What supports a plane in the air? David Robertson Phys Educ Jan 2014 p75

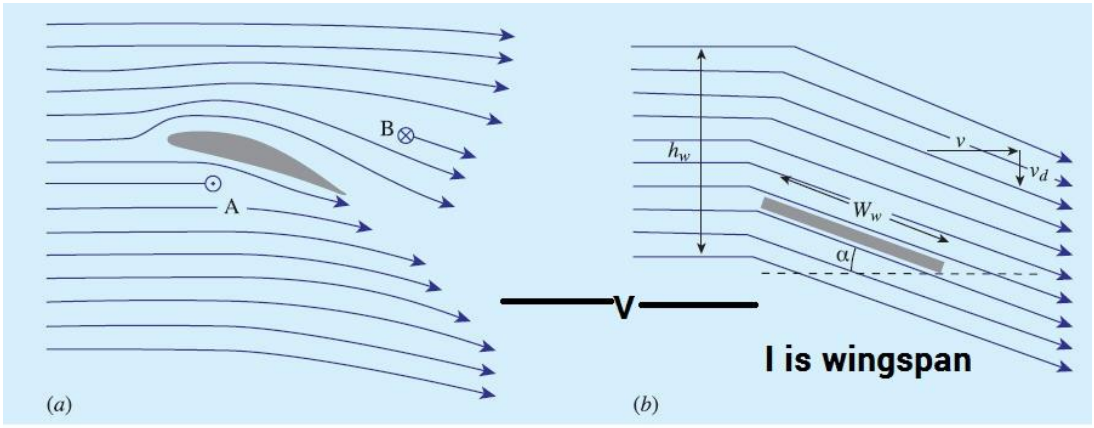
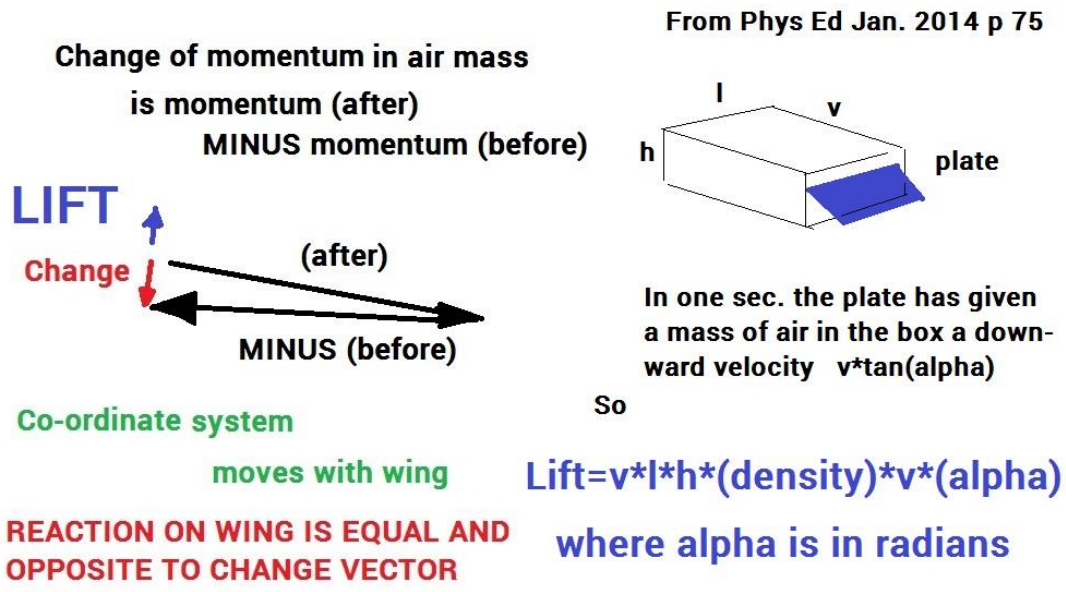


Figure 2. Streamlines over a thin rectangular section wing: (a) conceptualized, (b) idealized.

If we choose a coordinate system in the cockpit of the plane then the airflow coming towards the wing is deflected downwards so there is a change of momentum.



In Robertson's paper we have

Equation (1) lift = d(mv)/dt ie momentum change per second

If we choose a ONE SECOND interval then m = v.l.h.density

So lift is given by v^2 . l.h. density.tan(alpha)

v = 50 m/s l = 4m h = 2 m density 1.2 kg/m^3 and tan term is about 0.1

lift === 2500 N plane mass 250 kg

Weight 2500 N (we have lift off)

The backward force Drag is well explained in the following article Baumgartner's jump and the physics of freefall. It is referred to a Form/parasitic drag. The article by F R Greening 2013 *Phys. Educ.* **48** 139 Drag = ½ C_dA.(air density) v^2 Greening takes constant as 1, A = 0.6 sq m. Now when does Drag = force of gravity in free fall ?

