AIR TERMINAL
DRESS REGIONAL AIRPORT
EVANSVILLE, INDIANA

MICHAEL J. BUENTE
THESIS 77

A BUILDING REUSE PROJECT
PROGRAM

A BUILDING REUSE PROJECT
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Design Thesis  
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Thesis Proposal

The major problem facing Dress Regional Airport at this time is the inadequacy of the present terminal facilities. Although expansion of the existing facilities in recent years helped solve Evansville's immediate problems, it did not facilitate future needs. This project assumes the construction of a new crosswind runway, similar to the runway proposed by Ralph H. Burke, Inc., Airport Consultants. (1970) My proposal is to investigate the use of the existing Sunbeam Plastics Building and surrounding apron areas and design a new terminal to meet projected growth of air passengers. This building is near the new FAA offices and tower, and is in an advantageous spot for a terminal. It has a close relationship to both the existing runway and the proposed new runway.

The solution to the project entails determination of necessary interactions between people, land transportation, services, and aircraft, with primary interaction being circulation. This project will allow smooth transition between existing and new facilities, minimizing operational interruptions.

The Sunbeam Plastics Building is an old military aircraft modification plant which is a large free spanning structure. It has a square foot floor area of approximately 75,000 sq. ft. This project will most likely be an adaptive solution, and could deal with the redesigning of the interior of the existing building as well as the possibility of a new structure. Because this project has these qualities, I believe it will make an excellent Thesis project.

Because my father has always kept his plane at Dress Regional Airport, and because I have always lived nearby, I have spent many hours observing and participating in the activities there.  

Michael J. Buente

[Signature]
Project Goals and Objectives

1. Design a terminal and support facilities to meet the projections of 1990. This includes passenger handling, airline operations, convenience facilities, management, circulation of baggage and freight, and vehicular circulation and parking.

2. Create a facility that allows a smooth transition between air and land vehicular traffic.

3. Make use of existing buildings when feasible.

4. Create a gateway to Evansville which gives an initial impression to an airline passenger, that is favorable to Evansville and the community.

5. Minimize operational interruptions while making the transition between new and old operations.

6. Create a facility that will except expansion for future needs.

7. Co-ordinate with the conversion of the old terminal to a Fixed Based Operator facility which would serve business jets and charter flights. It should also co-ordinate with the air freight terminal which will have its own apron.

Design Assumptions

1. Based on the Burke study, the average number of seats on an aircraft serving Evansville will increase from the present 70 seats to about 170 seats. Therefore, it is assumed that DC-10 type aircraft will be operating at Evansville by 1990.

2. This project assumes that a new crosswind runway will be built in the location as recommended by the Burke study.

3. This project assumes that IND. Highway 57 could be re-routed to meet Highway U.S.41 by means of Interstate 64, thus allowing vacation of a portion of Highway 57 which runs north of the airport. This course of action is proposed by the Burke study, and is assumed that it can be followed if it seems beneficial to the project.
Reason for the Project

The rapid growth of aviation facilities at Dress Regional Airport, Evansville, Indiana, has caused many problems for the airport and the community. The primary cause of this growth was a economic revitalization of Evansville which started about 1962. The introduction of almost total jet service in 1967 showed the facilities to be inadequate, so consequently, additions to the terminal were made. The present terminal does a moderate job, but it is inhibiting expansion of the airline services to meet passenger projections of the future. As an example, when two airliners are at the terminal at the same time, the facilities are swamped, while realizing that this situation is a rare one at present, it shows the immediate need for expansion for the future.

