

# An airport in need of a step change: Geneva Airport's Terminal Ambition Plan

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## Abstract

*Geneva Airport is embarking on a revolutionary new programme to make its Terminal facilities future proof and aligned with the changes our industry is facing. Starting with a clean slate — thinking in opportunities, not only constraints — set the fundamentals for the feasibility study on phased implementation, given*

*COVID-19 budget constraints. The journey that the airport and its consultant NACO undertook to reach this point is worth sharing with our industry partners.*

## **Keywords**

*Airport terminal, capacity, customer experience, smart phasing, operational feasibility*

## **GENEVA'S SUSTAINABLE TRANSITION TO A LARGER-SCALE AIRPORT**

Switzerland's most international city, Geneva has risen as a global centre thanks to institutions such as the United Nations (UN), World Health Organization (WHO), World Trade Organization (WTO), unique research facilities like CERN and premier leisure activities on the surrounding snowy mountain peaks and its stunning lake. This rise ran parallel with the development of Geneva Airport (GVA), formerly known as Cointrin — with all these major drivers for Geneva's attractiveness relying on optimum connectivity. This symbiotic relationship goes back to the airport's creation in 1919 as part of the city's bid post-World War I to be the location of the new headquarters of the League of Nations; the predecessor of the United Nations.

Fast forward to the current situation and this successful relationship has resulted in the airport's 1968 second and current terminal building, originally built for 7m annual passengers, to accommodate no less than 18m in 2019 and there are demand predictions for almost 25m annual passengers by 2030 (see Figure 1).

This has meant a continuing historical evolution for the terminal building in terms of increasing both processor capacity, SUCH AS check-in and security control, and even more the commercial area, due to evolving passenger demands.

Since an airport is only as strong as its weakest link, the landside accessibility is not to be overlooked. The growth in

traffic has resulted in frequent congestion on the kerb and roads leading up to the airport. In its 100 year history, GVA has been fully surrounded by city and suburban development, creating space constraints for further extending towards the airside, limitations in regards to the highway on the landside and the French border running right at the boundary of the airport. These factors make for a formidable challenge.

Despite its challenging spatial context (see Figure 2), Geneva Airport is transitioning to a truly large airport requiring larger-scale thinking and embarking on a revolutionary new Terminal programme for more spacious operations and future-proof facilities, aligned with the changes our industry is facing.

Starting with a clean slate — thinking in terms of opportunities, not only constraints — set the fundamentals for the feasibility study on phased implementation, given COVID-19 budget constraints. The journey that the airport and its consultant NACO undertook to reach this point is worth sharing with our industry partners, since it is a case study relevant to many other airports faced with similar challenges.

## **GVA'S CUSTOMERS AND STAKEHOLDERS — NEEDS AND EXPECTATIONS**

GVA has a catchment area that covers around 6m people over the French speaking part of Switzerland, France (Rhône-Alpes and Jura) and Italy (Aosta



**Figure 1** Birdseye impression of the new terminal expansion accommodating the future needs of Geneva International Airport  
Source: Itten+Brechbühl SA.

valley) with a high propensity to fly (see Figure 3). As mentioned, the airport has a unique set of demand drivers that have allowed it to grow beyond what one would expect from a pure point-to-point airport in a mountainous region of Europe (less than 5 per cent of passengers self-connect at GVA as opposed to, for instance, Zurich airport which caters to a lot of connecting traffic as a Star Alliance transfer hub).

These unique demand drivers result in the airport having a number of unique customers and stakeholders with particular needs and expectations.

The UN staff enjoy the fact that the airport is a mere 10 minute bus ride from their UN offices, allowing them to catch an early morning flight and return the same day from, for instance, Brussels, completing meetings with their EU counterparts without having to have an overnight stay.

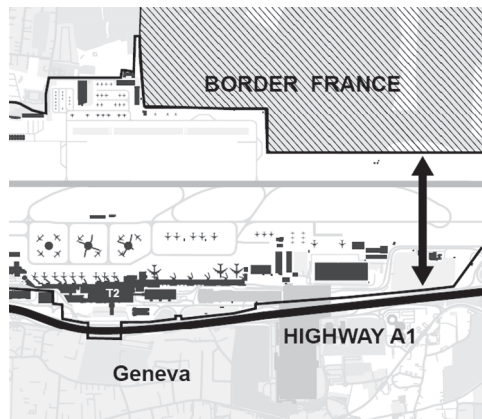
The same applies to people living in downtown Geneva who catch the

seven minute train ride to the airport from Geneva City's main railway station for same-day return flights for business across Europe.

