# SUPERSONIC TRAVEL

# POLICY PRIMER

CONSUMER CHOICE CENTER


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Consumer Choice Center – Policy Primer
By Bill Wirtz and Luca Bertoletti

## INTRODUCTION

Air travel experiences are in constant flux. We often see the biggest change in the technology, the area of safety, and the expectations of passengers. More consumers are travelling by plane than ever before, connecting people, friends and families across long distances. The Consumer Choice Center applauds the availability of air transport as a connector for everyone. As innovation progresses, we also see innovative types of aircraft hitting the market, increasing fuel efficiency and reducing costs for consumers and airlines.

One such area is supersonic travel, which has made considerable advancements since its alleged technological end in 2003. New aircraft have better fuel efficiency and are less noisy than early models, and could revolutionise intercontinental air travel.

The following policy primer argues in favour of regulatory changes that would permit supersonic air travel to and from Europe. This document outlines the opportunities for convenience of passengers, economic opportunities for businesses, as well as addresses environmental and well-being concerns.

## MEETING CONSUMER EXPECTATIONS

Since the 1960s, air travel has been forced to slow downd. According to Kate Repantis from MIT[1] cruising speeds for commercial airliners today range between 480 and 510 knots (889-945 km/h), compared to 525 knots (972 km/h) for the Boeing 707, a mainstay of 1960s jet travel. By today's standards, these are average travel times:

- London-New York: 8 hours
- Madrid-Brasilia: 9 hours 30 minutes

[1] Why Hasn't Commercial Air Travel Gotten Any Faster Since the 1960s?, Kate Repantis, March 19, 2014 https://alum.mit.edu/slice/why-hasnt-commercial-air-travel-gotten-any-faster-1960s

- Frankfurt-Buenos Aires: 14 hours
- Athens-Sydney: 18 hours 30 minutes
- Paris-Wellington (NZ): 23 hours

New technologies under current development promise a massive decrease in flight times. Reform of current regulatory aviation regimes would allow these technologies to compete with existing plane types and have the potential to make flying faster and thus more convenient for millions of passengers.

In past decades, most of the innovation in long-haul commercial passenger aviation was in-cabin products. Both soft and hard products in the cabin have been improving a lot in recent years. This can be seen in individual entertainment screens in economy class, the emergence of a premium economy class, flatbeds and a la carte dining in business class, and showers and enclosed suites in first class. Additionally, new planes reduced in-cabin noise, introduced wireless internet, improved ambient lighting and increased the humidity. These are all massive improvements in passenger comfort that all aim to treat symptoms of long flights: boredom and tiredness. Massive suites and showers might be less necessary for premium passengers, however, if the total flight time was drastically reduced.

**Long flight times have adverse consequences** for passengers, ranging from general discomfort to serious problems in medical emergencies. The latter is particularly consequential at cruising altitude over an ocean. Shorter flight times could, therefore, reduce the number of emergency landings caused by medical situations. In a more general sense, spending less time on an aircraft also contributes positively to the health of frequent travellers.

Shorter travelling times could also reduce incidences of violence stemming from fatigue and stress levels, often exacerbated by long flight times. This would contribute to the safety of both the flight crews and other passengers. Shorter flight times would also be beneficial for the exposure of cabin crew to the stress of long haul flights.

Other benefits of reduced flight times would be purely administrative. Today, city administrations and local communities must strike a balance between the amount of night time flights needed for economic prosperity and the necessary calm needed in the residential areas surrounding airports. Traditionally there are ‘rush hours’ for airports early in the morning and late in the evening to make red-eye flights to other continents feasible. Massively faster flight technologies such as super- and hyper-sonic planes might make red-eye flights less necessary. Reduced flight times could lead to faster and more numerous connections per day, which would cut down on nighttime flight necessities.