Another problem facing Dress Regional, is the fact that there is no crosswind runway. The present NE-SW runway is adequate for 96% of the wind conditions, but unsafe for the other 4%. The main problem however, is the lack of an adequate secondary runway capable of handling commercial aircraft in the event that the NE-SW runway must shut down. (i.e. a collapsed landing gear on a plane, or runway repairs) When this happens, Evansville is without commercial air service. In my opinion, the Evansville Air Board should adopt the runway layout in the Master Plan Study by Ralph H. Burke, Inc. (1970)

In my opinion; there are four courses of action available to Evansville if they intend to keep up with the demands for a modern airport. One is to buy land and construct a new airport, probably near Interstate 64. Another is to acquire land near the present airport to build both a new terminal and a new runway. Thirdly, they can acquire land for the runway only, and build a new terminal on land they already own. The fourth option is to expand and/or build a new structure at the present terminal site. Although it is questionable which course of action is the best one, this project deals
with the third course of action. This project will investi- 
gate the use of the existing Sunbeam Plastics Building 
(which the Airport Authority owns) and surrounding apron 
areas in an attempt to find a viable solution to expansion 
to meet projected growth while making use of existing facili-
ties. This is not to say that this is the best solution 
to Evansville’s airport problems, economically speaking, but 
it does seem to have some economic attractions. At most, this 
project will show what type of facilities that this site can 
accommodate. This project could possibly help the Evansville 
Air Board make a decision on how Dress Regional Airport will 
grow

Advantages of the Site

1.-- The site is at the intersection between the present in-
strument runway and the new runway.

2.-- The site includes the new FAA offices and tower

3.-- The site has an existing large free span structure and 
existing concrete apron areas.

4.-- The site is presently owned by the Airport Authority, or 
at least a large % of it.

5.-- If the portion of highway 57 running through the site is left 
open, the terminal could have access from two major 
highways from different directions. In either case, 
(close or open) 57 can serve as the major access to the 
site.

6.-- The site is far enough from U.S. 41 as to permit a clover 
leaf type intersection for an entrance into the termi-
nal. (unlike the existing terminal)
History of Client Operation Growth

Dress Regional Airport was opened for air operations in 1929. It was built on 278 acres of land which included a grass landing strip and Hanger #1, which is now leased to Metro City Aviation Inc.

In 1941, three concrete runways were constructed. These runways were each 3500 feet by 100 feet. Hanger #2 was built at this time and 177 acres of additional land was acquired. In late 1941, the Republic Aviation Plant (now the Whirpool Corporation Plant) was built to produce P-47 Thunderbolt fighter aircraft.

The Federal Government constructed a military plane modification plant in 1942. It is presently owned by the airport authority and leased to Sky Service Corporation, which in turn subleases to Sunbeam Plastics Corporation.

The Federal Government spent additional funds during the war to lengthen and widen two of the runways. This included the N-S and NE-SW runways.

In 1945, the first terminal building was constructed, as a temporary facility, and is presently the office of Tri-State Areo Inc. In Oct. 1946, the Federal Government returned the temporary wartime facility to civilian operations. In 1948, the present terminal building was constructed, and aircraft ramps, taxiways and roadways were constructed in 1951. The Evansville-Vanderburgh Airport Authority was established in 1959.

Since 1962, the principle additions to the airport have been the acquisition of some 700 acres of land, the lengthening of the NE-SW runway to approximately 8000 feet, and the extension of the taxiways. Other changes included electrical system and instrument improvements, the relocation of Highway 57 and part of the New York Railroad tracks. The addition of four new hangers have increased general aviation at the airport.

Recent expansion of the terminal consisted of enlarging
the airline operations, the baggage claim, waiting lounge, and the rest rooms. At the same time the parking was expanded, and a new vehicular entrance and roadway was built. In 1976, a new tower, which also houses FAA offices was erected near the present Sunbeam Plastics Plant. As of this time, no future expansion is planned; so how Dress Regional Airport will expand in the future is only speculation.

**Population and Air Carrier Passenger Potential**

The population of the community plays a major part in evaluating air carrier passenger potential. Estimates of air carrier traffic depends largely on the population growth of the community and the travel characteristics of the people. Evansville has no rail service and no Interstate Highways passing through it. Interstate 64 does run E-W through Indiana, but is at least ten miles north of Evansville. Evansville does have bus service, but airline service is the major gateway to Evansville. Although Evansville experienced rapid growth starting in 1962, its population growth has slowed considerably. The population of Evansville in 1975 was 144,124 and is estimated to be 156,950 by the year 2000.²

