk/cp/mtr.asp) before departure. If not possible then flight may depart on destination weather only.

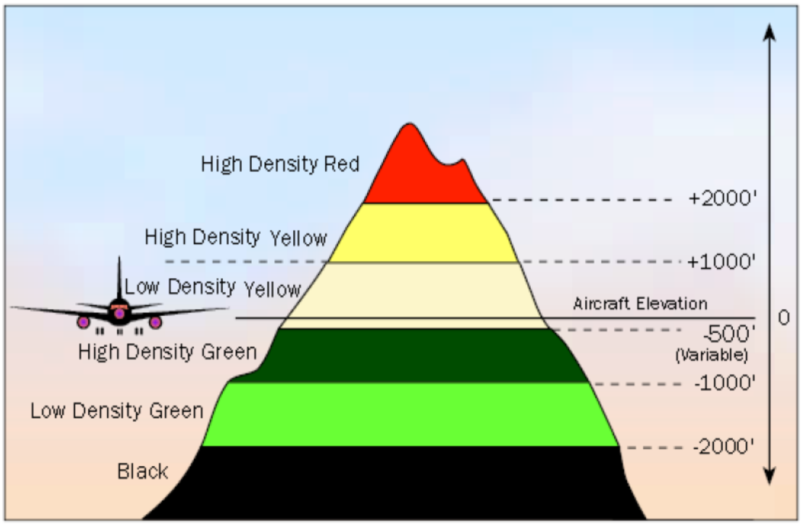
WEATHER OBSERVATORIES:



HONEYWELL EGPWS (MK V & MK VII)



- If no terrain data is available in the terrain database, then this area is displayed in a low-density magenta color.
- Terrain more than 2000 feet below the aircraft, or within 400 (vertical) feet of the nearest runway elevation, is not displayed (black color).



- The transition between green and yellow is below the aircraft in order to account for altimetry and/or terrain/obstacle height errors.
- Essentially, **any yellow or red painted terrain is at, or above the aircraft's altitude** and appropriate terrain clearance needs to be provided.
- Digital values representing elevation are based on the range selected (terrain in view). Bigger value is the highest terrain/obstacle elevation whereas smaller value is the elevation for the bottom of the lowest color band.
- The following table indicates the terrain awareness display colors and elevations:

Color	Indication
Solid Red	Terrain/Obstacle Threat Area – Warning.
Solid Yellow	Terrain/Obstacle Threat Area – Caution.
High Density Red Fill	Terrain/Obstacle that is more than 2000 feet above aircraft altitude.
High Density Yellow Fill	Terrain/Obstacle between 1000 and 2000 feet above aircraft altitude.
Low Density Yellow Fill	Terrain/Obstacle 500 (250 with gear down) feet below to 1000 feet above aircraft altitude.
Solid Green (Peaks Display)	Highest terrain not within 500 (250 with gear down) feet of aircraft altitude. May appear with dotted yellow terrain when the aircraft altitude is within 500 feet (250 feet with gear down) of terrain.
High Density Green Fill	Terrain/Obstacle 500 (250 with gear down) feet below to 1000 below aircraft altitude.
Low Density Green Fill	Terrain/Obstacle that is 1000 to 2000 feet below aircraft altitude.
Black	No significant Terrain/Obstacle.
Magenta Fill	Unknown terrain. No terrain data in the database

ISB – GIL:

- After takeoff from ISB in VMC, turn right to come over ZERO point, then FAISAL mosque, avoiding presidency, E9 and all the other restricted areas. As a rule of thumb, after takeoff turning right 360º for 1 minute and then turning left 340º places you in the correct position to avoid no fly zones.

- 4500 feet indicated (margin of 1000) should be maintained while crossing Margalla hills, then proceed to TIPOM.

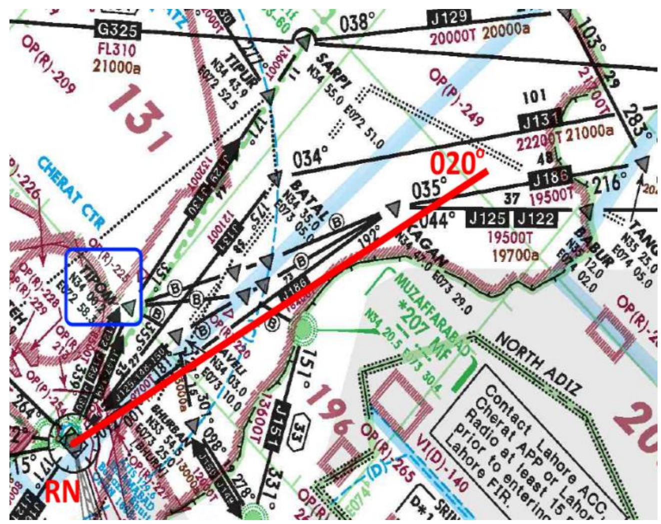
- After crossing Margalla hills, proceed to TIPOM and attain a height of 12,500 feet indicated in summers and 9500 feet in winters.

- From TIPOM turn right on course and observe RN radial 020 to avoid inadvertent incursion into restricted airspace.

- Except for the purpose of takeoff and landing, ridge clearance of 2000 feet shall be maintained.

- Weather permitting direct route should be flown normally at FL 175/185. Minimum levels for direct shall be FL 155/165 and for the valley route FL 125/135. **Note: FL155 on a direct track from Kaghan to Babusar does not clear all peaks as some peaks are calibrated yellow on terrain map. It will give a TERRAIN / PULL UP WARNING. Possibility of FL155 on this track is by visually avoiding those peaks.**

- Single engine ceiling for aircraft's estimated weight over KAGAN shall be derived when reaching TOC en route to GILGIT. This will help prevent delay in case of emergency.



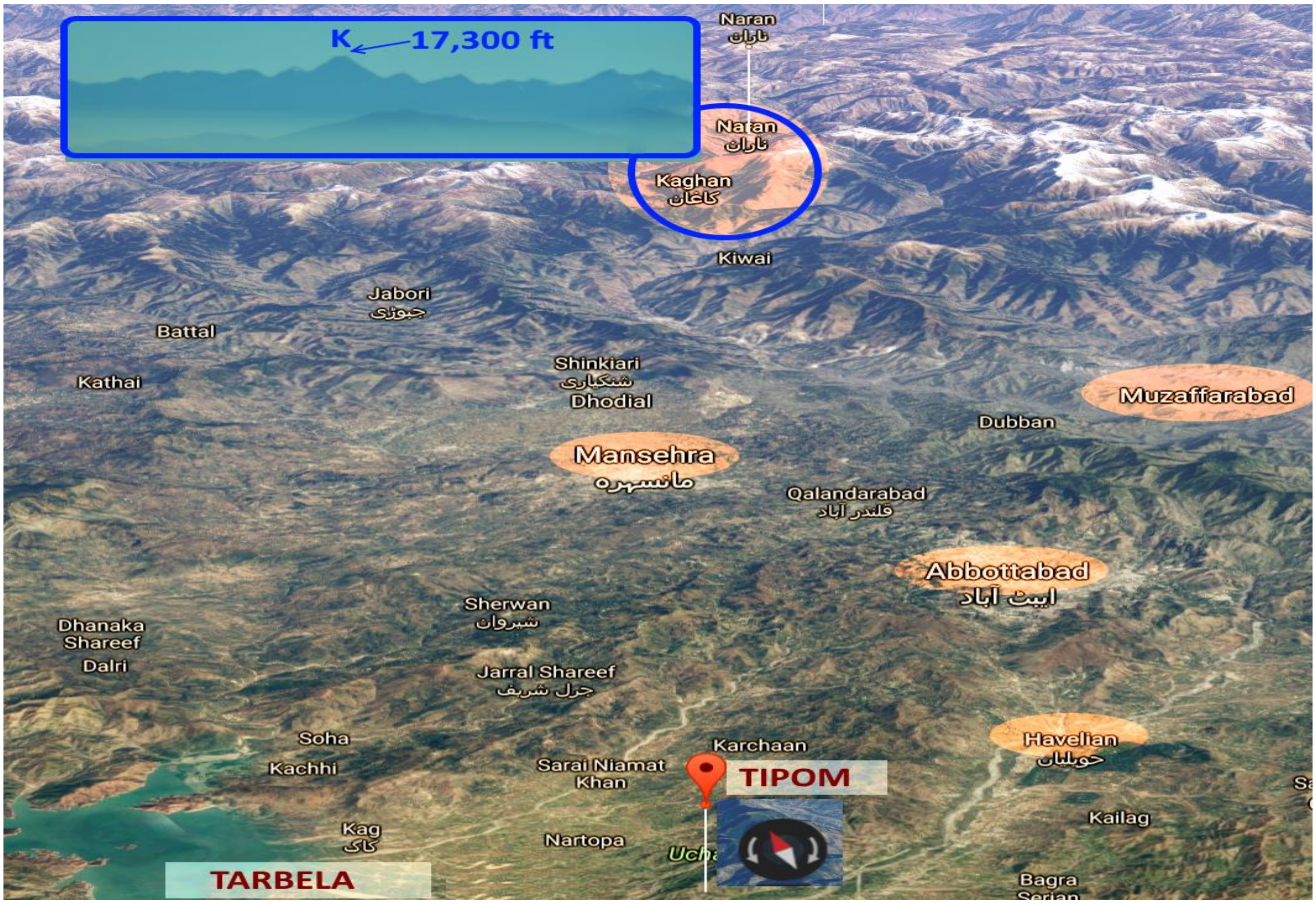
COMMUNICATION PROCEDURE:

- No. 2 VHF should be set on Northern Area Common Frequency 123.4 MHZ.
  - Blind calls should be transmitted on this frequency at reporting points
  - Calls should be preceded by the phrase "All Northern Area Traffic".
  - Message should include:
    - Flight Number.
    - Departure and Destination.
    - Flight Level.
    - Present Position.
    - Time and ETA at next position.
- No.1 VHF is to be set on 121.5 MHZ once released by Cherat Control.

