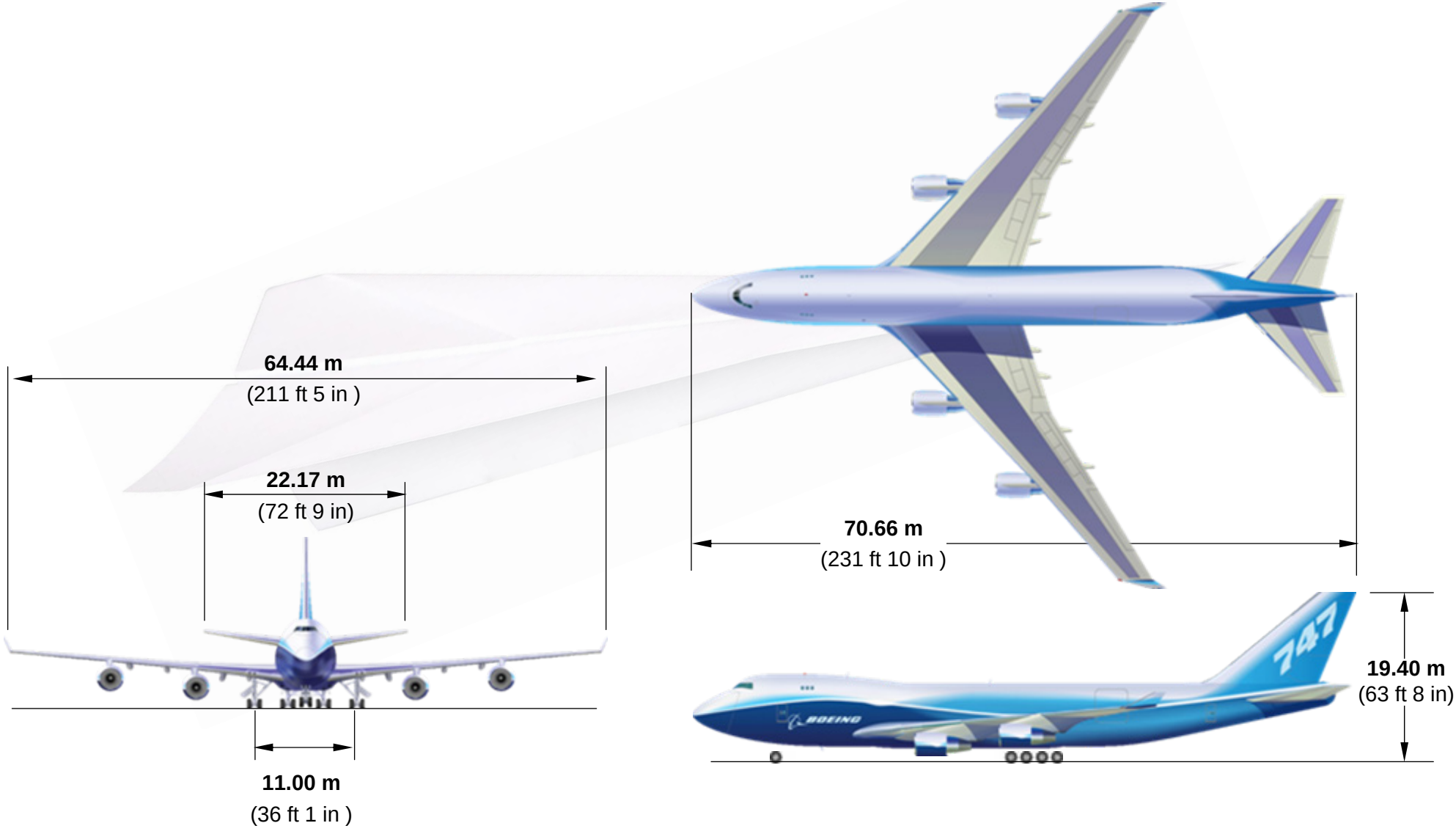
747-400/-400ER Freighters

StartupBoeing

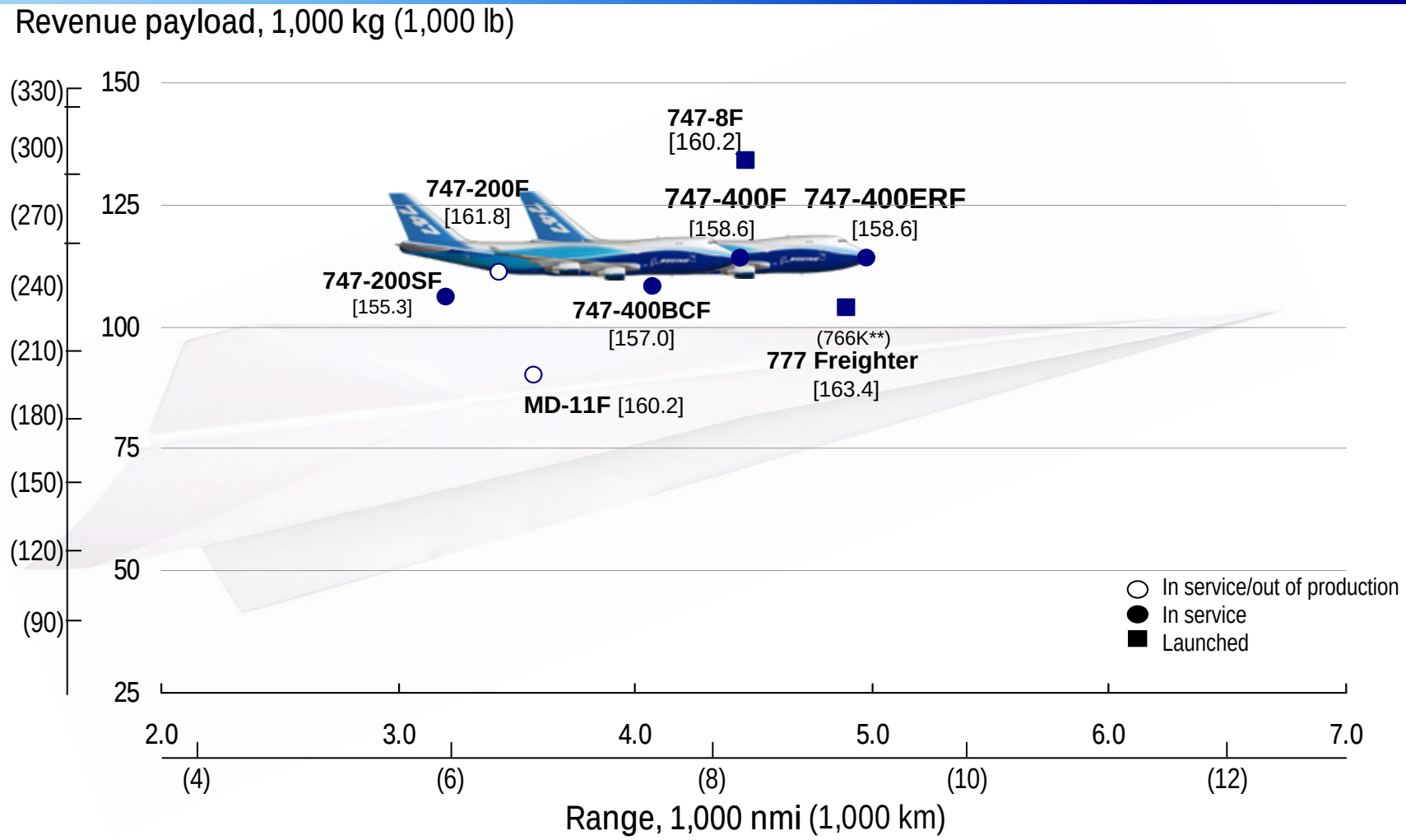


May 2010

747-400/-400ER Freighter

Part of a complete Boeing freighter solution

StartupBoeing



- Revenue payload = structural payload MZFW - (OEW + tare)
- [ ] = average density, kg/m³, for total volume excluding bulk

* Boeing Assessment
** Restricted loadability

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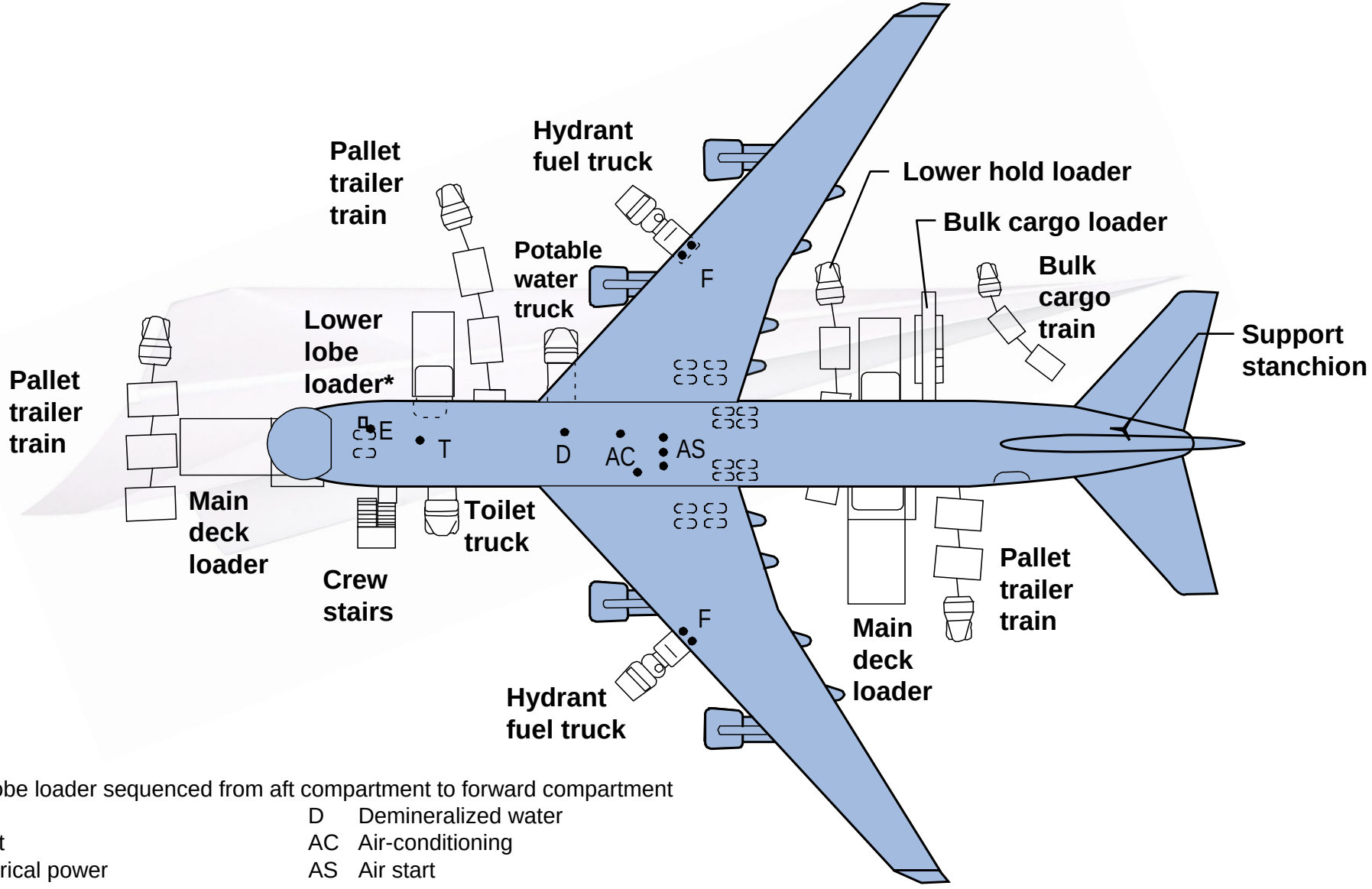
747-400/-400ER Freighter

Servicing arrangement, open ramp operation

StartupBoeing



*Lower lobe loader sequenced from aft compartment to forward compartment

F	Fuel	D	Demineralized water
T	Toilet	AC	Air-conditioning
E	Electrical power	AS	Air start

May 2010

747-400/-400ER Freighter

Nose door adds tremendous value

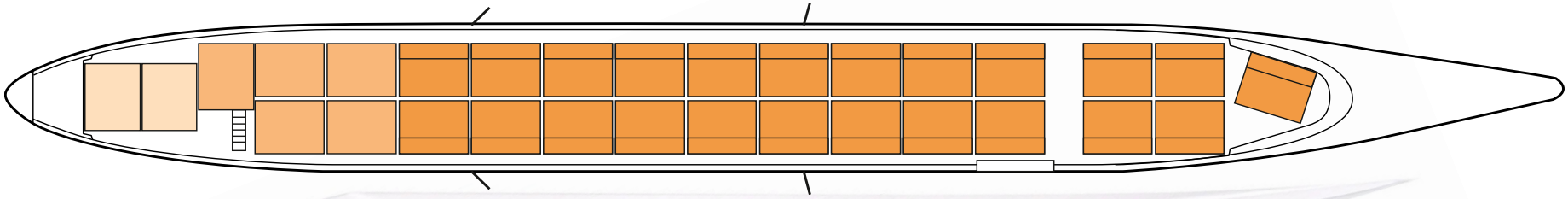
StartupBoeing

747-400 Freighter

Main deck cargo arrangements

StartupBoeing

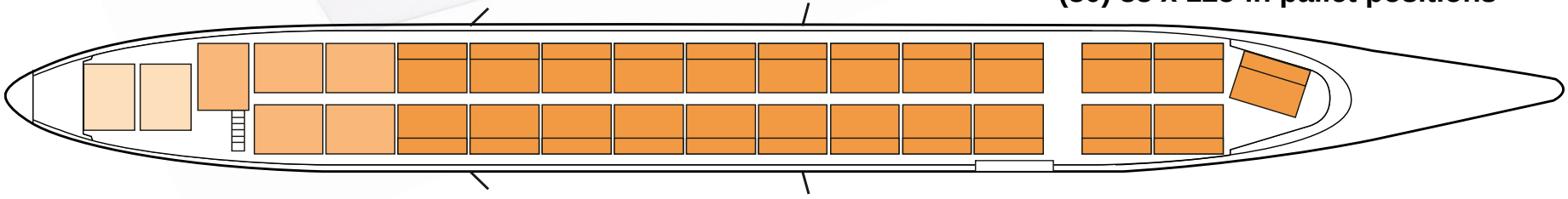
(30) 96 x 125-in pallet positions



(2) 96 x 125-in x 8-ft contoured pallets at 15.3 m^3 and 17.2 m^3 (540 ft^3 and 607 ft^3)
(5) 96 x 125-in x 8-ft pallets at 17.4 m^3 (613 ft^3)
(23) 96 x 125-in x 10-ft contoured pallets at 21.2 m^3 (750 ft^3)

Total 607.7 m^3 21,462 ft^3

(30) 88 x 125-in pallet positions



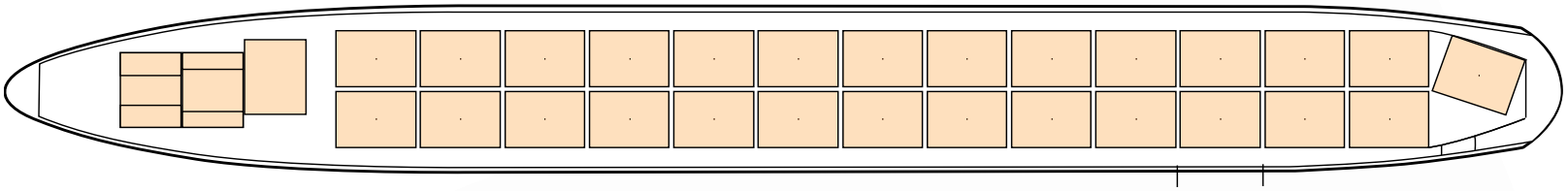
(2) 88 x 125-in x 8-ft contoured pallets at 13.9 m^3 and 15.7 m^3 (493 ft^3 and 554 ft^3)
(5) 88 x 125-in x 8-ft pallets at 15.9 m^3 (560 ft^3)
(23) 88 x 125-in x 10-ft contoured pallets at 19.3 m^3 (680 ft^3)

