SAE The Engineering Resource For Advancing Mobility®
400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE INFORMATION REPORT

C-15-08
SAE AIR 1673 C-15-10

Issued 7-8-86

Submitted for recognition as an American National Standard

AIRCRAFT CARGO DOOR OPENING/SILL DETAILS FOR GROUND SUPPORT EQUIPMENT INTERFACE

1. PURPOSE: The purpose of this report is to provide detailed data of the aircraft attachment points at each door position capable of loading pallets or containers on the current aircraft and on new aircraft, where known.

   Aircraft designers may utilize this information to enable future designs to fall into one of these categories with a view to keeping the range of elevator adaptor bars to the present level.

   The design of the aircraft attachment points is governed by sill design. Two types of attachment provisions for latch-on fittings are available as follows:

   1) Special fittings in the vicinity of door latch fittings.

   2) Special door latch fittings (spools) as approved for use by the airframe manufacturers.

   Ground equipment design objective should be to attempt to incorporate latch-on capability for 2 or more sill types on their adaptor bars.

1.1 Reference Documents:

1.1.1 IATA AHM 931, Functional Specification for Lower Deck Container/Pallet Loader.

1.1.2 IATA AHM 932, Functional Specification for Main-Deck Container/Pallet Loader.

IATA addresses:

Traffic Publications
International Air Transport
Association
2000 Peel Street
Montreal, Quebec
Canada H3A 2R4

Traffic Publications
International Air Transport
Association
26, Chemin de Joinville
1216 Cointrin - Geneve
Switzerland

2. SCOPE: Manufacturers/designers of all aircraft equipped with a pallet/container capability have provided a means of linking the ground loaders/elevators with the aircraft sill for the smoother transfer of pallets and containers into or out of the aircraft holds.

Use of the aircraft attachment points may be used as a means of averting damage to the aircraft door frames and other important parts. Latch-on guarantees fore and aft and vertical alignment of the loader bed with the aircraft doorway, when used in conjunction with the appropriate ground equipment.

This Aerospace Information Report has been prepared by SAE Subcommittee AGE-2A to present a review of the current range of aircraft attachment points on wide body aircraft and those narrow body aircraft with a ULD cargo capability. Airline operators, who utilized these facilities, have been faced with a growing number of adaptor bars necessary to suit each type of aircraft and door position. There is also a stowage problem on the elevator compounded by the increasing number of bars necessary to suit each aircraft. Some measure of standardization is obviously desirable.

The adaptor bars which have to be fitted to the forward face of the elevators to suit each different type of sill attachment are very heavy and present some handling problems to operators.

Where the same elevator services different aircraft types, these bars may have to be changed many times each day on the ramp.

Alternatively, elevators have to be restricted to servicing specific aircraft types or to those aircraft where a common attachment point already exists.

DATA CLASSIFICATION

1.	Airbus A300/310		
	Lower deck	-	Figs 1A thru 1E
	Main deck	-	Figs 2A thru 2C
2.	B707/B727		
	Main deck	-	Figs 3A thru 3B
3.	B737		
	Main deck	-	Figs 4A thru 4B
4.	B747		
	Lower deck	-	Figs 5A thru 5D
	Main deck	-	Figs 6A thru 6F
5.	B767		
	Lower deck	-	Figs 7A thru 7F
6.	DC8		
	Main deck	-	Figs 8A thru 8G
7.	DC9		
	Main deck	-	Figs 9A thru 9D
8.	DC10		
	Lower deck	-	Figs 10A thru 10D
	Main deck	-	Figs 11A thru 11E
9.	L1011		
	Lower deck	-	Figs 12A thru 12H
10.	L100		
	Main deck	-	Figs 13A thru 13D