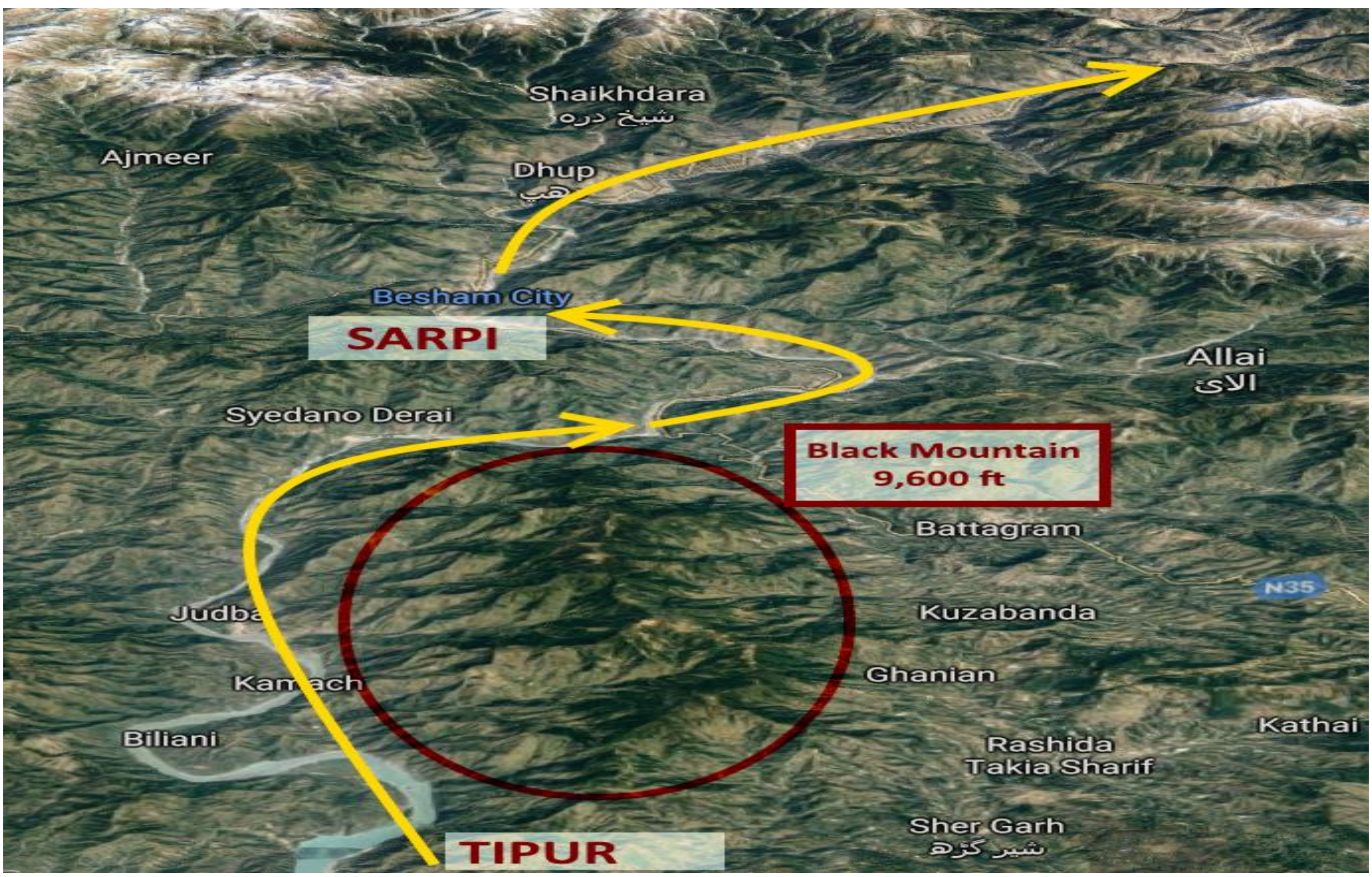
COMMUNICATION FAILURE:

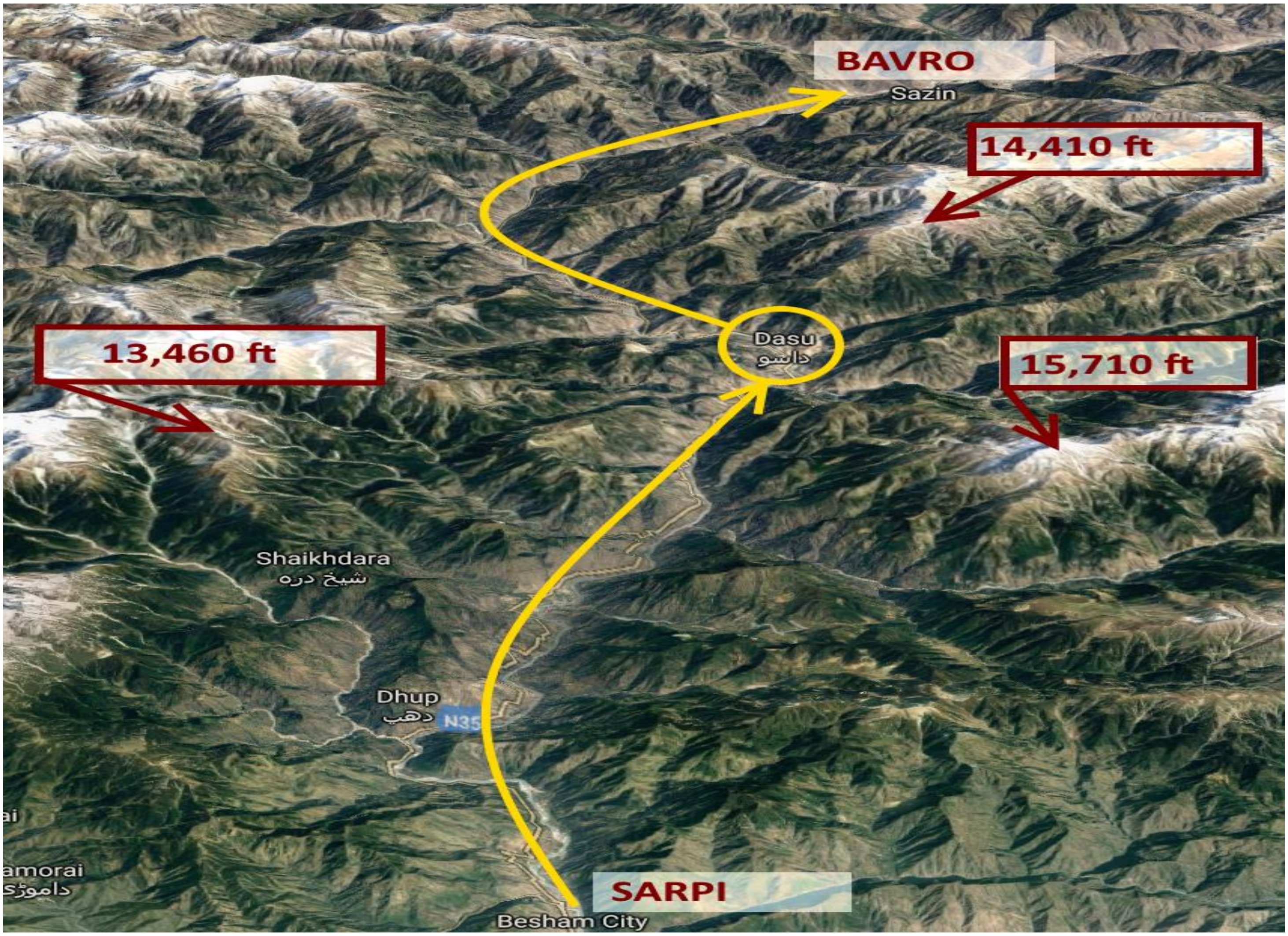
Call twice at 15 seconds interval on the primary frequency of the appropriate regular station, one of the other regular stations or any of the other stations of the network. Failing to get a reply, the aircraft should transmit its message twice preceded by the phrase 'TRANSMITTING BLIND" on primary and secondary frequency. If unable to establish communication due to receiver failure, transmit reports at scheduled times, or positions on the frequency in use, preceded by the phrase "TRANSMITTING BLIND" due to receiver failure.

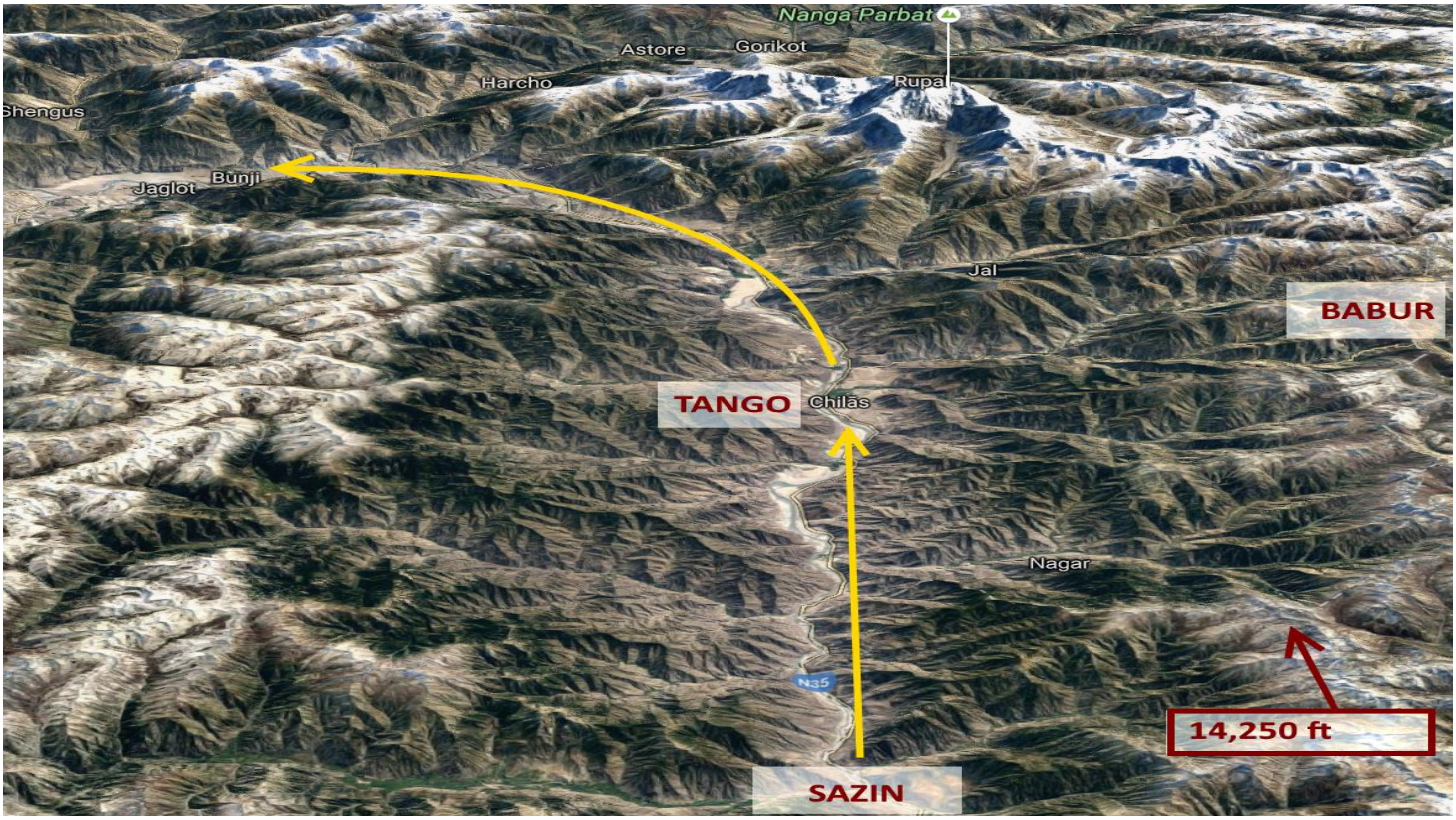
DIRECT ROUTE:



VALLEY ROUTE:

