In addition to specification weights, the freight carrying capacity and revenue generating potential of freighter aircraft is determined by the operator's choice of pallet or container. The range of various containers & ULDs available for narrowbodies & widebodies are examined.

Containers & ULDs for main & lower deck freight

Freight carriage on all types of freighters is either with pallets or containers, sometimes referred to as unit load devices (ULDs). ULDs are complete containers, which are required for specific types of freight. Cargo carriers have a range of ULDs to choose from; the selection being determined by aircraft type and its interior dimensions and the type of freight being carried. Pallets can be used for many types of general freight that do not require complete containerisation, and are covered with netting. Examples are large and bulky manufactured items.

Other types of freight that include express packages and mail, electronic goods, high value items, perishable food goods, and apparel are often containerised. Containers are also used for convenience, since they have quicker turn times. Containers also utilise a higher proportion of the lower deck volume than pallets.

There are several types of standard ULDs of different dimensions, tare weight and cubic capacity. Several types can be used on each aircraft type, and they can also be interlined between aircraft types at freight hubs, should airlines require.

ULD categories

ULDs fall into the four groups of those used on widebody maindecks, widebody bellies, narrowbody maindecks and narrowbody bellies. Most ULDs fall into one of the four groups, and are not included in two or more categories. There are a few narrowbody maindeck containers that can fit into the bellies or underfloor decks of widebodies.

Widebody maindeck ULDs have the largest dimensions. These can have contoured profiles to fit the shape of aircraft maindecks, and so provide the maximum amount of containerised volume in the aircraft. Different widebodies have different dimensions and fuselage profiles, and so different containers provide the optimum space for each aircraft type.

Most narrowbody freighters are the 707, 727, 737, 757 and DC-8. The four Boeing types have the same fuselage cross-section, and the DC-8 has almost identical dimensions. This simplifies standardisation of containers; with traverse-loaded containers having a maximum base width of 125 inches.

The A320/321 freighters, however, have a marginally wider fuselage, but will still use the same ULDs.

The common factor with narrowbody ULDs is that they have a maximum height of 81 inches, due to fuselage dimensional constraints. Widebody ULDs have a height of at least 96 inches.

Standard ULDs are recognised by two nomenclature systems. The first is the current IATA system of three letters, which was introduced in 1984. The second is the older system of either a lower deck (LD) container and associated number, or a main deck (M) container and associated number. Examples are the LD-3 and M1.

The first letter A, of the current system, signifies that it is a certified structural container. The second letter denotes the dimensions, and the third letter indicates the shape of the ULD. An example is the AKE, previously known as the LD-3. Another variation in naming is the use of 'N' as the third letter. This denotes that the ULD has forklift slots in the base for lifting. This adds weight and reduces volume, but the capability is required by some airlines.

ULD manufacturers

The largest manufacturers of ULDs include SATCO, Driessen, Nordisk, Fylin, Amsafe and VRR. There are several standard containers, and these manufacturers all make their own variants of the same types. These vary by weight and cubic capacity due to the materials used.

ULDs also vary by the type of doors and internal support structures, such as bars for hanging garments. They also vary by capability, with some having slots in the base for carriage by forklift truck. Some also have an internal cooling and refrigeration capability for the carriage of perishable goods, such as fish or flowers.

While most airlines use standard traverse containers in narrowbody aircraft, some airlines have developed their own containers to suit their own operations. FedEx, for example, has developed its own 'demi' standard container with a 62-inch wide base. This has the same profile as half of a traverse narrowbody container, such as the SAA. Two of these demis are loaded side-by-side in its narrowbodies, while three are used abreast in its widebody fleet; which comprises A300-600s, A310s, DC/MD-10s and MD-11s. The demi thus simplifies operations by being compatible with all types in the fleet. It does not, however, match the inner contour of the widebody fuselages, and so does not provide maximum cubic capacity.

Widebody maindeck ULDs

The 767 is the widebody with a maindeck with the smallest dimensions, and consequently cannot accommodate as many maindeck container types that other aircraft can. The 767 has a maindeck height of 101 inches, actually five inches more than the A300, but is 182 inches wide at the widest point; the narrowest of widebody fuselages *(see table, page 44)*. The width at floor level is slightly less than 182 inches, and so it cannot accommodate containers that are wider than 88 inches two abreast.