Total 553 m^3 19,487 ft^3

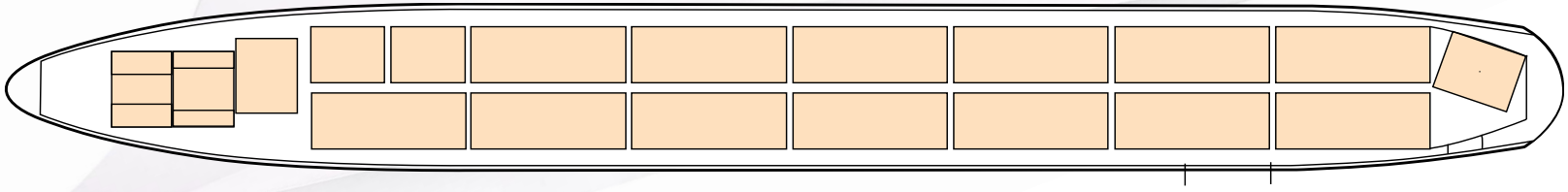
747-400/-400ER Freighter

Nose door loading

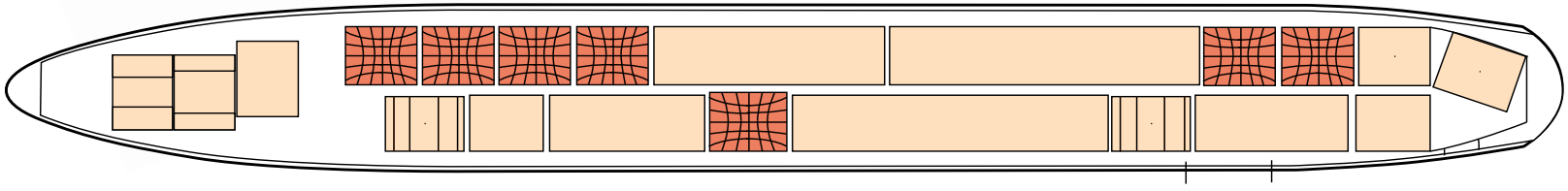
StartupBoeing



(29) 10-ft (3-m) **containers**



(13) 20-ft (6-m) **intermodal containers**
(5) 10-ft (3-m) **containers**

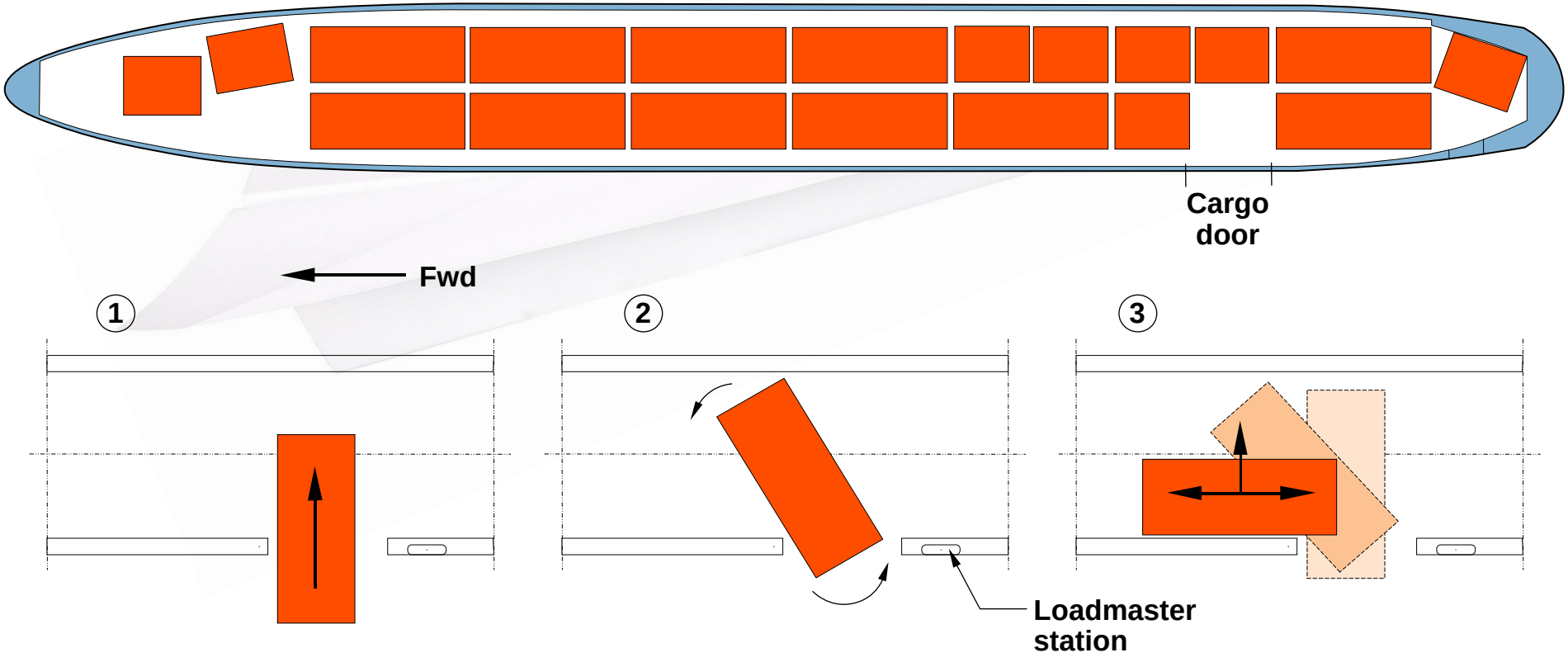


Random intermix, 10-, 20-, 30-, and 40-ft (3-, 6-, 9-, and 12-m) **loads**

747-400/-400ER Freighter

StartupBoeing

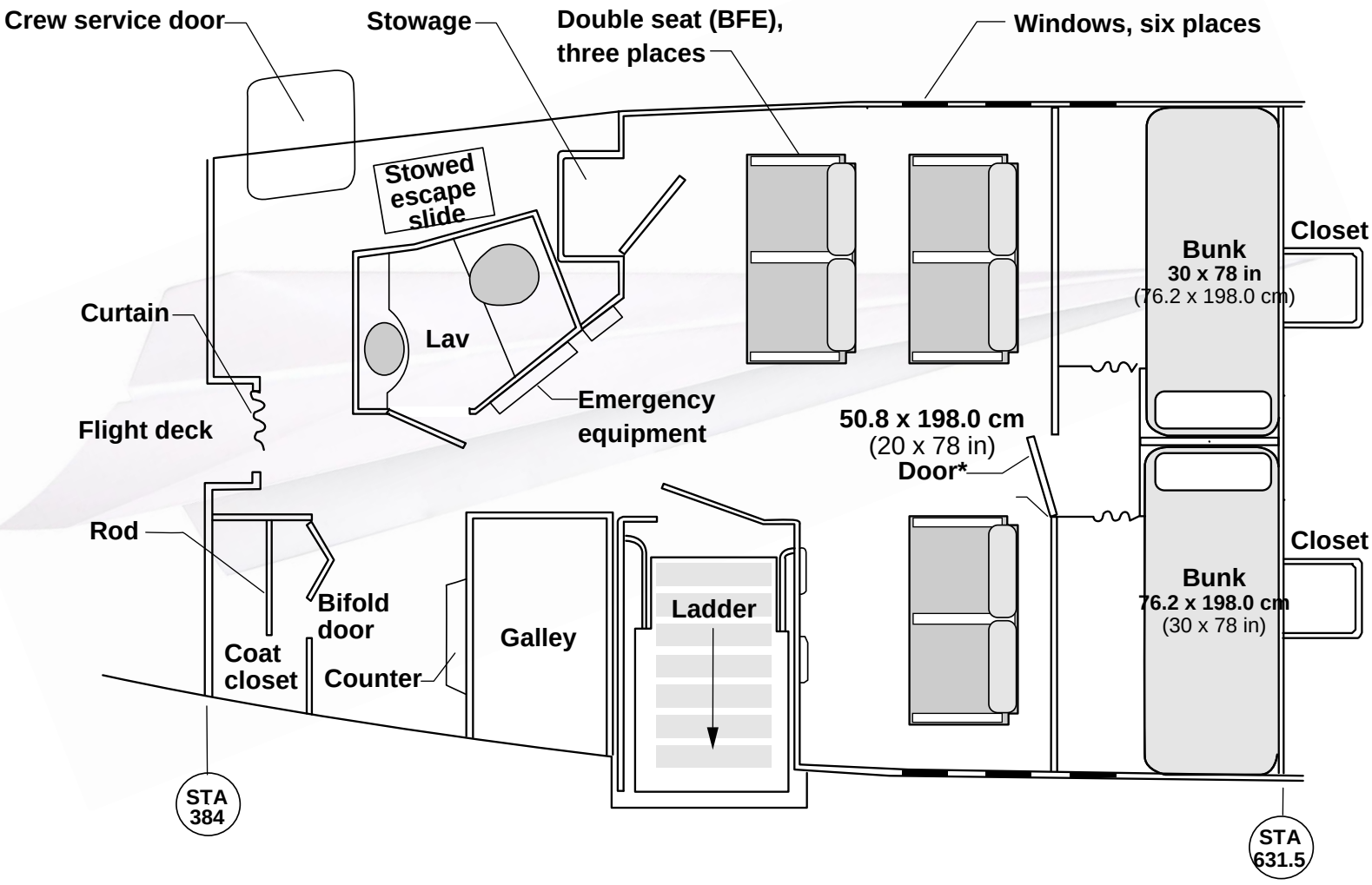
*Side cargo door loading **6-meter (20-foot) container***