Reducing flight times would not only be beneficial in the aforementioned situation. It would also benefit the comfort of both business and pleasure travellers. While a traveller visiting his or her relatives might not be in a significant rush, a business traveller certainly is. Allowing for faster travel means more effective meetings and greater opportunities for international trade. The move would also contribute to tourism as long flight times serve as an excuse for tourists from many parts of the world not to visit Europe.

The United States Federal Aviation Administration (FAA) has announced[2] that it wants to grow the supersonic civil aviation industry. Europe should follow in its footsteps.

Consumers have an expectation in favour of faster transportation. This can be assured with modern supersonic air travel.

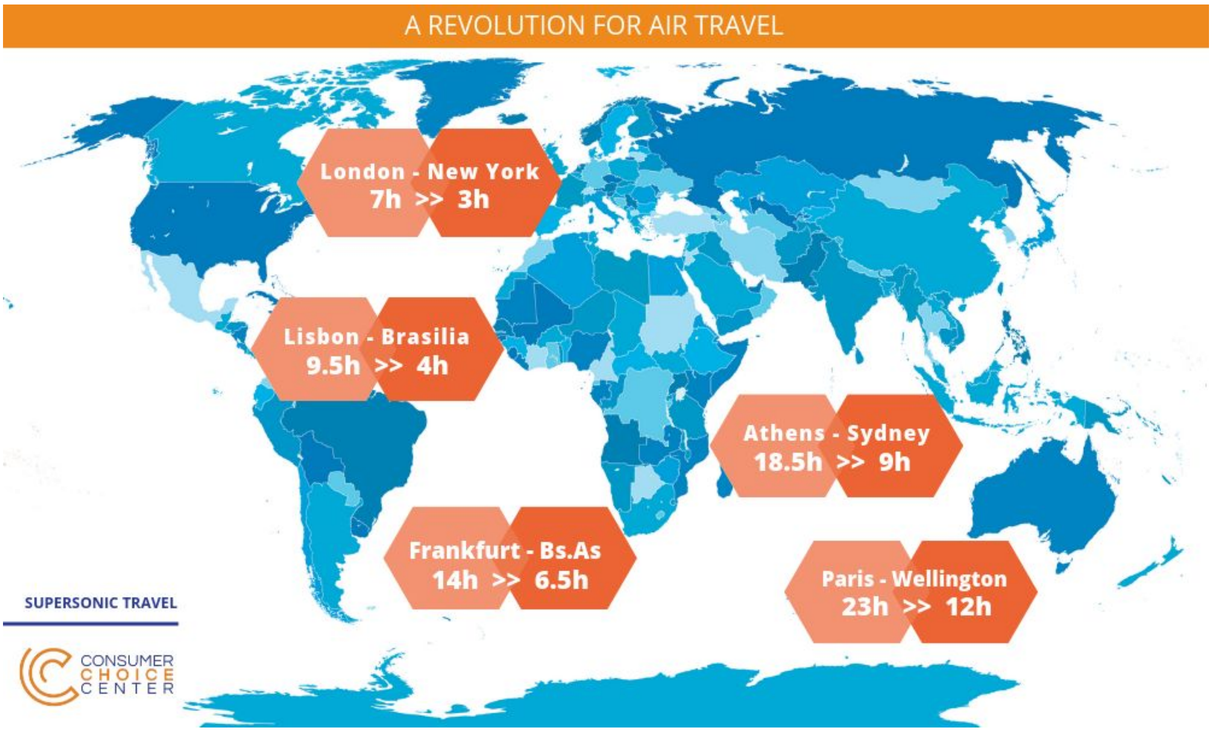
## A REVOLUTION FOR AIR TRAVEL

Different flight routes require different types of aircraft. Supersonic planes would revolutionise intercontinental air travel with increased speed. Certain supersonic models would be able to reach speeds up to 2,300 km/h, which represents 2.5 times the speed of today's commercial airliners. The above-mentioned flight times could, therefore, be adapted accordingly:

- London-New York: 7 hours — 3 hours ✔️
- Lisbon- Brasilia: 9 hours 30 minutes — 4 hours ✔️
- Frankfurt-Buenos Aires: 14 hours — 6,5 hours ✔️
- Athens-Sydney: 18 hours 30 minutes — 9 hours ✔️
- Paris-Wellington (NZ): 23 hours — 12 hours ✔️*

*(France to New Zealand would require a connection to refuel, as current supersonic prototypes only have a range of 16,500 km)

[2] FAA moves to support growth of civil supersonic air industry, Reuters, June 29, 2019
https://www.reuters.com/article/us-usa-aircraft-supersonic/faa-moves-to-support-growth-of-civil-supersonic-air-industry-idUSKCN1TI2HS




## EMPHASISING ALTERNATIVE FUEL USE

Technological innovation progresses as profits allow investments in research and development. 50 years of supersonic absence from commercial air travel have understandably slowed down this process of innovation. Yet, even though some models are still prototypes, partnerships with alternative fuel producers are in the making. One supersonic aircraft manufacturer announced in June 2019 that it will partner up with a producer of low-carbon jet fuel, with the vision of eventually operating on a carbon-neutral basis. This manufacturer gains the fuel through a process called direct air carbon capture, which removes carbon dioxide from the air and uses clean electricity to transform it into gasoline, diesel, and jet fuel. The electricity used in this process comes from renewable sources such as solar and wind, leading to an absence of net carbon emissions.

The necessary inputs for this alternative fuel are CO2, water (both from the air) and electricity.

The producers absorb CO2 and water vapor from the air into an aqueous electrolyte, then react the CO2 in the water with a copper catalyst to directly make alcohols like ethanol, butanol, propanol, etc. The extraction does not occur thermally, as they use a carbon nanotube membrane, extracting the alcohol from water in a single step at room temperature.

In a process that can be described as reverse combustion, the output is fuel and oxygen. However, the challenge for these biofuels is efficiency. The process of extraction through different methods of distillation has not yet been proven to be cost-efficient in comparison to regular fuel. Meanwhile, now an existing partnership between supersonic aircraft manufacturers and biochemical fuel producers shows that we are going beyond just theory. If supersonic planes are allowed to take off, then so could the industry of alternative fuels.

## NECESSARY REGULATORY CHANGES

Aircraft are required to meet the environmental certification standards adopted by the Council of the International Civil Aviation Organisation (ICAO). These are contained in Annex 16 (Environmental Protection) to the Convention on International Civil Aviation. This Annex at present consists of two volumes: Volume I: Aircraft Noise and Volume II: Aircraft Engine Emissions. These certification standards have been designed and are kept up to date in order to respond to concerns regarding the environmental impact of aviation on communities in the vicinity of airports as well as society at large.

U.S. Congress bill H.R. 302 asks the United States Federal Aviation Administration (FAA) to promote supersonic air travel by introducing regulatory changes. It asks to “consider the needs of the aerospace industry and other stakeholders when creating policies, regulations, and standards that enable the safe commercial deployment of civil supersonic aircraft technology and the safe and efficient operation of civil supersonic aircraft.”

As of now, supersonic aircraft fall under Chapter 12, which fails to elaborate on required noise levels. New supersonic models would be classified in the same categories as subsonic planes, being either Chapter 4 or Chapter 14 classifications (example on Chapter 4 regulations below).

The ICAO says that it supports a data-driven process that approaches environmental certification standards “from the viewpoint of technical feasibility, economic reasonableness and environmental benefit to be achieved”. This is particularly important since there should be no compromises made on the safety of the aircraft for the purpose of noise reduction.

Supersonic aircraft are louder than subsonic models, because of differences in airframe (the aircraft needs more thrust on landing and take-off (LTO), in order to have a more advantageous shape at cruising speed), and engine composition. On engines: subsonic aircraft are less noisy because they use fans in front of the engines, which makes air bypass the engine core and acts as additional thrust. Supersonic models couldn't replicate this technique since the fan-created drag would either rip the engine apart or destroy any fuel efficiency that the aircraft would have.