If person is 70 kg then gravity force is 700 N

If v = 45 m/s and density of air is1.2 kg/m^3 then Drag is about 700 N so there is no increase in speed. When a parachute is deployed then we have a big increase in A so landing on the ground is more like 4 m/s.

Baumgartner did not have any other controls to maneuver himself but a aeroplane's attitude can be altered so producing another Drag force. So we have

Form/parasitic Drag and Induced Drag

both are discussed in the Robertson article

Pros and cons of flying - John Holland-Kaye has his say

Weeks before announcing he was stepping down from his position as CEO at Heathrow Airport, John Holland-Kaye told the World Economic Forum at Davos that cutting back on air travel was a "Northern European indulgence". It's a strange accusation, but one that highlights the complex relationship between entitlement, privilege and responsibility within the debate about how to reach global decarbonisation. **We know** that the aviation industry needs to massively decrease its emissions. **We know,** based on current evidence, that technological solutions seriously lag behind our timeline to decarbonise. **We know** that cutting back on flying will be essential in slowing down the sector's emissions till those technology solutions are available. But the question remains; who gets to fly and who should fly less?

Holland-Kaye's words stand in direct opposition to movements such as 'flygskam' or 'flight shame', which have brought together people who want to cut back on flying on the basis of their moral commitment to act on climate change. At the heart of these movements, and the decision by activists such as Greta Thunberg not to fly, is the idea that choices made at an individual level will eventually lead to policy changes at a wider level. With flying being the quickest and cheapest way to grow your carbon footprint, many who avoid flying for environmental reasons hope that their actions – and the actions of like-minded individuals – will push governments to rethink their approach to encouraging increased demand for air travel. Naturally, this movement has not been received with great enthusiasm by those within the aviation industry.

According to John Holland-Kaye, there is no need to cut back on flying. Instead, he proposes a transition to Sustainable Aviation Fuel (SAF) to compensate for increased aviation emissions. Speaking at Davos, he said, "we can choose not to travel in this part of the world but that is not going to affect travel in Asia, India and Africa". In other words, why bother reducing your flying now, when demand in other countries is

just starting to take off? Holland-Kaye implicitly pushes the idea that growth is inevitable, and therefore that we should adopt a certain level of fatalism when it comes to controlling demand.

Yet as he doubtless knows, the aviation industry's emissions were, until the pandemic, the fastest growing compared to any other transport mode, with aviation emissions globally having grown 4-5% every year from 2010 to 2018 to reach their highest ever level until the Covid pandemic hit. Left unchecked, aviation emissions could triple by 2050.

The airline industry continues to push SAF as a viable way to meet its environmental targets while simultaneously justifying continual growth. However, it is highly unlikely that SAF will be available in large enough quantities in the next few decades to compensate for this growth. Although crop-based SAFs are not being considered by the Government, a recent paper, published by the Royal Society, highlights the challenges of scaling: an estimated third of all UK agricultural land would be needed to produce enough bio-fuel to meet UK jet-fuel demand.

This is clearly prohibitive. In fact, even the UK Government's techno-optimistic 'Jet Zero' plan, estimates that SAF will deliver only a 17% reduction in emissions by 2050. The introduction of SAF isn't going to be enough to guarantee the aviation industry meets its own emission reduction goals and certainly does not justify unmitigated growth.

The second issue with Holland-Kaye's argument is the implication that if people in Northern Europe choose to fly less that will have little impact on global aviation emissions and that flying less is somehow indulgent. But look at this another way: on a global scale, surely flying itself – and certainly frequent flying – is an indulgence of high-income countries, most typically those in the Global North.

Stefan Gössling and Andreas Humpe have studied the global inequality of air travel demand. From their research, we can see that in 2018, the proportion of people from high-income countries that fly at least once a year was 40%, compared to only 0.7% of people from low-income countries.

Hazards of flying ---------- flying is still the safest mode of transport BUT……

CONCORD On **25 July 2000**, Air France Flight 4590, a Concorde passenger jet on an international charter flight from Paris to New York, crashed shortly after takeoff, killing all 109 people on board and four on the ground. It was the only fatal Concorde accident during its 27-year operational history

The Boeing 737 MAX passenger airliner was grounded worldwide between March 2019 and December 2020 – longer in many jurisdictions – after 346 people died in two similar crashes: Lion Air Flight 610 on October 29, 2018, and Ethiopian Airlines Flight 302 on March 10, 2019. The Federal Aviation Administration initially affirmed the MAX's continued airworthiness, claiming to have insufficient evidence of accident similarities.[3] By March 13, the FAA followed behind 51 concerned regulators in deciding to ground the aircraft.[4] All 387 aircraft delivered to airlines were grounded by March 18, 2019.