747-400/-400ER Freighter

Upper deck arrangement

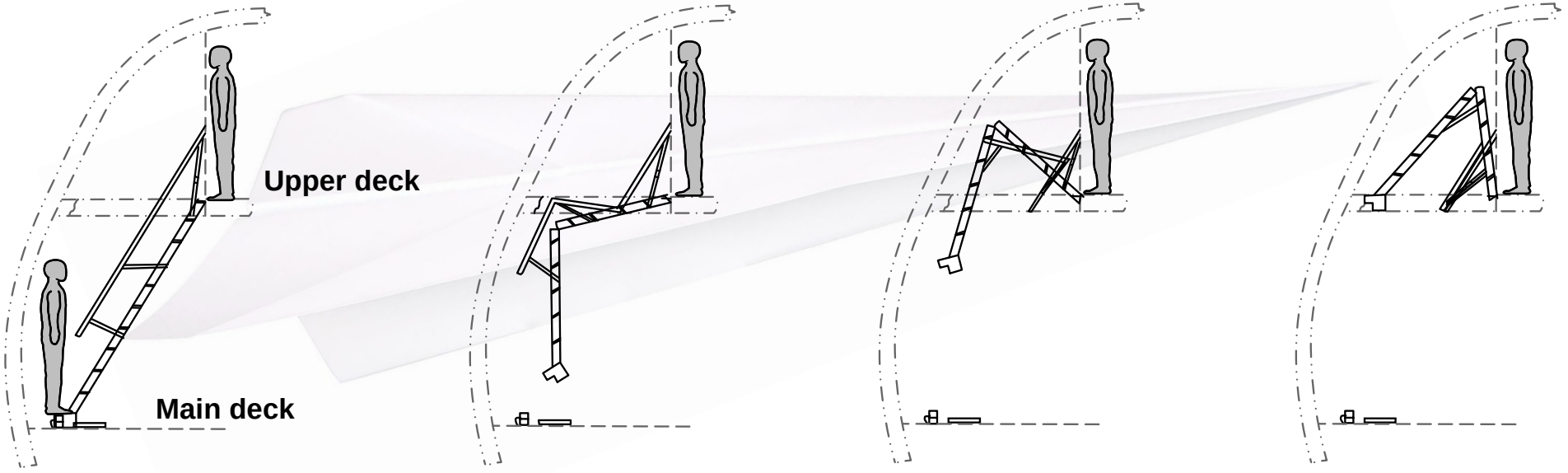
StartupBoeing



747-400/-400ER Freighter

Upper deck ladder operation

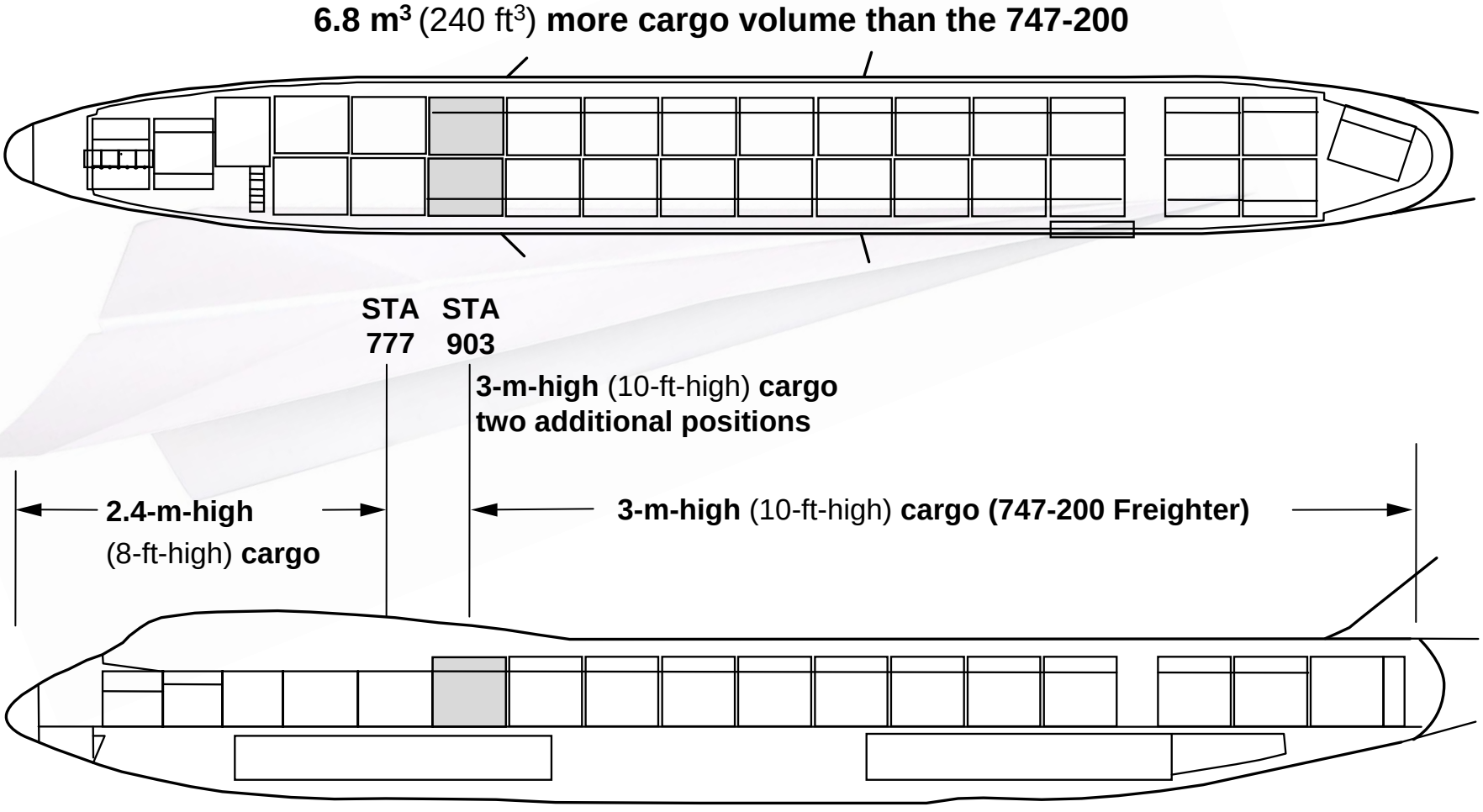
StartupBoeing



747-400/-400ER Freighter

StartupBoeing

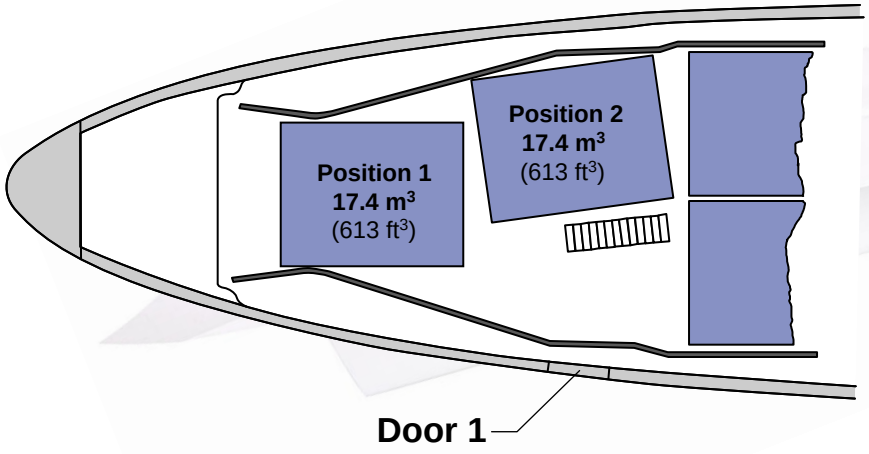
Additional 10-foot-high cargo capacity



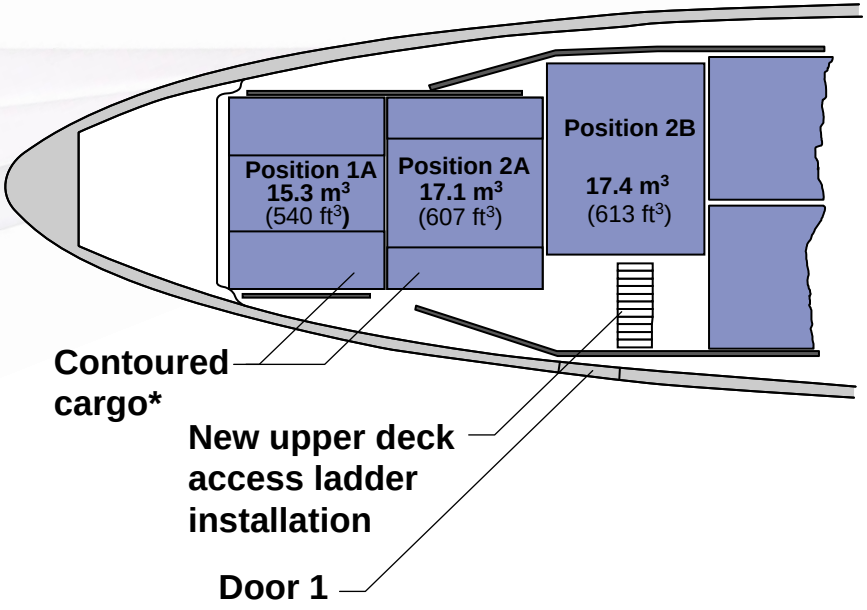
747-400/-400ER Freighter
Additional main deck pallet

StartupBoeing

747-200 Freighter
Existing positions P1, P2



747-400 Freighters

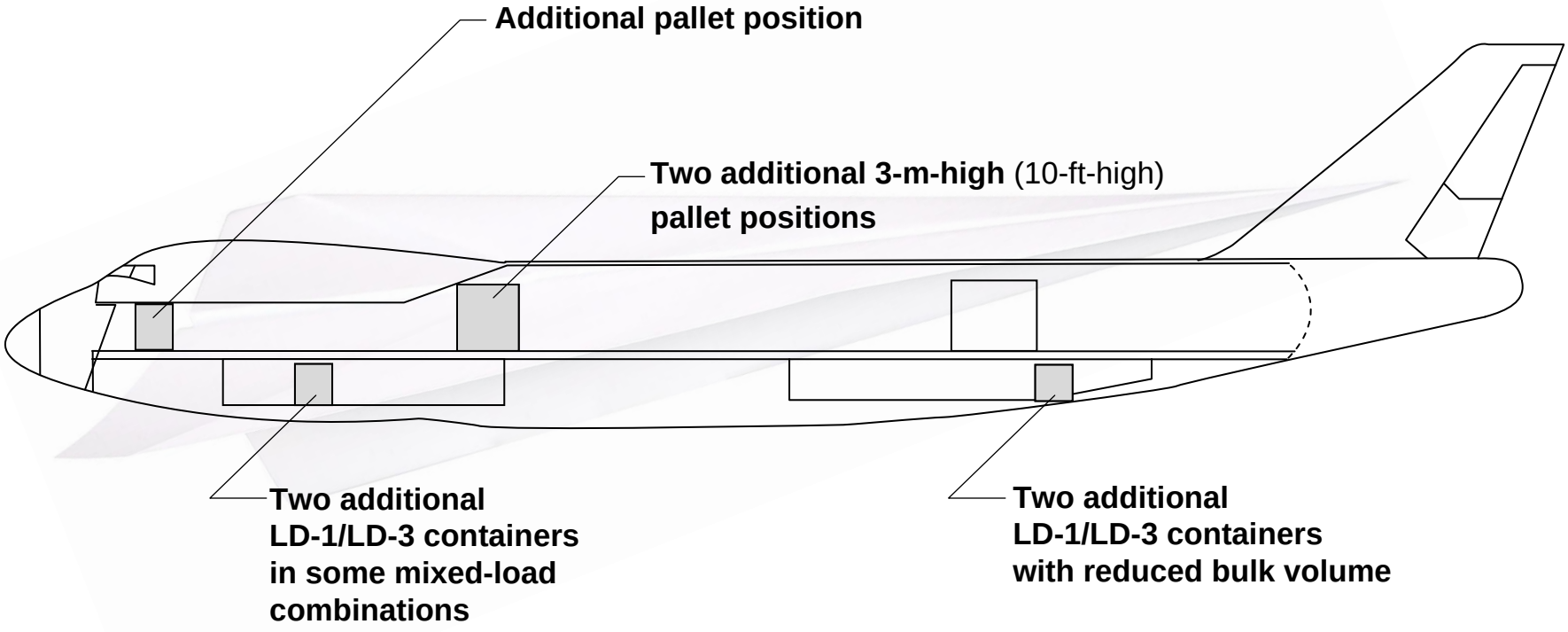


More than 15.1-m³ (534-ft³) **volume increase (one additional pallet)**

*Position 2A can be a full container (uncontoured) when loaded through the side cargo door.

747-400/-400ER Freighter
Additional cargo volume capability

StartupBoeing

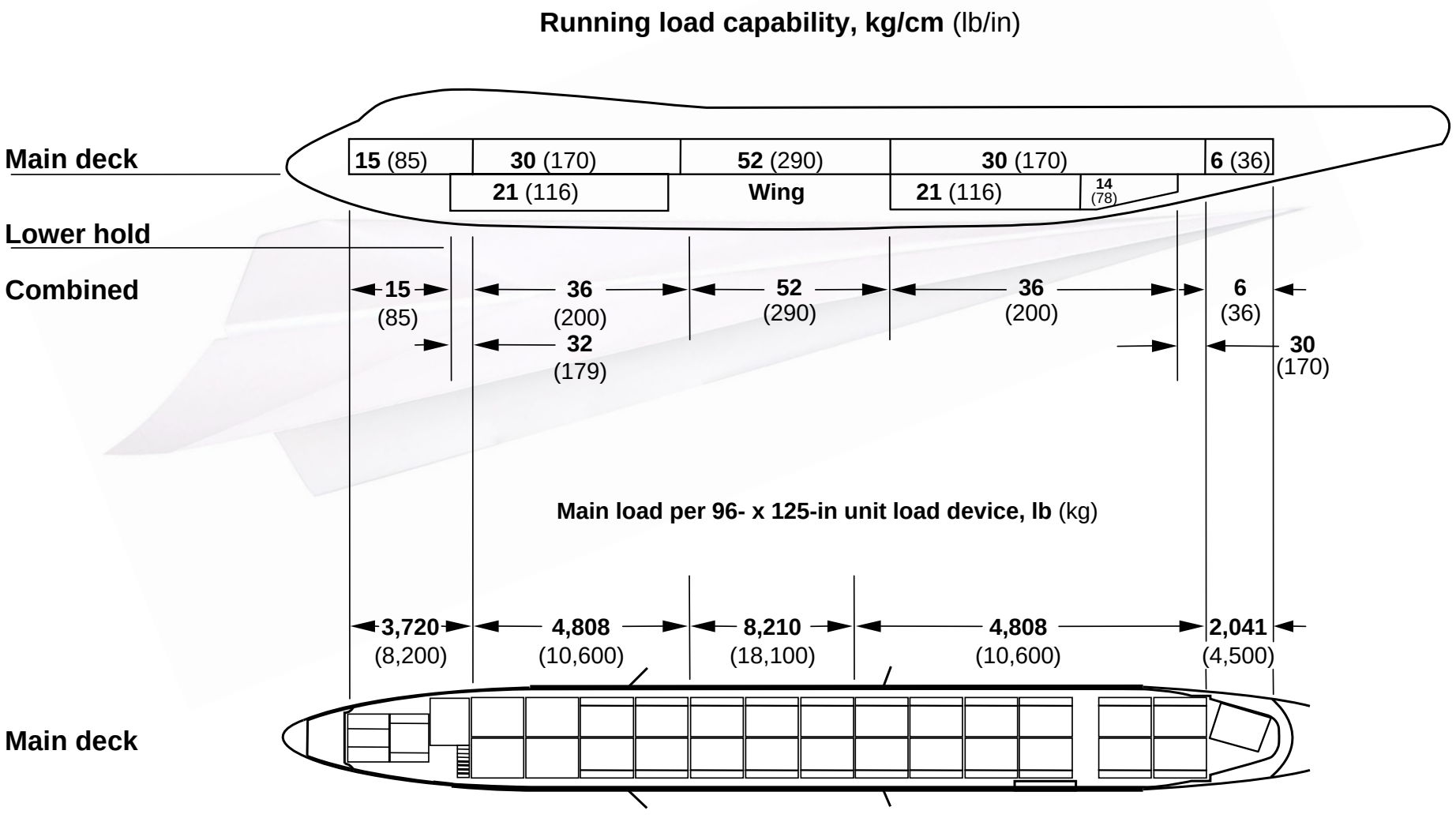


The 747-400 Freighters have 21.9 m^3 (774 ft^3) more main deck volume and up to 11.9 m^3 (420 ft^3) more lower hold volume than the 747-200 Freighter