While supersonic aircraft are louder during flight, new models, such as the *Overture* by the manufacturer Boom, are 100 times quieter than the Concorde. In addition, it is important to measure with comparable units: supersonic aircraft are the size of a regional jet but should be regulated in the same category as large planes flying intercontinental today, due to different transport capabilities, range, and missions.

Older supersonic aircraft would fall under the so-called Chapter 4 regulations. Volume 1, Part II, Chapter 4 of Annex 16 of the International Civil Aviation Organisation (ICAO), sets different levels when it comes to the expectation of acoustic burdens. As far as maximum noise limits are concerned, the same rules are applied as for Chapter 3 regulations, i.e. between 94 and 106 decibels for overflights, depending on the size of the aircraft and the number of engines. (see fig. 1)

**3.4 Maximum noise levels**

3.4.1 The maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 2, shall not exceed the following:

3.4.1.1 *At the lateral full-power reference noise measurement point*

103 EPNdB for aeroplanes with maximum certificated take-off mass, at which the noise certification is requested, of 400 000 kg and over and decreasing linearly with the logarithm of the mass down to 94 EPNdB at 35 000 kg, after which the limit remains constant.

3.4.1.2 *At flyover reference noise measurement point*

a) *Aeroplanes with two engines or less*

101 EPNdB for aeroplanes with maximum certificated take-off mass, at which the noise certification is requested, of 385 000 kg and over and decreasing linearly with the logarithm of the aeroplane mass at the rate of 4 EPNdB per halving of mass down to 89 EPNdB, after which the limit is constant.

b) *Aeroplanes with three engines*

As a) but with 104 EPNdB for aeroplanes with maximum certificated take-off mass of 385 000 kg and over.

c) *Aeroplanes with four engines or more*

As a) but with 106 EPNdB for aeroplanes with maximum certificated take-off mass of 385 000 kg and over.

3.4.1.3 *At approach reference noise measurement point*

105 EPNdB for aeroplanes with maximum certificated take-off mass, at which the noise certification is requested, of 280 000 kg or over, and decreasing linearly with the logarithm of the mass down to 98 EPNdB at 35 000 kg, after which the limit remains constant.

*Note.— See Attachment A for equations for the calculation of noise levels as a function of take-off mass.*

Figure 1: Part II - Chapter 3, Annex 16 - Environmental protection, ICAO

In essence, supersonic planes need their own environmental standards that account for the trade-offs inconvenience of passenger transport, benefits to flight crews, economic opportunities for consumers and business, and expectations of increased fuel efficiency and noise reduction.

Necessary regulatory changes, therefore, include the creation of a separate category that diverges from the expectations of subsonic models. Regulators should strike a balance between noise protection and the exciting opportunities of technological innovation, keeping citizens, who in turn are also consumers, in mind.

Environmental standards are developed by the ICAO Committee on Aviation Environmental Protection (CAEP). CAEP's membership comprises 25 full member countries, 9 of which are EU member states, and the group operates by consensus. Manufacturers, airlines, airports, and non-governmental entities are represented as observers.

The full CAEP will have an opportunity to adopt a landing and takeoff noise standard for supersonics at the next full meeting in February 2022. This opportunity should not be missed. It is in the interest of consumer choice and technological innovation that Europe finds a way to adopt standards that reflect the reality of air travel while setting realistic protections for citizens.

## About the Authors

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The Consumer Choice Center is the consumer advocacy group supporting lifestyle freedom, innovation, privacy, science, and consumer choice. The main policy areas we focus on are digital, mobility, lifestyle & consumer goods, and health & science.

The CCC represents consumers in over 100 countries across the globe. We monitor closely regulatory trends in Washington, Brussels, Geneva and other hotspots of regulation and inform and activate consumers to fight for #ConsumerChoice.

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