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## AIRCRAFT SEATING AND SEATING ARRANGEMENTS

Field of the Invention

5 This invention relates to an aircraft seat and seating arrangements, and to an aircraft cabin having the seating arrangements.

Background of the Invention

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International application no. PCT/SG2005/000041 discloses an aircraft seating arrangement particularly for first class or business class seating. The seat disclosed in this International application is intended  
15 to fold from a position where a passenger can be seated, to a position where the seat becomes a bed.

The contents of the above International application are incorporated into this specification by this reference.

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Summary of the Invention

The object of the invention is to improve the seat so a longer bed can be provided by each seat whilst still  
25 maintaining or reducing seat pitch.

The invention provides a seat for an aircraft cabin, comprising:

a backrest, having a front surface for  
30 supporting a passenger in a seating position when the backrest is in an upright position, and having a rear surface;

a seat base upon which a passenger is  
seatable;

35 a rear seat section behind the backrest when the backrest is in the upright position, the rear seat

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section having an open space which has a base, and a footwell closed to the open space beside the open space;

a fixed side ottoman located beside the seat portion and extending in front of the seat portion, the  
5 side ottoman having a front portion, the front portion of the side ottoman being locatable within the footwell of another said seat in front of the said seat;

the backrest being pivotally mounted for movement from the upright position to a flat position so  
10 the base of the open space, the rear surface of the backrest when in the flat position and the side ottoman form a bed configuration; and

the base, the rear surface of the backrest and the front portion of the ottoman form a substantially  
15 flat surface when the seat is in the bed configuration.

Thus, according to the invention when two such seats are located one in front of the other the front portion of the ottoman of the rear seat is locatable in the  
20 footwell of the front seat. This enables the actual length of the bed to increase compared to that of the abovementioned International application. Further still, because there is some overlap of the seat with the front portion locating in the footwell, although the  
25 length of the bedding is increased, the amount of space taken up by the seats can be the same pitch or reduced pitch compared to those in the above International application.

30 Preferably the backrest has an extension piece pivotally mounted to the backrest for pivotal movement when the backrest is in the flat position to fill a space between the rear of the backrest and the front portion of the ottoman, the extension piece forming part of the  
35 substantially flat surface.

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Preferably the extension piece folds flat against the rear surface of the backrest when the backrest is in an upright position.

- 5 Preferably the seat has a shell having sides and a rear panel, the open space being defined by one of the sides and the footwell, the footwell being formed partly in the rear panel as a box section extending forwardly of the rear panel.

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Preferably the sides have first rear sections and second front sections, the rear sections being higher than the front sections, and the open space being defined between one of the rear sections and the footwell.

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Preferably the footwell has a front wall and the backrest when in the upright position is adjacent to the front wall.

- 20 Preferably the footwell has a second part outside one of the sides, the second part being in line with the side ottoman.

Preferably the side ottoman has a shelf adjacent the  
25 said one of the sides.

The seat when in the bed configuration may provide a bed which is substantially horizontal or slightly upwardly inclined from the front portion of the side ottoman to  
30 the base of the open space.

The invention also provides an aircraft cabin having at least two seats arranged one in front of the other;  
each of said seats having;  
35 (a) a backrest having a front surface for supporting a passenger in a seating position when the

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backrest is in an upright position, and having a rear surface;

(b) a seat base upon which a passenger is seatable;

5 (c) a rear seat section behind the backrest when the backrest is in an upright position, the rear seat section having an open space which has a base, and a footwell closed to the open space beside the open space;

10 (d) a fixed side ottoman located beside the seat portion and extending in front of the seat portion, the side ottoman having a front portion; and wherein the backrest is pivotally mounted for movement from the upright position to a flat position so the base  
15 of the open space, the rear surface of the backrest when in the flat position and the side ottoman form a bed configuration;

the base, the rear surface of the backrest and the front portion of the ottoman form a substantially  
20 flat surface when the seat is in the bed configuration;

the front portion of the ottoman of a rear seat of the two seats extending into the footwell of a front seat of the two seats; and

wherein when the rear seat is in the bed  
25 configuration a passenger can lie transverse with respect to a central axis of the aircraft with the passenger's head resting on the base of the open space of the rear seat and the passenger's feet located in the footwell of the front seat on the front portion of the  
30 side ottoman of the rear seat.