This is no different for international researchers: The world-famous particle-physics lab CERN is less than 5 kilometres from the airport and has a special shuttle bus service offering premier connectivity for its international scientists and visitors.

Even seasonal (ski) tourists enjoy quick access to the premier ski areas around Geneva and would prefer the convenience of flights during morning and evening peaks so they can enjoy the maximum time on the slopes and not arrive/depart mid-day and lose precious leisure time. This means large numbers of these snow-sport enthusiasts — many with their own equipment in tow — group together at the airport's landside in and around these peaks.

Last, but not least, the international business aviation users with either high



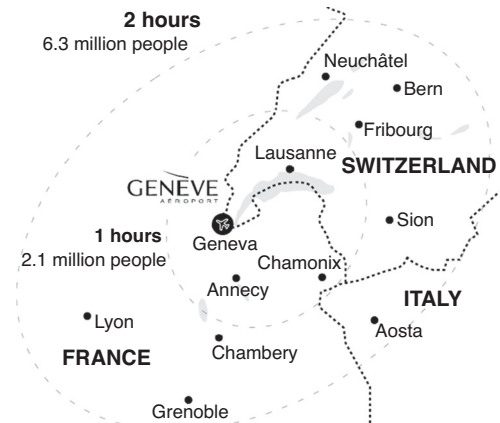
**Figure 2** Geneva Airport's constrained site crammed between the French border, urban area of Geneva and highway A1  
Source: NACO.

profile business meetings or living in Geneva's nearby mountains or on the lake, have similar demands that need to be met, although it mostly involves flying in and out with a private jet and being whisked away in a limo, instead of any means of public transport (20 per cent of aircraft being handled at GVA are business aviation planes).

To add to the challenge, there are of course the airport employees arriving and departing as per their shifts, which are also close to (but slightly preceding) these peak timings of the above-mentioned traveller segments.

Faced with such a high peak demand, the airport would try and incentivise its airlines to schedule flights just outside the peak, effectively 'spreading the peak'. This would save the airport significant investment in infrastructure to accommodate all the flights right in the peak; infrastructure that would otherwise lie idle outside of the peak.

However, the airlines are subject to market forces of a different kind; flights of low-cost carriers such as easyJet and the majority of point-to-point flights of carriers at GVA are scheduled during the same peak. The airlines are focused on

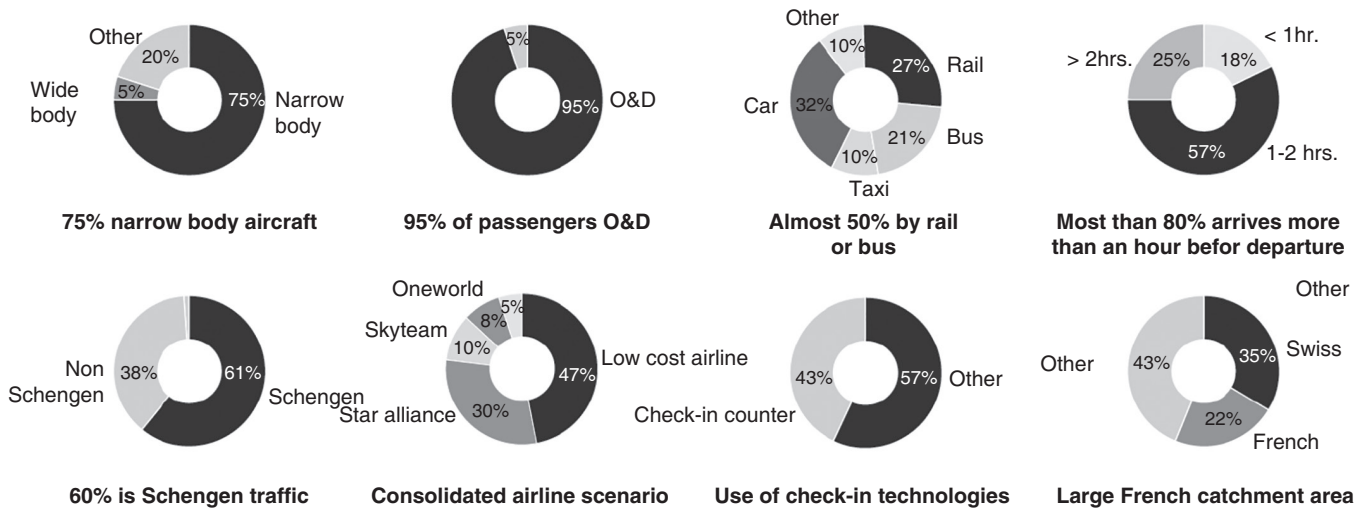


**Figure 3** Geneva Airport's catchment area covering three countries  
Source: NACO.

'giving the customer what it wants' (certain timeslots) and thus gain market share on competitors that do not. Airlines based more aircraft at GVA to efficiently serve the morning departure peak at a competitive rate and there was no looking back. Every time more seat capacity was made available in the peak, aircrafts filled up with passengers because it met their particular needs for timely connectivity in and out of Geneva.