747-400/-400ER Freighter

Structural loading limits

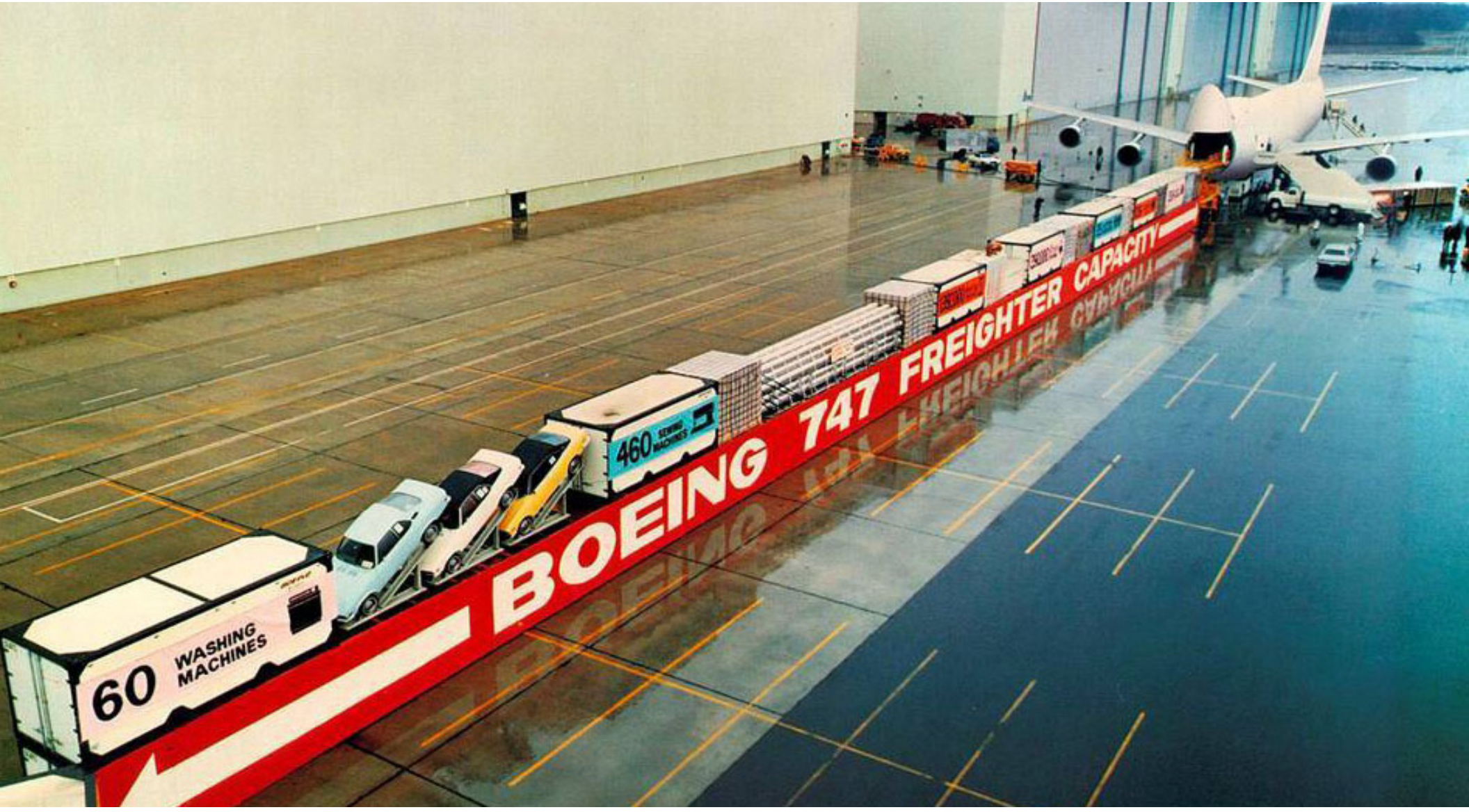
StartupBoeing



747-400/-400ER Freighter

Unmatched freight flexibility

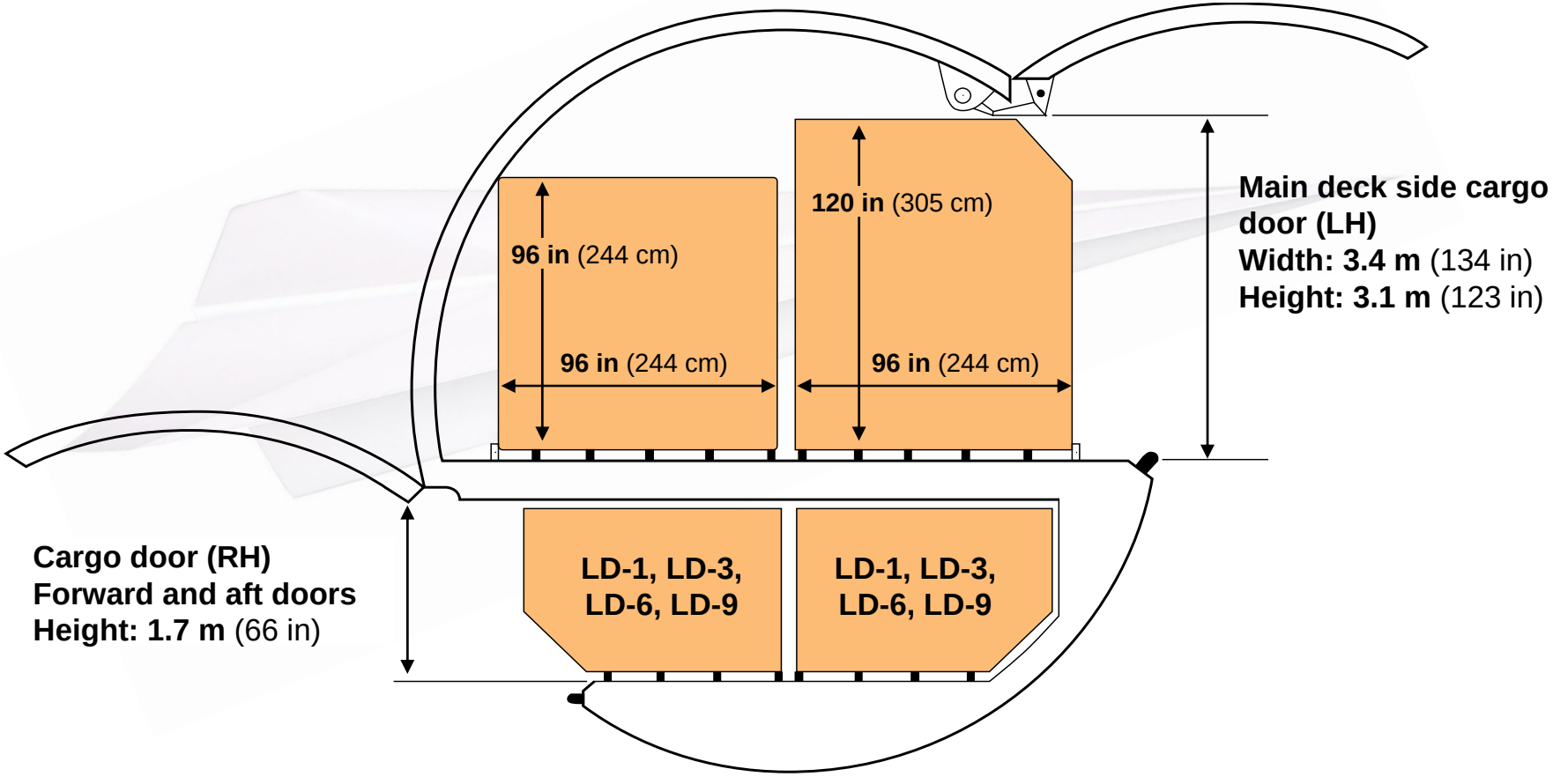
StartupBoeing



747-400/-400ER Freighters

Cross section

StartupBoeing



747-400/-400ER Freighter

StartupBoeing

747-400/-400ER Freighter

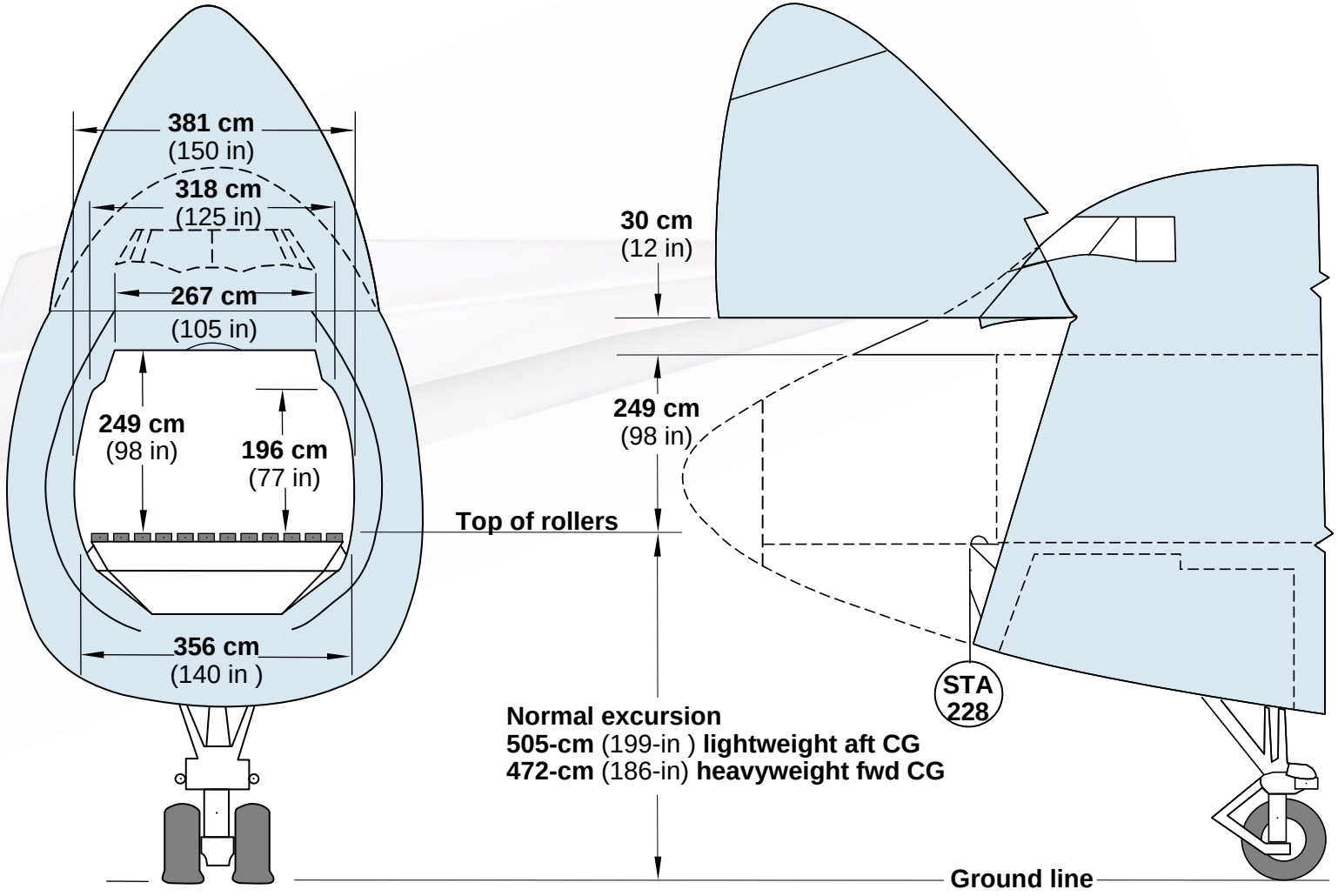
3 meter (10 foot) cargo capability

StartupBoeing

747-400/-400ER Freighter

Nose cargo door

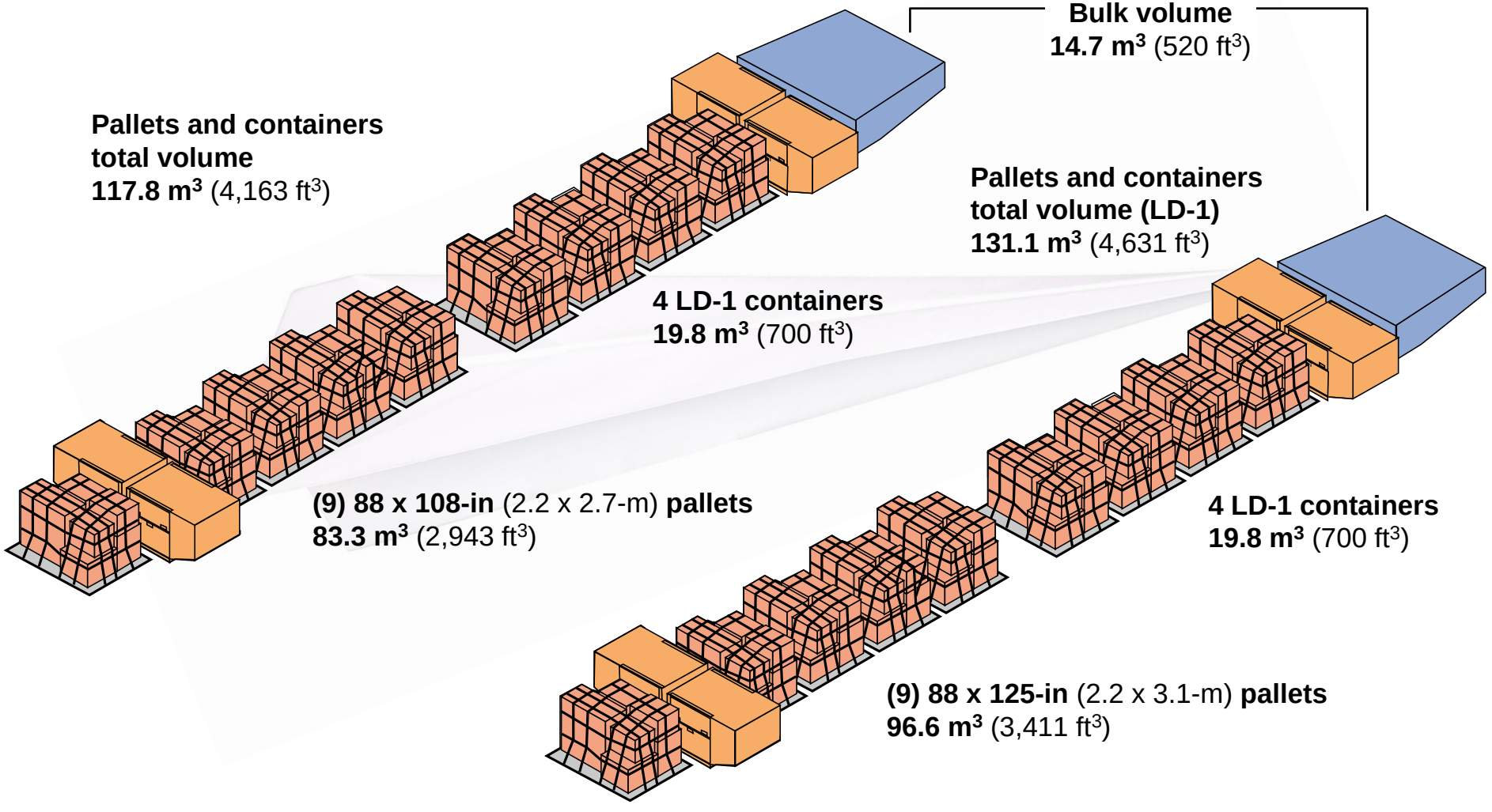
StartupBoeing



747-400/-400ER Freighter

Lower hold cargo arrangements

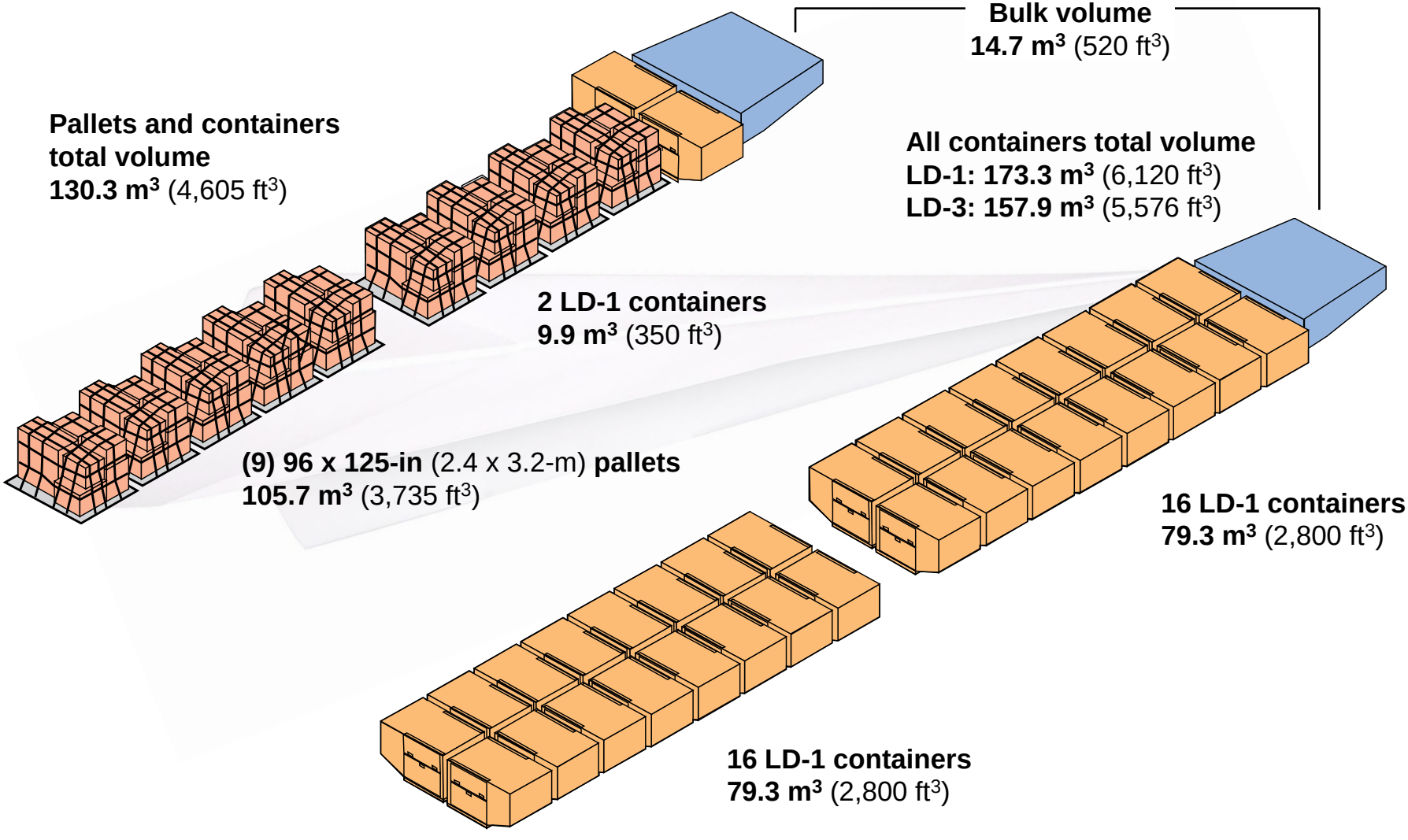
StartupBoeing



747-400/-400ER Freighter

Lower hold cargo arrangements

StartupBoeing



747-400/-400ER Freighter
Lower hold volume arrangements

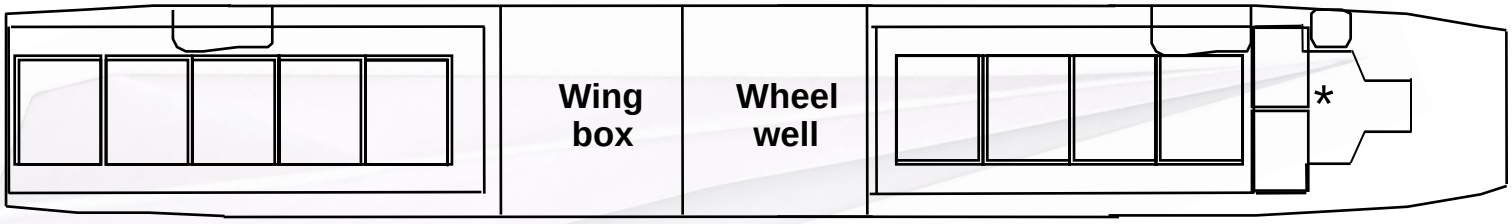
StartupBoeing

747-400F/ERF

Forward lower hold | **Aft lower hold**

Pallets and Containers

Total Volume
115.7 m³ (4,085 ft³)

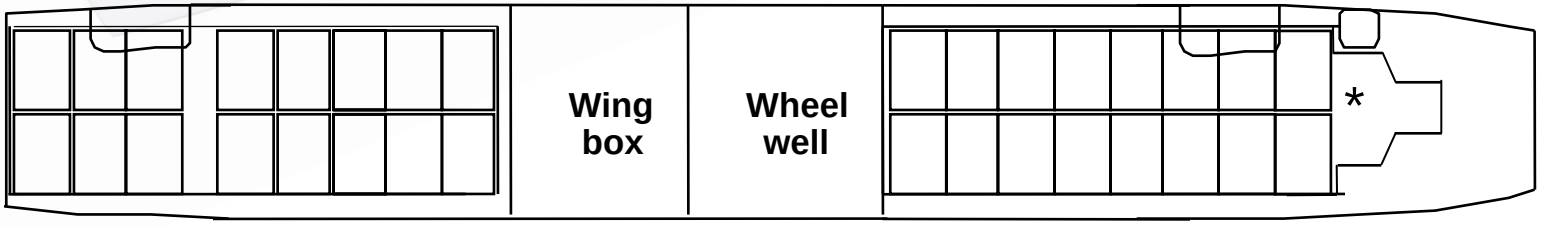


(5) 96-in x 125-in pallets
58.8 m³ (2,075 ft³)

(4) 96-in x 125-in pallets + (2) LD-1/LD-3 containers
56.9 m³ (2,010 ft³)

All Containers

Total Volume
158.6 m³ (5,600 ft³)



(16) LD-1/LD-3 containers
79.3 m³ (2,800 ft³)

(16) LD-1/LD-3 containers
79.3 m³ (2,800 ft³)

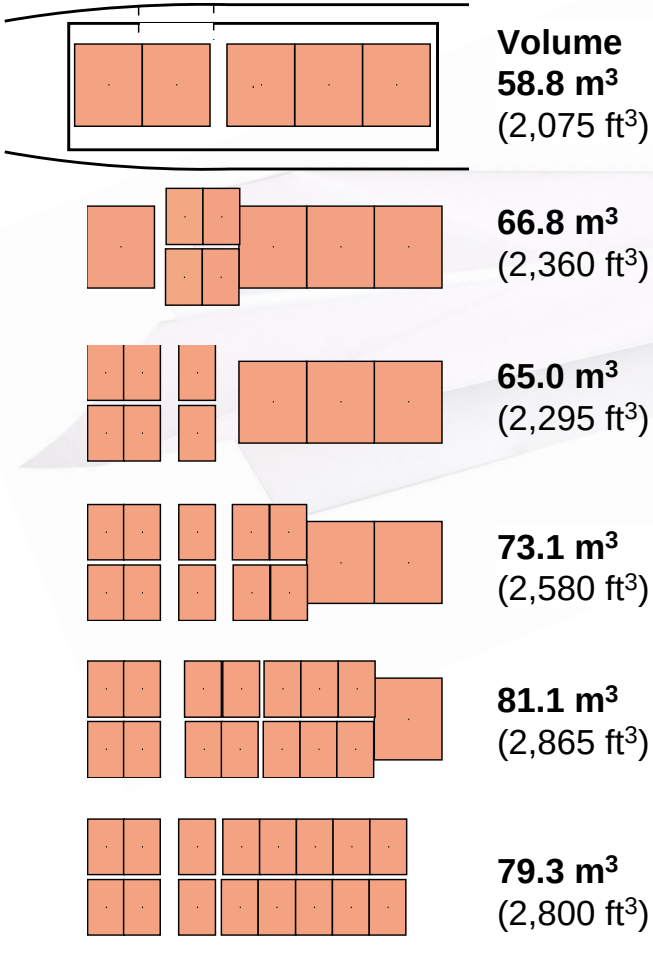
*Bulk cargo = 23.6 m³ (520 ft³).

