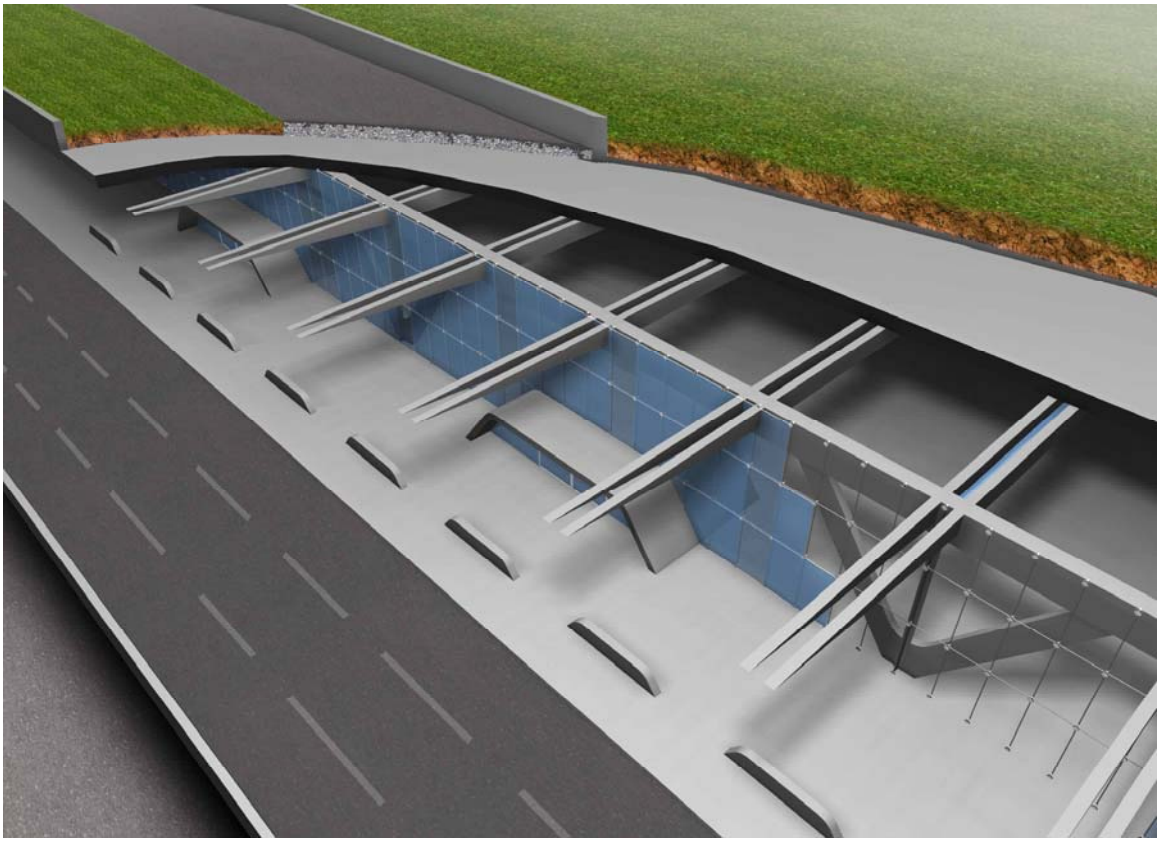
ARCH 384: Airport, Security, Circulation

Fluid Trajectory



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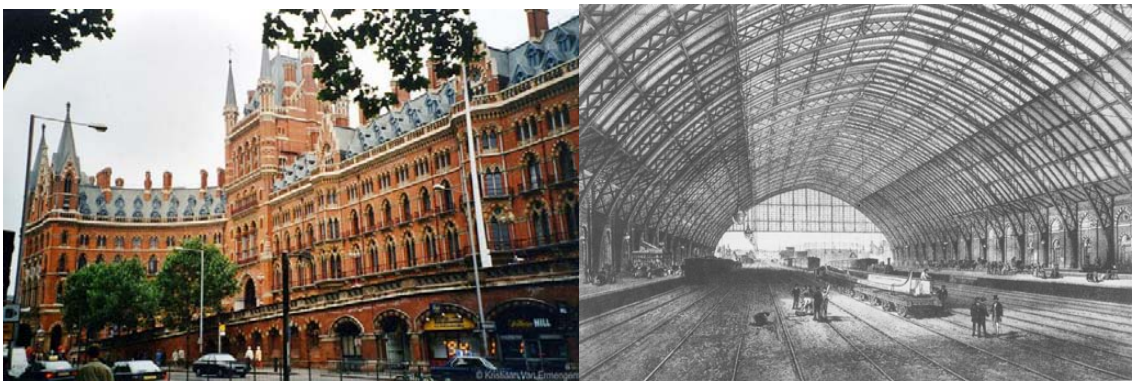
ARCH 373 Airport, Security, Circulation: Fluid Trajectory