The Airbus widebodies, the A300, A310 and A330, are the next largest. The A300/A310 maindeck has an internal height of 96 inches and width of 202

FREIGHTER MAIN & LOWER FREIGHT DECK DIMENSIONS

Aircraft type	Maindeck ceiling height -inches	Maindeck maximum width-inches	Lower deck height-inches	Lower deck top/bottom width-inches
707	89	136	N/A	N/A
727	85	125	N/A	N/A
737	85	129	N/A	N/A
757	83	135	N/A	N/A
DC-8	83	133	N/A	N/A
A320/A321			47	102/64
Widebody freighters				
767	101	182	64	128/96
787	N/A	N/A	64	160/125
A300/A310/ A330	96	202	67	162/125
DC-10/MD-11	126	216	64	162/125
777	118	227	64	160/125
747	118	237	64	188/125

inches *(see table, this page)*. Width at floor level is marginally less.

The DC-10 and MD-11 have the same fuselage profile, which at 216 inches is wider than Airbus widebodies. Internal height at 126 inches is the most for all widebodies *(see table, this page)*.

The 777F is the next largest aircraft. It has an internal ceiling height of 118 inches and maximum cabin width of 227 inches *(see table, this page)*.

The 747 freighter variants have the same internal maindeck height as the 777, but a fuselage width of 237 inches.

These six widebody maindeck cross-section profiles clearly affect the size of ULDs that can be loaded. The maindeck internal fuselage dimensions are summarised *(see table, this page)*. Profiled containers can be loaded two-abreast in rows to utilise the inner contour of the fuselage to maximum effect. There are square- or rectangular-profiled ULDs, and some are slightly contoured on the top. These can be loaded in single or double rows, although these underutilise the aircraft's capacity because they do not fill the upper section of the maindeck.

767

The 767's fuselage width of 182 inches allows two contoured AAX (IATA name) or A2 modified containers, that are 88 inches wide at the base, to be loaded side-by-side. These utilise the full floor width of the 767's maindeck. It is clearly not possible for two 96-inch containers to be loaded this way. These A2 modified containers are 96 inches in height, and can be 125- or 96 inches long. These each have a capacity of 502 cubic feet and tare weight of up to 600lbs *(see table, page 45)*. These A2 ULDs can be loaded side-by-side on all other widebodies, although their capacity would not be fully used.

SATCO manufacturers a container of the same dimensions; and has names of AAX and A1, tare weight of 577lbs and internal volume of 507 cubic feet.

Nordisk manufactures the AAX/A2 with these dimensions, and has a volume of 467 cubic feet and tare weight of 485lbs.

UPS also has its own version of this container, the A1N, in a two-abreast configuration. This has an internal volume of 507 cubic feet.

A second option for the 767 maindeck is for 125-inch wide contoured containers, loaded in a single row, that are 88 inches deep and 96 inches high. This is similar to the standard traverse container used on narrowbodies, although it is higher. These have a capacity of 552 cubic feet. The same style of containers that are 96 inches deep have a capacity of 606 cubic feet.

A third option is for square-profile 'AMA' or 'M1' containers that are 96 inches wide and 96 inches tall, with a length of 125 inches, to be loaded in a single row. These have a capacity of 619 cubic feet and tare weight of up to 970lbs *(see table, page 45)*.

SATCO manufactures its version of the M1, also calling it the AMA-GOH. This has a tare weight of 970lbs and internal volume of 620 cubic feet.

While 96-inch high containers are the maximum height that can be accommodated on the 767, SATCO has two types of ULDs that are contoured in two dimensions. These can be used on the 767 and 727, or other Boeing narrowbodies. These have a height of just less than 81 inches, and a base measuring 125 inches by 88 inches. These can be loaded two-abreast with the 88-inch side taking up half the width of the 767's maindeck. Turned through 90 degrees, they can be loaded with the 125-inch width forming a single row in the 727. These are the AAC, with a tare weight of 469lbs and volume of 420 cubic feet, and AAY, with a tare weight 545lbs and volume of 420 cubic feet *(see table, page 45)*.