These travellers were more and more conscious about getting value for money. They seek budget options for standard aspects of their travel and like to be in control of what they pay for. This is one of the reasons behind the success of regional air travel in Europe; no more 'all-in packages', but instead allow the traveller a frugal base rate and give them the choice to procure value-adding 'extras' like choosing one's seat, availing themselves of the option to check-in luggage, priority boarding, etc.

These modern travellers at the same time are willing to spend on consumption and products provided they add to their aspired-to lifestyle and experiences. They are increasingly tech savvy and in the case of GVA more than 50 per cent



**Figure 4** Key characteristics for Geneva International Airport as starting point for the Terminal Ambition Plan  
Source: NACO.

of air travellers are already checked-in online when they arrive at the airport.

One such point-to-point carrier that got it right was easyJet. It was so successful in meeting the demands of the core customer groups at Geneva that it grew into the airport's largest carrier, holding 44.8 per cent of the market in 2019, with the majority of its flights flying during the peaks; an important stakeholder for GVA with a very focused strategy for meeting their customer's expectations and frequent connections to target destinations across Europe — up to 90 per cent of GVA's total passengers are flying to destinations within continental Europe and over 60 per cent to Schengen destinations. This is mostly done on narrow-body aircraft (75 per cent of aircraft at GVA) and easyJet's fleet of A319s and A320s form a large part of that number. This means that, given 20 per cent business jets, only 5 per cent of GVA's aircraft are widebodies.

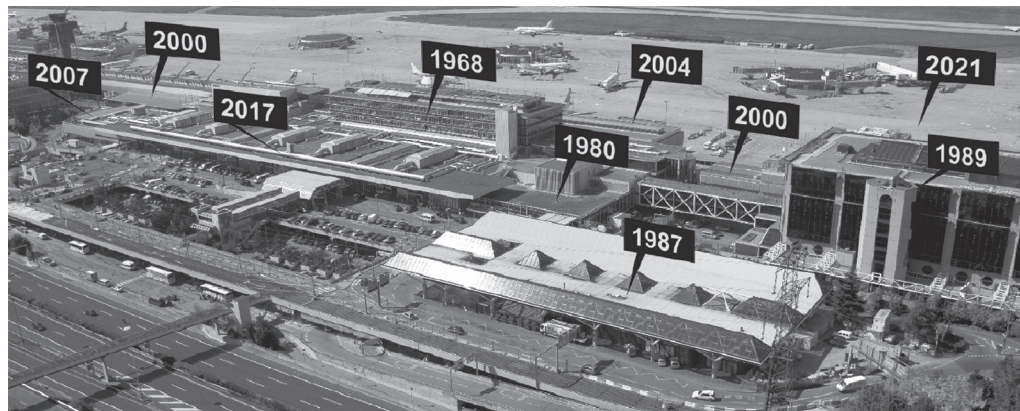
It is clear that the needs and expectations of the different customers and stakeholders of GVA have resulted in a complex assortment of different modes of transport that converge on the airport's

forecourt areas in a very concentrated time frame — the so-called 'landside peak' — a direct consequence of the concentrated departure and arrival peaks of the major airline stakeholders like easyJet and Swiss (see Figure 4).