747-400/-400ER Freighter

Lower hold loading versatility

StartupBoeing

96-in pallets, 11.8 m³ (415 ft³) **volume**
LD-1, 4.9 m³ (175 ft³) **volume**



Volume
58.8 m³
(2,075 ft³)

66.8 m³
(2,360 ft³)

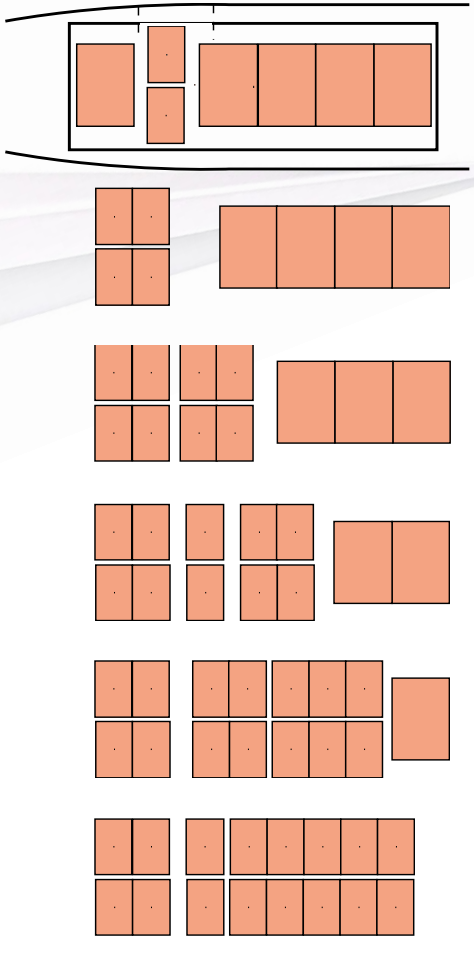
65.0 m³
(2,295 ft³)

73.1 m³
(2,580 ft³)

81.1 m³
(2,865 ft³)

79.3 m³
(2,800 ft³)

88-in pallets, 10.7 m³ (379 ft³) **volume**
LD-1, 4.9 m³ (175 ft³) **volume**



Volume
63.6 m³
(2,245 ft³)

62.8 m³
(2,216 ft³)

71.8 m³
(2,537 ft³)

71.0 m³
(2,508 ft³)

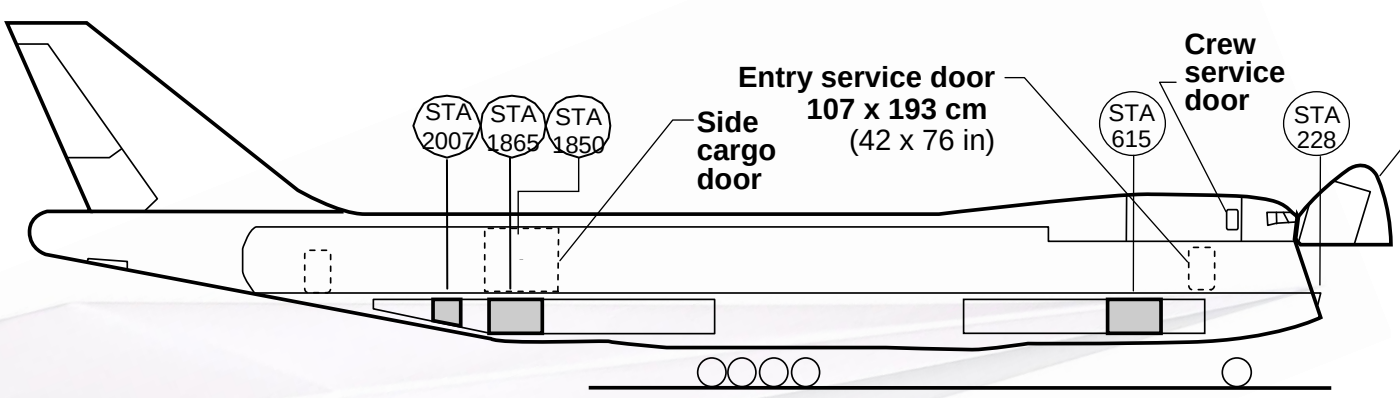
80.1 m³
(2,829 ft³)

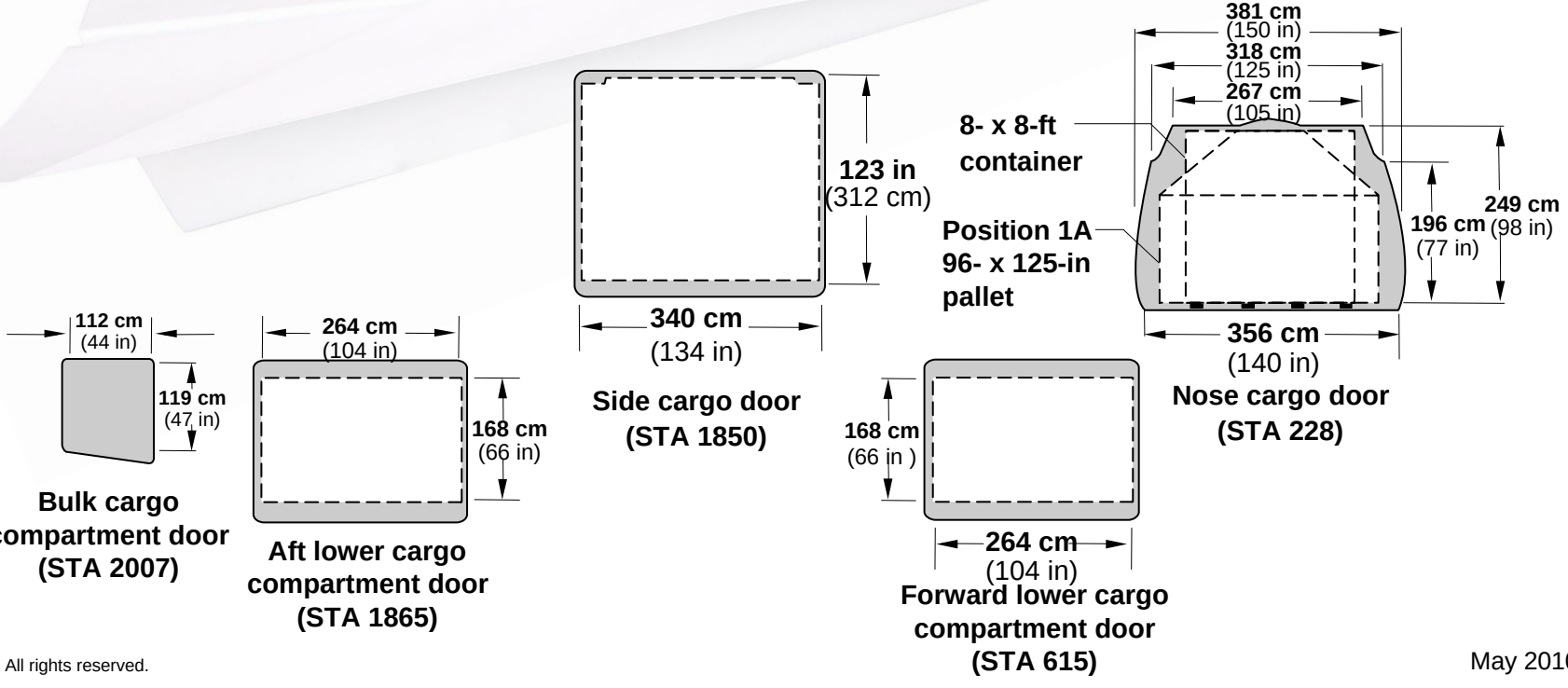
79.3 m³
(2,800 ft³)

747-400/-400ER Freighter

Cargo door arrangement

StartupBoeing





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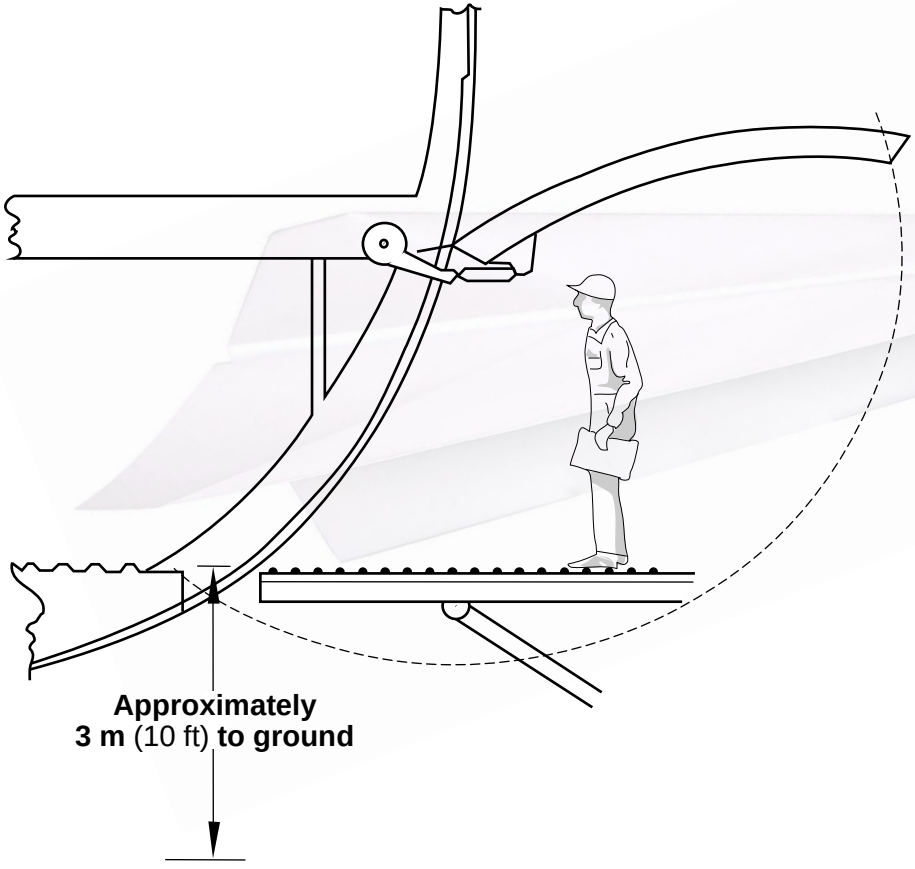
747-400/-400ER Freighter

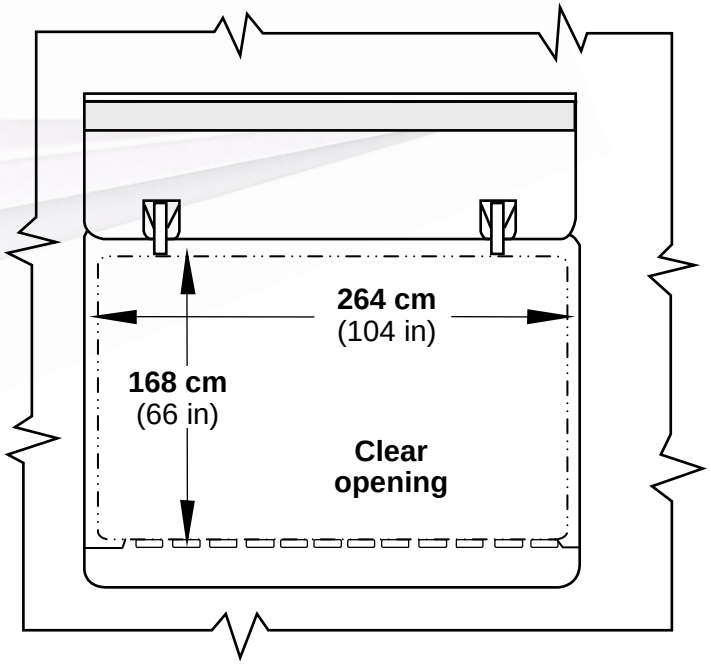
Lower cargo compartment door

StartupBoeing

Rear view



Right-hand side view

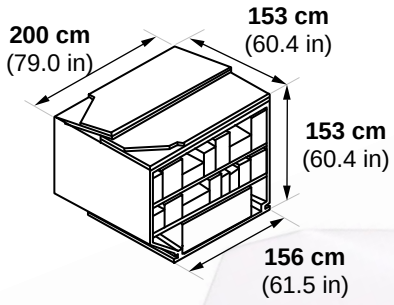


747-400/-400ER Freighter
Lower hold capability

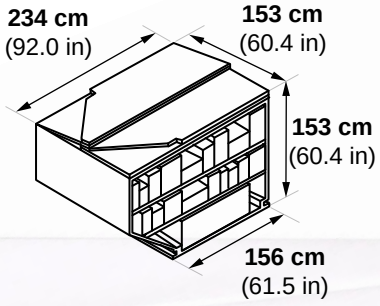
StartupBoeing

Containers and pallets

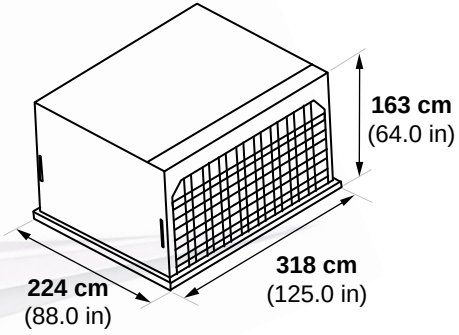
Basic



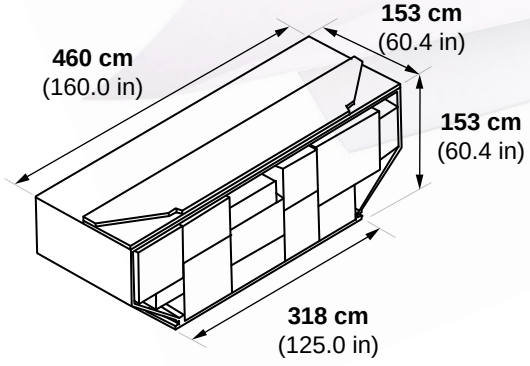
1,588-kg (3,500-lb) **MGW**
4.5 m³ (159 ft³)
(LD-3)