A300/A310/A330

Airbus widebodies have a 10-inch wider fuselage width than the 767, and so can use wider ULDs. These can be loaded two abreast on the A300 and other Airbus widebodies. These are referred to as AMJ/M1. These have a more pronounced curvature in the wall that is adjacent to the aircraft's fuselage than the AMA/M1 ULDs used on the DC-10 and MD-11. Their profile thus allows them to fit into the Airbus maindeck fuselage.

The ULD has a height of 96 inches, base width of 96 inches and height of 125 inches. These have a tare weight of 562lbs and an internal volume of about 600cubic feet.

The A300 and other Airbus widebodies can of course use the same A2 containers that the 767 can use, loaded two-abreast. This, of course, does not use all the available space in the Airbus fuselage cross-section.

A third option is the use of a square-profiled container loaded in a single row. This is the AMA/M1, which has a base width of 125 inches, a length of 96 inches and height of 96 inches. Nordisk and SATCO are two manufacturers, with their containers having internal volumes of 618 and 620 cubic feet. Nordisk makes a lightweight version with a tare weight of 562lbs. SATCO's container is designed to carry extreme loads and for rugged operation, and consequently has a high tare weight of 970lbs.

DC-10/MD-11 & 777

The DC-10 and MD-11 have a maximum internal width of 216 inches *(see table, page 45)*; 14 inches wider than Airbus widebodies. The 777F has a nine-inch wider maindeck than the DC-10/MD-11. Despite this small difference, the 777F has the same options for maindeck containers as the DC-10/MD-11.

WIDEBODY MAINDECK ULDS

Container/ ULD type	Manufacturer	Base width -inches	Depth -inches	Height -inches	Volume cubic feet	Tare weight-lbs	Aircraft type	ULD loading
AAX/A2 modified		88	125	96	532	to 600	767	2-abreast
AAX/A1	SATCO	88	96	96	507	577	767	2-abreast
AAX/A2	Nordisk	88	125	96	467	485	767	2-abreast
AMA/M1	SATCO	96	125	96	620	970	767/Airbus	1-abreast
AMA/M1	Nordisk	96	125	95.3	600	562	767/Airbus	1-abreast
AAC	SATCO	88	125	80.75	420	469	767	2-abreast
AAY	SATCO	88	125	80.75	420	545	767	2-abreast
AMJ/M1CN	SATCO	96	125	96	594	767	A300/A310/A330	2-abreast
AMJ/M1CN	SATCO	96	125	96	594	767	DC-10/MD-11, 777, 747	2-abreast
AMJ/M1CW	SATCO	96	125	96	588	831	DC-10/MD-11, 777, 747	2-abreast
AMJ/M1	Nordisk	96	125	95.3	586	557	DC-10/MD-11, 777, 747	2-abreast
AMA/M1	SATCO	96	125	96	620	970	DC-10/MD-11, 777	1-abreast
AMA/M1	Nordisk	96	125	96	600	562	DC-10/MD-11, 777	1-abreast
AMD/M5	Nordisk	96	125	117.3	759	672	DC-10/MD-11, 777, 747	2-abreast
AMA/M1	SATCO	96	125	96	620	970	747	2-abreast
AMA/M1	Nordisk	96	125	96	600	562	747	2-abreast
M2		96	238	96	1,190		747	2-abreast

One popular maindeck ULD configuration for the DC-10 and MD-11 is the use of contoured AMJ/M1 containers loaded two-abreast. The AMJ/M1 has a base width and height of 96 inches and length of 125 inches *(see table, this page)*, and is contoured to fit the curved fuselage profile.

The container is manufactured by Nordisk and SATCO. It has an internal capacity of 586-601 cubic feet, and tare weight of 557-831lbs, depending on exact configuration *(see table, this page)*. The side of the container adjacent to the inner wall of the aircraft has a curvature at the top of the aircraft.