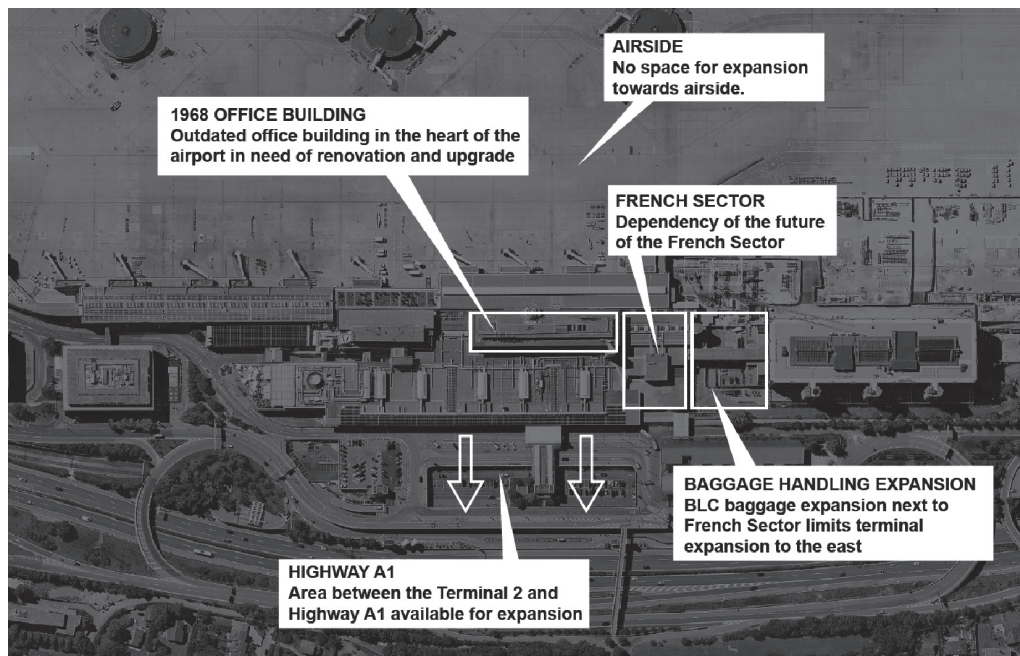
This space crunch, coupled with changing needs and expectations of the modern traveller in terms of consumption and products in line with their aspired-to lifestyle and experiences, meant that GVA needed to embark on a demanding Terminal programme for more spacious operations and future-proof facilities: It was important to ensure that the first and last impression that guests of the airport get is on par with the international status that Geneva enjoys.

### Existing conditions of the main terminal building

The initial phase of the existing terminal building was commissioned in 1968 and was envisaged to accommodate 7m passengers. Over the next 50 years, that building has been constantly extended and developed, as you can see in the



**Figure 5** Evolution of additions to Geneva Airport Terminal building  
Source: NACO.

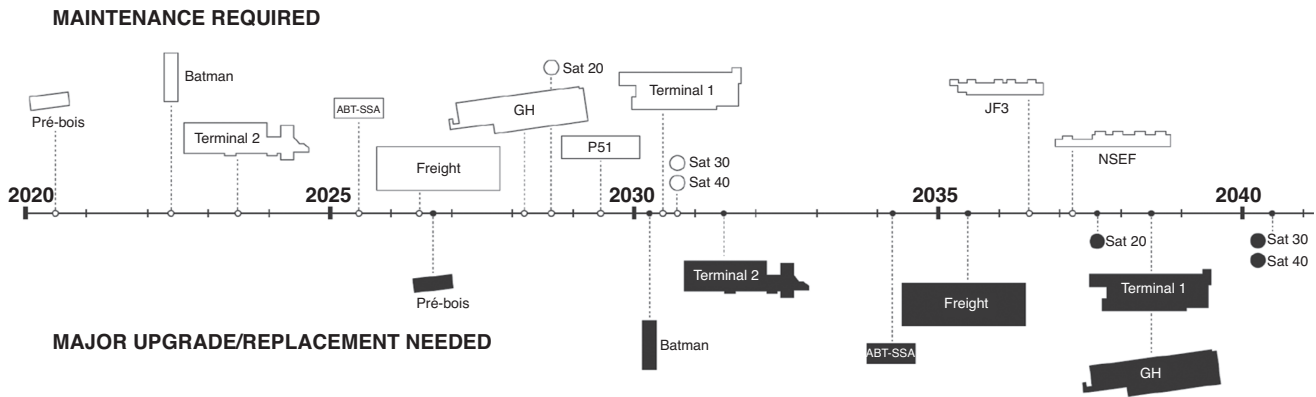


**Figure 6** Geneva International Airport's Terminal expansion limitations  
Source: NACO.

following graphic (see Figure 5). This has resulted in a collage of various building volumes from different eras, creating an evolutionary collage of structures that lack the flexibility and adaptability for future development.

In addition, there are several constraints limiting future extension (see Figure 6), such as:

- Towards the north, there is no space for expansion towards the airside.
- The office slab from 1968, which is starting to look old and is functionally in the wrong place, at the heart of the terminal building.
- Towards the south, there is no space for expansion due to the highway, high voltage line and rail.