AIRBUS A300 AND A310 - LOWER DECK CARGO DOOR SILL ATTACHMENT FITTING DETAILS FOR GROUND LOADING EQUIPMENT

A.300

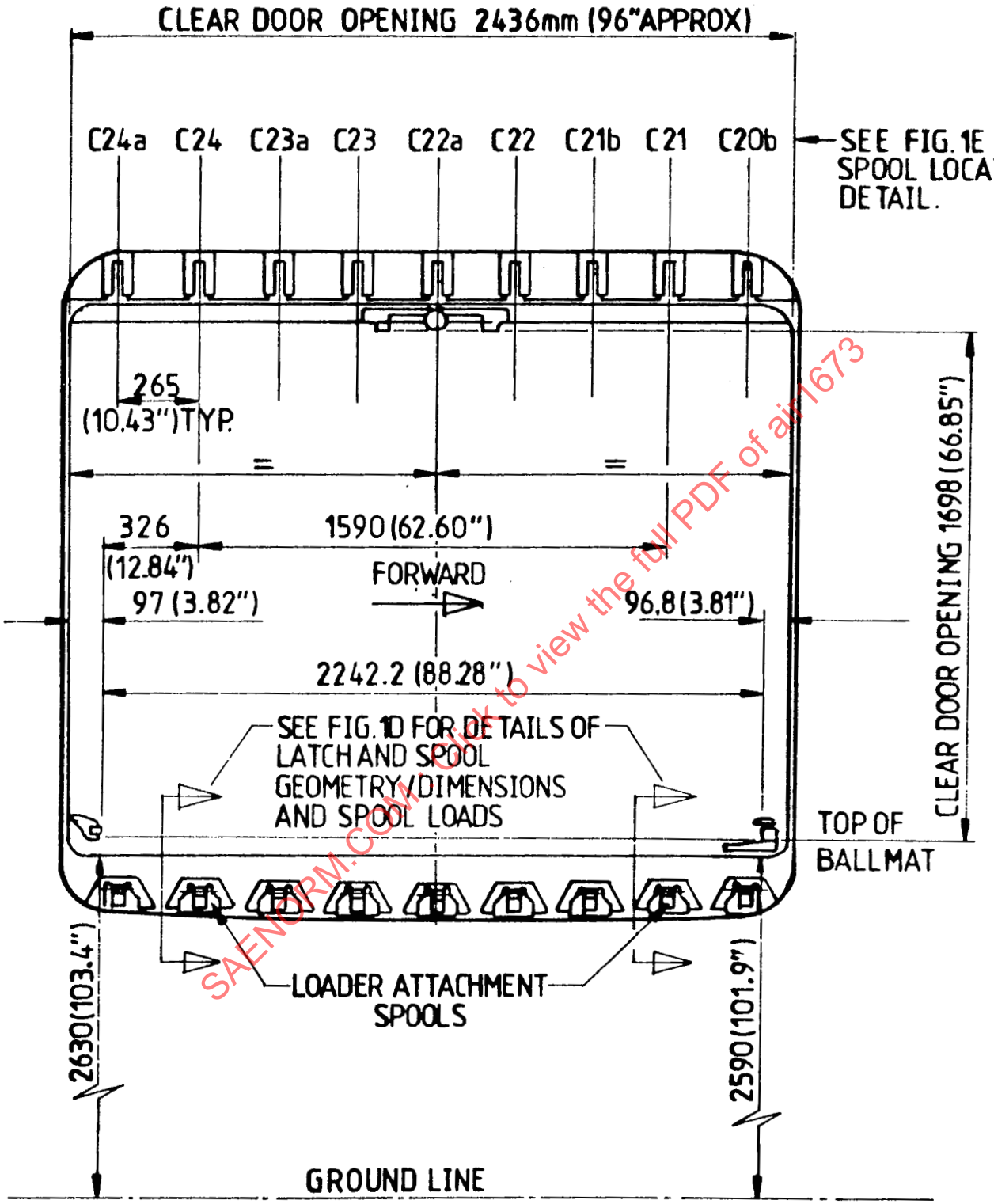


