August 7, 2009

This sketchbook is an affirmation of our faith in the urbanistic and ecologically regenerative possibilities of extant infrastructure in a rapidly evolving world with limited natural resources.

U.S. airfields, primarily designated for military aviation use, grew significantly during the WPA administration. Over the last 75 years, the Federal Aviation Administration and the Department of Transportation has worked tirelessly to modernize, or replace altogether, most of these facilities, including many of which that have evolved into one of the 439 commercial US airports throughout the county. The current economic and environmental challenges we face brings to the forefront a series of important questions to address with the rehabilitation of our aging U.S. aviation infrastructure.

Using a major mid-Atlantic U.S. airport as our laboratory for this analysis, we continue to ponder these key questions forming the basis of our design inquiry:

- What is sustainability in a seemingly “un-sustainable” context, such as aviation?

- Can extant airport infrastructure be re-imagined to take advantage of latent energy resources and provide a framework for good urban design?

- Can aviation systems be re-engineered to be self-sustaining and co-generative?
KEY ISSUES

Is it possible today, to go beyond the perfunctory ‘green’ terminal building in aviation systems? Considering the disproportionality of building structures to the overall land mass in airports, is it possible for design and engineering teams to begin reconceiving this 20th Century system as a holistic ecological network that is regenerative and opportunistic with the abundant natural resources that are latent?

We suggest to our colleagues in the industry that it is indeed economically and operationally feasible to reconceptualize airports in such a seemingly far-reaching manner.

Consider the abundance of renewable resources surrounding large airport systems: sun, wind, and water. The most readily available resource at the airport is also its most daunting challenge – the aircraft. Leveraging all these resources, including the aircraft, the team has embarked on a line of enquiry that seeks to create recombinative relationships that are efficient and resourceful to enable airports to be more than a mere coupling of ‘green’ buildings.

THE CHALLENGE

The disparity between landmass and energy consumption illustrates a fundamental problem with resource utilization in airports.

Our design enquiry proposes to further investigate opportunities to:

1) Optimize the regenerative capacity of the airport’s largest landmass – the airfield – the take advantage of wind, water, and solar energy sources that permeate the site.

2) Leverage interrelationships with these resources to make the airport facilities carbon-neutral.
IS AVIATION SUSTAINABLE?

Aircraft are the largest source of carbon emissions in our world... That’s the largest single contributor, and it’s the toughest thing we’re dealing with.

Gina Marie Lindsay, Executive Director
Los Angeles World Airports
Interview on Verde Xchange News, November 2007

67% of the overall area at this airport is considerably underutilized.
THE Co-GENERATIVE AIRPORT

The airport airfield - which in this particular case, representing over 60% of the overall airport land mass – is laden with regenerative opportunities on the horizontal as well as vertical surfaces of the campus. Many of these areas, as identified by the orange-colored imaginary obstruction clearance surfaces, are restricted zones – generally restrictive of public access and congregation. As such, these airfield zones often lay fallow and underutilized.

However, by analyzing the interstitial zones – physical and otherwise – that emerge from these extant conditions, it becomes apparent that this large landmass can be better optimized to harness the abundance of latent solar, hydrological, as well as wind power opportunities around the airport site.

The following sketches developed for PROJECT RUNWAY begin to explore potential lines of inquiry to reimagine restricted airport airspace areas.
THE Co-GENERATIVE AIRPORT

LEGEND

A ALGAE FARMS FOR BIODEISEL PRODUCTION
B BIO-FILTRATION DETENTION PONDS FOR AIRPORT RUN-OFF
C HYDROPONIC AND OTHER RESEARCH PLANTINGS SERVED BY DETENTION POND
D NATURAL RESERVE / HABITAT
E MEP HEAT EXCHANGER RESERVOIR

NOTES

WIND HARNESSING BLAST / SECURITY WALLS
BIOFILTRATION SWALES – RELEASES WATER INTO DETENTION POND
**STRATEGY 1: Water | Solar Harvesting**

**ALGAE FARMS**
1 – cargo area
2 – main terminal area
3 - general aviation area

Algae farms are low-lying, minimal maintenance systems that can generate bio-diesels using solar exposure. Their locations exploit areas with height restrictions.

**BIORETENTION / FILTRATION PONDS**
4 – main terminal area
5 – FedEx apron
6 – ARFF area
7 – general aviation apron

Bio-retention / filtration ponds can support biodiversity and naturally consume effluents and other run-off typically not appropriate for re-entry into waters. The systems will also treat / purify water for re-use in other areas, including the hydroponic growth zones along the airside. These systems are strategically located at all large aircraft parking areas and are fed by the yellow bioswales that make up the majority of the airfield.

**HYDROPONIC GROWTH ZONES**
8 - cargo area
9a – FedEx apron A
9b – FedEx apron B
10 – ARFF area

Hydroponic agriculture requires only water – which can be provided by the airport’s biofiltration ponds – with no dependency on soil. Its disposition makes it increasingly popular in urban and industrial locations. Its unique configuration also makes it appropriate for myriad airfield locations with height restrictions.
Rather than fight the river’s various natural aquatic habitats (as well as the conservation commission), a strategy we propose for consideration is the development of heat exchange basins that provide a buffer for the direct release of process energy from natural resources.
The airfield environment is robust with latent wind energy. Whether it is from jet propulsion or from the elements, the open airfield should be properly analyzed and exploited for its abundance of renewable energy. Re-conceptualizing the traditional blast/security fence, an integrated turbine-blast wall ("turbinewall") system was developed to harness wind energy.

The inclusion of an air filtration plenum located between the blast wall and the supporting structure further improves the adjacent pedestrian or abutter environs.
STRATEGY 3: (cont’d)

Urban Design Considerations

One of the most important points of these sketches is a reminder that the architecture of infrastructure carries a public responsibility and must be capable of rising to meet the challenge of transportation as well as civic aspirations. We believe strongly in an architecture that incorporates thoughtful urban design and integration to the abutting environs.

As a solution to typical blast walls at airports, this is an effort to further our argument that sustainability, architecture, infrastructure, and urban design are not mutually exclusive.
PROJECT RUNWAY

Otherwise known as wpa2.0 – Towards a Sustainable Airport Urbanism