**Figure 7** Lifecycle analysis of structures at Geneva International Airport  
Source: NACO.

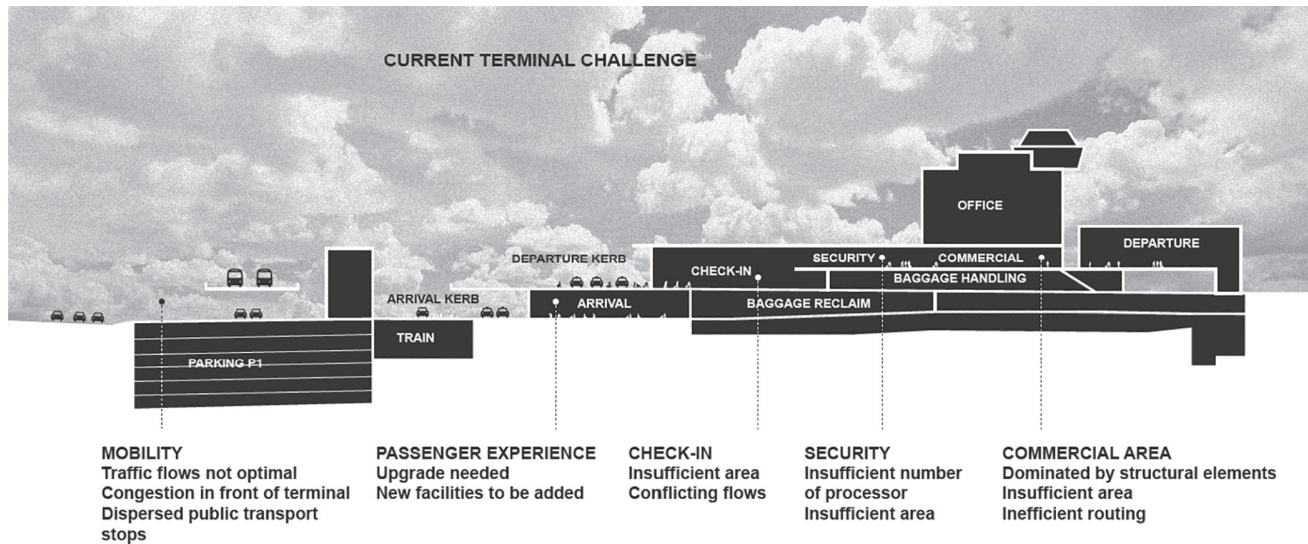
- Towards the east, there is no space for expansion due to the baggage sorting centre and Halle 7.
- And finally, the need to maintain the French sector, a domestic French terminal within the main terminal, with direct road access to and from France, offers unique challenges.

Finally, given the age of the terminal building, an analysis of the lifecycle of the assets was conducted (see Figure 7). This showed that, by 2032, some of these structures part of the terminal area's evolution will deteriorate to such a degree that they will be unable to perform any function unless they are renovated or replaced.

Whereas the terminal building in its current state has been able to accommodate the needs up to now, significant limitations are coming to the fore, which will increase over the coming years, and these are:

- The arrival and departure kerb capacity is low due to limited lanes and its organisation in front of the terminal is becoming too complicated and less and less adapted to the future security imperatives and also the need for a real intermodal mobility hub.

- Intermodal connectivity is not organised efficiently enough to convince travellers to switch to the use of public transport. The railway station is not sufficiently integrated within the airport and does not allow easy integration of bus or a possible tramway.
- The terminal mixes processor areas and their queuing areas and the connectivity between processors, like sales desks, check in and security control. This translates into insufficient queuing depth and circulation space and conflicting flows.
- All processor areas are very small and this will act as a constraint to accommodating the foreseen passenger numbers.
- The check-in area lacks space to allow for future developments of self-check in and biometric solutions; this area also lacks space to fully accommodate the needs of the main airlines serving the airport.
- Only standard 3 security scanning devices will allow for the quality of service to passengers and the capacity GVA is intent on offering. However, the current security control is too small to accommodate the complete migration from standard 2 to standard 3 scanning devices.



**Figure 8** The main constraints and key challenges at Geneva International Airport  
Source: NACO.

- The historical evolution of the terminal, with the increasing operational needs for space, has resulted in very limited space for commercial activities. There is a deficit of over 40 per cent and a need to rebalance it between land- and airside. Even the commercial space that is there has inefficient circulation and routing due to the structural elements from the 1960s obstructing the free flow of space.

It is clear that the past 50 years of continuously adding new building parts and redeveloping some of the existing ones has reached its limits (see Figure 8). Hence, any attempt to align the airport for its future challenges must be looked at with a fresh approach which will result in eventually overhauling the terminal in an integrated manner.