FIG.1A LOWER DECK - HOLD 1 DOOR (PRE. MOD. 2295)
A.300 AIRCRAFT

A.300
A.310

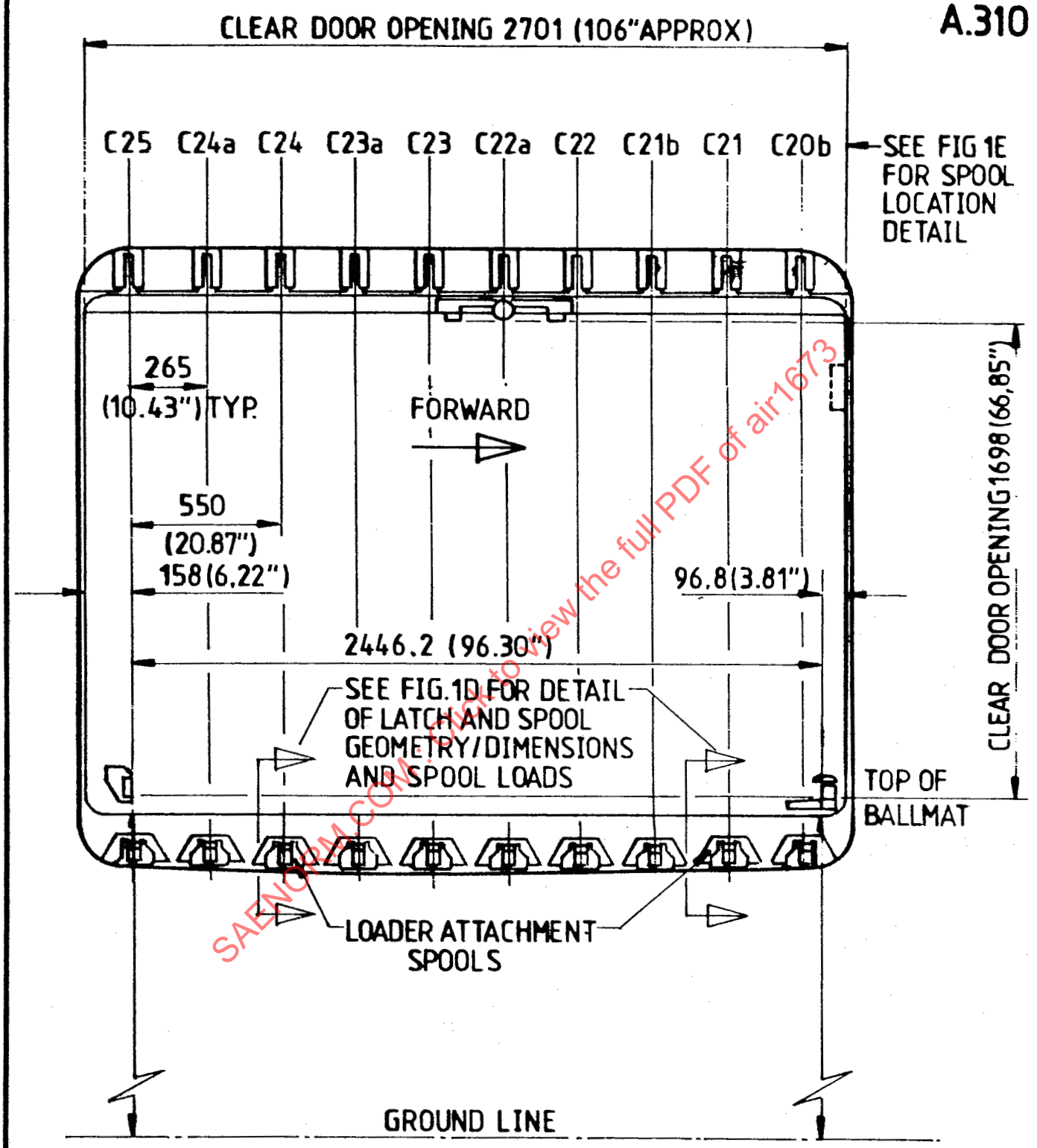


FIG.1B LOWER DECK - HOLD 1 DOOR (POST MOD. 2295)
A.300 AIRCRAFT AND A.310 AIRCRAFT.