SATCO has two versions of the M1; the M1CN and M1CW, which is slightly heavier and designed for heavyweight and oversized cargo. It also has a full width door. The lighter M1CN is more appropriate for lighter freight, such as express packages.

Nordisk provides a lightweight version of the M1, with a tare weight of 573lbs.

UPS has also developed its own version, known as the M1N and is a modified M1. This has the same base dimensions as the SATCO and Nordisk containers, but the UPS container provides a cubic capacity of 607 cubic feet *(see table, this page)*.

Similar profiled containers with a base width of 88 inches can be used, which clearly have a smaller internal cubic capacity. Container length can also be an option of 108 inches.

A second option is for AMA/M1 square profile containers to be loaded in a single row. When turned through 90 degrees, they have a width of 125 inches, and length and height of 96 inches. These have the same internal capacity and tare weight as the same ULDs that can be used on the Airbus widebodies. Clearly these do not utilise all available space on the maindeck.

A third option is for a single row of contoured AMD/M5 containers that have a width of 96 inches, length of 125 inches and height of 118 inches. These have almost a square profile, but have contours on the top corners to maximise utilisation of aircraft fuselage contours. These can clearly only be used on the DC-10/MD-11, 777F and 747F variants because of their height. Nordisk is one manufacturer of the AMD/M5, and it has a tare weight of 672lbs and internal volume of 759 cubic feet *(see table, this page)*.

One other possibility is for an AMA/M1 to be loaded abreast together with an 88-inch wide AAX/A2 ULD that is used on the 767.

747

The 747 is unique in that factory-built freighters have a nose door in addition to a side door. This means long ULDs can be loaded longitudinally on the maindeck. The 747 therefore has several maindeck ULD configurations. The first of these is AMD/M1, M1H or M5 contoured ULDs loaded two-abreast. These have a 96-inch wide base, are 118 inches tall and 125 inches long *(see table, this page)*. The internal capacity is 701-773 cubic feet, while tare weight is 551-672lbs. Nordisk manufactures a heavy version.

A second option is for AMJ/M1 containers to be loaded two-abreast. These are the same type used by the DC-10/MD-11 and 777, and have capacities of 586 cubic feet and a tare weight of 557lbs.

A third configuration is a double row of square-profiled AMA/M1 ULDs. These are the same as used by the DC-10/MD-11 and 777. The AMA/M1 can also be used on other widebodies, and consequently is the ULD often used for interlining between all widebody aircraft where and when necessary.

A fourth type of container is one with the same square profile of the M1, with a 96-inch width and height, and with a 238-inch length. This is known as the M2 container, and has a capacity of 1,190 cubic feet.

Widebody belly ULDs

The selection of ULDs for widebody belly sections is simpler than for maindecks. The first issue is that all

WIDEBODY BELLY ULDS

Container/ ULD type	Manufacturer	Top width -inches	Base width -inches	Depth -inches	Height -inches	Volume cubic feet	Tare weight-lbs	Aircraft type
Half-width ULDs								
DPE/LD-2	Driessen/Nordisk	61.5	47	60.4	64	116.5/124	148-169/121+	767
DPN/LD-2	Driessen/Nordisk	61.5	47	60.4	64	109.5/124	198-209/141+	767
AKC/LD-1	Driessen/Nordisk	92	61.5	60.4	64	169/173	190-218/178	747
AKE/LD-3	Driessen	79	61.5	60.4	64	148-152	207/172-203	Airbus, 787, 777, DC-10, MD-11
AKN/LD-3	Driessen	79	61.5	60.4	64	145	214-260	Airbus, 787, 777, DC-10, MD-11
AKE/LD-3	Nordisk	79	61.5	60.4	64	155	121-163	Airbus, 787, 777, DC-10, MD-11
AKE/LD-3	SATCO	79	6.15	60.4	64	153	200	Airbus, 787, 777, DC-10, MD-11
Full-width winged ULDs								
DQF/LD-8	Nordisk	125	96	60.4	64	258	240	767
ALF/LD-6	Nordisk	159/160	125	60.4	64	314	355	Airbus, 787 DC-10/MD-11, 777
AAF/LD-26	Driessen/Nordisk	159/160	125	88	64	459	574-743/586	Airbus, 787, DC-10/MD-11, 777
AMF/LD-36	Nordisk	159/160	125	96	64	552	617	Airbus, 787, DC-10/MD-11, 777
AAU/LD-29	Nordisk	186	125	88	64	503	621	747
AMU/LD-39	Nordisk	186	125	96	64	552	650	747
Box profile ULDs								
DQP/LD-4	Driessen/Nordisk	96	96	60.4	64	191/200	235-240/238	767
ALP/LD-5	SATCO	125	125	60.4	64	253	355 & 375	All except
ALP/LD-11	Driessen	125	125	60.4	64	247	361	767
AAP/LD-9	Driessen/Nordisk	125	125	88	64	365-370	459-514	All except 767
AAZ/LD-9	SATCO	125	125	88	64	365	511	All except 767
AMP	Driessen/Nordisk	125	125	96	64	406	624/533	All except 767