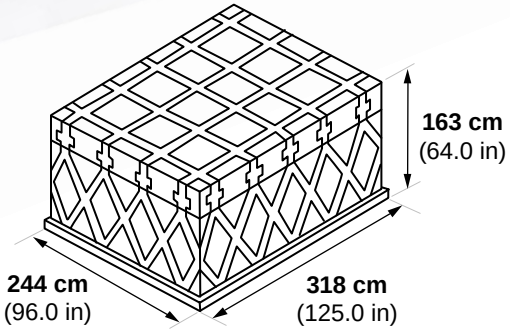
1,588-kg (3,500-lb) **MGW**
4.9 m³ (175 ft³)
(LD-1)



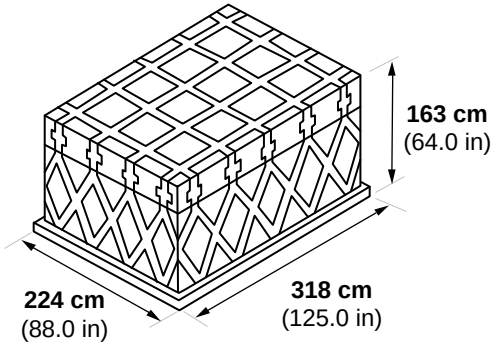
4,627-kg (10,200-lb) **MGW***
10.8 m³ (381 ft³)
(LD-9)



3,175-kg (7,000-lb) **MGW***
9.1 m³ (322 ft³)
(LD-6)



5,035-kg (11,100-lb) **MGW***
11.8 m³ (415 ft³)



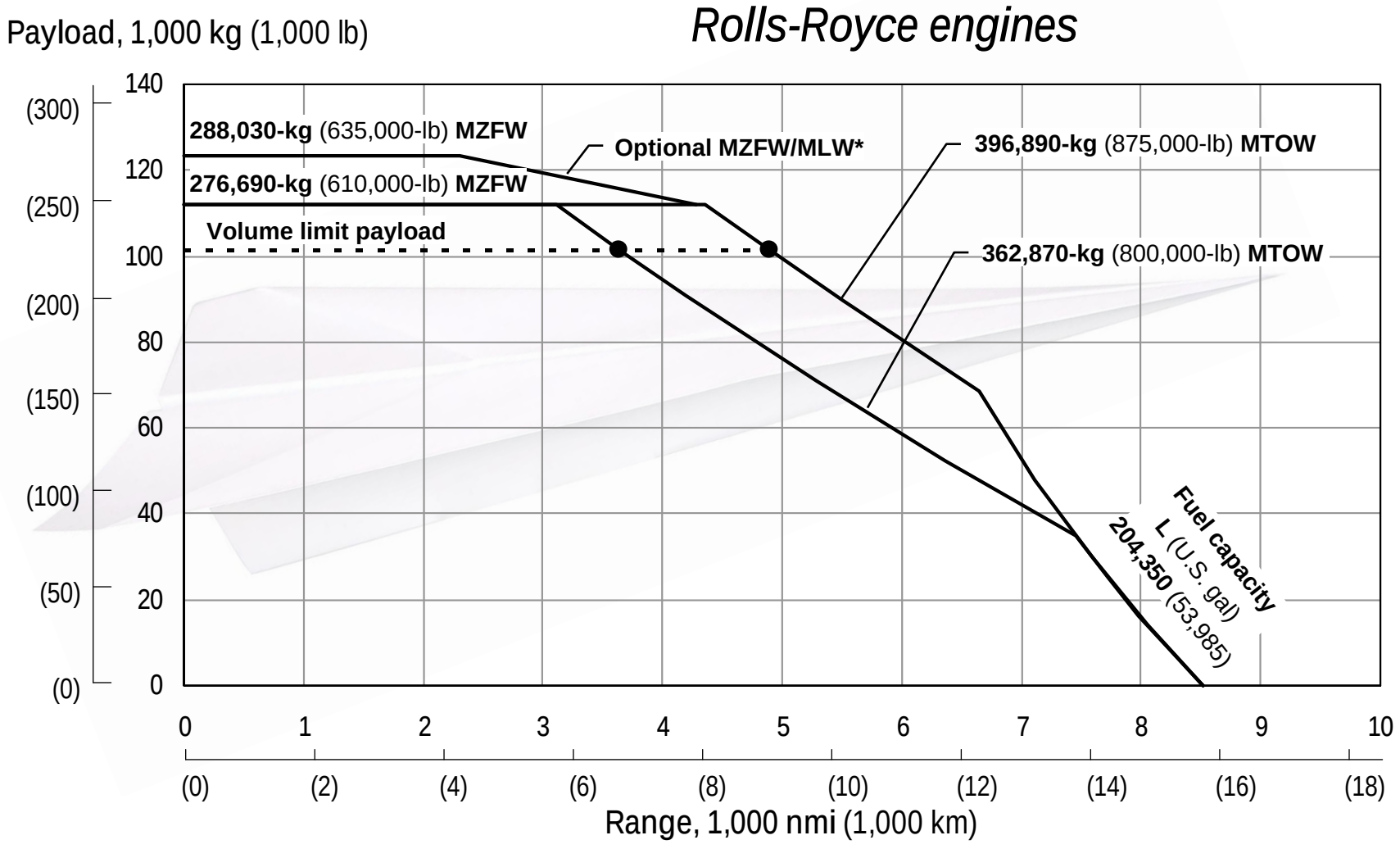
4,627-kg (10,200-lb) **MGW***
10.5 m³ (372 ft³)

* Maximum gross weights shown are based on lower hold running load capability, 21 kg/cm (116 lb/in), subject to overall airframe structural limits.

747-400 Freighter
Payload-range capability

StartupBoeing

Rolls-Royce engines



• Typical mission rules.

*MZFW decreases linearly from 288,030 kg (635,000 lb) to 276,690 kg (610,000 lb) as MTOW increases from 367,863 kg (811,000 lb) to 394,625 kg (870,000 lb).

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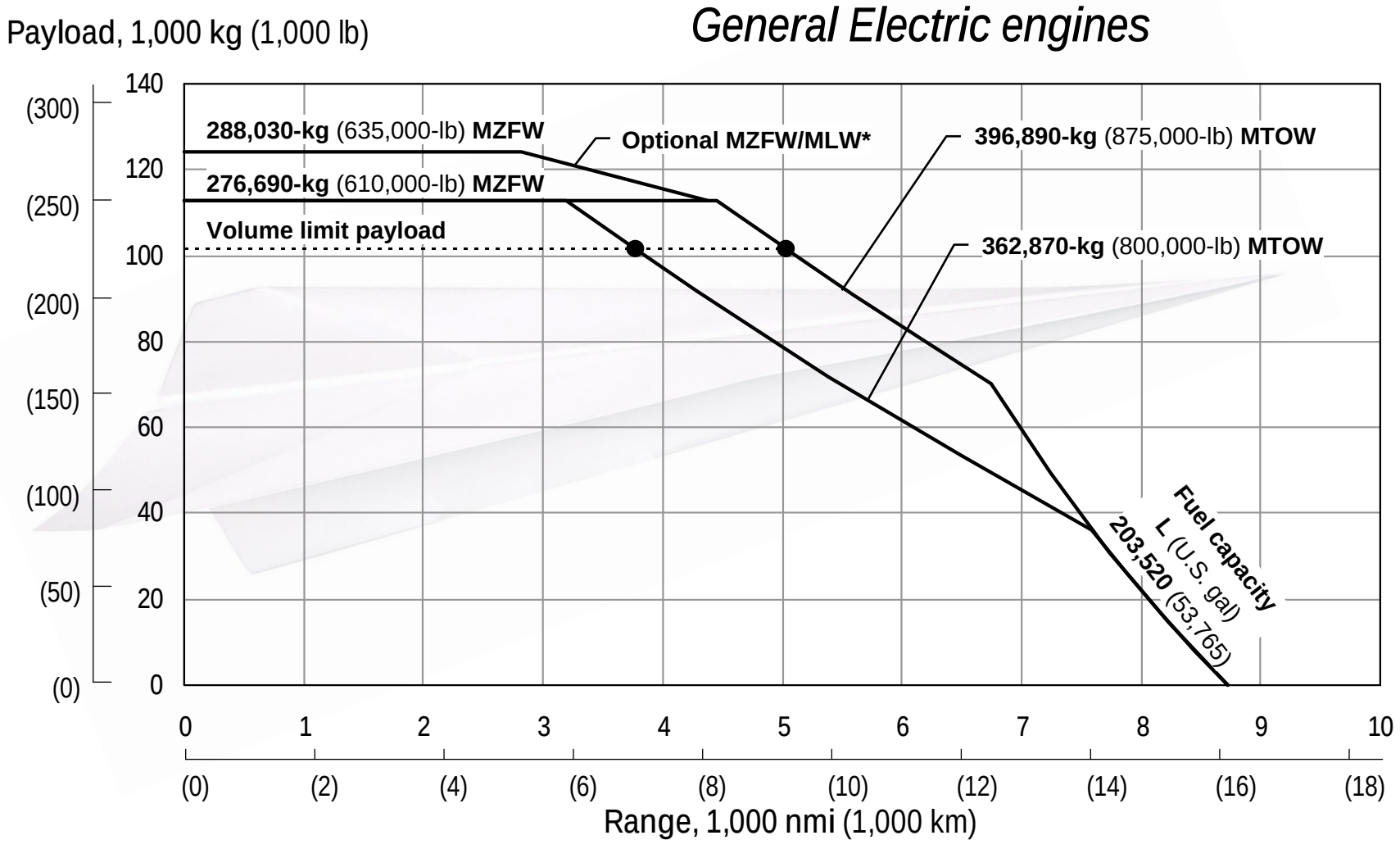
747-400 Freighter
Payload-range capability

StartupBoeing



• Typical mission rules.

*MZFW decreases linearly from 288,030 kg (635,000 lb) to 276,690 kg (610,000 lb) as MTOW increases from 367,863 kg (811,000 lb) to 394,625 kg (870,000 lb).

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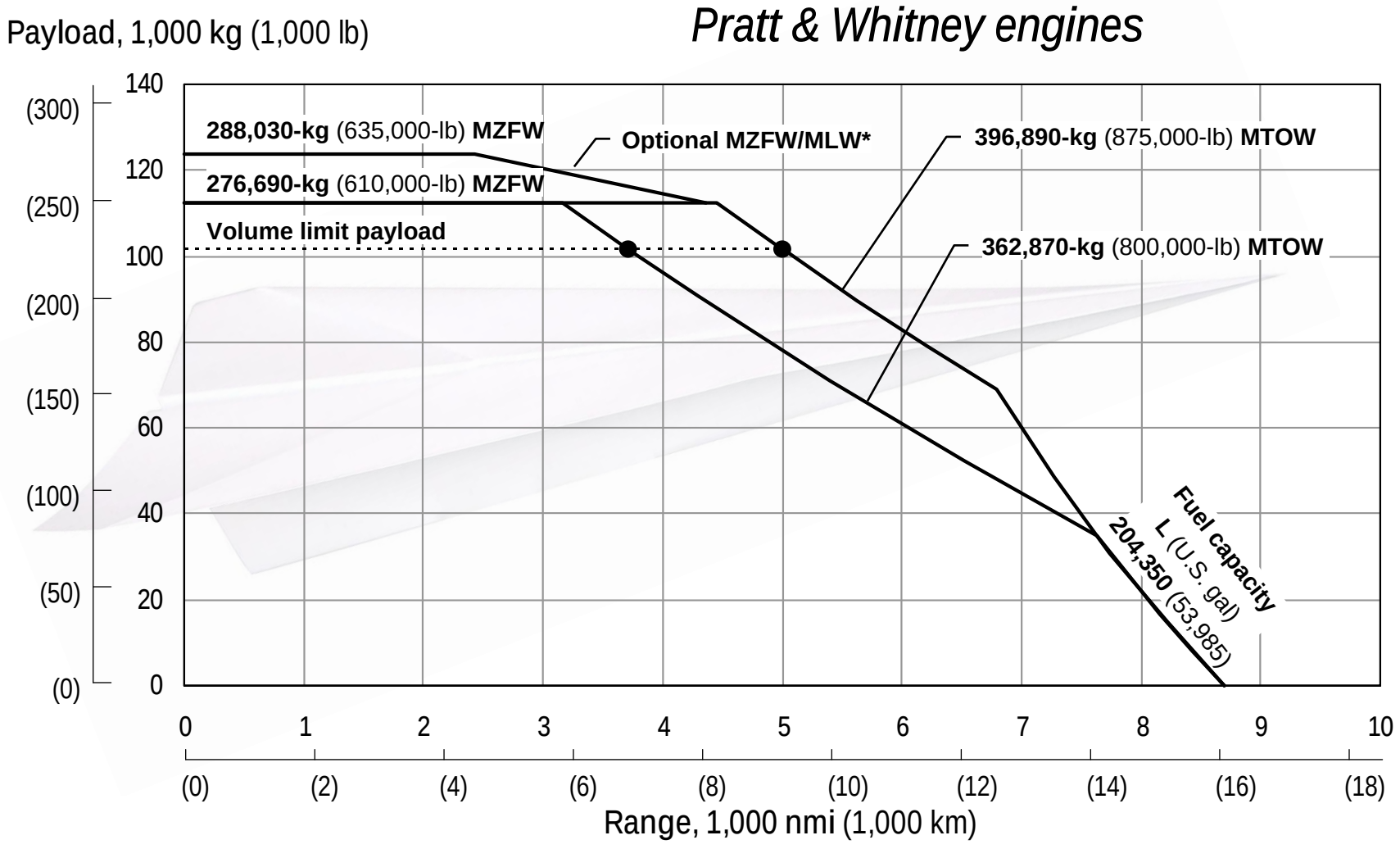
747-400 Freighter
Payload-range capability

StartupBoeing

Pratt & Whitney engines



• Typical mission rules.

*MZFW decreases linearly from 288,030 kg (635,000 lb) to 276,690 kg (610,000 lb) as MTOW increases from 367,863 kg (811,000 lb) to 394,625 kg (870,000 lb).

