3.3.3 Layout of Doors, Emergency Exits and Windows

All doors, exits and windows are potential sources for leaks, noise, drag and excess weight. Passenger comfort and emergency evacuation requirements demand a minimum number of as well as a minimum size for doors, exits and windows. Here is a clear conflict between requirements of safety, comfort and economics.

3.3.3.1 General aviation airplanes

FAR 23.807 (Ref.11) lists the requirements for emergency exits which apply to this airplane category. Consult this FAR before finalizing any door and exit layout.

Window layout is normally dictated by the seating arrangement in this type of airplane. The reader should look at the door and window layouts shown in the threeviews of Chapter 3, Part II.

Figures 3.48 through 3.52 contain information about door and exit layouts used in general aviation airplanes.

In many general aviation airplanes the wing attaches to the fuselage via two or more fuselage frames. In such cases the window spacing and sizing is dictated by structural considerations.

Refer to sub-sub-section 3.3.3.2 for more information about window location and window design.

3.3.3.2 Transport airplanes

Transport airplanes normally are required to have three types of doors/exits:

1. Passenger access doors 2. Service access doors
3. Emergency exits

Passenger access doors are normally located on the port side. Servicing access doors are normally located on the starboard side.

For airplanes carrying less than 80 passengers one passenger access door is normally sufficient. For airplanes carrying between 80 and 200 passengers at least two such doors should be provided. For airplanes carrying more than 200 passengers, the number of doors depends on the envisioned boarding scenarios.

Comfortably sized passenger access doors should be

6x3 ft. These dimensions are very difficult to achieve in smaller airplanes and a compromise is needed.

The reader must bear in mind that any door or exit represents a potential pressurization leak, a potential drag cause (because of seal deterioration) and a significant increment in weight. From a weight as well as from an economics viewpoint it makes sense to have as few doors and exits as possible. From an emergency evacuation viewpoint the opposite is true.

The number and the size of doors and emergency exits required in civil airplanes are defined in FAR 23 and 25 parts 807-813. The reader should consult these FAR's before starting the door layout process.

Table 3.4 defines the number and the type of required exits as a function of the number of passengers carried. Table 3.5 provides the minimum required dimensions for each type of exit. Figure 3.31 shows what the various exit types look like and where they are located.

Important notes:

1. FAR 25.807 also demands ventral and/or tailcone exits.

2. All emergency exits and doors must meet the 'unobstructed access' requirement. To satisfy this requirement the following dimensions are used:

   For Type I exits: 36 inches of access width
   For Type II exits: 20 inches of access width
   For Type III and IV exits: 18 inches of access width.

3. The unobstructed access width requirement affects the allowable seat pitch near emergency exits! Account for this in preparing a seating layout.

4. FAR 25.807 also requires escape chutes in some cases. Figure 3.32 shows an example for the Boeing 767-200.

5. Additional requirements apply to airplanes which are operated over water, to cope with emergency evacuation following a ditching.

The window pitch in a passenger transport is normally dictated by the 'frame spacing' requirement and not by the seating layout. Fuselage frames are typically spaced about 20 inches apart.

Windows should be shaped as circles, ovals or rec-

Table 3.4 Required Number of Exits per FAR 25

Number of Passenger Seats	Number of Required Exits on Each Side of the Fuselage			
	Type I	Type II	Type II	Type IV
1 - 10	none	none	none	1
11 - 19	none	none	1	none
20 - 39	none	1	none	1
40 - 59	1	none	none	1
60 - 79	1	none	1	none
80 - 109	1	none	1	1
110 - 139	2	none	1	none
140 - 179	2	none	2	none
more than 179	The FAA imposes special conditions			

Notes: 1. The BCAR requirements of Ref.23 are different.
2. Exits do not have to be located diametrically opposed to each other.
3. Instead of one Type III exit it is permissible to use two Type IV exits.
4. See Table 3.5 for dimensions of each exit Type.

Table 3.5 Minimum Dimensions for Exits of Table 3.4

Exit Type and Location	Dim. B	Dim. H	Dim. R	Maximum Step Height	
				Dim. h_1 inside	Dim. h_2 outside
I Floor level	24	48	8.0	not applicable	
II Floor level	20	44	6.7	not applicable	
Above wing				10	17
III Above wing	20	36	6.7	20	27
IV Above wing	19	26	6.3	29	36

Notes: 1. See Figure 3.31 for explanation of dimensions.
2. All dimensions are in inches.

tangles with liberally rounded corners. This is to avoid unneccessary stress concentrations in the pressure shell.

Window tops should be located at eye level of a 90 percentile passenger.

Many dedicated cargo transports do not have windows to save weight!

In supersonic airplanes which fly at very high altitudes cabin windows should be as small as possible. The large pressure differentials encountered by such airplanes may dictate the elimination of passenger windows.

Examples of door and window layouts of passenger and cargo airplanes are given in Section 3.4.

3.3.3.3 Military airplanes

The door and exit requirements for military airplanes varies with the type of mission. The military RFP will normally include references from which the door and exit requirements can be distilled.

Figures 3.53 (AN-26 and Hercules) show examples of door and window layouts of typical military transports.

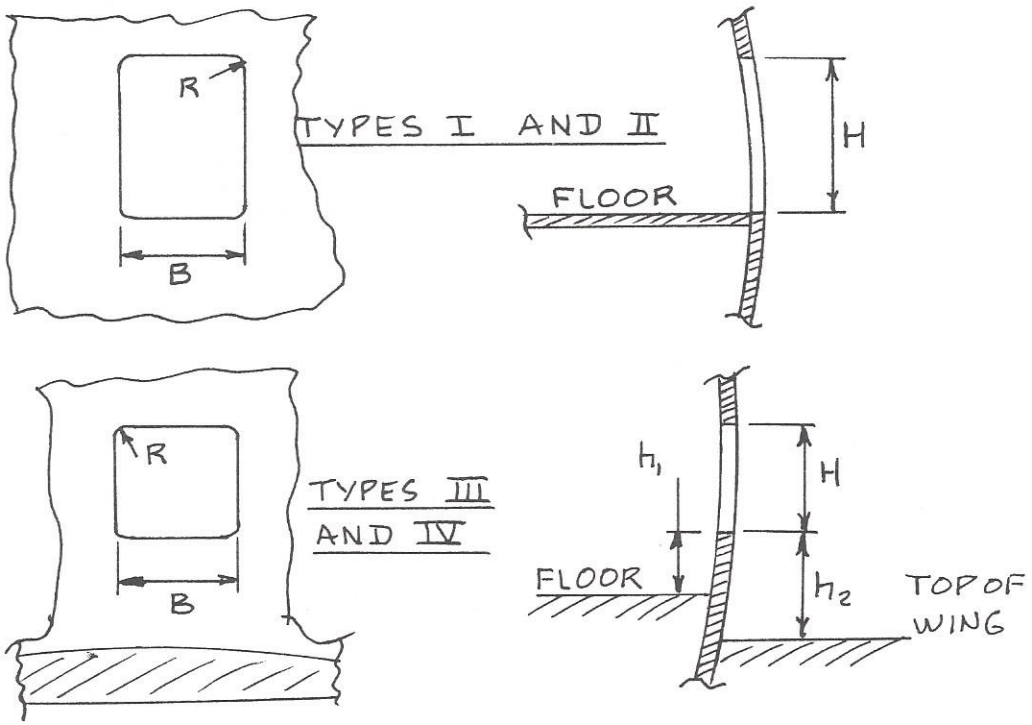

Figure 3.31 Definition of Exit Geometry