Preferably the backrest has an extension piece pivotally mounted to the backrest for peripheral movement when the backrest is in the flat position to fill a space between  
35 the rear of the backrest and the front portion of the ottoman, the extension piece forming part of the

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substantially flat surface.

Preferably the extension piece folds flat against the rear surface of the backrest when the backrest is in an upright position.

Preferably the seat has a shell having sides and a rear panel, the open space being defined by one of the sides and the footwell, the footwell being formed partly in the rear panel as a box section extending forwardly of the rear panel.

Preferably the sides have first rear sections and second front sections, the rear sections being higher than the front sections, and the open space being defined between one of the rear sections and the footwell.

Preferably the footwell has a front wall and the backrest when in the upright position is adjacent to the front wall.

Preferably the footwell has a second part outside one of the sides, the second part being in line with the side ottoman.

Preferably the side ottoman has a shelf adjacent the said one of the sides.

#### Brief Description of the Drawings

A preferred embodiment of the invention will be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a view of a seat according to the preferred embodiment in a seated position with the seat in an

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upright position;

Figure 2 is a view of the seat of Figure 1 but showing a passenger reclined on the seat whilst the seat is in the upright position;

Figure 3 is a view of the seat of Figures 1 and 2 in a bed configuration;

Figure 4 is a rear view of a seat according to the preferred embodiment;

Figure 5 is a plan view through two seats;

Figure 6 is a cross-section through the seats of Figure 5;

Figure 7 is an illustration showing the configuration of the previously mentioned International application; and

Figure 8 is an illustration of the preferred embodiment of the invention showing the difference between the preferred embodiment and the seat of Figure 7.

#### Detailed Description of the Drawings

Figure 1 is a view showing a seat 10 in an upright position with a passenger seated in the seat 10.

Figure 2 is a view of the same seat 10 shown in Figure 1 with one leg of the passenger resting on a side ottoman. In an aircraft cabin a number of these seats are arranged one in front of another and are fixed to suitable supports such as rails or the like (not shown) to secure the seats in place.

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As shown in Figures 1 and 2 the seat has a shell 12 formed from any suitable rigid material such as aluminium, rigid plastic material or the like. The shell 12 supports a seat base 14 and the backrest 16.

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The shell 12 has a side shell 20 which supports a side ottoman 22. The side shell 20 typically extends adjacent the side wall of the aircraft cabin.

10 The shell 12 has first and second side portions 23 and 24 and first and second rear side portions 25 and 26. The rear sections 25 and 26 are higher than the front sections 23 and 24. The shell 12 also has a rear panel 27.

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The seat 10 will be provided with a safety belt as is conventional, which is not shown in the drawings. A separate set of safety belts can be provided for the seat when in the bed configuration.

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Figure 3 is a view of the seat 10 in a bed configuration. In the configuration shown in Figure 3 the backrest 16 has been pivoted down to a flat position so that rear surface 17 is uppermost. Movement of the backrest to the position shown in Figure 3 exposes a rear seat portion 30 located behind the backrest 16 when in the upright position, and which is generally defined by the back panel 27 and the side sections 25 and 26. The rear seat section 30 has an open space 32 which has a base 34, and the first part 31 of a footwell cavity 32. The footwell part 31 is a box section formed from an upright panel 33, an inclined top panel 35, and a small front surface 36. A second part 38 of the footwell 32 is an extension of the part 31 defined within the shell 12 beside wall 26.

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The side ottoman 22 has a shelf 39 which can be used both when the seat is in the seating configuration shown in Figures 1 and 2 and the bed configuration shown in Figure 3. The ottoman 22 has an ottoman surface 40 and  
5 a front portion 42 which is a continuation of the surface 40. The front portion 42 is located in front of the backrest 16 when the backrest is in the position shown in Figure 3.

10 An extension piece 41 is pivotally connected to the backrest 16 and can pivot from a position overlapping the backrest 16 to the position shown in Figure 3 to occupy the space between the rear surface 17 of the  
15 line 45 shown in Figure 3 generally shows the position of the rear panel 27' (Fig 6) of another seat 10' (Fig 6) in front of the seat shown in Figure 3.

The front portion of the ottoman 42 extends into the  
20 footwell 32' of the seat 10' in front of the seat 10 shown in Figure 3 as is best shown in Figure 4.

In Figure 4 the front seat 10' located in front of the seat 10 shows the cavity which forms the footwell 32'  
25 into which the front portion 42 extends.