A.300
A.310

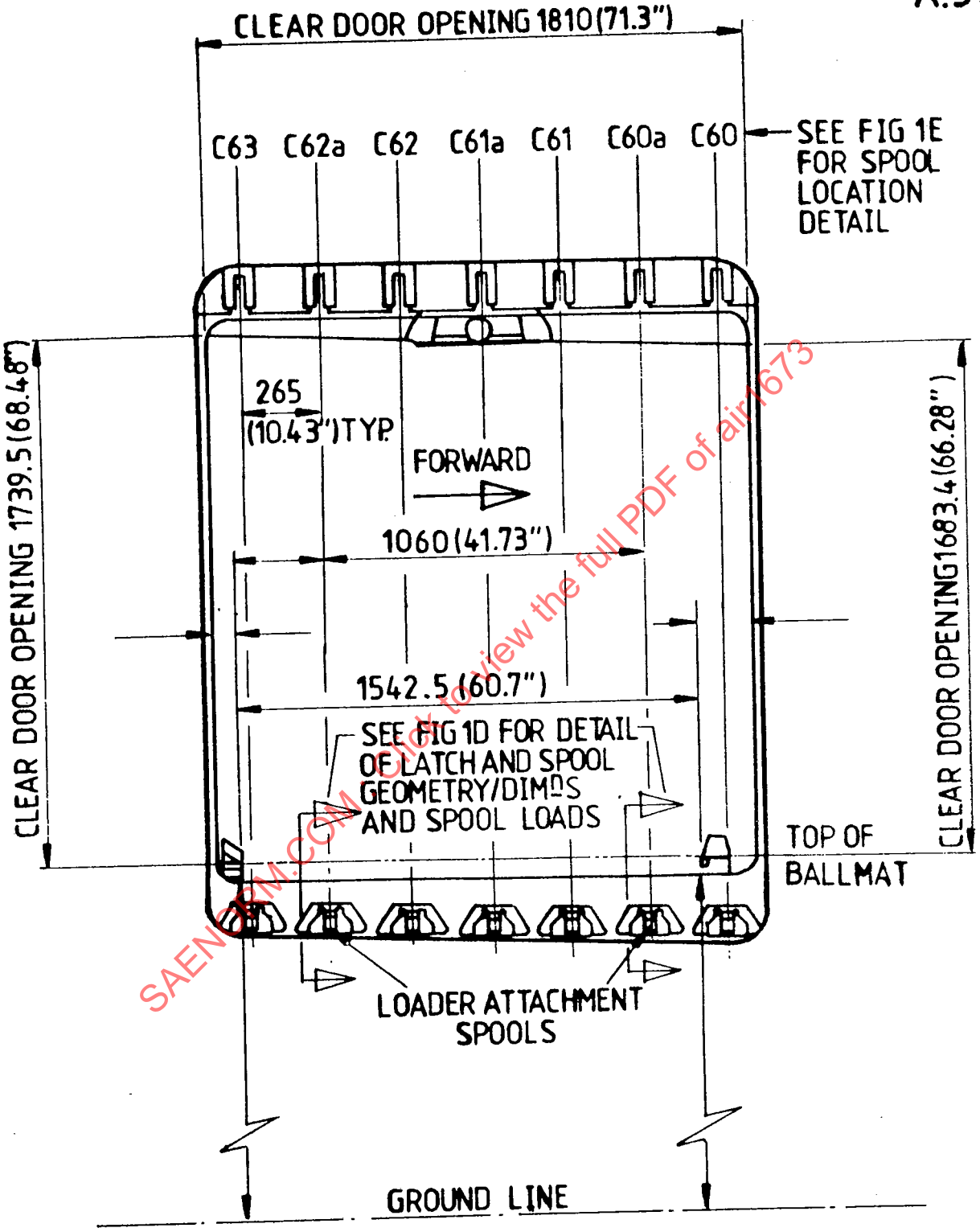


FIG.1C. LOWER DECK - HOLD 2 DOOR
A.300 AIRCRAFT AND A.310 AIRCRAFT

A.300
A.310

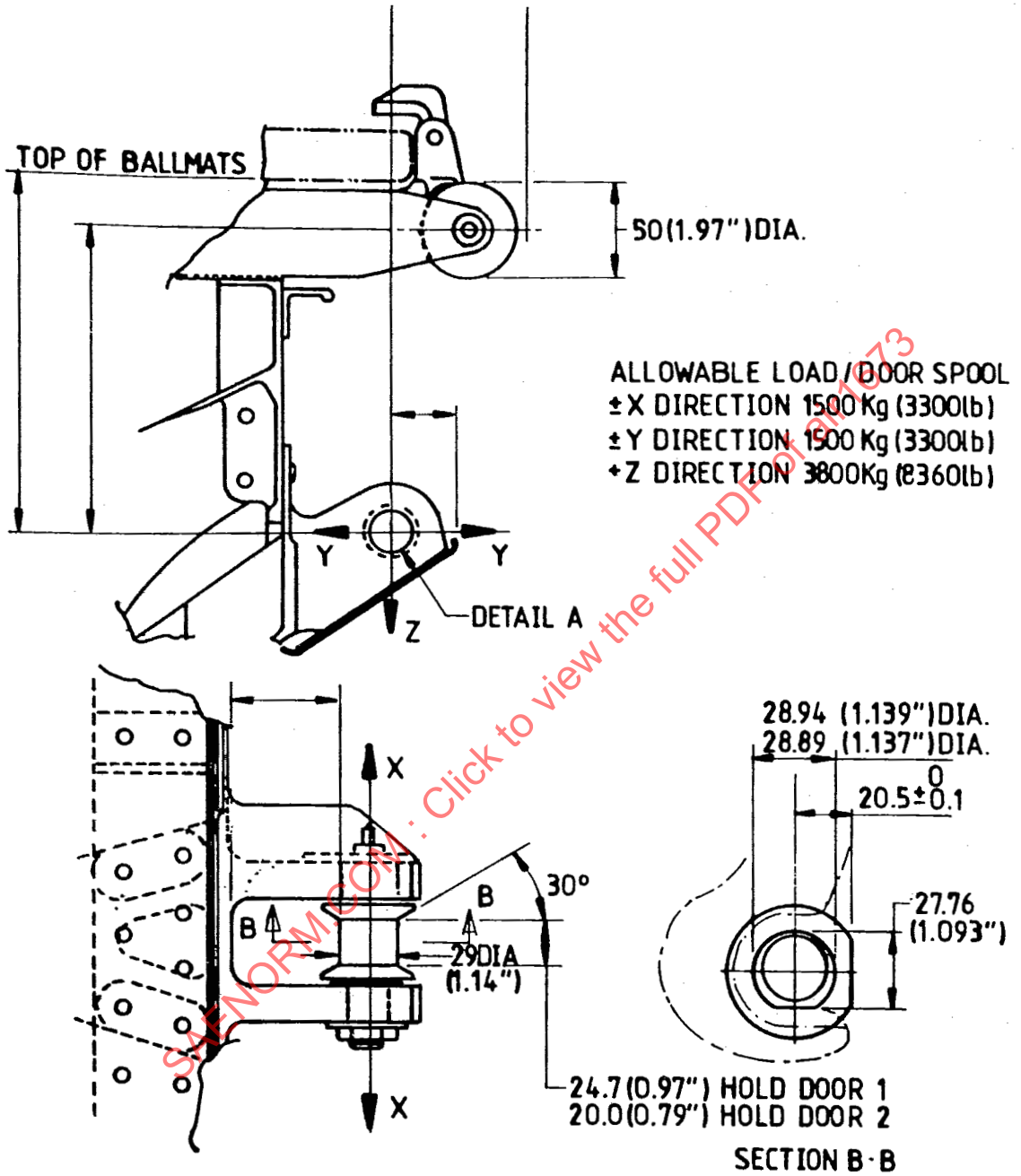


FIGURE 1D
LOWER DECK - HOLD 1 AND 2 DOORS
LATCH AND SPOOL GEOMETRY/DIMENSIONS.
A300 AIRCRAFT AND A310 AIRCRAFT

A300
A310

HOLD 1 DOOR

DOOR SPOOL POSITIONS

FRAME SPANT	DISTANCE ABSTAND Y (mm)	DISTANCE ABSTAND Z (mm)
C20b	Y20b = - 1543,52	Z20b = - 2288,32
C21	Y21 = - 1554,89	Z21 = - 2295,15
C21a	Y21a = - 1564,57	Z21a = - 2299,57
C22	Y22 = - 1572,48	Z22 = - 2301,48
C22a	Y22a = - 1578,55	Z22a = - 2300,77
C23	Y23 = - 1583,08	Z23 = - 2297,86
C23a	Y23a = - 1587,46	Z23a = - 2294,76
C24	Y24 = - 1591,84	Z24 = - 2291,65
C24a	Y24a = - 1596,22	Z24a = - 2288,53
C25	Y25 = - 1600,57	Z25 = - 2285,40

HOLD 2 DOOR

DOOR SPOOL POSITIONS

FRAME SPANT	DISTANCE ABSTAND Y (mm)	DISTANCE ABSTAND Z (mm)
C60	Y60 = - 1621,56	Z60 = - 2261,52
C60A	Y60A = - 1612,99	Z60A = - 2259,52
C61	Y61 = - 1603,19	Z61 = - 2255,81
C61A	Y61A = - 1592,17	Z61A = - 2250,40
C62	Y62 = - 1579,94	Z62 = - 2243,31
C62A	Y62A = - 1566,51	Z62A = - 2234,55
C63	Y63 = - 1551,91	Z63 = - 2224,16