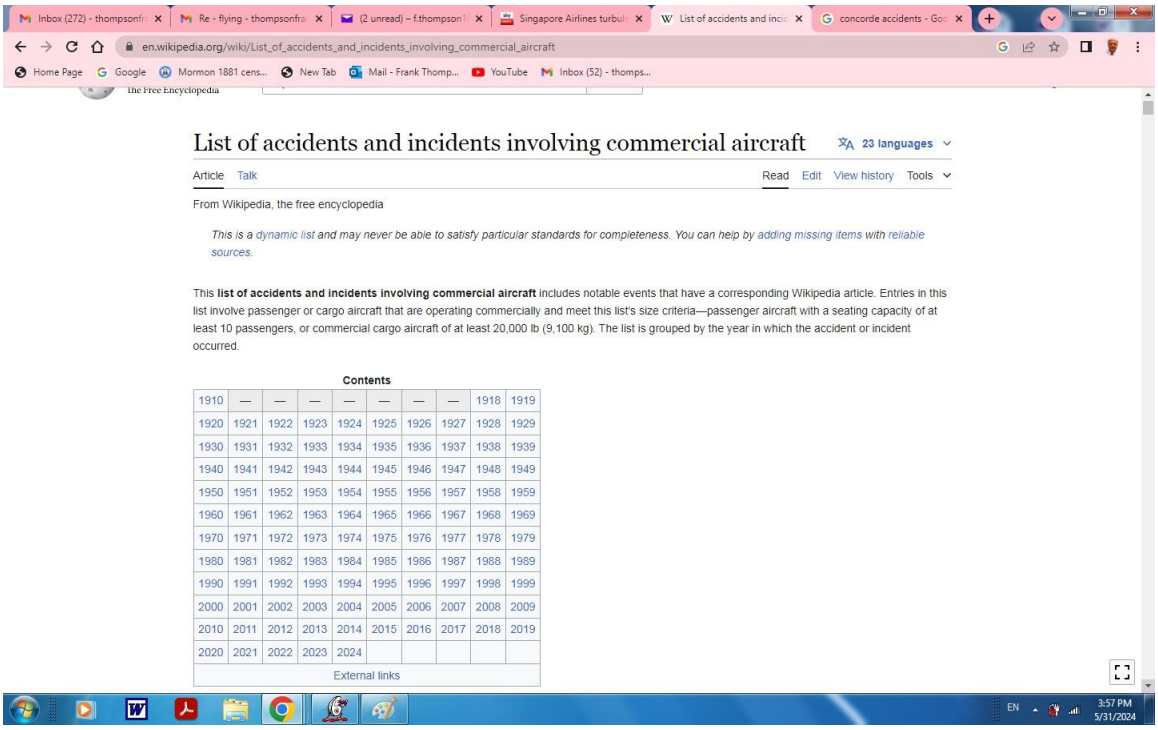
In 2016, FAA approved Boeing's request to remove references to a new Maneuvering Characteristics Augmentation System (MCAS) from the flight manual. In November 2018, after the Lion Air accident, Boeing instructed pilots to take corrective action in case of a malfunction in which the airplane entered a series of automated nosedives. Boeing avoided revealing the existence of MCAS until pilots requested further explanation. In December 2018, the FAA privately predicted that MCAS could cause 15 crashes over 30 years. In April 2019, the Ethiopian preliminary report stated that the crew had attempted the recommended recovery procedure, and Boeing confirmed that MCAS had activated in both accidents.[5]

Singapore Airlines turbulence: Flight experienced 'rapid change in gravitational force', investigation finds

A 73-year-old British man died from a suspected heart attack when the flight hit severe turbulence on 21 May 2024. Now, an investigation into the incident has discovered the severity of the turbulence.

Wednesday 29 May 2024 11:48, UK

Wikipedia gives more details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This list of accidents and incidents involving commercial aircraft includes notable events that have a corresponding Wikipedia article. Entries in this list involve passenger or cargo aircraft that are operating commercially and meet this list's size criteria—passenger aircraft with a seating capacity of at least 10 passengers, or commercial cargo aircraft of at least 20,000 lb (9,100 kg). The list is grouped by the year in which the accident or incident occurred.
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