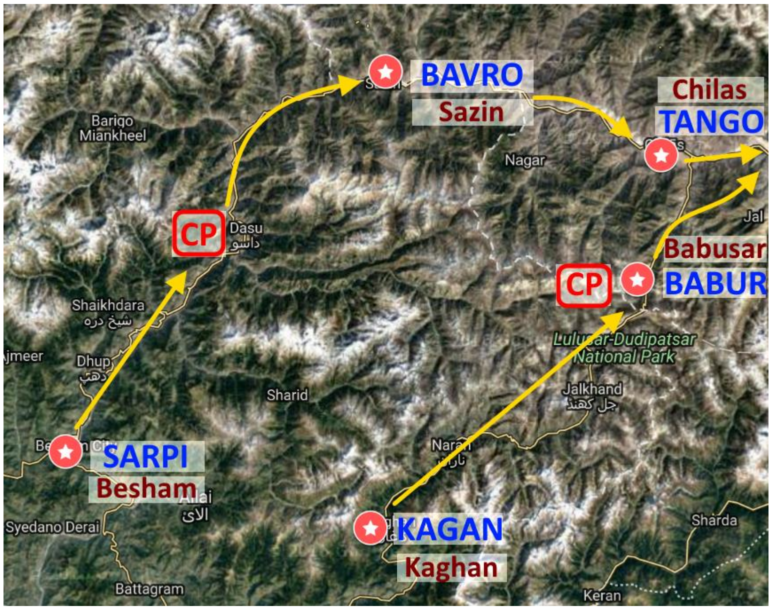



BAVRO
Sazin
14,410 ft
13,460 ft
Dasu
داسو
15,710 ft
Shaikhdara
شیخ درہ
Dhup
دھپ
N35
amorai
SARPI
Besham City


Nanga Parbat
Astore
Gorikot
Harcho
Rupal
Shengus
Jaglot
Bunji
Jal
BABUR
TANGO
Chilas
Nagar
N35
14,250 ft
SAZIN

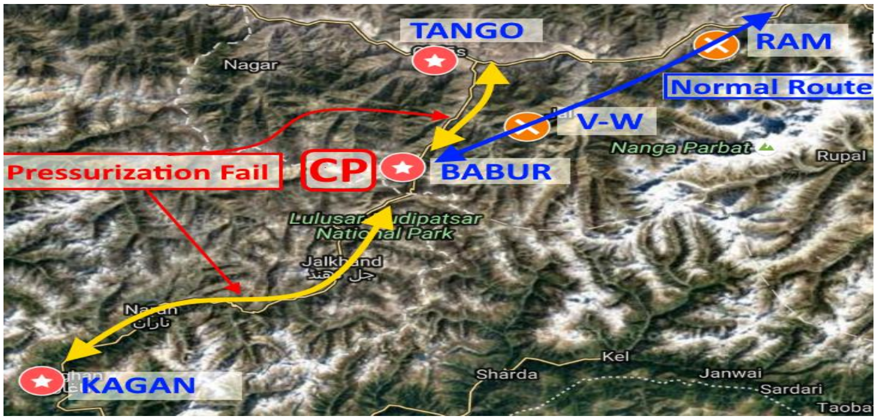
CRITICAL POINTS (ISB – GIL):

- Direct Route – BABUR
- Valley Route – Between SARPI and BAVRO (approx. 36 min from RN)



PRESSURIZATION FAILURE:

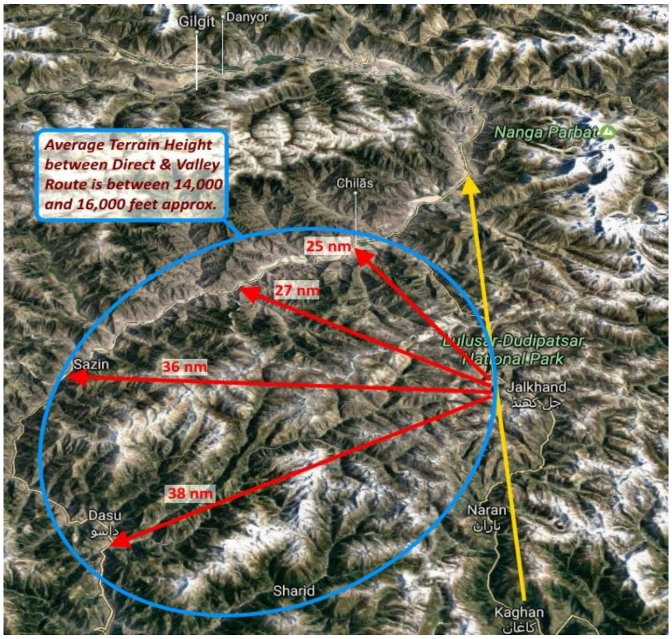
- BEFORE BABUR:
    - Turn left, maintain visual contact with terrain and enter Kaghan valley.
- AFTER BABUR:
    - Maintain visual contact with terrain and descend gradually to enter the valley leading to TANGO (Chilas).

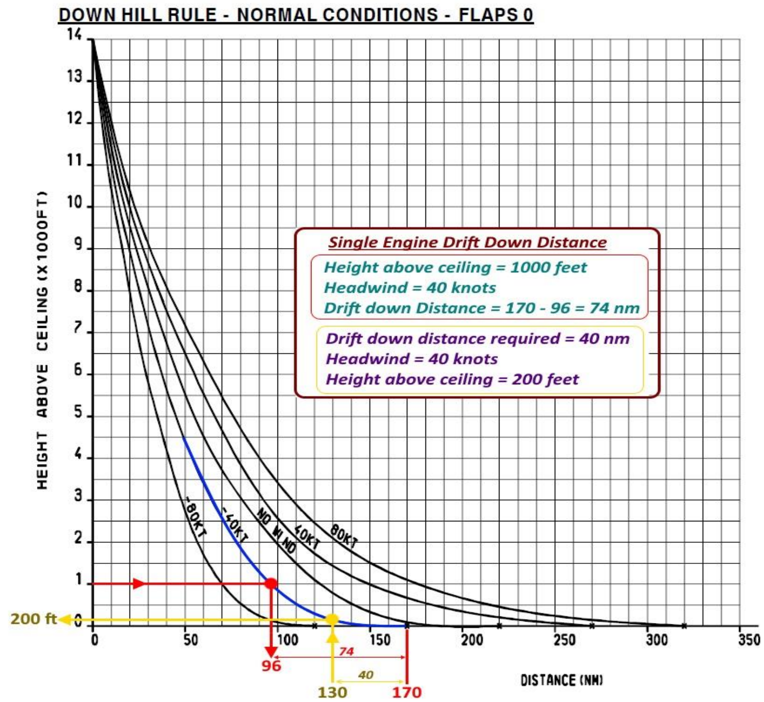


Note: In case of Tango (Chilas), the valley is wide and low so it might be easy to descend to 10,000 feet however in case of Kaghan it might not be possible to descend to 10,000 feet initially e.g. Naran is around 8000 feet and before that, towards Babusar, the terrain is rising (reaching around 11,000 by Lalusar lake). Even if possible to descend to 10,000 feet, beware of valley winds and be sensible in deciding how low you really want go. See the last section in this document about “Topographical Effects on Wind” to comprehend the associated hazards.

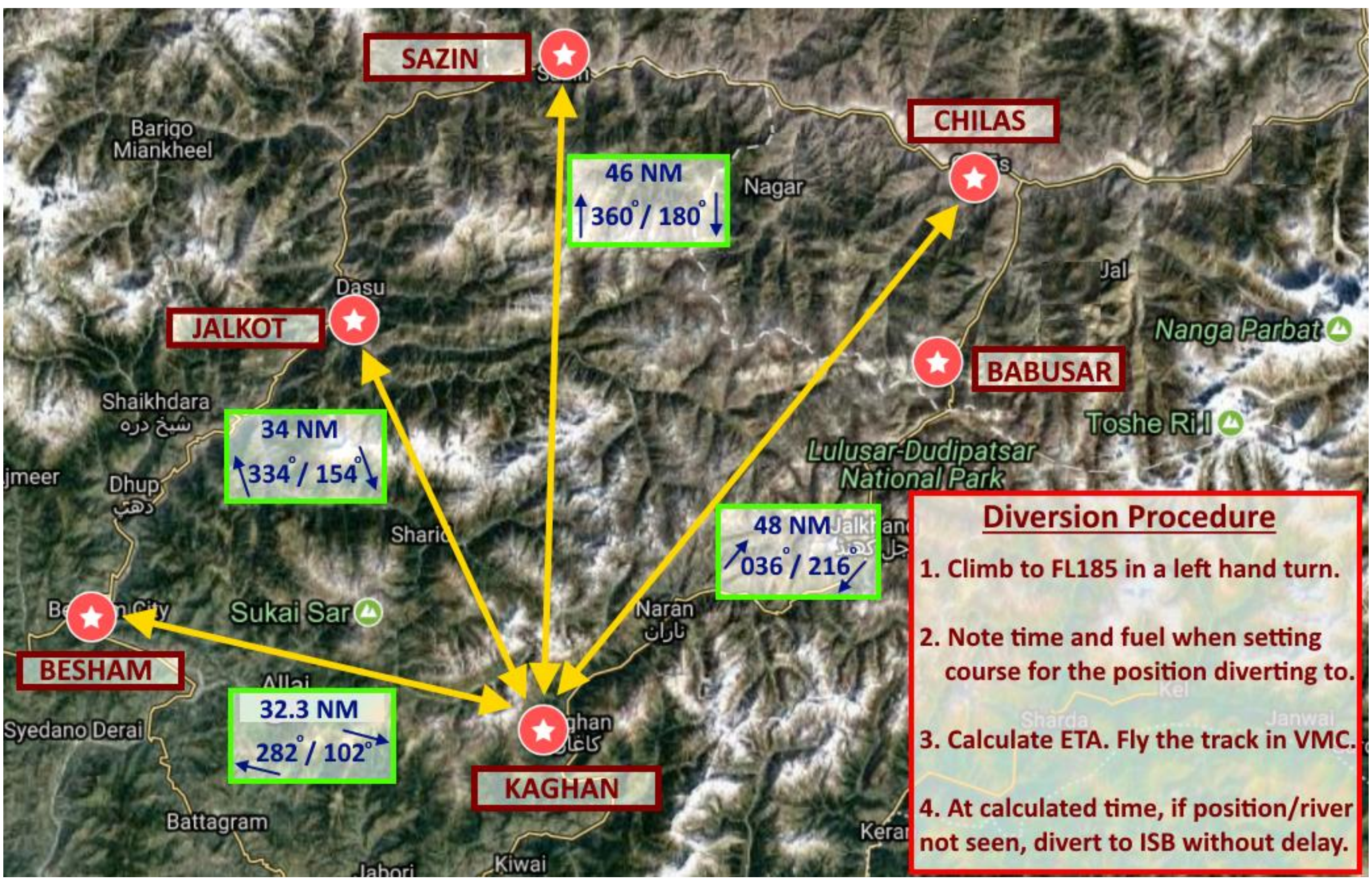
- COURSE OF ACTION: Depending on minimum levels and en route weather, continue to Gilgit or return to ISB.

