

Leh Flight Cancellations: High Temperatures and Their Impact on Air Travel

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- How do aircraft fly?
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- Role of global warming

Why in News?

High temperature at high altitude is disrupting flight operations to and from Leh, located at nearly 10,700 feet above the mean sea level.

How do aircraft fly?

- Aircraft wings are designed with the top surface more curved than the bottom. As the aircraft moves, air flows faster over the top of the wings than beneath them.

- According to **Bernoulli's principle**, this faster-moving air results in lower pressure above the wings compared to the pressure below.
 - Bernoulli's principle: Within a horizontal flow of fluid, points of higher fluid speed will have less pressure than points of slower fluid speed.
- This pressure difference generates a force known as lift, which helps the aircraft take off.

High temperatures and impact on aircraft's flight

- **Thinning of air and loss of required lift**
 - Higher temperatures cause air to expand and become less dense, resulting in fewer air molecules beneath an aircraft's wings to generate sufficient lift.
 - According to experts of atmospheric science, aircraft lose about 1% lift for every 3°C temperature increase.
- **Impact on engine performance**
 - Thinner air also affects engine performance by reducing the oxygen available for combustion, thereby decreasing thrust.
 - As a result, planes need longer runways and more powerful engines to take off in hotter conditions.
 - For example, a runway that is 6,500 feet at 20°C would need to be 8,200 feet at 40°C. In extreme heat, takeoff can become impossible.
- **Landing becomes more challenging**
 - Thinner air also makes landings more challenging. In addition to the brakes on the wheels, pilots use reverse thrust (literally, thrust in the opposite direction to the movement of the aircraft) to slow down the aircraft while landing.
 - In case of thin air, the reverse thrust generated might not be enough to perform the task.
- **Situation at Leh**
 - These issues are particularly felt in airports located in higher altitudes (like the one in Leh), where the air is anyway thin and runways are often shorter.

Role of global warming

- The extreme heat affecting aircraft take-offs and landings is a result of global warming.
- Since 1880, the global average temperature has risen by at least 1.1°C, and in India, annual mean temperatures have increased by about 0.7°C since 1900.
- Studies show that higher temperatures are already disrupting air travel.
 - A 2020 study on Greek airports found that the warming trend reduced the maximum take-off weight of the Airbus A320 by 127 kg per year, impacting lift and thrust.
 - A 2023 study predicted that rising temperatures will increase the take-off distance for a Boeing 737-800 by 6% on average by 2071-2080, requiring an additional 113-222 meters at low-altitude airports.
- In the short term, airports must adapt by scheduling flights during cooler times, extending runways, and reducing take-off weights.
- Long-term solutions involve significantly reducing fossil fuel consumption to mitigate global warming.

Q.1. What is global warming?

Global warming refers to the long-term increase in Earth's average surface temperature due to human activities, primarily the emission of greenhouse gases like carbon dioxide and methane. This phenomenon leads to climate change, causing extreme weather events, rising sea levels, and disruptions to ecosystems and biodiversity.

Q.2. What is Bernoulli's principle?

Bernoulli's principle states that within a flowing fluid, an increase in velocity occurs simultaneously with a decrease in pressure. In aviation, this principle explains how faster air over an aircraft's curved wings results in lower pressure above the wings, generating lift and enabling the aircraft to fly.

Source: Behind Leh flight cancellations: high temperatures, low air | India Today

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