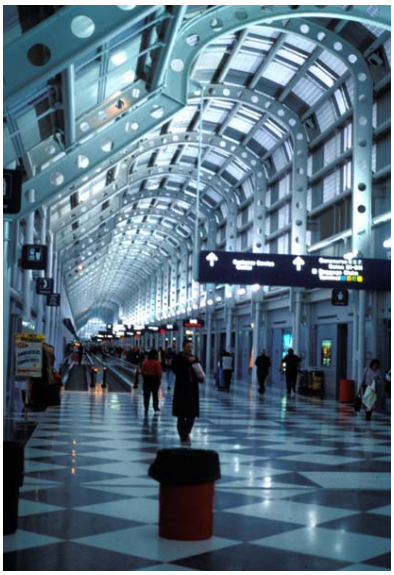
Since the industrial revolution, transportation hubs have become important symbolic buildings. As the gateway to city or region, these buildings provide visitors with their first impression of a place and as such are expected to reflect the local culture and environment. In addition to the local symbolism, these buildings are also symbolic of the increased mobility and globalization that characterizes modern times.

In the nineteenth century, this role was filled by the major train stations. Most of the train stations of this period consisted of two major components: a monumental masonry building and long span, steel train shed. The masonry building usually contained the main ticket hall and provided the front façade of the station. The architectural style reflected the history and traditions of the place and thus provided a connection to the local surroundings. The steel train shed was located at the back of the station and spanned the platforms and tracks. This structure had no historical precedents and instead was designed in a functional, industrial aesthetic. These buildings were showcases of the power of modern industry and technology and as such, of the international forces of the industrial revolution. The juxtaposition of these two parts allowed the station to relate to tradition and place while also being modern and international. This arrangement did not completely reconcile the conflicting symbolisms because it did not provide any continuity or connection between the two conditions.



St Pancras Station, London: Façade and Train Shed

Since the Second World War, air travel has replaced the train as the primary means of international transportation and as a result, the airport terminal has replaced the train station as the symbol of modernism and travel. Since that time, an international architectural style for the airport terminal has evolved. This style generally ignores the need to symbolize place and instead is international and modern. These airports are characterized by open airy spaces intended to evoke flight. Modern steel and glass are the primary building materials. The public spaces are often covered by a long span steel roof structure, whose aerodynamic shape recalls the airplanes that passengers will soon board.



Chicago O'Hare International

The programmatic demands of the airport terminal are unique to this building type and require unique solutions. The terminal is characterized by the need to efficiently process large numbers of passengers who are passing through the terminal en route to another destination. While passing through the terminal passengers must do a series of tasks including getting boarding passes, checking luggage, passing through a security checkpoint and reclaiming luggage. The terminal must also connect to multiple types of ground transportation to allow passengers to arrive and depart. A separate specialized system

is required to accurately sort luggage and load and unload it from planes.

Airports and airplanes have been the targets of many terrorist attacks and as a result a high degree of security is required. For security purposes the airport terminal is divided into two distinct zones referred to as landside and airside. The landside area is unsecured and contains the ticket counters, baggage check and baggage claim. The airside is separated from landside by a security checkpoint and contains the concourse where passengers board and disembark from the planes. Securing the boundary between airside and landside is critical for protecting the planes from attack. This is the primary security concern since, historically, attacks on airplanes have caused much more damage than attacks on airports. Since 1980, there have been 150 attacks on aircraft causing 4 280 fatalities, but only 75 attacks on airports causing 76 fatalities. If the airside-landside boundary is secure, the greatest danger occurs in crowded areas on the landside. People waiting to get boarding passes or to reclaim luggage are attractive targets due to the potential for a large number of casualties, the symbolic value of attacking an airport and the lack of a security checkpoint protecting the target.