SINGLE ENGINE DRIFT DOWN PERFORMANCE (FROM DIRECT TO VALLEY ROUTE)

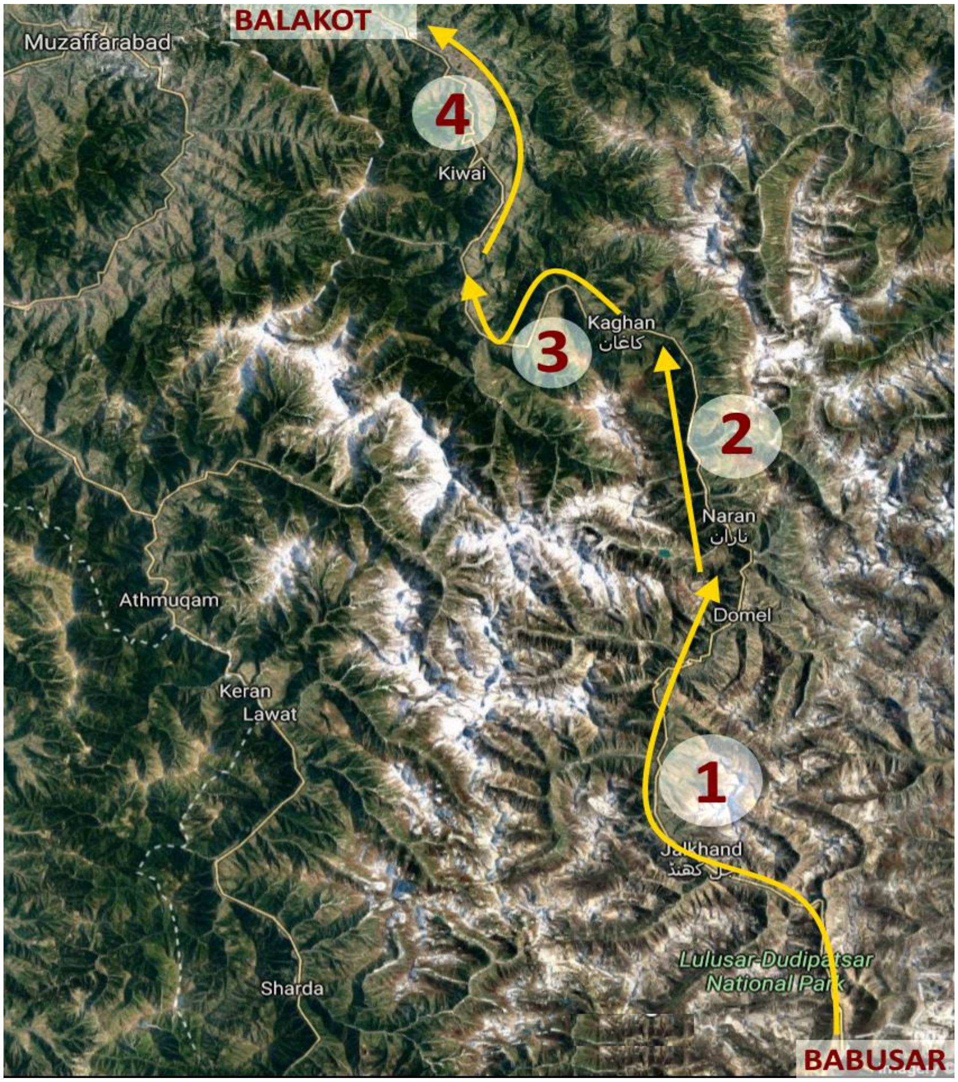


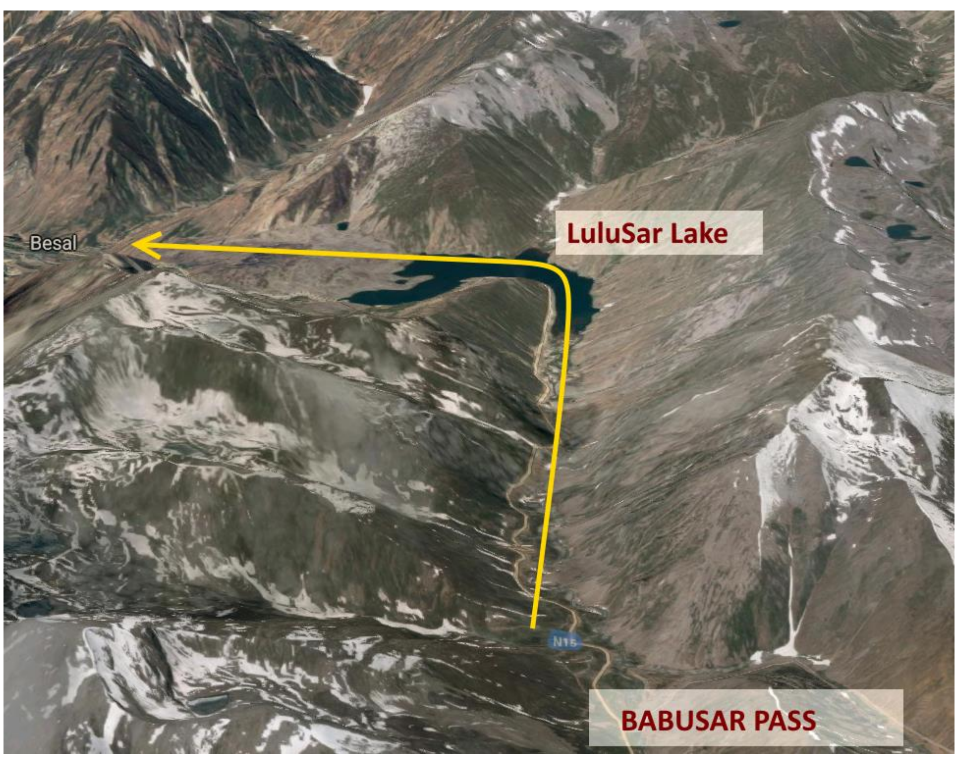


DIVERSION PROCEDURE (FROM DIRECT TO VALLEY ROUTE)



KAGHAN VALLEY:

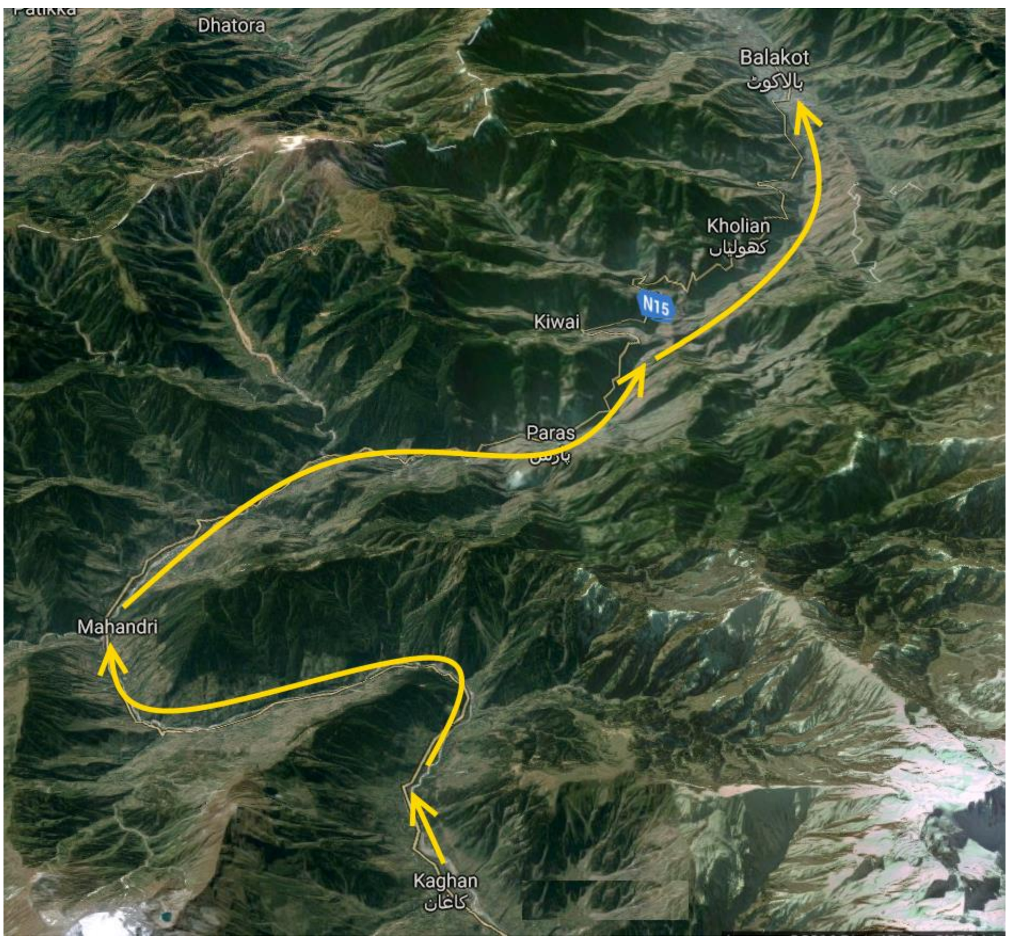




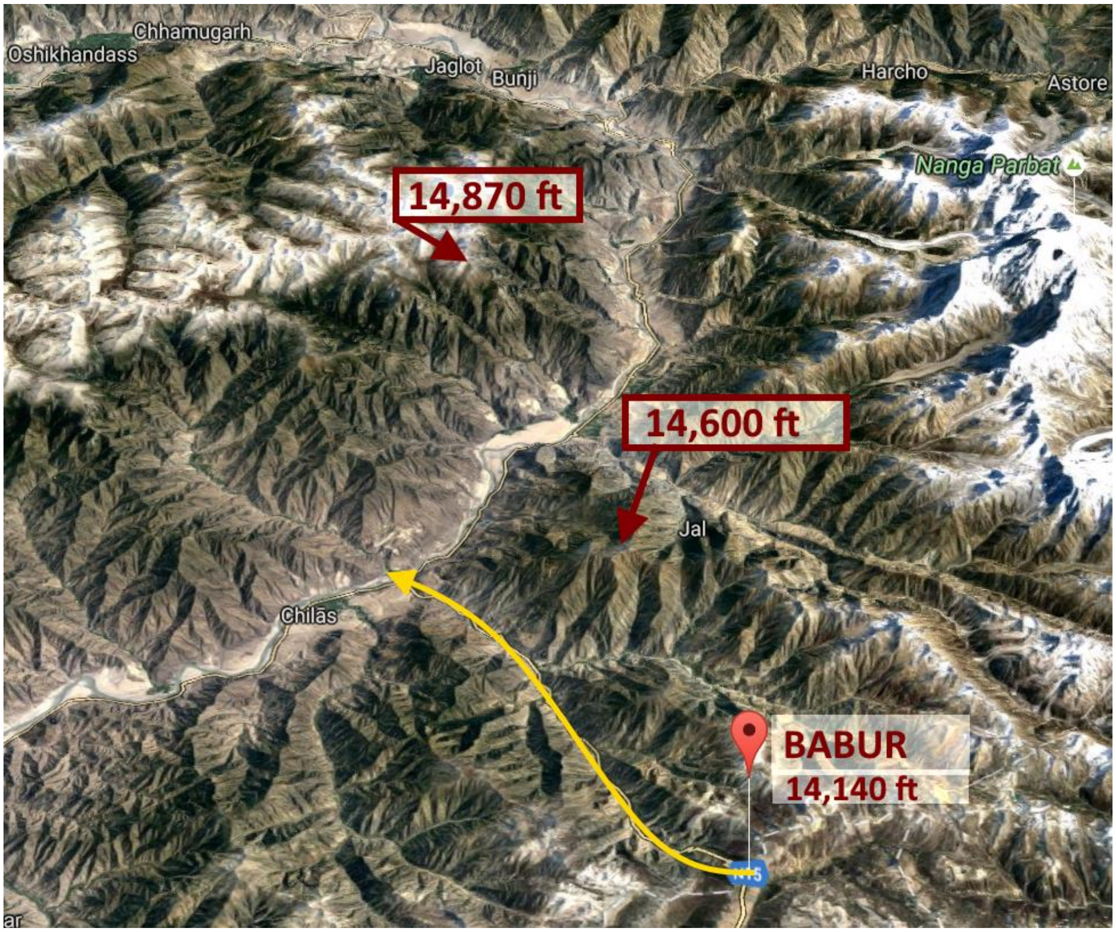

Batakundi
N15
Jalkhand
جل کھنڈ
Besal

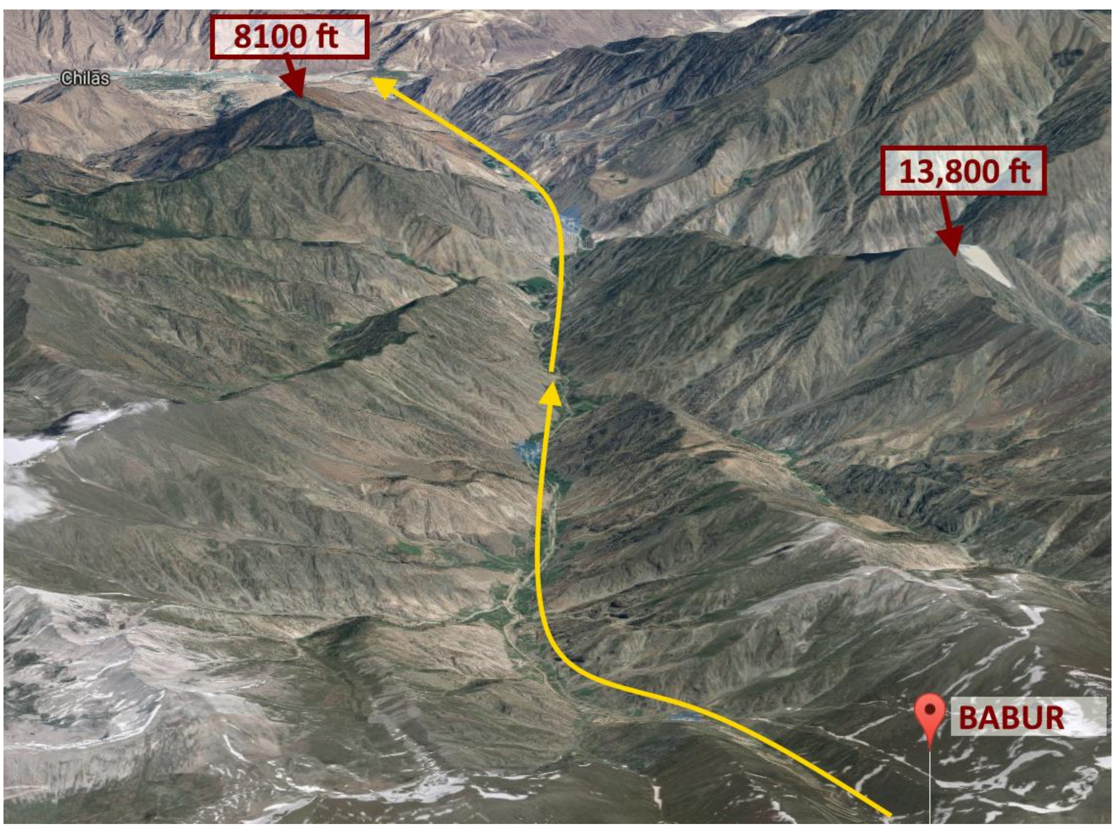

Naran
ناران
Domel
Batakundi
N15


Mahandri
Kaghan
کاغان
Saiful Maluk
National Park
سیف الملوک
نیشنل پارک
Naran
ناران


Dhatora
Balakot
بالاکوٹ
Kholian
کھولیاں
N15
Kiwai
Paras
پارس
Mahandri
Kaghan
کاغان

BABUR TO TANGO (CHILAS) VALLEY:



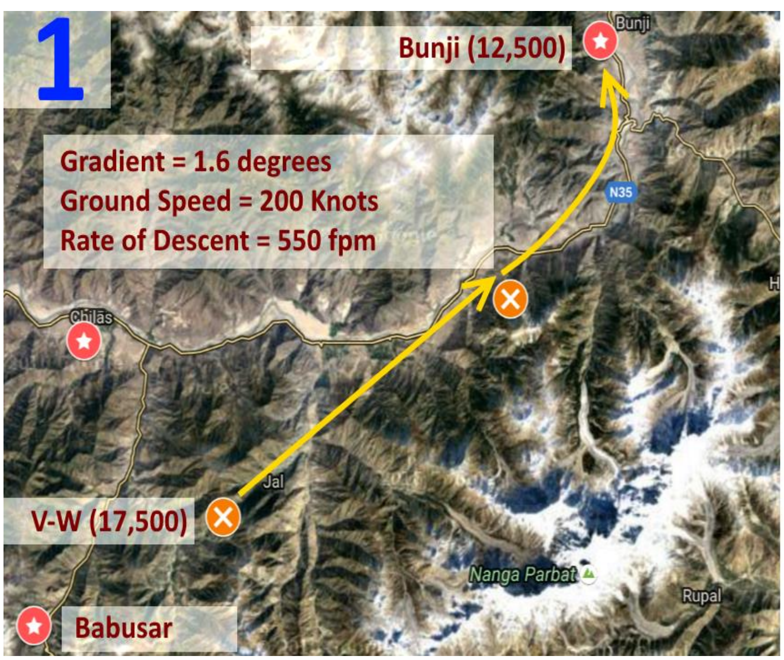


EN ROUTE ALTERNATE AIRFIELD:

- Chilas (TANGO) airfield can be used in extreme emergency. Runway information is as follows:
    - Direction: 10/28 Bitumen surface, with centerline and threshold markings
    - Length: 5500 x 50 feet. Shoulder of 50 feet on both sides without overrun.
    - Elevation: 3700 feet AMSL.
    - R/W surface condition: Unknown (there's a bump on the right edge of runway 28, approx. half way down).

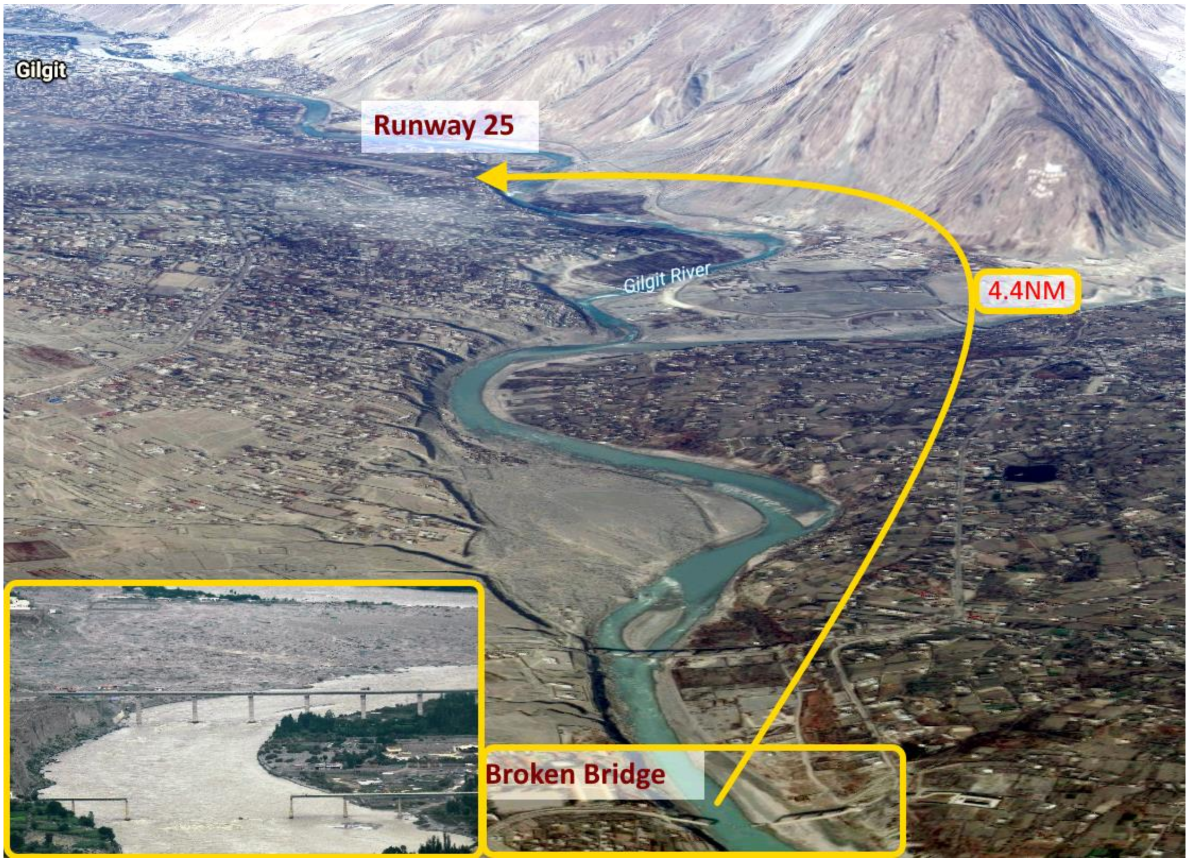
NORMAL DESCEND TO GILGIT:

- Speed:
    - No turbulence: 200 knots.
    - In turbulence or bad weather: 180 Knots.
    - Chance of diversion: White Bug +10 Knots.
- Height:
    - Approximately 12,500 feet by BUNJI.



APPROACH TO GILGIT:

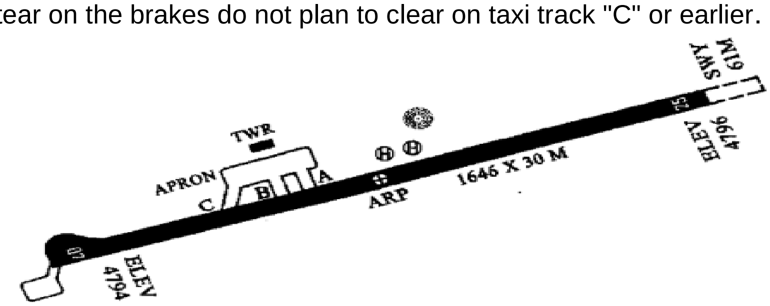
- By broken bridge, be in landing configuration – Speed VAPP, Height 1500 ft AGL (6300 indicated).



LANDING RUNWAY 25:

- Runway 25 shall normally be used for landing. Final turn should be at 500 to 700 feet AGL (5300 to 5500 indicated).
- With tail wind more than 15 knots, runway 07 shall be used. Exercise extreme caution and sense the wind gradient which is invariably present on the approaches.