When the seat is in the bed configuration shown in Figure 3 the base 34 of the open space 32, the rear surface 17 of the backrest 16, the extension piece 41  
30 and the front portion 42 of the ottoman 22 form a flat surface which forms a bed.

The preferred embodiment of the invention includes the side ottoman 22 as part of the available bed surface  
35 when the seat is in the bed configuration. The height

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of the ottoman 22 is designed to match the height of the other bed components (i.e. rear surface 17) when the seat is in the bed configuration.

- 5 The base 34, rear surface 17 and extension piece 42 can be covered by a comfortable foam material or the like as is the ottoman surface 40 and front portion 42.

10 Figure 5 is a plan view of two seats 10 and 10' with the seat 10 in the bed configuration. As is apparent from Figure 5 a person's head can locate in the open space 32 resting on the base 34 (or on a pillow or other comfortable head support located on the base 34) and the person can lay diagonally across the rear surface 17 of the backrest 16 with the person's feet locating on the  
15 front portion 42 of the ottoman 22 within the footwell 32' of the front seat 10'.

A side view of the two seats is shown in Figure 5. In  
20 Figure 6 a pivotal coupling 51 can be seen which enables the backrest 16 to move from the upright position to the flat position as shown by dotted line A, and also the pivotal coupling 52 which enables the extension piece 41 to move from the folded position against the rear  
25 surface 17 of the backrest 16 into positions shown in Figure 6 as illustrated by the dotted line B in Figure 6. It is also apparent from Figure 6 that the front portion 42 of the side ottoman 22 extends into the footwell 31' of the front seat 10'. Figure 6 also shows  
30 the supporting structure 52 which supports the seat in the aircraft cabin. The supporting structure 52 is conventional and therefore will not be described in any further detail. Figure 6 also shows seat mechanism 53 for enabling the seat to be adjusted between a fully  
35 upright position shown in Figures 1 and 2 and into a

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reclined position in which the seat base 14 moves slightly forward causing the backrest 16 to take up a more inclined upright position. Again the mechanism 53 is conventional and therefore will not be described in further detail.

Figure 7 is a plan view of two seats according to the abovementioned International application with the rear seat in the bed configuration. As can be seen from Figure 7 the width of the actual seat portion itself is 38 inches with the overall width of the seating configuration being 46 inches. The length of the bed is generally illustrated by double-headed arrow C in Figure 7.

Figure 8 shows the rear seat 10 of the preferred embodiment of the invention in the bed configuration, with the front seat 10' in the normal upright configuration. As is apparent from Figure 8 the width of the seat is reduced to about 30 inches whilst the overall width of the configuration remains the same. However, the length of the bed is increased as shown by arrow D. Arrow C is also shown in Figure 8 for comparison purposes. Thus, the bed configuration is larger without sacrificing the overall width of the seat configuration shown in Figures 7 and 8 or the overall length of the seat configuration. Thus, a larger bed length is achieved for the same pitch of seating within the aircraft cabin.

The rear of the panel 27 may be provided with a television screen for the person behind that seat or with other items such as a foldable shelf etc.

In the preferred embodiment of the invention the shell 12 can be formed in a number of parts such as a first

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part containing the sides 23 and 24 and the lower part of the footwell part 31 and the rear sections 25 and 26. The upper part of the rear panel 30 together with the upper part of the footwell 31 can be formed as a second  
5 part and joined to the first part along, for example, line 70 shown in Figure 3.

When the seat 16 is in the upright position the rear of the seat 17 can rest against the front wall 36 for  
10 support. The seat may also lock in the upright position as is conventional until it is adjusted to move into the flat position shown in Figure 3 by means of a release mechanism 72 shown in Figure 3 which can be manoeuvred to allow the seat to fold into the flat position shown  
15 in Figure 3 and used as a handle to return the seat to the upright position.

In the claims which follow and in the preceding description of the invention, except where the context  
20 requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of  
25 further features in various embodiments of the invention.

Since modifications within the spirit and scope of the invention may readily be effected by persons skilled  
30 within the art, it is to be understood that this invention is not limited to the particular embodiment described by way of example hereinabove.