FIG.1E- LOWER DECK-HOLD1 AND HOLD2 DOORS
DOOR SPOOLS-POSITIONING DETAILS
A300 AIRCRAFT AND A310 AIRCRAFT

AIRBUS A300 AND A310 - MAIN DECK CARGO DOOR SILL ATTACHMENT FITTING DETAILS FOR GROUND LOADING EQUIPMENT

A.300
A.310

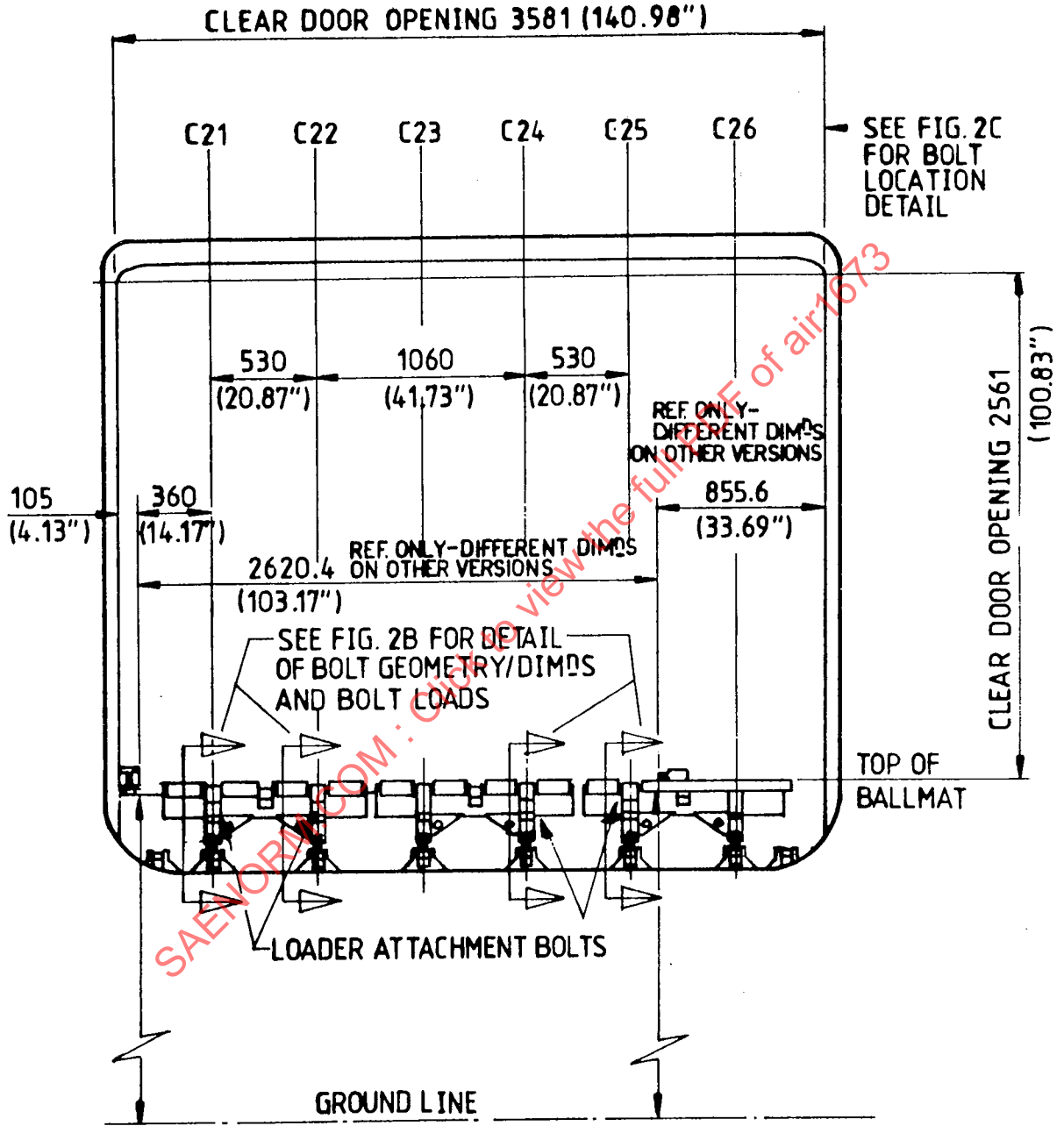
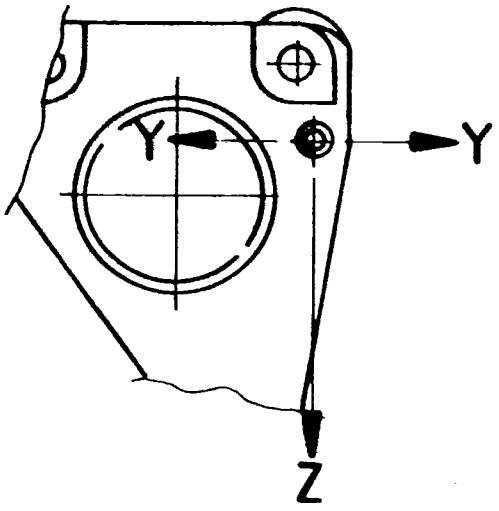
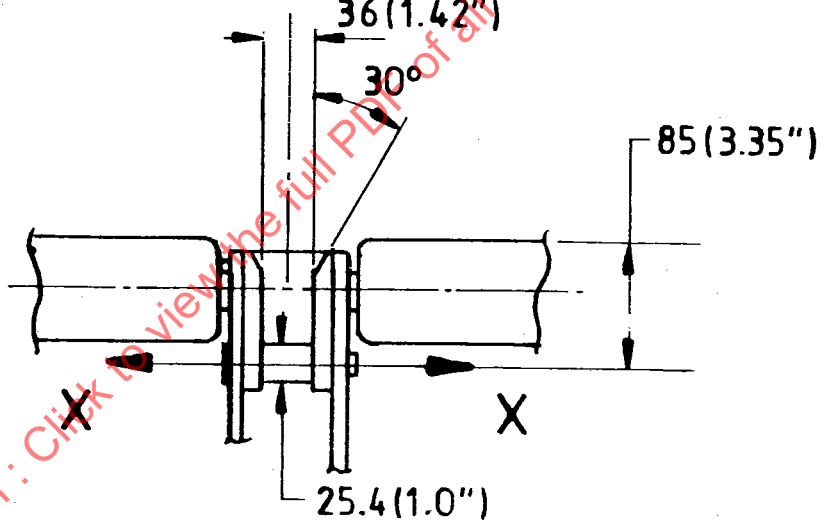


FIG. 2A UPPER DECK - CARGO DOOR.
A.300-C4 AIRCRAFT AND A.310 AIRCRAFT.