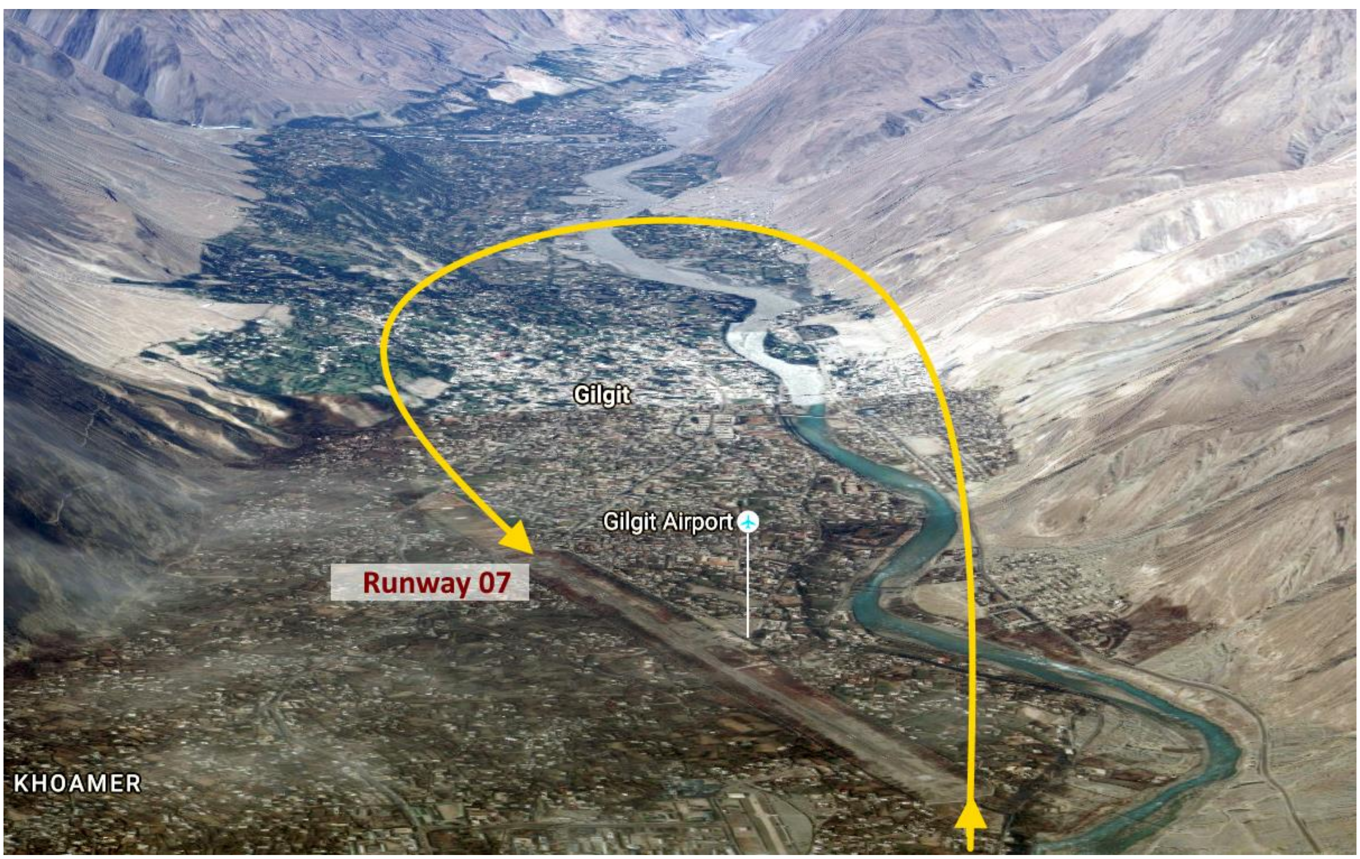
- To avoid wear and tear on the brakes do not plan to clear on taxi track "C" or earlier. Use full length.



LANDING RUNWAY 07:

- Height: Approximately 500' AGL (5300' indicated) to be close to a 3º profile for a 1.5 NM final leg.
- Gears: Down, Flaps: 25, Speed: VmHB 25.
- Abeam Mosque: Flaps 35, Speed VAPP.
- End of Downwind: Turn with 30º bank and stay visual with the high ground throughout the approach.

Note: For better terrain clearance it is possible to maintain 1500' AGL (6300' indicated) till the end of downwind. However, the distance of 2.3NM (end of downwind to threshold runway 07 i.e. base turn + final leg) will give you a roughly 6º profile in this case. Due to higher rate of descent, power will have to be at idle to maintain VAPP speed. Anything in between 500 & 1500' like 1000' AGL would be more appropriate for gradient & terrain clearance optimization.

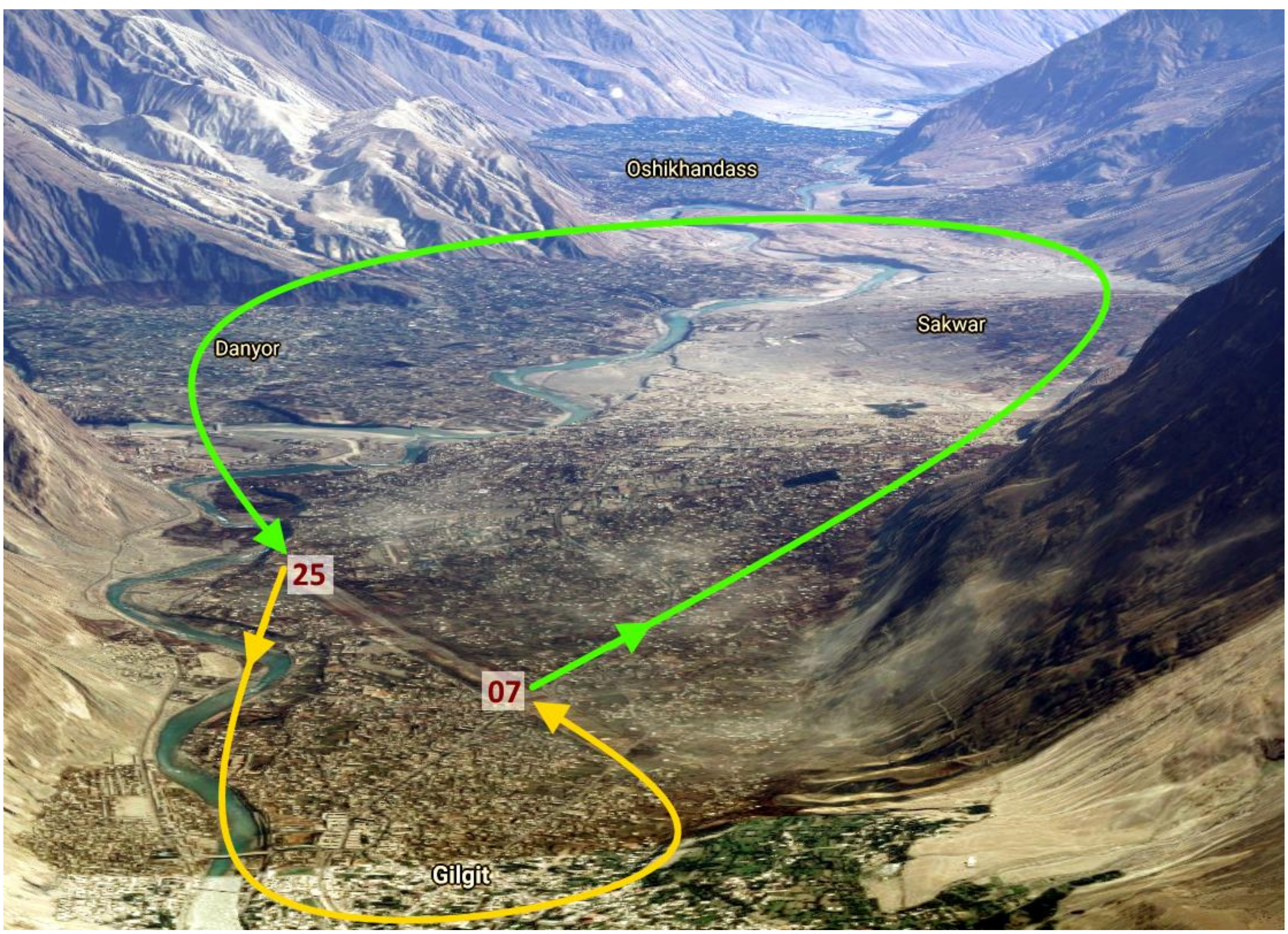


GO AROUND RUNWAY 25:

- Carry out the normal procedure for go around.
- Climb and maintain approximately 500 feet AGL (5300 indicated) and drift to the right of the valley.
- Maintain Flaps 25 and Speed VmHB 25.
- Planning to Land on Runway 07 (wind permitting):
    - Downwind: Gears down.
    - Abeam mosque: Flaps 35, Speed VAPP.
    - End of Downwind: Turn left with a 30º bank back to the field.
- Not Planning to Land on Runway 07:
    - Maintain: Flaps 25, Speed VmHB25 (to reduce radius of turn) and Gears Up.
    - Make a left turn, come over the runway.
    - Climb to 1000 feet AGL (go around acceleration altitude).
    - Flaps: 15, Speed: White bug +10.
    - Come over the bridge and adjust to make a left turn for left base runway 25 in landing configuration.

GO AROUND RUNWAY 07:

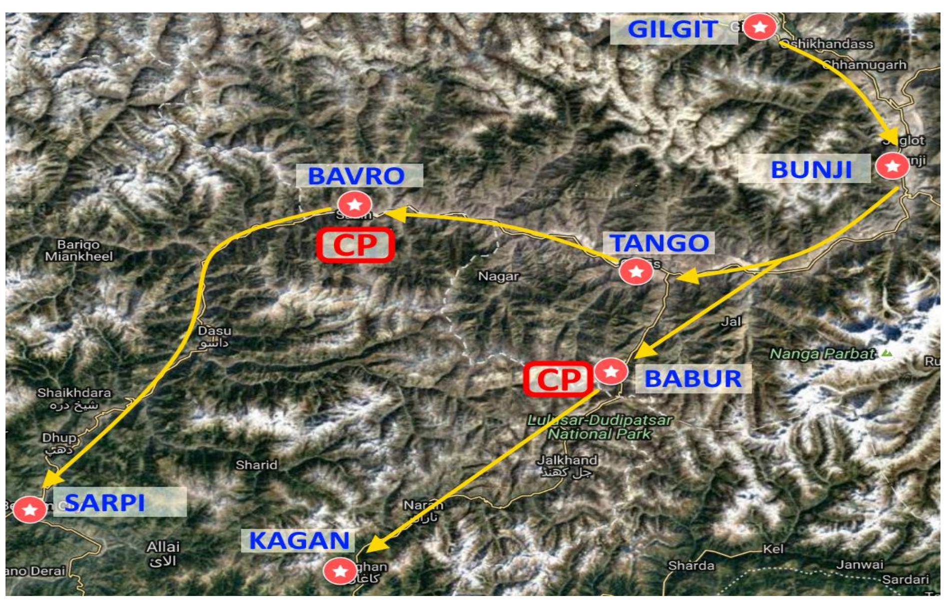
- Carry out the normal procedure for go around.
- Climb to 1000 feet AGL (go around acceleration altitude) and drift to the right.
- Accelerate to White Bug +10 but keep Flaps 15.
- Come over the bridge and adjust to make a left turn in landing configuration for another approach.



GIL – ISB:

- Runway 07 will only be used for takeoff.
- If the tail wind is more than 15 knots, wait for the wind to die down.
- At acceleration altitude, clean up, accelerate to and maintain white bug plus 10 speed.
- After attaining 12500 feet indicated (minimum level in the valley), normal climb speed can be maintained.
- Should the a/c become asymmetric at takeoff, a gentle turn to the right shall be commenced and a climb out achieved anticipating a gentle wide left turn for carrying out an asymmetric landing on RWY 25.