A series of typical programmatic arrangements have evolved that are able to reconcile the complex demands of this program. The landside portion of the terminal is usually contained in a central building with access roads along one façade to allow for passenger pickup and drop off. The security checkpoint connects the landside to the airside concourse which is typically consists of a configuration of long piers that provide space for aircraft to dock. In airports that do not handle many connecting flights, it is preferable to segregate arriving and departing passenger circulation. This arrangement creates more efficient circulation and improves security by making it more difficult for arriving and departing passengers to meet. Arriving passengers are a possible security risk because the security may have been insufficient at their origin airport. (Hub airports usually do not segregate arrivals and departures in order to make it easier to transfer flights.) This separation is usually accomplished in section. Departing passengers travel towards the airplanes on the

upper level of the terminal and descend to the airplanes. Arriving passengers descend from the plane and travel towards the baggage claim below the departures concourse. As a result, passengers are never required to go up which can cause delays for large crowds.

Our proposal re-examines and attempts to reconcile these contradictory requirements. Like the early train stations, our terminal reflects its role as both a gateway and a part of an international system. The landside portion of the terminal, like the masonry front of the train stations, provides the strongest connection to local conditions. The building is integrated into the gently rolling topography of the river valley. A series of sloping roofs rise from the level ground of the airport. The roofs are planted with meadow grasses to further integrate the building with the landscape and provide environmental benefits. The flowing curves echo the adjacent river. On the airside, the building opens up to the airside concourse which is a tubular glass and steel structure. The two halves of the building are integrated by a shared geometry and the repetition of the architectural language of the landside in each of the gate lounges.

Our proposal attempts to express the circulation of passengers because it is the primary function of the terminal. The terminal creates a series of processional spaces in which circulation occurs. Curving lines define the shape of the building and follow the route of the passenger. The sloping roofs of the landside accommodate access roads for the parking garage, transit terminal and the landside and airside curbsides. The curve of the roads forms a large entrance court in front of the building. A second curve defines the shape of the building and acts as a transition between the alignment of the access roads and the alignment of the runway. Circulation between the airside and landside follows this path. On the airside, the circulation path weaves between the gate lounges, adding variety and breaking the monotony of the long concourse.

Our design also incorporates many security features. We minimized connections between airside and landside to reduce the possibility of security breaches and decrease the number of security staff required to operate the building. All passenger circulation passes through a

single checkpoint. A second checkpoint located nearby on the lowest level of the airport, screens cargo and staff. In addition to securing the airside, we focused on the security of passengers from various attacks while on the landside. Some of the dangers we considered were car bombs, luggage bombs and biological or chemical attacks. The most effective solution to all of these dangers is to reduce crowds on the landside. In the ticketing hall, queues can easily be reduced operationally by adding staff. At baggage claim it is more difficult to reduce crowds operationally because passengers must wait to collect their bags and the bags generally move slower than the people. To reduce this danger, we enclosed the baggage claim hall so that entry can be restricted to arriving passengers only. This arrangement has the additional benefits of reducing theft and easing passenger flow through the terminal. To reduce the danger from car bombs, we placed the ticket desks and queuing areas at a generous distance from the road so that they would be out of range. The curtain wall is suspended and is designed to absorb part of the force of the blast without shattering the glass. The danger from biological and chemical attacks is reduced by a very effective ventilation system. The heating, cooling and ventilation system uses the hollow cores of pre-cast concrete slabs as ducts. The concrete of the slab acts as thermal mass, dramatically improving the efficiency of the system. The improved efficiency allows it to run affordably while only supplying fresh air. The lack of recirculated air allows the system to dilute any toxic agent quickly and effectively.

Despite its unusual appearance, the organization of our terminal is still based on many of the standard relationships typical of modern airports. The airside concourse is configured as two piers. Departing passengers enter the terminal at the upper level and descend to the airside concourse and their planes. Arriving passengers deplane into the lower level of the concourse and continue on that level to baggage claim and the curbside. We chose to retain these relationships because they are functional and allow for an efficient, flexible and safe terminal. The aesthetic expression of our proposal is built around and inspired by these basic relationships. Its articulation of the main circulation paths helps orient passengers and eases their passage through the building.

The form of the building is the result of a thorough study of the programmatic, security and symbolic demands of the building type. The result is both expressive of its function as a center of circulation and transportation and strongly tied to the surrounding landscape.

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