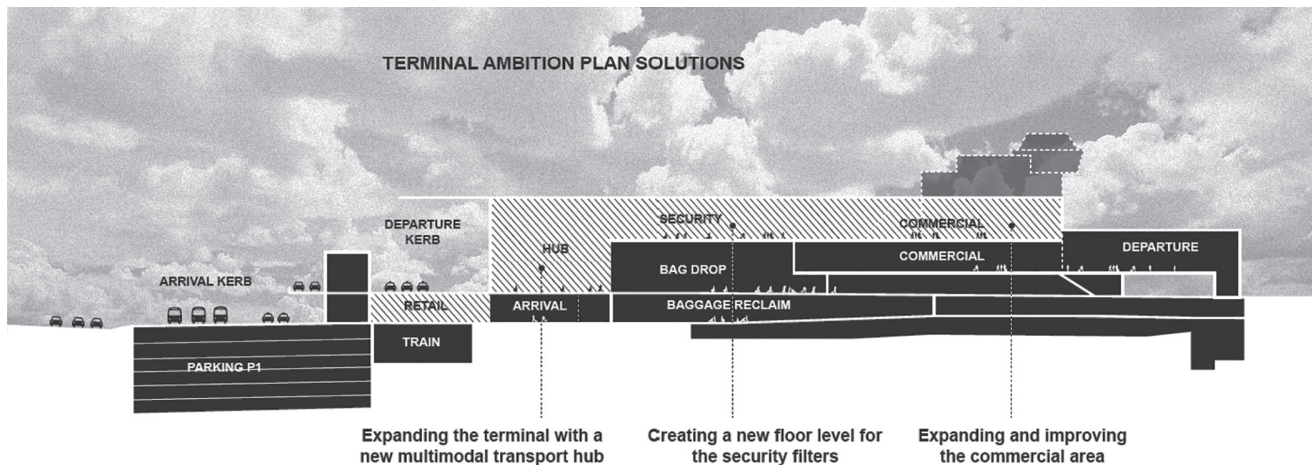
### Challenges and opportunities

Given the operational and space constraints, space allowance at GVA's terminal has fallen well below the IATA recommendations for the different

functions of an airport. Based on GVA's strategic development plan and forecasted future passenger numbers, it had become clear that the redevelopment of the main terminal would need to be ready — at least partially — by 2030–2033. This is to ensure its ageing build structure and infrastructure are renewed to ensure continued operations and to accommodate the future operational and commercial needs for Geneva Airport.

Additionally, given the strong traffic peaks in the morning and evening, there is major congestion on the so-called 'landside' of the airport; both at the drop-off forecourt of the terminal, as well as on some of the main access roads. To tackle this problem and find alignment with GVA's sustainability ambitions, the airport had the ambition to increase public transport use to and from the airport from 47 per cent to close to 60 per cent and reduce the number of travellers and employees coming by private vehicle. (Fun fact: 7 per cent of employees reach the airport by bicycle, but this is eclipsed by the majority taking their car.)





**Figure 9** Geneva International Airport Terminal Ambition Plan main focus areas in the terminal and forecourt  
Source: NACO.

To achieve this goal, public transport needs to be an attractive alternative to taking one's own private vehicle. This calls for seamless connections between the different modes of public transport and the terminal; a true multi-modal mobility hub.

It is time to start from a clean slate to find the most appropriate way for Geneva Airport to define its future terminal and possible implementation strategies (see Figure 9).

To understand the exact requirements in the next 20 years, GVA appointed NACO to develop a so called 'Terminal Ambition Plan'. Geneva Airport is in transition to a larger scale airport. The Terminal Ambition Plan (TAP) represents this larger scale. There is a step change needed in thinking to accommodate future needs.

As the first step in its proven planning methodology, NACO assessed the ultimate facility sizing for the year 2040 and this was then scaled back to feasible intermediary development (capacity) milestones that would allow for a phased programme of development.

The facility sizing was looked at in an integral way; not merely focusing on

functional processing but including an assessment of the future need for Commercial Area and facilities that enhance Customer Experience. This integrated approach allowed NACO to develop a facility programme that brought more value than merely the sum of its parts.

As an example, you can see how this approach is applied to important elements of the passenger journey and how they are integrally linked to passenger experience and commercial interests. (see Figure 10)

Calculating the requirements for the number of self-service bag drop and manned check-in desks would have *met the requirements* of processing GVA's customers. However, planning for an increased depth of the check-in hall to allow for better circulation of a two-step check-in process and accommodating area and flow for passengers without check in or with odd-sized luggage (such as ski equipment), would *add significant value* to the Customer Experience.