Dress Regional serves more that just the citizens of Evansville in that it is the major airport in the Tri-State area. This can be seen in the fact that on the average day, 60% of the automobiles in the terminal parking lot, are from out-of-state. For this reason, the Evansville Standard Metropolitan Statistical Area (SMSA) population, which includes Evansville, Vanderburgh County, and Henderson County, Kentucky, must be taken into consideration in estimating air carrier passenger potential. The estimated population of this SMSA area in 1990 is 273,750 people.⁴ Although this SMSA area serves as the primary air trade area, a secondary air trade area encompasses an area within a 30 mile radius of Evansville.
If the facilities at Dress Regional Airport are expanded, Evansville may attract passengers from smaller cities that currently have very limited air carrier service. These cities include Owensboro and Paducah, Kentucky; Marion-Herrin, Illinois; Mt. Vernon and Lawrenceville, Illinois; and Vincennes, Indiana.

From the estimated population of the SMSA in 1990 and taking into account the secondary air trade areas, the probable annual passenger movements will be 1095000, and the peak hour passenger movements will be 554.⁵
Terminal Configurations

When looking at terminal configurations, there is one attribute that the configuration must have. That attribute is flexibility. A factor that the designer may consider stable is that of change. Aircraft change is size and maintenance, service requirements, and capacities. Terminal systems change as technology improves. Therefore, public spaces, baggage claim, ticketing, holding rooms, and corridors must be able to adapt to meet these changes. Deficiency in terminals, when change occurs, may be resolved by technological means. These deficiencies, on the other hand, can be remedied much easier through flexible design procedures at the outset of the project. Therefore, flexibility can not be stressed enough.

The method of accepting aircraft to the terminal is the one most important influence on the configuration of the building, both in form and circulation. There are four basic terminal concepts. These are the pier, satellite, linear, and the transporter. (diagrams and descriptions are on the following pages) These basic terminal configurations are the result of a evolutionary process. In a simplified form, there are three generations of terminals. The first generation terminal occurred in about 1930-50. It was a simple building which permitted direct interchange from airport access modes and the aircraft. Evansville's present terminal is this type. Second generation terminals were built in the late 50's as a result of increased air traffic and the need for more gates. These extra gates were usually attached to existing 1st generation terminals, usually through concourses with walkways to serve for both enplaning and deplaning passengers. This type of terminal is the most common in the U.S. and Europe. Third generation terminals have now evolved as a result of the need for more gates which cannot be efficiently solved by the addition of more concourses. The primary difference between 2nd and 3rd generation terminals is the way passen-
gers are moved to the plane and by the means that baggage is processed. Mechanical devices (people movers, mobile lounges) have replaced walking because of the great distances.

Aircraft Parking

There are several types of positions that an aircraft can park at a gate; nose-in, parallel, angled nose-in, and angled nose-out. Some of the advantages and disadvantages of each follow:

nose-in Plane pulls perpendicular to the gate with the nose as close to the building as possible, and maneuvers into position under own power. It must then be towed out.

advantages:
1. Requires the smallest gate area for a given plane.
2. Low noise levels and no turning movement.
3. No jet blast toward the building.
4. The nose is close to the building, hence, short bridges.

disadvantages:
1. Requires the use of towing equipment.
2. Rear doors are too far from the building to be used effectively for loading or unloading.
3. The towing maneuver may take up to 2 minutes.

parallel

advantages:
1. Easiest maneuvers for the aircraft.
2. Low noise and jet blast.
3. Both front and rear doors can be used.

disadvantages:
1. Long loading bridges must be used.
2. Uses a long gate position.
angled nose-in
Similar to the nose-in, but can maneuver in and out of the gate on its own power. However, it has a larger noise level and requires a larger gate area than the nose-in.

angled nose-out
Can maneuver in and out of the gate on its own power. Requires more gate area than the nose-in but less than the angled nose-in. It has a high noise level and jet blast level.