widebody aircraft have the same height limit of 64 inches in their belly space. The only difference to consider is the widths at the floor and at the top of the belly.

The 767's belly space has a top width of 128 inches and bottom width of 96 inches. The 787, all Airbus widebodies including the A380, DC-10/MD-11 and 777 all have basically the same belly compartments, with top widths of 160-162 inches and base widths of 125 inches. The 747 has a top belly width of 188 inches and base width of 125 inches.

Belly ULDs can be winged shaped, with the top width longer than the floor width. Winged ULDs are either loaded two-abreast or as wider single units. There are also rectangle-profile belly ULDs that are loaded as single units.

NARROWBODY MAIN DECK ULDS

Container/ ULD type	Manufacturer	Base width -inches	Depth -inches	Height -inches	Volume cubic feet	Tare weight-lbs
AAP/LD-9	Driessen/ Nordisk	125	88	64	370	459-514
AAZ	SATCO	125	88	64	365	511
AAY-demi	SATCO	62	88	79	202	298
SAA	SATCO	125	88	79	448	580
AAA	SATCO/VRR	125	88	80	436/400	424/504
AAC	SATCO	125	88	80.75	420	469
AAY	SATCO	125	88	80.75	420	545

Half-width ULDs

There are three basic standard half-width winged belly ULDs. These are the DPE/DPN/LD-2 for the 767, the AKC/AVJ/LD-1 which is used on the 747, and the AKE/AKN/LD-3 which is used in all other widebody aircraft. These include all Airbus widebodies, DC-10, MD-11, 787 and 777.

The LD-2 is unique to the 767 due to the small dimensions of its belly space. The width at the top of the belly is 128 inches. The LD-2 has a height of 64 inches, a depth of 60.4 inches, base width of 47 inches and top width of 61.5 inches.

One manufacturer of the LD-2 is Driessen; a specialist in belly ULDs. Its basic non-forkliftable container has an internal volume of 116.5 cubic feet and tare weights of 150-169lbs, depending on the type of door and other specifications *(see table, page 46)*. Driessen also makes the ULD with a forkliftable base, that has slots in its base. This reduces its internal volume to 109.5 cubic feet, but increases its tare weight to 198-209lbs.

Nordisk's LD-2s have tare weights of 121-123lbs and capacities of 124 cubic feet. Nordisk also makes a forkliftable version.

The LD-1 is unique to the 747, because of its large belly compartment. The 747's belly section has a top width of 188 inches and base width that allows a pallet or containers of up to 125 inches to be loaded. The LD-1 has a base width of 61.5 inches and top width of 92 inches, and so are loaded two-abreast. The containers also have a depth of 60.4 inches and height of 64 inches.

Driessen's version of the LD-1 has an internal volume of 169 cubic feet and tare weight of 190-218lbs *(see table, page 46)*. Nordisk's LD-1 has a volume of 173 cubic feet and tare weight of 178lbs.

The LD-3 is the standard belly container for the majority of widebodies, which allows them to be interlined between aircraft. It has a top width of 79 inches and base width of 61.5 inches. LD-3s have the same depth and base width as the LD-1 *(see table, page 46)*. The top belly width of the Airbus widebodies, DC-10/MD-11 and 777 are 160-162 inches, which allows LD-3s to be loaded two-abreast.