Increasing the number of security processors in line with capacity demand would have *met the needs* of GVA's customers. But reserving sufficient depth to



**Figure 10** Geneva International Airport Terminal Ambition Plan key challenges  
Source: NACO.

accommodate stage 3 security screening (benefit of not having to take electronics out of bags before screening) with expandable capacity length and ample circulation area ensures not only compliance with the latest security requirements, but *enhances the Customer Experience*, assuring an enjoyable experience for passengers.

These examples show that each element of the passenger journey relies on an accurate assessment of the facility sizing; going beyond the straightforward numbers and taking into account the dynamic capacity and ease of use as part of the passenger journey. Failing to diligently apply this approach to even a single element of the passenger journey can detrimentally affect the Customer Experience. This may result in congestion, confusion, missing one's flight and ultimately result in heightened levels of stress.

Such traveller stress due to ill-dimensioned terminal spaces was heightened worldwide during the COVID-19 pandemic when such spaces had to accommodate additional processes due to health protocols. This was a wake-up call for many airports to go beyond offering the bare minimum space and plan for more reserved areas for circulation and unforeseen situations.

NACO calculated how much the deficient commercial area had to be increased at GVA, but also — thanks to the proper facility sizing of the above-mentioned processes — ensured that passengers

would enter these areas with reduced levels of stress and therefore a more conducive attitude to spending time and money in the new commercial areas.

Why was this a fresh approach for GVA? Because it purposely ignored the fact that the current terminal would never be able to accommodate this enhanced space programme within its current built shell. Therefore, the consultant assisted Geneva Airport in not accepting a bare minimum or less-than-optimal future space programme by compromising on its facility sizing. Backed by its ability to adopt both a helicopter view or evaluate how solutions may affect very detailed airport systems (zoom in and out), the consultant helped GVA to think in opportunities, not constraints; to start from a clean slate.

The next step in the consultant's planning methodology was to look at how 'quick wins' could improve the current capacity of different areas of the existing terminal. By re-routing the passenger flow and removing cross-flows, it was for instance found that the capacity of the check-in area could be improved and more easily facilitate expansion.

The security area, however, lacked sufficient depth and its current location prohibited future expansion. From the analysis it was concluded that this important process would need to be relocated to a more suitable location, keeping in mind both expansion possibilities and intuitive wayfinding considerations.

The analysis looked at where routing can be improved throughout the terminal for intuitive wayfinding is another important driver to reduce stress levels; it allows passengers to experience their journey through the terminal as if on autopilot, naturally flowing from one space to the next, without disorientation or having to read signs due to (avoidable) cross-roads along the way.

For the Commercial areas, the consultant concluded from its analysis that the existing  $7.2 \times 7.2$ -metre grid of this part of the terminal was incompatible with modern retail concepts, since it blocked the customer's unrestricted orientation and circulation with no potential for the optimal commercial layout plan with the smart routing of customers, maximising frontage for the retail and Food & Beverage (F&B) outlets. It was clear that ultimately, the commercial area would also need to shift to allow for better returns and future expansion.

The existing 1968 terminal building did not only have a restrictive structural grid at the location of its current commercial area, but also an unusually large multi-story office block. It was in the wrong place and obstructed the passenger flow and overall flexibility of the terminal's expansion.

On the landside, the consultant explored how the current situation with an array of transportation modes, frequently congested and not logically aligned, could be transformed into a new transport hub with an enhanced traffic-flow recirculation system, a more seamless connection to the terminal processor, and compliance with the latest security considerations.

Now that the existing terminal building areas' programmatic constraints and potential (improved) capacity were

established, the gap could be defined with the future capacity demand (and calculated future facility sizing).

This additional programmatic area of the TAP will need to be realised in the most logical relationship with the existing terminal functional areas, together forming a new and enlarged terminal. This is initially done via a massing study, exploring different configurations that allow for logical functional flows from landside to airside and *vice versa*.

At key stages in the above-mentioned process, the consultant was able to liaise with the airport's key internal stakeholders thanks to GVA's well-established stakeholder framework. This is to be cognisant of their key concerns and operational challenges and ensure that the different steps in the planning process take account of them.

