Helping keep air travel safe

COVID-19 passenger testing guide for airlines

COVID-19 has presented difficult challenges to the airline industry. With the ever-growing availability of vaccines, a way forward is emerging. However, testing all passengers for COVID-19 will still be an important requirement for domestic and international air travel.

This guide explains the testing options for the airline industry, the best practices for testing, and the additional resources needed by airlines, labs, government agencies and digital health passport vendors.

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COVID-19 testing programs and protocols for airlines

Although vaccines for COVID-19 are rolling out worldwide, as of June 2021, nearly all of the world's countries have restrictions on entry, based on travelers' COVID testing status and/or vaccination status.[1] COVID-19 vaccine certificates as a condition for international travel are being debated, but there are practical and ethical concerns, and the World Health Organization (WHO) has not yet made a recommendation about them.[2]

Neither vaccine immunity nor natural immunity is perfect, and breakthrough infections have been recorded despite vaccinations. This means that COVID-19 testing for air travel is still an important part of keeping passengers safe and preventing new outbreaks.[3]

Travel restrictions and testing requirements around the world change regularly and without prior notice. In this uncertain climate, universally-acknowledged gold-standard PCR testing helps assure governments, airlines, and passengers of the highest accuracy in detecting COVID-19 before boarding.

Primary test recommendation focuses on pre-departure testing

In March 2020, the International Civil Aviation Organization (ICAO) announced the formation of the ICAO Council Aviation Recovery Task Force (ICAO CART) to align all air travel risk management initiatives to the COVID-19 pandemic. Their efforts, in collaboration with the United States CDC and European CDC as well as contributions from WHO, led to the release of the first set of guidelines "ICAO CART Take-Off Guidance" in May 2020 as well as the "Manual on Testing and Cross-border Risk Management Measures" in November 2020. An advance, unedited Version 2 was released in March 2021.[4]

In these guidelines, ICAO CART describes the three reasons for the implementation of testing as:

1) Reducing transmission during the actual travel
2) Reducing potential introduction of disease in a region/country
3) Potentially reducing or eliminating quarantine for the traveler at their destination

The primary test recommendation focuses on pre-departure testing. A post-arrival test may also be considered in order to potentially reduce the quarantine period in place for the destination requirement.

Recommended air travel testing protocol for passengers

Pre-departure testing

As a way to limit the potential of viral transmission on flights, many countries require air travelers to show evidence of a negative test result pre-departure. Ideally, passenger testing should happen before the passenger arrives at the airport, because point-of-care testing in airports with lower sensitvity tests could create departure bottlenecks, expose more travelers to potential infection, and degrade the customer experience for air travelers.

Based on continually updated guidelines released by the CDC and WHO, the testing protocol for air travel is expected to evolve over time. Current recommendations as of this edition from both organizations are:

- **International flight testing** – testing 24-72 hours prior to travel, and testing post arrival per country protocol (2-4 days)

- **Domestic flight testing** – testing 24-72 hours prior to travel

Post-arrival testing

The establishment of mandatory 14-day quarantines by countries based on public health recommendations has allowed for the safe entry of travelers into their final destination. However, implementation of post-arrival testing — with a second negative test result and no symptoms — can help shorten the quarantine period.[5]

Self-quarantine

The CDC recommends a self-quarantine period with or without post-arrival testing for international and domestic travelers:

- **Full quarantine period: 14 days** — Quarantine requires no testing as after 14 days, the transmission risk is nearly eliminated.

- **Reduced quarantine period: 7 days with testing 3-4 days post arrival** — This option provides a comparable reduction in transmission risk to full quarantine[6]

The marketplace of testing solutions for air travel

Currently, the largest demand drivers for testing are national and state governments that require it. Negative tests were required for travel in many countries and regions worldwide in 2020 and have accelerated in 2021 with the U.S. government requiring all international travelers to arrive in U.S. airports with a negative COVID-19 test.

There are two solution models currently in place:

- **Traveler DIY ("Do-It-Yourself"):** this model places all responsibility on the traveler to get a test and present the result at departure or arrival (depending on the requirement by the port of entry country). There is potential for error or fraud in this model.

- **Testing provided by a full-service lab provider:** More than just a testing lab, this is an organization that coordinates all parts of the testing process: sample collection, running the tests, and sending results to the people being tested and to digital health passport vendors. This model aims to provide a turnkey, end-to-end solution for the traveler.

Testing options for air travelers

First, it's important to understand the difference between testing for an active infection and testing for previous infections. Serology tests or antibody tests show whether a person has had a SARS-CoV-2 infection in the past by detecting the presence of antibodies for the virus. These types of tests do not identify an active infection. However, we'll be discussing tests for active infections, which are the type used in testing to help prevent virus spread.