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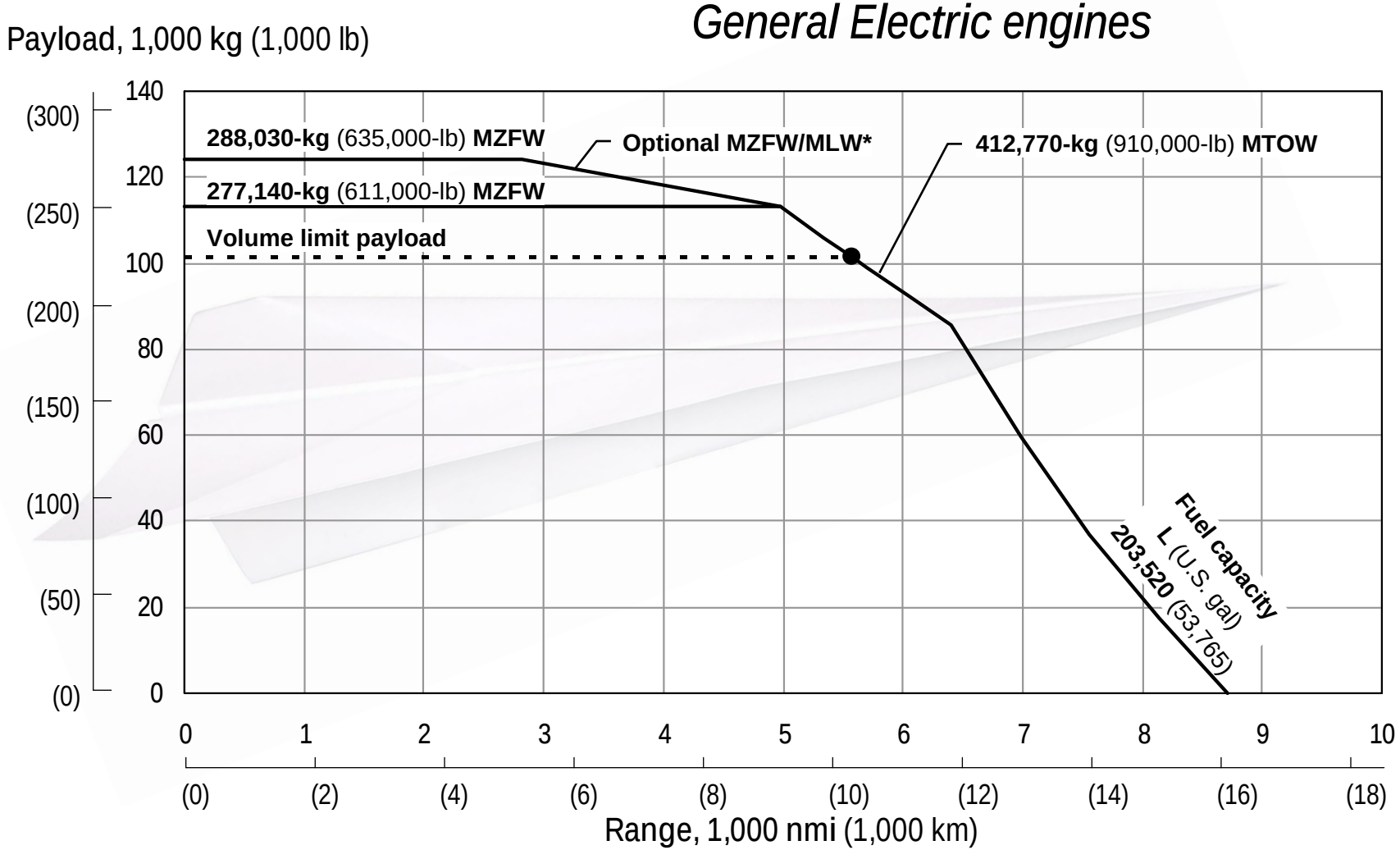
747-400ER Freighter
Payload-range capability

StartupBoeing

General Electric engines



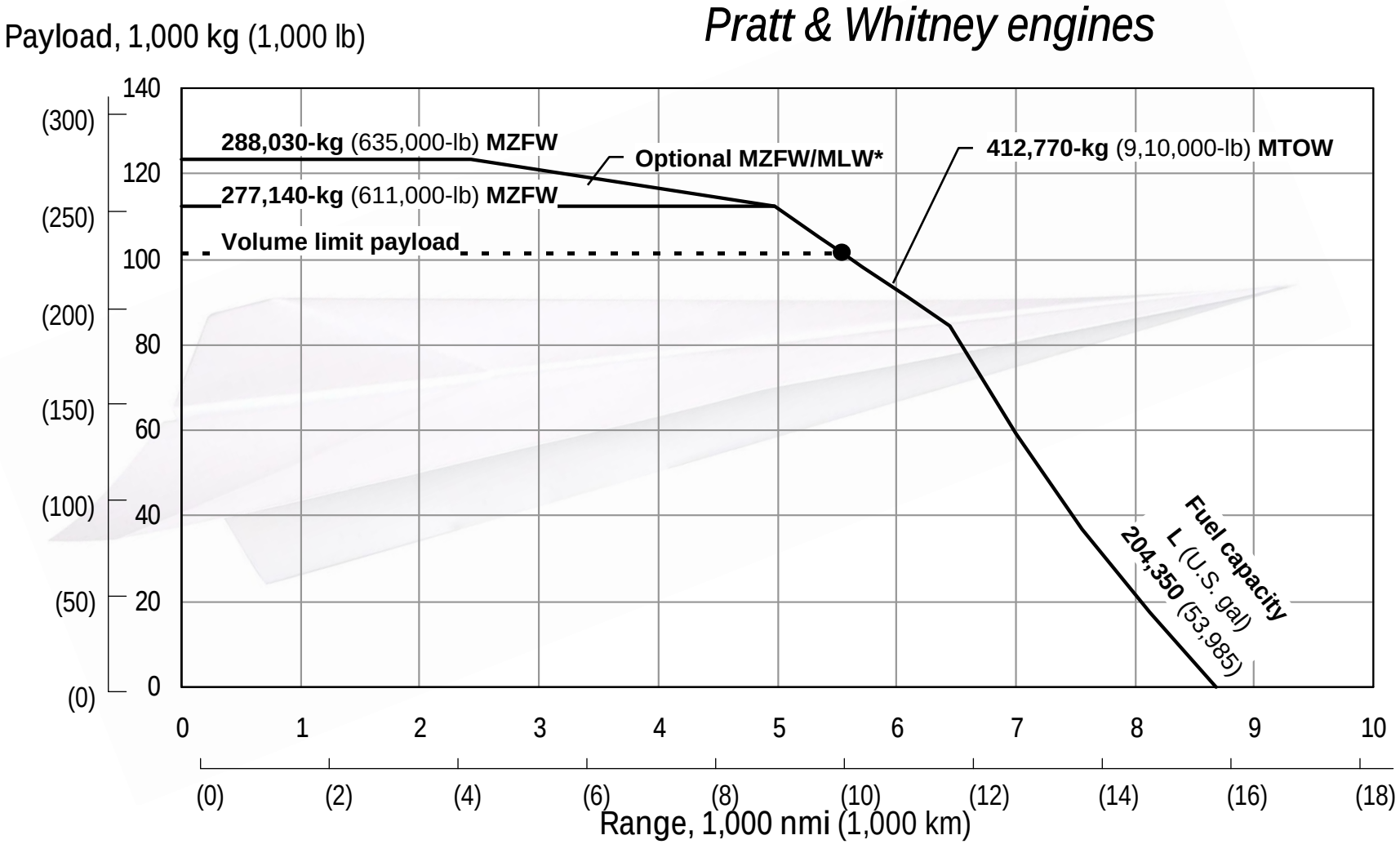
• Typical mission rules.

*MZFW decreases linearly from 288,030 kg (635,000 lb) to 277,140 kg (611,000 lb) as MTOW increases from 367,863 kg (811,000 lb) to 412,760 kg (910,000 lb).

747-400ER Freighter
Payload-range capability

StartupBoeing

Pratt & Whitney engines



• Typical mission rules.

*MZFW decreases linearly from 288,030 kg (635,000 lb) to 277,140 kg (611,000 lb) as MTOW increases from 367,863 kg (811,000 lb) to 412,760 kg (910,000 lb).

May 2010

747-400 Freighter
Performance summary

StartupBoeing

General Electric engines

		Basic	Option[2]	Option[3]
Cargo	MD pallets/LD pallets/LD containers[1]	30/9/2		
Engines		CF6-80C2-B1F	CF6-80C2-B5F	CF6-80C2-B1F
SL standard-day takeoff thrust/flat-rated temperature	lb/°F	56,5000/90	62,100/86	56,500/90
Maximum taxi weight	kg **(lb)**	364,230 **(803,000)**	398,250 **(878,000)**	369,220 **(814,000)**
Maximum takeoff weight	kg **(lb)**	362,870 **(800,000)**	396,890 **(875,000)**	367,860 **(811,000)**
Maximum landing weight	kg **(lb)**	295,740 **(652,000)**	295,740 **(652,000)**	302,090 **(666,000)**
Maximum zero fuel weight	kg **(lb)**	276,690 **(610,000)**	276,690 **(610,000)**	288,030 **(635,000)**
Operating empty weight[4]	kg **(lb)**	163,700 **(360,900)**	163,700 **(360,900)**	163,700 **(360,900)**
Tare weight	kg **(lb)**	5,450 **(12,010)**	5,450 **(12,010)**	5,450 **(12,010)**
Fuel capacity	L **(U.S. gal)**	203,520 **(53,765)**	203,520 **(53,765)**	203,520 **(53,765)**
Maximum revenue payload	kg **(lb)**	112,990 **(249,100)**	112,990 **(249,100)**	124,330 **(274,100)**
Design range (at max. revenue payload)	nmi **(km)**	3,190 **(5,910)**	4,455 **(8,250)**	2,825 **(5,230)**
Cruise Mach		0.845	0.845	0.845
Takeoff field length (SL, 86°F, MTOW)	m **(ft)**	2,820 **(9,250)**	3,110 **(10,200)**	2,910 **(9,550)**
Initial cruise altitude (MTOW, ISA + 10°C)	**ft**	34,600	32,700	34,300
Landing field length (MLW)	m **(ft)**	2,195 **(7,200)**	2,195 **(7,200)**	2,225 **(7,300)**
Approach speed (MLW)	kias	157	157	158
Block fuel data				
3,000 nmi	kg **(lb)**	68,200 **(150,360)**	68,200 **(150,360)**	Not applicable[5]

- Typical mission rules.

[1]96- x 125-in pallets/LD-1 containers.
[2]Highest available MTOW, only available with 276,690-kg (610,000-lb) MZFW.
[3]Highest available MZFW, only available with 367,860-kg (811,000-lb) MTOW. Operating restrictions require linear reduction in MTOW with MZFW increase from 276,690 to 288,030-kg (610,000 to 635,000 lb).
[4]Includes tare weight.
[5]Maximum landing weight limited.

747-400 Freighter
Performance summary

StartupBoeing

Pratt & Whitney engines

		Basic	Option[2]	Option[3]
Cargo	MD pallets/LD pallets/LD containers[1]	30/9/2		
Engines		PW4056	PW4062	PW4056
SL standard-day takeoff thrust/flat-rated temperature	lb/°F	57,100/92	63,300/86	57,100/92
Maximum taxi weight	kg **(lb)**	364,230 **(803,000)**	398,250 **(878,000)**	369,220 **(814,000)**
Maximum takeoff weight	kg **(lb)**	362,870 **(800,000)**	396,890 **(875,000)**	367,870 **(811,000)**
Maximum landing weight	kg **(lb)**	295,740 **(652,000)**	295,740 **(652,000)**	302,100 **(666,000)**
Maximum zero fuel weight	kg **(lb)**	276,690 **(610,000)**	276,690 **(610,000)**	288,030 **(635,000)**
Operating empty weight[4]	kg **(lb)**	164,380 **(362,400)**	164,380 **(362,400)**	164,380 **(362,400)**
Tare weight	kg **(lb)**	5,450 **(12,010)**	5,450 **(12,010)**	5,450 **(12,010)**
Fuel capacity	L **(U.S. gal)**	204,350 **(53,985)**	204,350 **(53,985)**	204,350 **(53,985)**
Maximum revenue payload	kg **(lb)**	112,310 **(247,600)**	112,310 **(247,600)**	123,650 **(272,600)**
Design range (at max. revenue payload)	nmi **(km)**	3,170 **(5,870)**	4,450 **(8,240)**	2,430 **(4,500)**[5]
Cruise Mach		0.845	0.845	0.845
Takeoff field length (SL, 86°F, MTOW)	m **(ft)**	2,820 **(9,250)**	2,985 **(9,800)**	2,910 **(9,550)**
Initial cruise altitude (MTOW, ISA + 10°C)	ft	34,600	32,700	34,300
Landing field length (MLW)	m **(ft)**	2,165 **(7,100)**	2,165 **(7,100)**	2,225 **(7,300)**
Approach speed (MLW)	kias	157	157	158
Block fuel data				
3,000 nmi	kg **(lb)**	68,280 **(150,530)**	68,280 **(150,530)**	Not applicable[5]

- Typical mission rules.

[1]96- x 125-in pallets/LD-1 containers.
[2]Highest available MTOW, only available with 276,690-kg (610,000-lb) MZFW.
[3]Highest available MZFW, only available with 367,860-kg (811,000-lb) MTOW. Operating restrictions require linear reduction in MTOW with MZFW increase from 276,690 to 288,030-kg (610,000 to 635,000 lb).
[4]Includes tare weight.
[5]Maximum landing weight limited.

747-400 Freighter
Performance summary

StartupBoeing

Rolls-Royce engines

		Basic	Option[2]	Option[3]
Cargo	MD pallets/LD pallets/LD containers[1]	30/9/2		
Engines		RB211-524G-T	RB211-524H-T	RB211-524G-T
SL standard-day takeoff thrust/flat-rated temperature	lb/°F	56,400/86	59,500/86	56,400/86
Maximum taxi weight	kg **(lb)**	304,230 **(803,000)**	398,250 **(878,000)**	369,220 **(814,000)**
Maximum takeoff weight	kg **(lb)**	302,870 **(800,000)**	396,890 **(875,000)**	367,860 **(811,000)**
Maximum landing weight	kg **(lb)**	295,740 **(652,000)**	295,740 **(652,000)**	302,090 **(666,000)**
Maximum zero fuel weight	kg **(lb)**	276,690 **(610,000)**	276,690 **(610,000)**	288,030 **(635,000)**
Operating empty weight[4]	kg **(lb)**	164,520 **(362,700)**	164,520 **(362,700)**	164,520 **(362,700)**
Tare weight	kg **(lb)**	5,450 **(12,010)**	5,450 **(12,010)**	5,450 **(12,010)**
Fuel capacity	L **(U.S. gal)**	204,350 **(53,985)**	204,350 **(53,985)**	204,350 **(53,985)**
Maximum revenue payload	kg **(lb)**	112,170 **(247,300)**	112,170 **(247,300)**	123,510 **(272,300)**
Design range (at max. revenue payload)	nmi **(km)**	3,110 **(5,760)**	4,365 **(8,080)**	2,305 **(4,270)**[5]
Cruise Mach		0.845	0.845	0.845
Takeoff field length (SL, 86°F, MTOW)	m **(ft)**	2,850 **(9,350)**	3,290 **(10,800)**	2,920 **(9,600)**
Initial cruise altitude (MTOW, ISA + 10°C)	ft	34,600	32,700	34,300
Landing field length (MLW)	m **(ft)**	2,165 **(7,100)**	2,165 **(7,100)**	2,225 **(7,300)**
Approach speed (MLW)	kias	157	157	158
Block fuel data				
3,000 nmi	kg **(lb)**	69,540 **(153,320)**	69,540 **(153,320)**	Not applicable[5]

- Typical mission rules.

[1]96- x 125-in pallets/LD-1 containers.
[2]Highest available MTOW, only available with 276,690-kg (610,000-lb) MZFW.
[3]Highest available MZFW, only available with 367,860-kg (811,000-lb) MTOW. Operating restrictions require linear reduction in MTOW with MZFW increase from 276,690 to 288,030-kg (610,000 to 635,000 lb).
[4]Includes tare weight.
[5]Maximum landing weight limited.

747-400ER Freighter
Performance summary

StartupBoeing

General Electric engines

		Basic	Option[2]
Cargo	MD pallets/LD pallets/LD containers[1]	30/9/2	
Engines		CF6-80C2-B5F	CF6-80C2-B5F
SL standard-day takeoff thrust/flat-rated temperature	lb/°F	62,100/86	62,100/86
Maximum taxi weight	kg **(lb)**	414,130 **(913,000)**	369,220 **(814,000)**
Maximum takeoff weight	kg **(lb)**	412,770 **(910,000)**	367,860 **(811,000)**
Maximum landing weight	kg **(lb)**	296,200 **(653,000)**	302,090 **(666,000)**
Maximum zero fuel weight	kg **(lb)**	277,140 **(611,000)**	288,030 **(635,000)**
Operating empty weight[3]	kg **(lb)**	164,020 **(361,600)**	164,020 **(361,600)**
Tare weight	kg **(lb)**	5,450 **(12,010)**	5,450 **(12,010)**
Fuel capacity	L **(U.S. gal)**	203,520 **(53,765)**	203,520 **(53,765)**
Maximum revenue payload	kg **(lb)**	113,130 **(249,400)**	124,010 **(273,400)**
Design range (at max. revenue payload)	nmi **(km)**	4,980 **(9,220)**	2,825[4] **(5,230)[4]**
Cruise Mach		0.845	0.845
Takeoff field length (SL, 86°F, MTOW)	m **(ft)**	3,340 **(10,950)**	2,560 **(8,400)**
Initial cruise altitude (MTOW, ISA + 10°C)	ft	31,800	34,300
Landing field length (MLW)	m **(ft)**	2,180 **(7,150)**	2,255 **(7,400)**
Approach speed (MLW)	kias	157	158
Block fuel data			
3,000 nmi	kg **(lb)**	68,310 **(150,590)**	Not applicable[4]

- Typical mission rules.