- Single engine ceiling for aircraft's estimated weight over BABUR shall be derived at position BUNGI, after attaining cruise level. This will help in diverting the flight without delay in case of emergency.
- **CRITICAL POINTS**:
  - Direct Route – BABUR
  - Valley Route –BAVRO



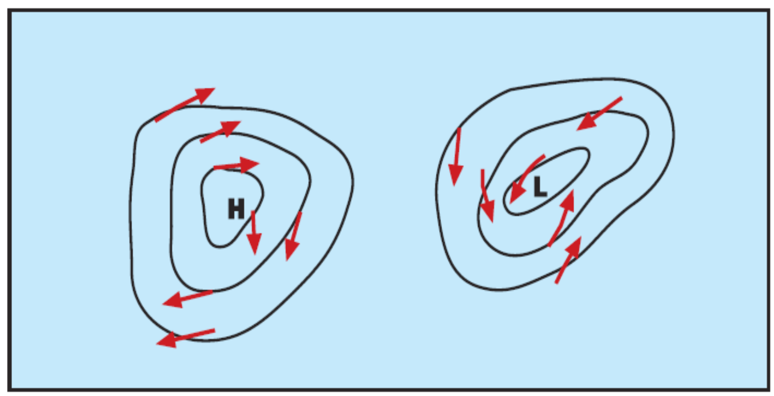
TOPOGRAPHICAL EFFECTS ON WIND ***(credit: navcanada.ca)***

(a) Lee Effects

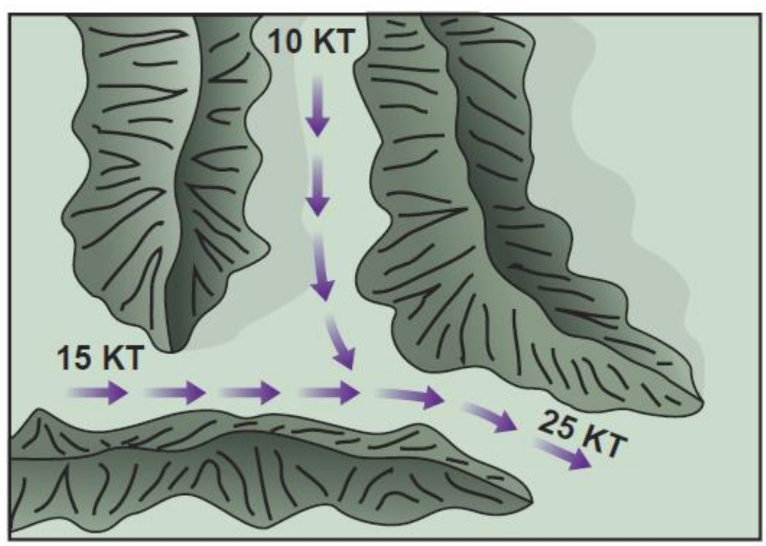
When the winds blow against a steep cliff or over rugged terrain, gusty turbulent winds result. Eddies often form downwind of the hills, which create stationary zones of stronger and lighter winds. These zones of strong winds are fairly predictable and usually persist as long as the wind direction and stability of the air stream do not change. The lighter winds, which occur in areas called wind shadows, can vary in speed and direction, particularly downwind of higher hills. In the lee of the hills, the wind is usually gusty and the wind direction is often completely opposite to the wind blowing over the top of the hills. Smaller reverse eddies may also be encountered close to the hills.

(b) Friction Effects

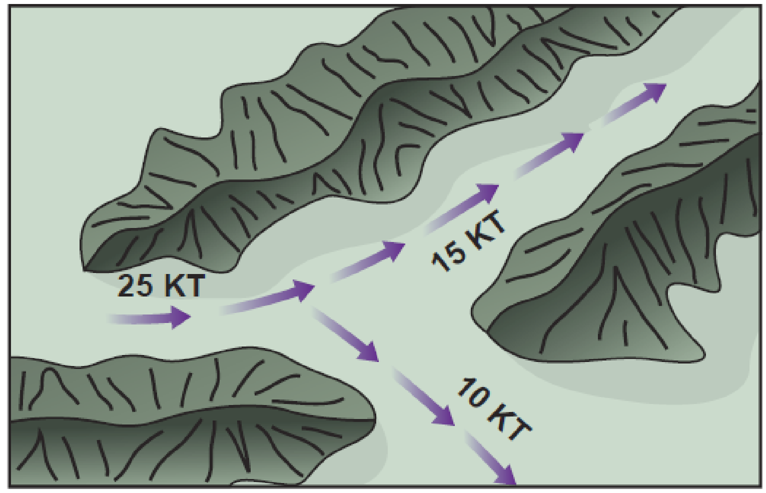
The winds that blow well above the surface of the earth are not strongly influenced by the presence of the earth itself. Closer to the earth, however, frictional effects decrease the speed of the air movement and back the wind (turns the wind direction counter-clockwise) towards the lower pressure. For example, in the northern hemisphere, a southerly wind becomes more southeasterly when blowing over rougher ground. There can be a significant reduction in the wind speed over a rough terrain when compared to the wind produced by the same pressure gradient over a relatively smooth prairie.



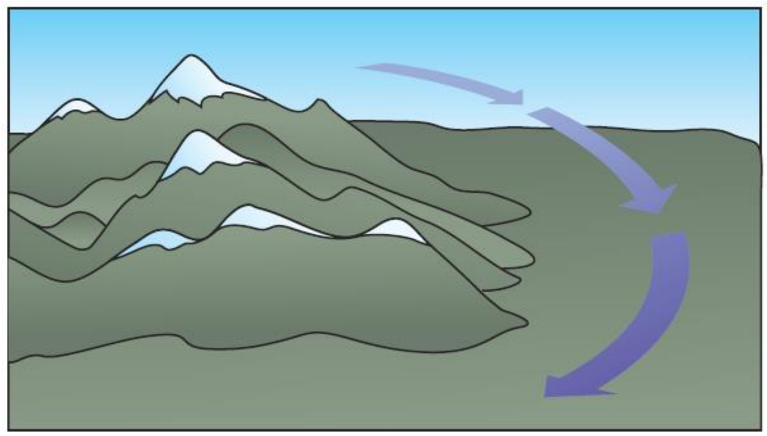
(c) Converging Winds When two or more winds flow together or converge, a stronger wind is created. Similar effects can be noted where two or more valleys come together.



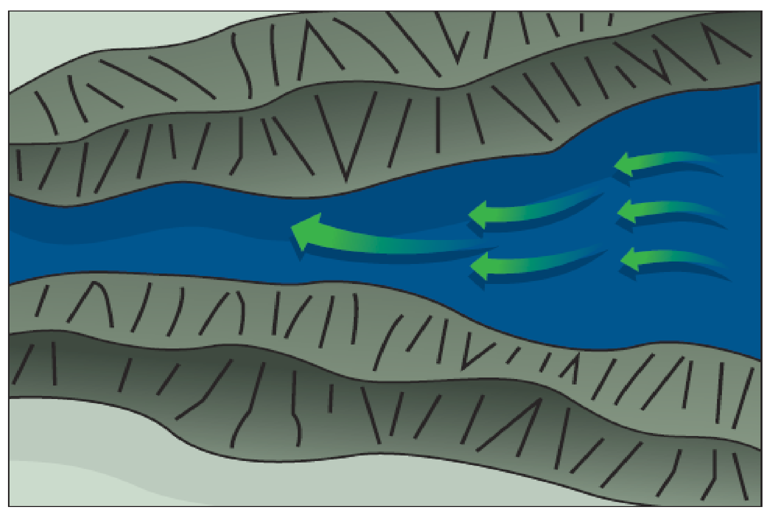
(d) Diverging Winds A divergence of the air stream occurs when a single air stream splits into two or more streams. Each will have a lower speed than the parent air stream.



(e) Corner Winds When the prevailing wind encounters a headland, there is a tendency for the wind to curl around the feature. This change in direction, if done abruptly, can result in turbulence.

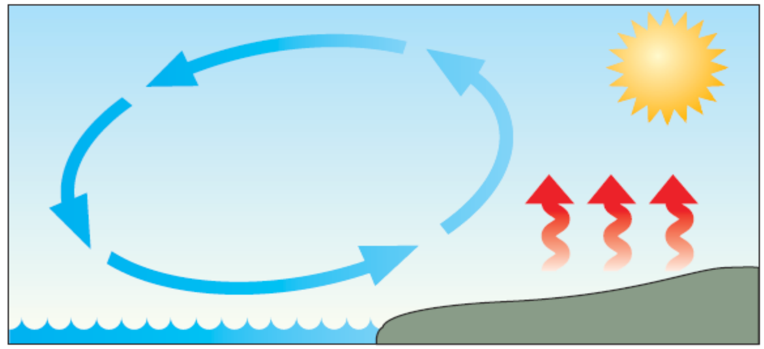


(f) Funnelled or Gap Winds When winds are forced to flow through a narrow opening or gap, such as an inlet or narrow section of a pass, the wind speed will increase and may even double in strength. This effect is similar to pinching a water hose and is called funnelling.

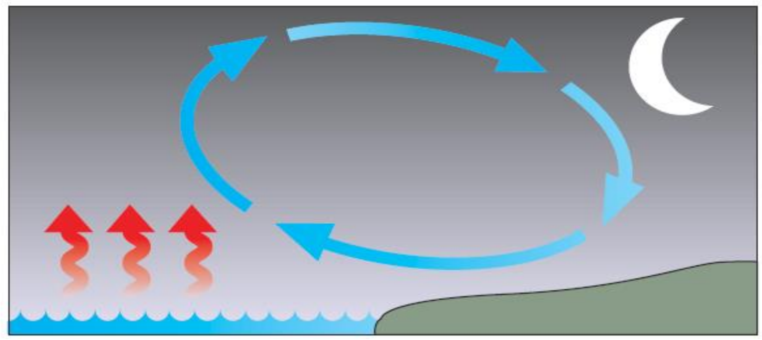


(g) Channelled Winds The topography can also change the direction of the winds by forcing the flow along the direction of a pass or valley. This is referred to as channelling.

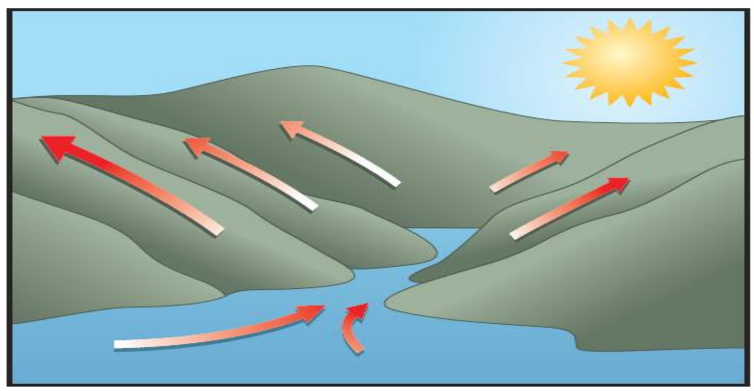
(h) Sea and Land Breezes Sea and land breezes are only observed under light wind conditions and depend on temperature differences between adjoining regions. A sea breeze occurs when the air over the land is heated more rapidly than the air over the adjacent water surface. As a result, the warmer air rises and the relatively cool air from the water flows onshore to replace it. By late afternoon, the time of maximum heating, the sea breeze circulation may be 1,500 to 3,000 feet deep, have obtained speeds of 10 to 15 knots and extend as far as 50 nautical miles inland.