## AIRCRAFT SEATING AND SEATING ARRANGEMENTS

CLAIMS

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1. A seat for an aircraft cabin, comprising:  
a backrest, having a front surface for  
supporting a passenger in a seating position when the  
backrest is in an upright position, and having a rear  
10 surface;

a seat base upon which a passenger is  
seatable;

a rear seat section behind the backrest when  
the backrest is in the upright position, the rear seat  
15 section having an open space which has a base, and a  
footwell closed to the open space beside the open space;

a fixed side ottoman located beside the seat  
portion and extending in front of the seat portion, the  
side ottoman having a front portion, the front portion  
20 of the side ottoman being locatable within the footwell  
of another said seat in front of the said seat;

the backrest being pivotally mounted for  
movement from the upright position to a flat position so  
the base of the open space, the rear surface of the  
25 backrest when in the flat position and the side ottoman  
form a bed configuration; and

the base, the rear surface of the backrest and  
the front portion of the ottoman form a substantially  
flat surface when the seat is in the bed configuration.

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2. The seat of claim 1, wherein the backrest has  
an extension piece pivotally mounted to the backrest for  
pivotal movement when the backrest is in the flat  
position to fill a space between the rear of the  
35 backrest and the front portion of the ottoman, the  
extension piece forming part of the substantially flat

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surface.

3. The seat of claim 2, wherein the extension  
piece folds flat against the rear surface of the  
5 backrest when the backrest is in an upright position.

4. The seat of claim 1, wherein the seat has a  
shell having sides and a rear panel, the open space  
being defined by one of the sides and the footwell, the  
10 footwell being formed partly in the rear panel as a box  
section extending forwardly of the rear panel.

5. The seat of claim 4, wherein the sides have  
first rear sections and second front sections, the rear  
15 sections being higher than the front sections, and the  
open space being defined between one of the rear  
sections and the footwell.

6. The seat of claim 5, wherein the footwell has  
20 a front wall and the backrest when in the upright  
position is adjacent the front wall.

7. The seat of claim 4, wherein the footwell has  
a second part outside one of the sides, the second part  
25 being in line with the side ottoman.

8. The seat of claim 1, wherein the side ottoman  
has a shelf adjacent the said one of the sides.

30 9. An aircraft cabin having at least two seats  
arranged one in front of the other;  
each of said seats having;  
(a) a backrest having a front surface for  
supporting a passenger in a seating position when the  
35 backrest is in an upright position, and having a rear  
surface;

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(b) a seat base upon which a passenger is seatable;

(c) a rear seat section behind the backrest when the backrest is in an upright position, the rear  
5 seat section having an open space which has a base, and a footwell closed to the open space beside the open space;

(d) a fixed side ottoman located beside the seat portion and extending in front of the seat portion,  
10 the side ottoman having a front portion; and wherein the backrest is pivotally mounted for movement from the upright position to a flat position so the base of the open space, the rear surface of the backrest when in the flat position and the side ottoman form a bed  
15 configuration;

the base, the rear surface of the backrest and the front portion of the ottoman form a substantially flat surface when the seat is in the bed configuration;

the front portion of the ottoman of a rear  
20 seat of the two seats extending into the footwell of a front seat of the two seats; and

wherein when the rear seat is in the bed configuration a passenger can lie transverse with respect to a central axis of the aircraft with the  
25 passenger's head resting on the base of the open space of the rear seat and the passenger's feet located in the footwell of the front seat on the front portion of the side ottoman of the rear seat.

30 10. The cabin of claim 9, wherein the backrest has an extension piece pivotally mounted to the backrest for pivotal movement when the backrest is in the flat position to fill a space between the rear of the backrest and the front portion of the ottoman, the  
35 extension piece forming part of the substantially flat surface.

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11. The cabin of claim 10, wherein the extension piece folds flat against the rear surface of the backrest when the backrest is in an upright position.

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12. The cabin of claim 9, wherein the seat has a shell having sides and a rear panel, the open space being defined by one of the sides and the footwell, the footwell being formed partly in the rear panel as a box section extending forwardly of the rear panel.

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13. The cabin of claim 12, wherein the sides have first rear sections and second front sections, the rear sections being higher than the front sections, and the open space being defined between one of the rear sections and the footwell.

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14. The cabin of claim 9, wherein the footwell has a front wall and the backrest when in the upright position is adjacent the front wall.

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15. The cabin of claim 11, wherein the footwell has a second part outside one of the sides, the second part being in line with the side ottoman.

25

16. The cabin of claim 9, wherein the side ottoman has a shelf adjacent the said one of the sides.