Apron Service Requirements

Aircraft need to be serviced at their respective gates. While most of these services may be accomplished by means of mobile units, there is a need to limit apron congestion as much as possible. Hence, there is a trend to replacing mobile units with fixed installations. Some of these installations and their requirements are as follows:

Aircraft fueling
Hydrant systems are the most popular of fueling systems. A valve is mounted flush with the pavement of the apron, and a hose reel, meter, filter, and air eliminator are contained in a mobile self-propelled unit. While this does not eliminate the mobile unit altogether, its size is greatly reduced over tankers. The mobile pumping unit also reduces the cost and maintenance of having these pumping facilities at each gate. Each grade of fuel requires a separate hydrant.

Electric Power
Electric power is necessary at the apron for the aircraft prior to engine starting. Often it is necessary for the starting of engines itself. For fixed installations, the most satisfactory technique is to bury conduits under the apron, terminating them at the supply point. This should be some distance from the fuel hydrant.
Aircraft Grounding

Grounding facilities are required to ground the planes and pumping inits from static discharge. The location of this facility will be near the hydrant valves.

Apron lighting

Adequate lighting of the apron is required and each gate should be well illuminated when possible. This lighting eliminates the need of headlights on ground vehicles which can lead to confusion on the apron area. Uniform lighting is desired, but pilot glare should be eliminated. Flush up-lights are required for the underside of the aircraft. This allows lighting for the service crews.

Aircraft Handling Equipment

In certain parking configurations (ie. nose-in) mechanical equipment may be used to maneuver the aircraft.
1. Turntables on which aircraft wheels would be positioned and the aircraft would be rotated at the gate.
2. Drag lines with subpavement driven cables.
3. Tugs or a unit that attaches to the planes landing gears and rotates the main gear wheels and maneuver the plane.
Flight Interface

The following facilities should be provided for the passengers between the processing area and the apron area:

1. Space for assembly of passengers adjacent to aircraft gates. These gate lounges are used for a holding area following the security check, as well as an area to assemble passengers for a particular flight.

2. Conveyance facilities, including moving sidewalks, buses, or mobile lounges, depending on the handling concept used.

3. Loading facilities, including jetways, nose bridges, stairs or escalators.

4. Conveyance facilities for passengers who are transferring between flights.

![Typical aircraft loading jetway](image)

![Typical mobile lounge](image)
Processing

Three major design objectives relating to passenger processing include:

1. Minimize delay in processing of passengers and baggage.
2. Minimize walking distances.
3. Protection from the elements.

As mentioned before, flexibility of the building design to allow change is essential. Since this project will most likely include adapting a large existing structure, which will most likely serve as a shell, flexibility should not become a great obstacle.

Vertical separation between primary processing activities has the same advantages as the vertical separation of vehicular arrivals and departures. With a one-level system, separation between arriving and departing passengers, and baggage handling occurs horizontally. With this system, stairs are normally used to load passengers onto the aircraft. This is suitable for terminals not exceeding 1 or 2 million passengers annually, which would apply to Evansville. Two-level terminals separate the processing areas from the baggage handling areas. One method is the same as the one-level with the exception of the baggage handling being on the lower level. Another method is to have the departing-passenger-processing on the upper level and the arriving-passenger-processing, including baggage claim, at the lower level. In this configuration, vehicular access and parking occurs at both levels, one for arrivals and one for departures. With both of the multi-level configurations, an obvious advantage is that the passenger handling level is at the same height as the aircraft doorsill. A multitude of variations can be made from these basic configurations. These configurations combined with the different flight interface configurations make a variety of possibilities for passenger processing. (see flow charts)
Activities in the Processing System

Departures:
1. counters for ticketing and baggage check-in.
2. counters for security check (prior to enplaning)
3. holding areas following the security check, should be comfortable for passengers waiting to board.

Arrivals:
1. conveyence of passengers who are transferring flights
2. Baggage claim for arrivals.

In addition to these processing activities there should be waiting rooms (separate from holding rms.), observation areas for visitors, rest rooms, and convenience facilities; restaurant, bar, concessions, barber, car-rentals, insurance, ect.

Circulation should be easily followed by the traveler, with information boards for displaying flight schedules, ect. The placement of management facilities should preferably be at an upper level in a position that enables the manager to observe the terminal areas.