Two LD-2s can also be loaded two-abreast in these aircraft, although these are 7.5 inches narrower than the LD-3. Conversely, LD-3s can be loaded in a single row in the belly of the 767.

There are several LD-3 manufacturers, which include Nordisk, SATCO and Driessen. Nordisk's LD-3s have an internal volume of 155 and 159 cubic feet, and tare weights of 121-163lbs. SATCO's LD-3 has a capacity of 153 cubic feet and tare weight of 200lbs *(see table, page 46)*. Driessen makes several variants. The standard has a capacity of 152 cubic feet and tare weight of 172-203lbs, depending on the use of a fabric or metal door. It also makes forkliftable LD-3s which have lower volume and higher tare weights, while it has also introduced the Herculight series which has a tare weight of 172lbs.

Full-width winged ULDs

There are several full-width winged belly ULDs. These are the LD-6, -8, 26, -29, -36 and -39. All have a height of 63.5 or 64 inches.

The LD-8 is the smallest of these, and is the only one to fully utilise the width of the 767's belly. It has a top width of 125 inches, base width of 96 inches and depth of 60.4 inches.

Nordisk's LD-8 has a volume of 258 cubic feet. Its ultralite variant has a tare of 240lbs, and its standard LD-8 has a tare of 264lbs *(see table, page 46)*. Driessen's LD-8 has an internal volume of 247 cubic feet. There are three variants with fabric and metal doors with tares of 254-355lbs.

The LD-6, LD-26 and LD-36 are all suited to use on the Airbus widebodies, DC-10/MD-11, 787 and 777. They have a top width of 159 and 160 inches, and base width of 125 inches. These dimensions perfectly match the belly space of these aircraft. The LD-6 has a depth of 60.4 inches, the LD-26 a depth of 88 inches, and the LD-36 a depth of 96 inches. Any ULD can thus be used according to airline requirements.

Nordisk manufactures the ALF/LD-6, which has a capacity of 314 cubic feet and tare weight of 355lbs. Driessen's variant has a volume of 293 cubic feet and tare weight of 387lbs.

Driessen and Nordisk produce the LD-26, which has a volume of 459 cubic feet. Nordisk's variant has a weight of 586lbs. Driessen has two versions; the lighter model being 547lbs and the heavier example being 743lbs *(see table, page 46)*.

The LD-36, which is manufactured by Nordisk, has an internal volume of 552 cubic feet and tare weight of 617lbs *(see table, page 46)*.

The top width of 186 inches of the LD-29 and LD-39 means they are only useable on the 747. The LD-29 has a depth of 88 inches, while the LD-39 has a depth of 96 inches. Nordisk manufactures both. The LD-29 has an internal volume of 503 cubic feet and tare weight of 621lbs. The LD-39 has a volume of 552 cubic feet and tare weight of 650lbs.

Block profile ULDs

There are six main types of block profile belly ULDs for widebodies. They all have a height of 64 inches. The LD-4 is the only one that can be used on the 767. The other five all have a width of

Each aircraft type has a type of maindeck ULD with a contour that most closely matches the inner profile of its fuselage, and this maximises use of the aircraft's space. In the case of the DC-10 and MD-11, the AMJ/M1 is the ULD that provides the highest possible containerised volume for the aircraft.

125 inches, and are used on the other types of widebody.

The DQP/LD-4 has a width of 96 inches and depth of 60.4 inches. Driessen's variant has an internal volume of 191 cubic feet and tare weight of 235-240lbs. Nordisk's LD-4 has a higher volume of 200 cubic feet and tare of 238lbs *(see table page 46)*.

The five containers used on larger widebodies all have the same width of 125 inches and height of 64 inches. They differ in depth and volume.

The ALP/LD-5 has a depth of 60.4 inches. Two variants are manufactured by SATCO, both of which have an internal volume of 253 cubic feet. Tare weights are 355lbs and 375lbs.

The ALP/LD-11, manufactured by Driessen, has the same dimensions as the LD-5. The LD-11 has an internal volume of 247 cubic feet. The non-forkliftable version has a tare weight of 361lbs, while the forkliftable variant has a weight of 507lbs *(see table, page 46)*.