A.300
A.310



DETAIL A



DETAIL A

ALLOWABLE LOAD/LOADER ATTACHMENT BOLT
± X DIRECTION —— Kg (—— lb)
± Y DIRECTION —— Kg (—— lb)
- Z DIRECTION 2700 Kg (5925 lb)

FIGURE 2B
UPPER DECK - CARGO DOOR
BOLT GEOMETRY AND DIMENSIONS
A300-C4 AIRCRAFT AND A310 AIRCRAFT

FRAME	DISTANCE Y (mm)	DISTANCE Z (mm)
C21	Y21 = 2792	Z21 = 4516,5
C22	Y22 = 2792	Z22 = 4524,6
C23	Y23 = ——	Z23 = ——
C24	Y24 = 2792	Z24 = 4541
C25	Y25 = 2792	Z25 = 4549
C26	Z26 = ——	Z26 = ——

(4 POINTS PROVIDED FOR LOADER ATTACHMENT)

FIG. 2C- UPPER DECK - CARGO DOOR
BOLT - POSITIONING DETAILS
A300-C4 AIRCRAFT AND A310 AIRCRAFT

BOEING 707 AND 727 - MAIN DECK CARGO DOOR SILL ATTACHMENT FITTING DETAILS FOR GROUND LOADING EQUIPMENT