One of the key concerns of airport stakeholders is 'operational continuity'. Ensuring that terminal operations are able to continue with minimal hindrance during a refurbishment or expansion project is one of NACO's core expertise areas, having perfected this art during 50 years of modular expansion and refurbishments of Schiphol Amsterdam Airport's 80-MAP 'one roof terminal' complex. For each TAP configuration, the consultant analysed the potential phasing challenges/strategy with intermediate phasing steps, keeping things simple and buildable with a clear and clean configuration.

In close collaboration with the GVA, one of the TAP configurations was finally chosen for further detailing.

Next, feasibility studies were undertaken to test the robustness of the development phases in terms of continuing existing terminal operations during the construction and refurbishment of each phase. As part of this study,

GVA has analysed alternative locations for a new terminal, to allow the existing terminal to remain in operations unhindered whilst constructing the new one.

However, all the alternative locations for a new terminal that were analysed have all been declared not suitable. Reasons ranged from political ones, as the land would be just over the border in France, to a lack of future extension possibilities, or a general lack of landside capacity to accommodate all arriving and departing passenger traffic.

Since finding a location for a new terminal was abandoned, the next stage of feasibility studies was to look at different implementation strategies to rebuild the terminal in the same location of the existing terminal. This implementation strategy needed to ensure that the maximum level of reduction of operational capacity was limited to 20 per cent, since this would result in an acceptable reduction in the operational quality of the airport. Unfortunately, three different approaches investigated during these feasibility studies either did not ensure the maximum level of operational capacity reduction or the number of required intermediary stages resulted in an unacceptable total duration.

This was also the case if the airport was to opt for a complete renovation since the constraints to maintain operations would result in the total works lasting over 45 years. Furthermore, this approach would not address the expectations, requirements and issues related to space and building constraints mentioned in previous chapters.

## Solutions

A solution that was briefly explored in the initial phases of the Terminal Ambition

Plan proved to offer a way around these limitations. By shifting the taxis, buses and parking spaces for arriving and departing passengers from the forecourt and demolishing a restaurant that sits on the roof of the railway station, a first phase of the terminal replacement can be realised in front of the existing terminal, providing the required depth for both the new 2- or 3-step check-in and the new standard 3 security screening filter (see Figure 11).

This first phase is composed of the intermodal hub on top of the railway station and the terminal replacement in front of the existing terminal that would create better integration with the railway station and multiple mobility options, a vertical access core, new check in and new security area (see Figure 12). This will allow for a seamless connection between air, rail and public transport options to support GVA's ambition to increase public transport use by air travellers and staff to 60 per cent.

The second phase would then replace the existing 1960s terminal by creating an increased and modernised area for the passengers after the security control and before boarding, with an expanded commercial area, better circulation space and a much better frontage for the different areas.

In 2020 GVA like all other airports was hit by the COVID-19 pandemic and was forced to reduce its investment budget for the coming years. Nevertheless, the terminal replacement programme must commence before the end of 2021 to ensure the availability of increased capacity by 2032, the year we would reach serious capacity constraints with the existing terminal. Hence, a decision was taken to limit the committed investments to phase 1 only.



**Figure 11** Exterior impression of the Terminal expansion with integrated mobility hub  
Source: Itten+Brechbühl SA.



**Figure 12** Interior impression of the Terminal expansion with integrated mobility hub  
Source: Itten+Brechbühl SA / Saguez & Partners.

The implementation of the first phase would enable GVA to address the main operational challenges and allow a first extension and modernisation of the commercial area. The second phase would have to be decided around 2030 and would then allow the modernisation of the rest of the main terminal and bring the commercial space to its final size.

Given the complexity of expanding an existing building partly on top of an underground railway station, the capabilities and knowledge of construction companies was appreciated as early as possible in the process. Therefore, it was decided to ensure 'Early Contractor Involvement' by shortlisting three Design & Build (D&B) consortia who would work in parallel, competing to bring GVA the best, realistic design solution for phase 1 of the works. A detailed programme definition will ensure the underlying requirements are met.

During this parallel project development that will last approximately one

year, GVA will have regular exchanges with the three companies to ensure they work towards a scheme that is well adapted to the identified needs, whilst at the same time overcoming the constraints (operational and otherwise).

The selection phase of the three participating companies will be between September 2021 and January 2022, followed by the parallel project development from January to December 2022 and the final selection by end of 2022. The selected D&B Contractor will then be appointed by May 2023 and construction will continue through to May 2032.

GVA looks forward to thus realising the most important aspects of its Terminal Ambition Plan, namely a more spacious terminal with largely improved commercial areas, new security and enhanced check-in/bag drop facilities and an integrated multi-modal mobility hub with sufficient capacity to cater to future demand peaks, free from congestion and in line with its sustainability credentials.