The AAP/LD-9 has a depth of 88 inches. Nordisk and Driessen each make a variant, with both offering volumes of 365-370 cubic feet. The Nordisk variant has a forkliftable base and so has a tare of 485lbs. The Driessen variants have tares of 459lbs and 514lbs; the heavier version equipped with a garment hanger.

SATCO offers a variant of the LD-9 with a curved top, which allows it to be used on the maindeck of a narrowbody freighter. This ULD is known as the AAZ/LD-9, and its curved top reduces internal volume to 365 cubic feet. It has a tare weight of 511lbs.

The AMP is the largest ULD in this class, with a depth of 96 inches. This consequently gives it a high volume of 406 cubic feet. Nordisk's variant has a forkliftable base and tare weight of 533lbs. Driessen's ULD does not have a forkliftable base, but has the option of a garment handing rail. Tare weights are 624lbs and 644lbs *(see table, page 46)*.

Narrowbody maindeck ULDs

The main narrowbody freighters are the 727, 737, 757, DC-8 and A320/A321. These all have similar maindeck dimensions, and so can use the same type of ULDs. Maindeck ceiling heights are 83-89 inches, and most aircraft have a maximum maindeck width of 129-136 inches. Actual floor widths are a few inches less.

There are several groups of maindeck ULDs for narrowbodies. The first of these are shallow containers that can also be used in the belly sections of most widebodies. The second group are ULDs that are contoured to the inner shape of narrowbody maindecks. The third group are ULDs that are contoured in two dimensions that can also be used on the maindecks of widebodies.

The first group includes the LD-7 and LD-9. These have the dimensions of ULDs for use in the belly sections of widebodies, as described. They have a height of 64 inches, and have a curved profile which allows them to be used on the maindecks of narrowbodies. The LD-9 has a capacity of 365 cubic feet and tare weight of 511lbs.

UPS has a variant of the LD-9, the L9N. This is 88 inches deep and has a capacity of 365 cubic feet.

There are various contoured ULDs with dimensions and profiles to closely match the fuselages of narrowbody freighters. The standard base width of these is 125 inches, and standard depth is 88 inches.

FedEx has developed its own 'demi' containers that have a profile of half the full-width ULD. Demis are thus loaded two-abreast, and have a base width of 61.5 inches. SATCO also manufactures AYY-demi ULDs. These have a base width of 62 inches, height of 79 inches and depth of 88 inches. They have a capacity of 202 cubic feet and tare weight of 298lbs *(see table, page 47)*.

The SAA, AAA, AAY and AAZ are all full-width ULDs. These have a base width of 125 inches and depth of 88 inches. Heights vary with the SAA at 79 inches, the AAA at 80 inches, and AAZ at 82 inches. Capacities are 399-448 cubic feet, while tare weights are 424-580lbs *(see table, page 47)*.

There are also variations of these standard maindeck ULDs. This can be a 108-inch base width, while using the standard depth of 88 inches. Another variation is a standard base width of 125 inches and depth of 96 inches.

The third group are the AAC and AAY ULDs as described. These are contoured in two dimensions so that they can be interlined with the 767 *(see tables, page 45 & 47)*.

Narrowbody belly ULDs

No Boeing narrowbody freighters or the DC-8 utilise ULDs in their belly spaces. This compartment is used by freight carriers by loading freight in bulk or in mail bags. The only narrowbodies to use ULDs in the belly section are the A320/A321. The first freighter variants of these aircraft are expected to enter service in 2012.

The A320/A321 have a belly space that allows ULDs with a top width of 96 inches and a base width of 61.5 inches. The ULD that completely utilises all belly space in the A320/A321 is the AKH/LD3-45. Nordisk and Driessen are manufacturers of this ULD. It has a depth of 60.4 inches and height of 45 inches. The Nordisk variants have a capacity of 131 cubic feet and tare weight of 159-185lbs, depending on specification. The Driessen variant has a volume of 124 cubic feet and tare weight of 181-192lbs. AC