Baggage Systems

The activities needed for processing of outgoing baggage include:
1. Conveyance from baggage check-in points to central sorting area.
2. Sorting of baggage according to the aircraft on which it departs.
3. Conveyance of the sorted baggage to the appropriate gate position.
4. Loading baggage onto the aircraft.

For incoming baggage, processing activities include:
1. Unloading.
2. Conveyance from gate positions to central sorting areas
3. Sorting out baggage that needs transferring to another flight.
4. Conveyance of baggage to claim areas.
There are a variety of claim systems that can be used at the baggage claim; simple shelf, rotating carousel, jet claim, and race track. Whatever is used, baggage claim areas must have sufficient space for passengers to assemble. With conveyor-belt systems, it is possible to check-in and claim baggage at remote locations such as parking garages.
### Terminal Building Space Requirements (1990)

554 peak hr. passenger movements

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<tr>
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#### Airline Space

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#### Management

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Airspace Lufttraum → Runways Startbahnen → Taxiways Rollwege → Taxiways Rollwege → Runways Landebahnen → Airspace Lufttraum

Operations and Ramp Services Operations und Bodendienste

Inbound Baggage Räume für ankommendes Gepäck

Baggage Claim Gepäckausgabe

Holding Area Wartebereich

Emigration Paßkontrolle

Ticketing Flugscheinschalter

Curbs / Vorfahrten

Parking / Parkplatz

Airport Access Flughafenzufahrt → Pedestrian Circulation / Fußgänger

Airport Egress Flughafenabfahrt → Vehicular Circulation / Fahrzeuge

Freight and Baggage Service Beifahrer und Gepäckdienste

Interline Baggage Umsteigergepäck

Outbound Baggage Räume für abgehendes Gepäck

A International Flights Internationale Flüge
B Domestic Flights Inlandflüge

If applicable Falls erforderlich
Ground Access to the Airport

Access to the airport should not be difficult, dangerous, or congested. While these characteristics seem self-evident, to many airports cause tension for the traveler from the time he approaches the airport until he has left it far behind. Options that should be considered at Dress Regional are:

1. Provide more than one route of vehicular access. If highway 57 is left open, this can be possible without building any new major access roads.

2. Separate the various types of vehicular traffic in the airport area. Separate levels of access and departure, including underground levels, could be used to accomplish this.

3. Provide for smooth flow of traffic on and off access roads. This can be done by constructing cloverleaf type interchanges at 41 and 57 and if 57 is left open, there should be a flowing interchange at the terminal also.

4. It would be advantageous to keep air freight trucks out of the terminal access roads. Therefore, the existing cargo building should be maintained and a connecting road or railway should be constructed between the new terminal and the cargo building. This route can serve air freight trains as well as passengers who transfer from commercial flights to charter or private flights.
Parking

Parking problems can be expected to grow as air traffic grows, even if public transportation is used. Facilities for parking should give primary consideration to passenger and baggage-handling. Some options to be considered to handle the parking problems are:

1. Provide separate parking areas, according to purpose for which a vehicle is brought to the airport. Access to the terminal should not be the same for passengers, employees, and visitors. Employees and visitors may be required to park a greater distance from the terminal than passengers.

2. Multilevel parking facilities decrease land use area and reduce walking distances.

3. Control procedures related to parking may be necessary to ensure parking for passengers. Parking space reservations for travelers who store their cars at the airport while away might be sold with the advance purchase of a ticket, ensuring the traveler a slot and giving parking management information of expected traffic.

Space Requirements

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<td>storage</td>
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Footnotes


2. Obtained from Evansville Area Plan Commission.

3. Obtained from Col. James B. Stapleton, Airport Manager.

4. Adjusted from Burke, op. sit.

5. Adjusted from Burke, op. sit.

Bibliography


Wood, John, *Airports*, New York, Coward McCann Inc. 1940
DESIGN

A BUILDING REUSE PROJECT
Evansville Terminal

Michael Buente
SOLUTION

A BUILDING REUSE PROJECT
SECTION

SOUTH ELEVATION