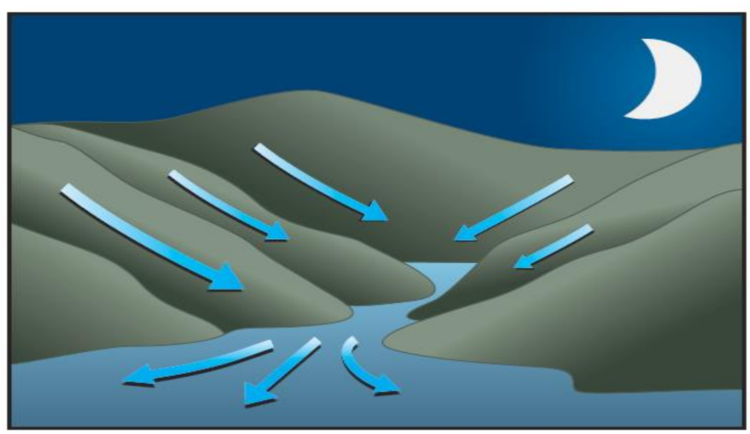
During the evening the sea breeze subsides. At night, as the land cools, a land breeze develops in the opposite direction and flows from the land out over the water. It is generally not as strong as the sea breeze, but at times it can be quite gusty. Both land and sea breezes can be influenced by channelling and funnelling resulting in almost frontal-like conditions, with sudden wind shifts and gusty winds that may reach up to 50 knots.



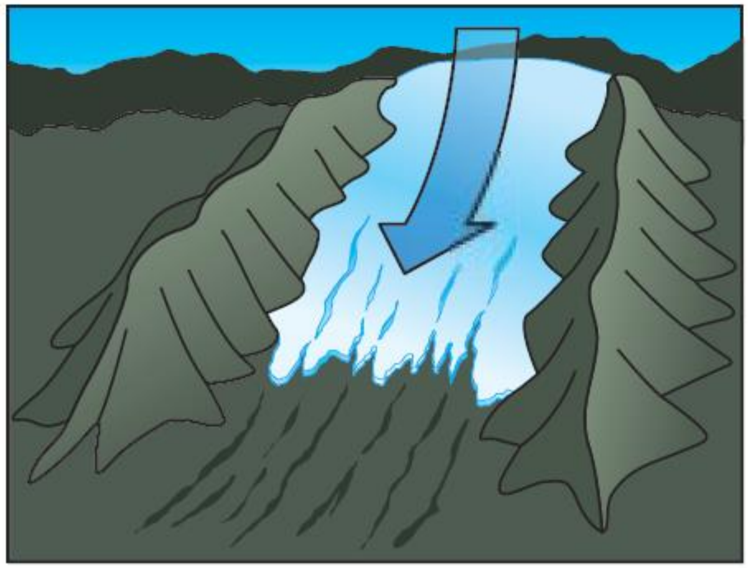
(i) Anabatic and Katabatic Winds During the day, the sides of the valleys become warmer than the valley bottoms since they are better exposed to the sun. As a result, the winds blow up the slope. These daytime, upslope winds are called anabatic winds. Gently sloped valley sides, especially those facing south, are more efficiently heated than those of a steep, narrow valley. As a result, valley breezes will be stronger in the wider valleys. An anabatic wind, if extended to sufficient height, will produce cloud. In addition, such a wind offers additional lift to aircraft.



At night, the air cools over the mountain slopes and sinks to the valley floor. If the valley floor is sloping, the winds will move along the valley towards lower ground. The cool night winds are called drainage winds, or katabatic winds, and are often quite gusty and usually stronger than anabatic winds. Some valley airports have windsocks situated at various locations along their runways to show the changeable conditions due to the katabatic flow.



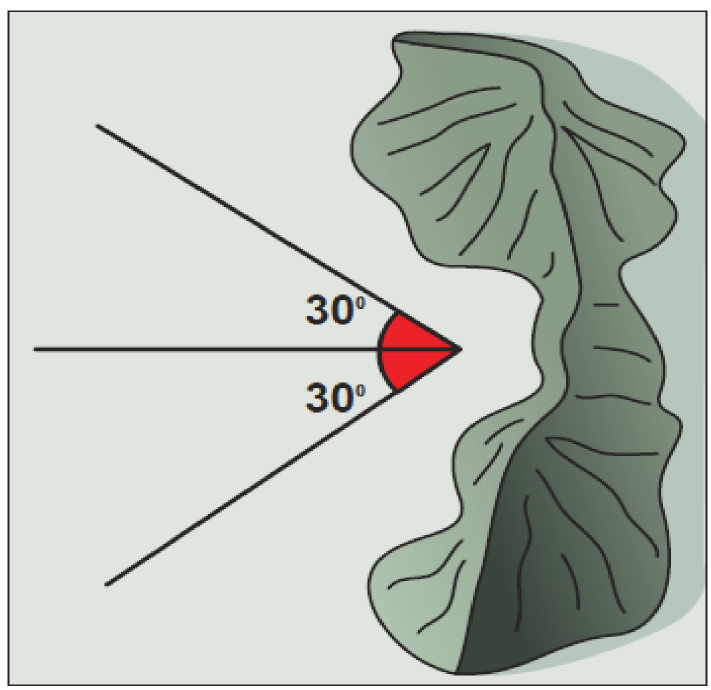
(j) Glacier Winds Under extreme cooling conditions, such as an underlying ice cover, the katabatic winds can develop to hazardous proportions. As the ice is providing the cooling, a shallow wind of 80 knots or more can form and will persist during the day and night. In some locations the katabatic flow "pulsates" with the cold air building up to some critical value before being released to rush downslope.



It is important to recognize that combinations of these effects can operate at any given time. Katabatic winds are easily funnelled resulting in winds of unexpected directions and strengths in narrow passes. Around glaciers in the summer, wind fields can be chaotic. Katabatic winds from the top of the glacier struggle for dominance with localized convection, or anabatic winds, induced by heated rock slopes below the ice. Many sightseeing pilots prefer to avoid glaciated areas during the afternoon hours.

Lee Waves When air flows across a mountain or hill, it is disturbed the same way as water flowing over a rock. The air initially is displaced upwards across the mountain, dips sharply on the lee side, then rises and falls in a series of waves downstream. These waves are called "mountain waves" or "lee waves" and are most notable for their turbulence. They can develop on the lee side of the mountains of Ellesmere Island and the mountain along the east side of Baffin Island.

The Formation of Lee Waves The development of lee waves requires that several conditions be met:



(a) the wind direction must be within 30 degrees of perpendicular to the mountain or hill. The greater the height of the mountain and the sharper the drop off to the lee side, the more extensive the induced oscillations.

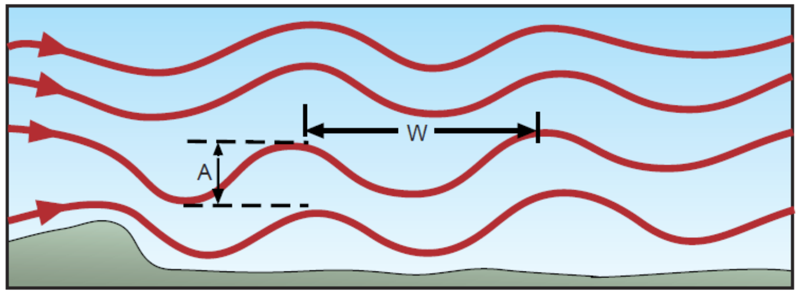
(b) wind speed should exceed 15 knots for small hills and 30 knots for mountain ridges. A jet stream with its associated strong winds below the jet axis is an ideal situation.

(c) the wind direction should be constant while increasing in speed with height throughout the troposphere.

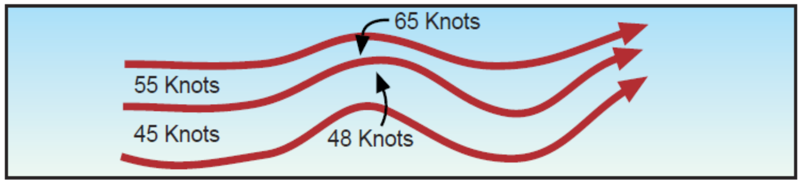
(c) the air should be stable near the mountain peaks but less stable below. The unstable layer encourages the air to ascend and the stable layer encourages the development of a downstream wave pattern.

While all these conditions can be met at any time of the year, winter wind speeds are generally stronger resulting in more dangerous lee waves.

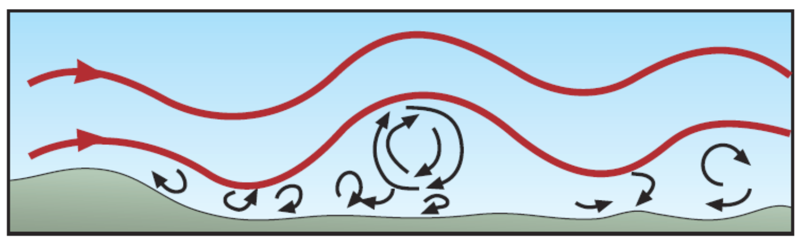
Characteristics of Lee Waves Once a lee wave pattern has been established, it follows several basic rules:



- Stronger the wind, the longer the wavelength. The typical wavelength (W) is about 6 miles but can vary from as short as 3 miles to as long as 15 miles.
- Position of the individual wave crests will remain nearly stationary with the wind blowing through them as long as the mean wind speed remains nearly constant.



- Individual wave amplitude (A) can exceed 3,000 feet.
- Layer of lee waves often extends from just below the tops of the mountains to 4,000 to 6,000 feet above the tops but can extend higher.
- Induced vertical currents within the wave can reach values of 4,500 feet per minute.
- Wind speed is stronger through the wave crest and slower through the wave trough.
- Wave closest to the obstruction will be the strongest with the waves further downstream getting progressively weaker.



- A large eddy called a "rotor" may form below each wave crest.
- Mountain ranges downstream may amplify or nullify induced wave patterns.
- **Downdrafts are frequently found on the downwind side of the obstruction**. These downdrafts typically reach **values of 2,000 feet per minute but downdrafts up to 5,000 feet per minute have been reported**. The strongest downdraft is usually found at a height near the top of the summit and **could force an aircraft into the ground**.

Clouds Associated with Lee Waves Lee waves involve lift and, if sufficient moisture is available, characteristic clouds will form. The signature clouds may be absent, however, due to the air being too dry or the cloud being embedded within other clouds and not visible. It is essential to realize, nevertheless, that the absence of lee wave clouds does not mean that there are no lee waves present.

(a) Cap cloud A cloud often forms over the peak of the mountain range and remains stationary. Frequently, it may have an almost "waterfall" appearance on the leeward side of the mountain. This effect is caused by subsidence and often signifies a strong downdraft just to the lee of the mountaintop.

(b) Lenticular clouds A lens shaped cloud may be found at the crest of each wave. These clouds may be separated vertically with several thousand feet between each cloud or may form so close together they resemble a “stack of plates.” When air flows through the crest it is often laminar, making the cloud smooth in appearance. On occasion, when the shear results in turbulence, the lenticular cloud will take on a ragged and wind torn appearance.

Lenticular cloud at Resolute credit: David Schmidt

(c) Rotor cloud A rotor cloud may form in association with the rotor. It will appear as a long line of stratocumulus, a few miles downwind and parallel to the ridge. Its base will be normally below the peak of the ridge, but its top can extend above it. The turbulence associated with a rotor cloud is severe within and near the rotor cloud.