- **PCR (polymerase chain reaction) tests** work by detecting the genetic material of the virus in samples collected from individuals. They are the most sensitive and accurate COVID-19 tests available. PCR tests can be designed to identify multiple targets of the same virus (multiplexing) therefore potentially safeguarding these types of tests against new variants, also known as virus mutations. Some of these tests also include a built-in control to assess sample integrity. Two types of PCR are:

  - **Real-time PCR tests** are the gold standard for SARS-Cov-2 detection. Saliva, nasal, or nasopharyngeal (deep nasal) samples have their RNA extracted and amplified to detect even small amounts of virus genetic material.[7]

  - **Fast PCR tests** (also known as Direct PCR) use the same technology, but with a different workflow bypassing the RNA extraction step, and other modified conditions. It uses many of the same sample types as Real-time PCR, including saliva and nasal. Fast PCR runs faster, uses fewer materials and plastics, and has proven to be cost effective.

The cost of PCR testing is dropping below USD $100 per test in many countries,[8] and both competition and government action can help to drive the cost even lower.

- **RADTs (Rapid antigen detection tests)** work by detecting specific viral antigens (proteins) on the surface of the virus. They are also called point of care (POC) antigen tests, because they can be run in a doctor's office or in a laboratory. RADTs use nasal and deep-nasal samples.

  RADTs are not as sensitive as PCR tests, which means they are less likely to detect an infection if the amount of virus is low.[9] This makes RADTs more relevant for diagnostic testing within 5-7 days of symptom onset, when viral loads are high, than for testing asymptomatic people or those at the beginning stage of the disease when the viral loads are lower.

  RADTs can also return false positives for some people, which could create the disruption of denying boarding to passengers who are not truly infected. RADTs can perform a complementary role to RT-PCR testing in some situations, but they are not a replacement for RT-PCR.[10]

The World Health Organization (WHO) recommends nucleic acid amplification tests (NAAT) such as RT-PCR for international travel[11]

WHO guidance recommends NAAT tests, including RT-PCR, because of their high sensitivity and specificity. They find RADT tests more suitable for people with high viral loads and active infections that produce symptoms, who should already have been prevented from traveling or entering airports.[11]

RADT tests are run one at a time on each piece of equipment, so they may not be scalable if a large population such as air travelers needs to be tested. **POC PCR tests** and **LAMP (loop-mediated isothermal amplification**) tests have been used by select airlines (e.g., United Airlines) and airports (e.g., San Francisco International Airport) for small-scale pilot tests, but are not scalable for broader testing initiatives.[11]

Resources and solutions needed for the airline industry

To solve air travel testing challenges in a coordinated, efficient manner, the organizations involved must come together to form strong connections and service networks.

What airlines need from their lab testing partners

Airlines need to satisfy the health and safety requirements of the countries in which they travel, while offering their passengers a streamlined, user-friendly booking, testing, and departure experience. Thermo Fisher is working with testing labs to support airlines in meeting their customer experience standards and the requirements for safe travel. Here are some other specific needs:

- **Secure and verifiable result documentation** is a critical requirement for point-of-entry.
  - While many countries, airports, or airlines currently allow passengers to present self-selected, paper copies of their negative lab results, there is an emerging recognition[12] that lab results will need to be verifiable to allow for improved cross border travel.
  - Digital health passport applications (e.g., CLEAR, CommonPass, and IATA Travel Pass) may provide a simple, secure method for demonstrating testing compliance through secure access to health data from multiple full-service lab providers in a way that maintains personal health record privacy.
- **Test sample type:** Noninvasive samples such as saliva or nasal swabs have the simplest and easiest collection method for air travelers.
- **Testing accuracy:** Fast, cost-effective, and easy to use testing methods may be required for air travel hubs with high volumes of travelers, but the highest priority will continue to be high-sensitivity and high-quality results, due to the risk of allowing infected travelers to cross borders.
- **Data management:** A HIPAA-compliant software solution is required to manage testing and results tracking.

Thermo Fisher can help airlines connect to strong testing networks

Thermo Fisher is working with labs, lab providers, digital health passport providers, and governments to put together testing networks that can offer airlines a unified testing experience that is fast and straightforward for airline customers.

We encourage airlines to reach out to our Business Development Team at traveltesting@thermofisher.com so that we can connect you to our networks.

The networks we are creating include:

- **Labs and full-service lab providers** with scalable testing technology that can address regulatory and end-customer requirements for high-sensitivity and high-quality results.
- **Organizations with sample collection capabilities** who can provide this function for labs that don't collect their own samples.
- **Digital health passport providers** with a deep understanding of testing requirements, best practices and end-to-end workflow solutions (e.g. sample collection), as well as strong connections to high-quality labs across the global regions.

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Additional relevant information regarding Air Travel COVID-19 Strategies

ECDC rapid assessment of laboratory practices and needs related to COVID-19. 18 January 2021 https://www.ecdc.europa.eu/sites/default/files/documents/covid-19-rapid-assessment-laboratory-practices-needs.pdf

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