[1]96- x 125-in pallets/LD-1 containers.
[2]Highest available MZFW, only available with 367,860-kg (811,000-lb) MTOW. Operating restrictions require linear reduction in MTOW with MZFW increase from 276,690 to 288,030-kg (610,000 to 635,000 lb).
[3]Includes tare weight.
[4]Maximum landing weight limited.

747-400ER Freighter
Performance summary

StartupBoeing

Pratt & Whitney engines

		Basic	Option[2]
Cargo	MD pallets/LD pallets/LD containers[1]	30/9/2	
Engines		PW4062	PW4062
SL standard-day takeoff thrust/flat-rated temperature	lb/°F	63,300/86	63,300/86
Maximum taxi weight	kg **(lb)**	414,130 **(913,000)**	369,220 **(814,000)**
Maximum takeoff weight	kg **(lb)**	412,770 **(910,000)**	367,860 **(811,000)**
Maximum landing weight	kg **(lb)**	296,200 **(653,000)**	302,090 **(666,000)**
Maximum zero fuel weight	kg **(lb)**	277,140 **(611,000)**	288,030 **(635,000)**
Operating empty weight[3]	kg **(lb)**	164,700 **(363,100)**	164,700 **(363,100)**
Tare weight	kg **(lb)**	5,450 **(12,010)**	5,450 **(12,010)**
Fuel capacity	L **(U.S. gal)**	204,350 **(53,985)**	204,350 **(53,985)**
Maximum revenue payload	kg **(lb)**	112,450 **(247,900)**	123,330 **(271,900)**
Design range (at max. revenue payload)	nmi **(km)**	4,985 **(9,230)**	2,430[4] **(4,500)[4]**
Cruise Mach		0.845	0.845
Takeoff field length (SL, 86°F, MTOW)	m **(ft)**	3,290 **(10,800)**	2,540 **(8,350)**
Initial cruise altitude (MTOW, ISA + 10°C)	ft	31,900	34,300
Landing field length (MLW)	m **(ft)**	2,195 **(7,200)**	2,255 **(7,400)**
Approach speed (MLW)	kias	157	158
Block fuel data			
3,000 nmi	kg **(lb)**	68,380 **(150,750)**	Not applicable[4]

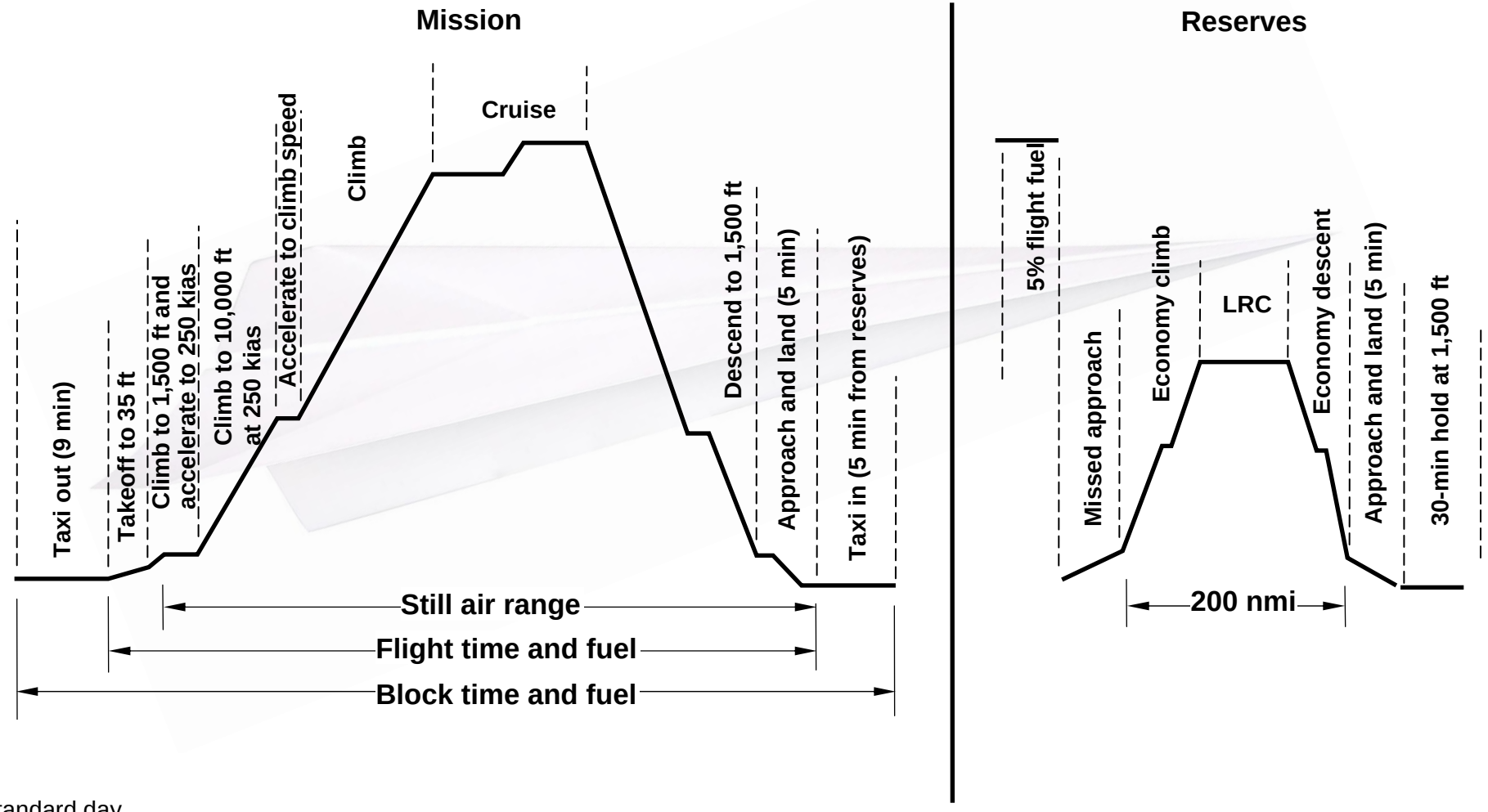
- Typical mission rules.

[1]96- x 125-in pallets/LD-1 containers.
[2]Highest available MZFW, only available with 367,860-kg (811,000-lb) MTOW. Operating restrictions require linear reduction in MTOW with MZFW increase from 276,690 to 288,030-kg (610,000 to 635,000 lb).
[3]Includes tare weight.
[4]Maximum landing weight limited.

747-400/-400ER Freighter
Mission profile

StartupBoeing

Typical mission rules



- Standard day.
- 6.7 lb per U.S. gal fuel density.
- Nominal performance.

747-400/-400ER Freighter
Range capability from New York

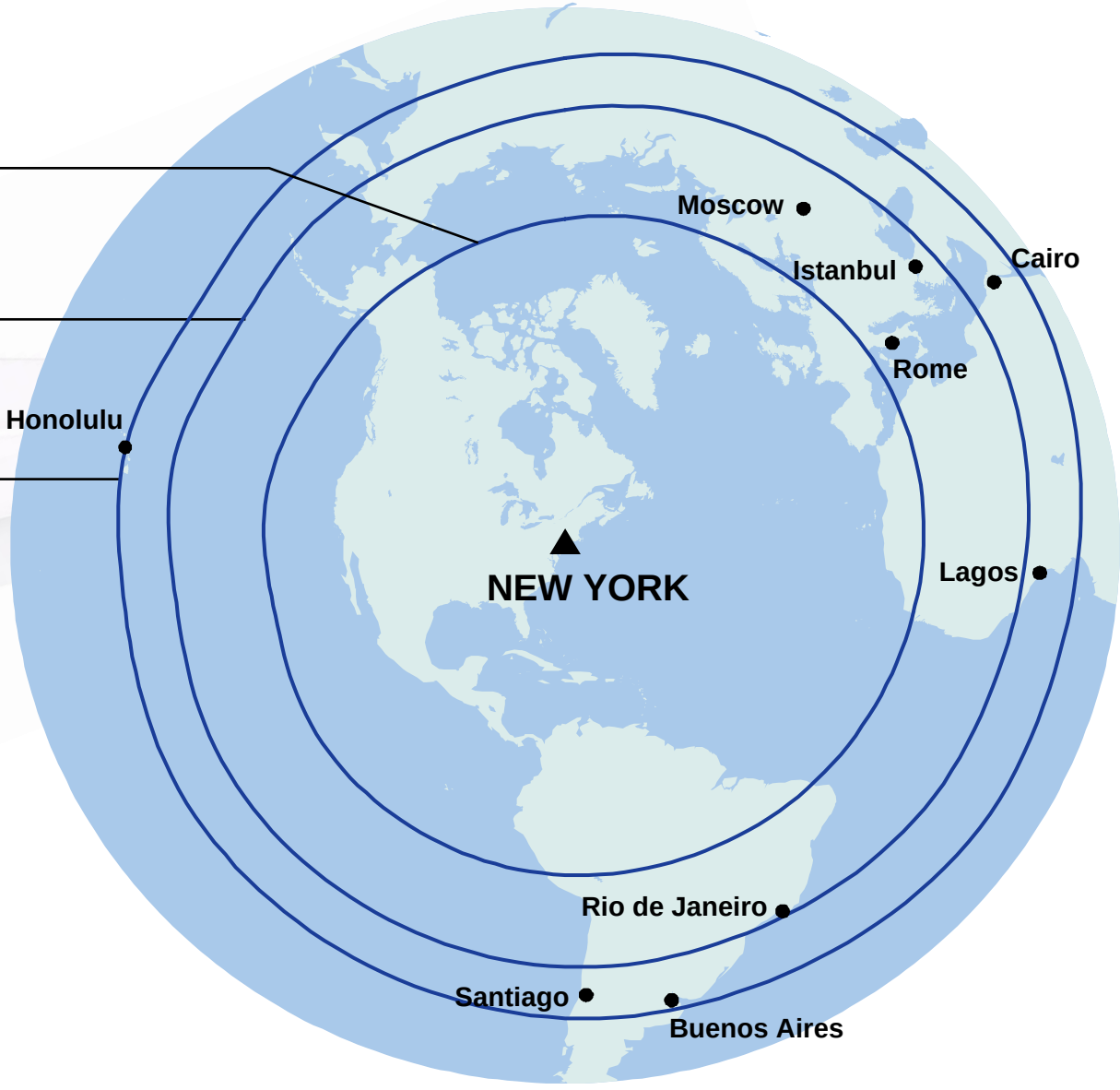
StartupBoeing

*Maximum revenue payload**

747-200F
377,842-kg (833,000-lb) **MTOW**
111-tonne (122-tons) **payload**

747-400F
396,893-kg (875,000-lb) **MTOW**
113-tonne (124-tons) **payload**

747-400ERF
412,770-kg (910,000-lb) **MTOW**
113-tonne (124-tons) **payload**



- Typical mission rules.
- 85% annual winds.
- Airways and traffic allowances included.
- Range capability from New York.

* Does not include tare.

May 2010

747-400/-400ER Freighter
Range capability from Dubai

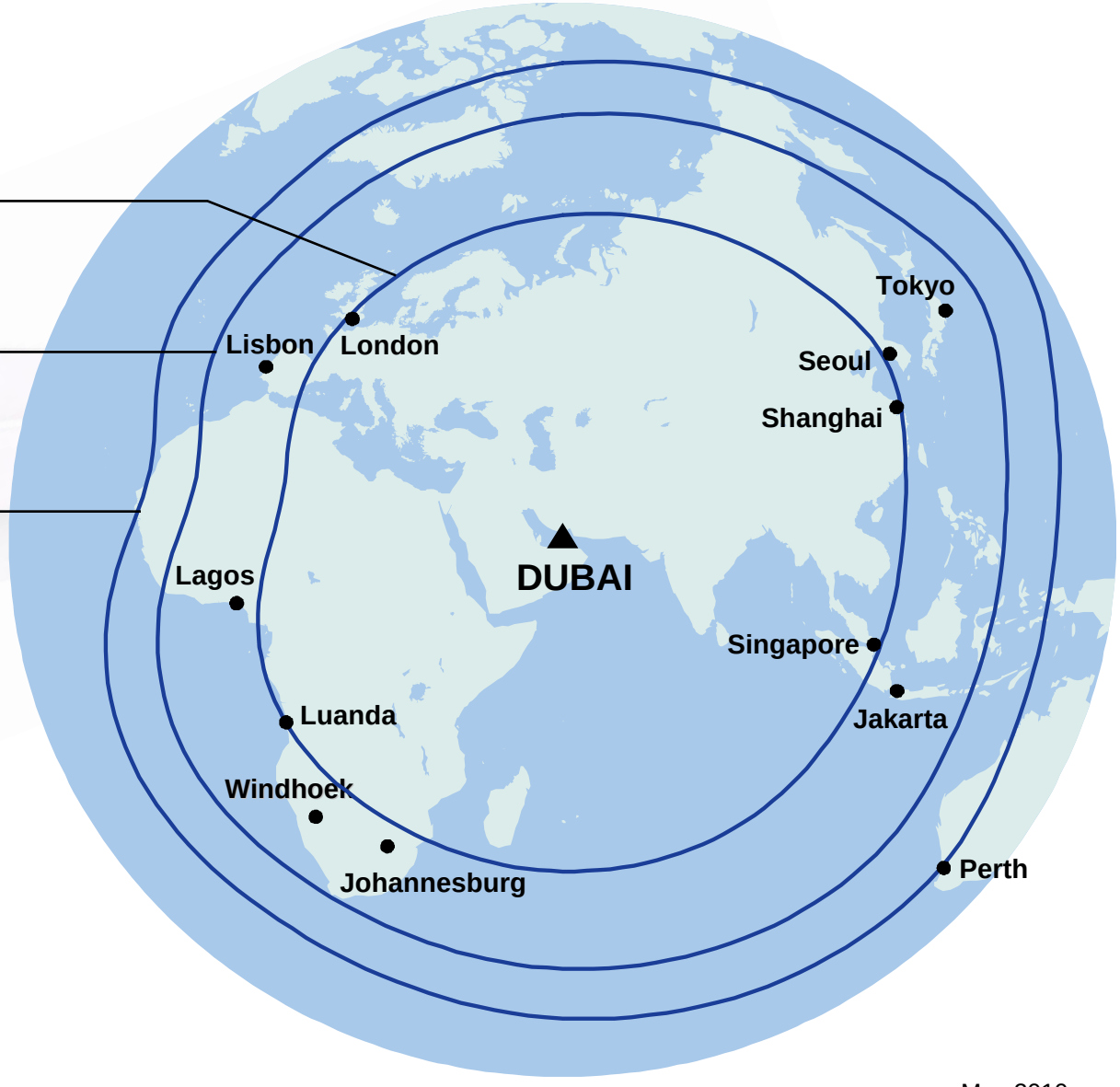
StartupBoeing

*Maximum revenue payload**

747-200F
377,842-kg (833,000-lb) **MTOW**
111-tonne (122-tons) **payload**

747-400F
396,893-kg (875,000-lb) **MTOW**
113-tonne (124-tons) **payload**

747-400ERF
412,770-kg (910,000-lb) **MTOW**
113-tonne (124-tons) **payload**



- Typical mission rules.
- 85% annual winds.
- Airways and traffic allowances included.
- Range capability from Dubai.

* Does not include tare.

May 2010

747-400/-400ER Freighter
Range capability from Hong Kong

StartupBoeing

*Maximum revenue payload**

747-200F
377,842-kg (833,000-lb) **MTOW**
111-tonne (122-tons) **payload**

747-400F
396,893-kg (875,000-lb) **MTOW**
113-tonne (124-tons) **payload**

747-400ERF
412,770-kg (910,000-lb) **MTOW**
113-tonne (124-tons) **payload**

- Typical mission rules.
- 85% annual winds.
- Airways and traffic allowances included.
- Range capability from Hong Kong.

* Does not include tare.

May 2010

747-400/-400ER Freighter
Range capability from London

StartupBoeing

*Maximum revenue payload**

747-200F
377,842-kg (833,000-lb) **MTOW**
111-tonne (122-tons) **payload**

747-400F
396,893-kg (875,000-lb) **MTOW**
113-tonne (124-tons) **payload**

747-400ERF
412,770-kg (910,000-lb) **MTOW**
113-tonne (124-tons) **payload**

- Typical mission rules.
- 85% annual winds.
- Airways and traffic allowances included.
- Range capability from London.

* Does not include tare.

May 2010