B.707
B.727

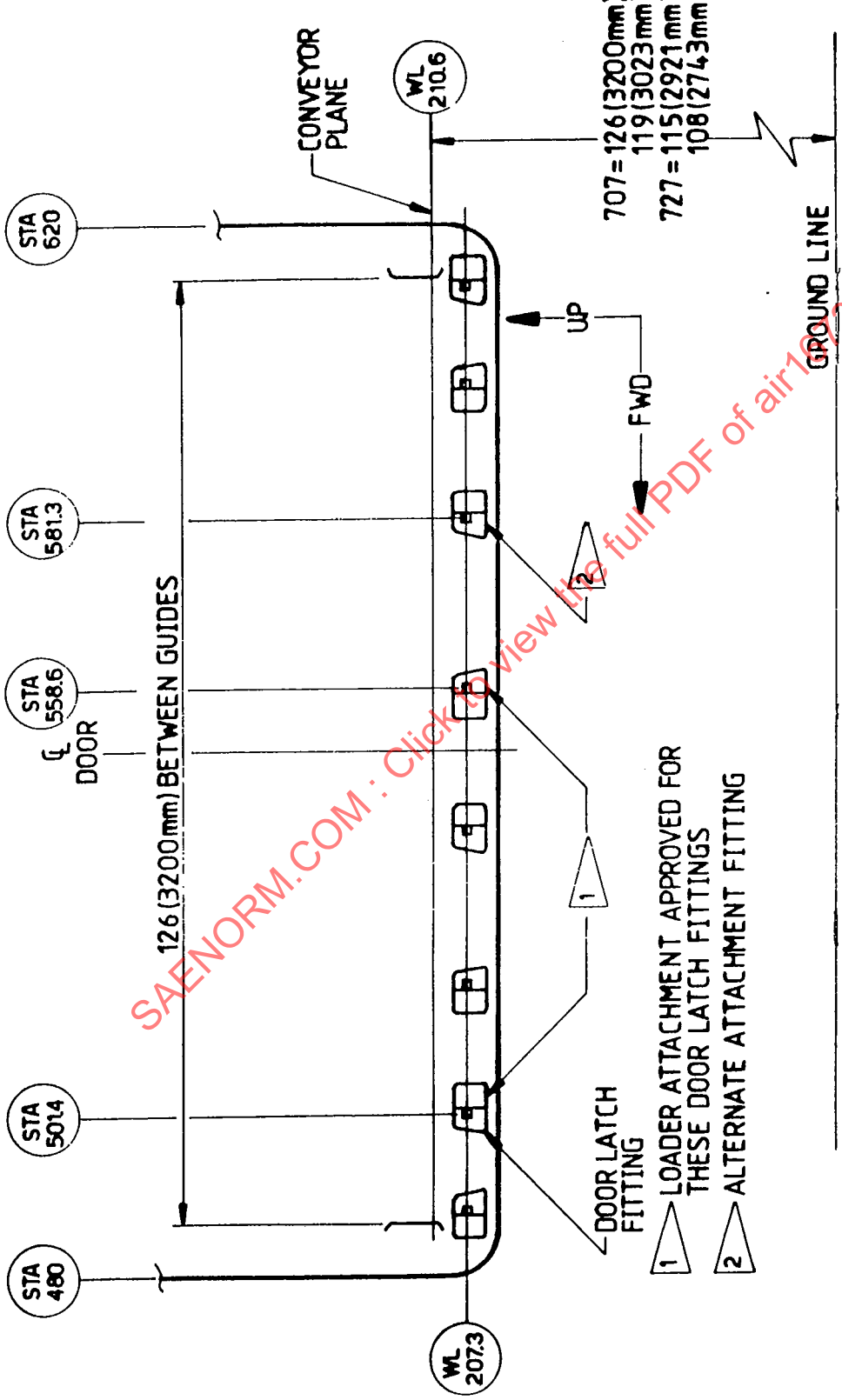
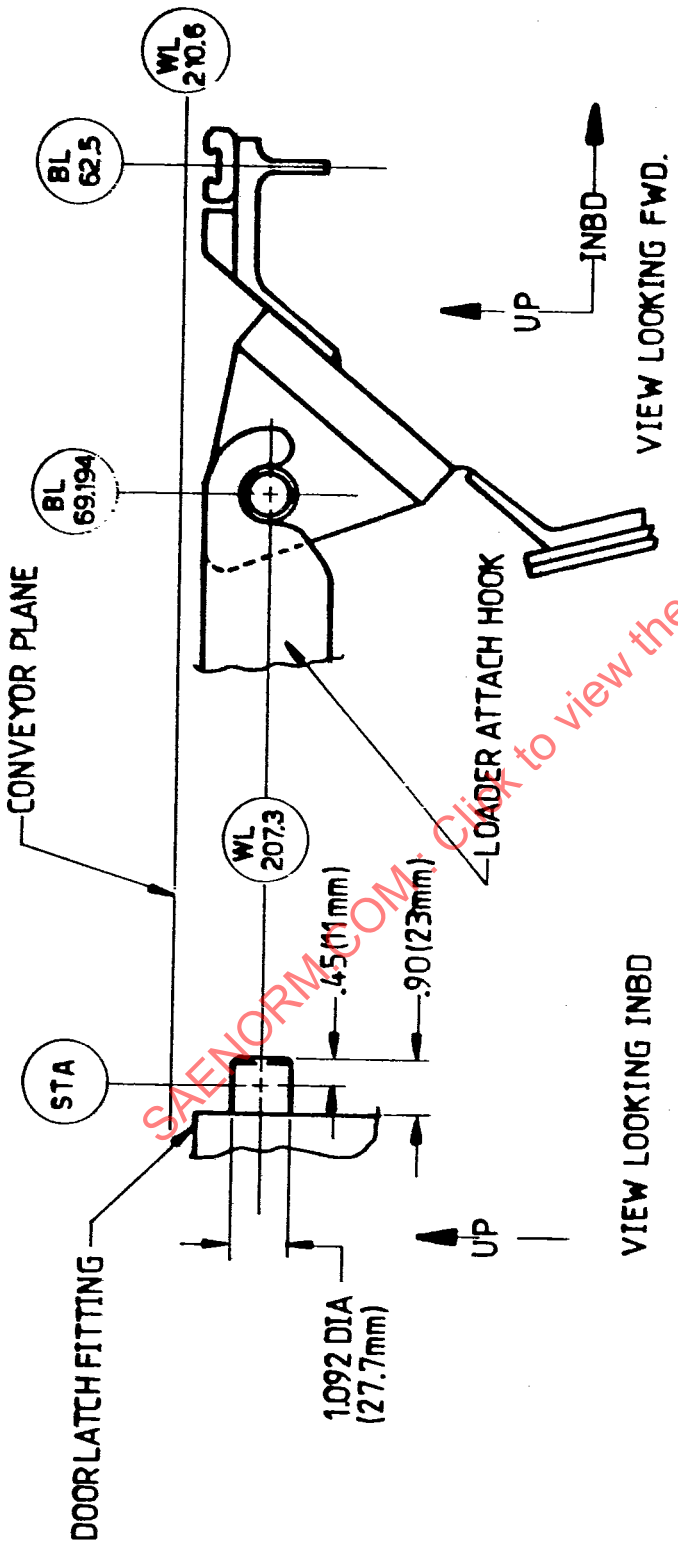


FIGURE 3A
BOEING-707 AND 727 LOADER ATTACHMENT
MAIN DECK CARGO DOOR

B.707
B.727



STA	MAXIMUM LOADS POUNDS (KILOGRAMS)					
	707			727		
	VERTICAL	FORE/AFT	INBD/OUTBD	VERTICAL	FORE/AFT	INBD/OUTBD
501.4	2797 (1269)	1000 (454)	1000 (454)	3140 (1240)	1000 (454)	1000 (454)
558.6	6978 (3165)	1000 (454)	1000 (454)	4530 (2055)	1000 (454)	1000 (454)
581.3	5905 (2678)	1000 (454)	1000 (454)			

ALL LOADS MAY BE APPLIED SIMULTANEOUSLY

FIGURE 3B
B.707 AND B.727 LOADER ATTACHMENT

BOEING 737- MAIN DECK CARGO DOOR SILL ATTACHMENT FITTING DETAILS FOR GROUND LOADING EQUIPMENT

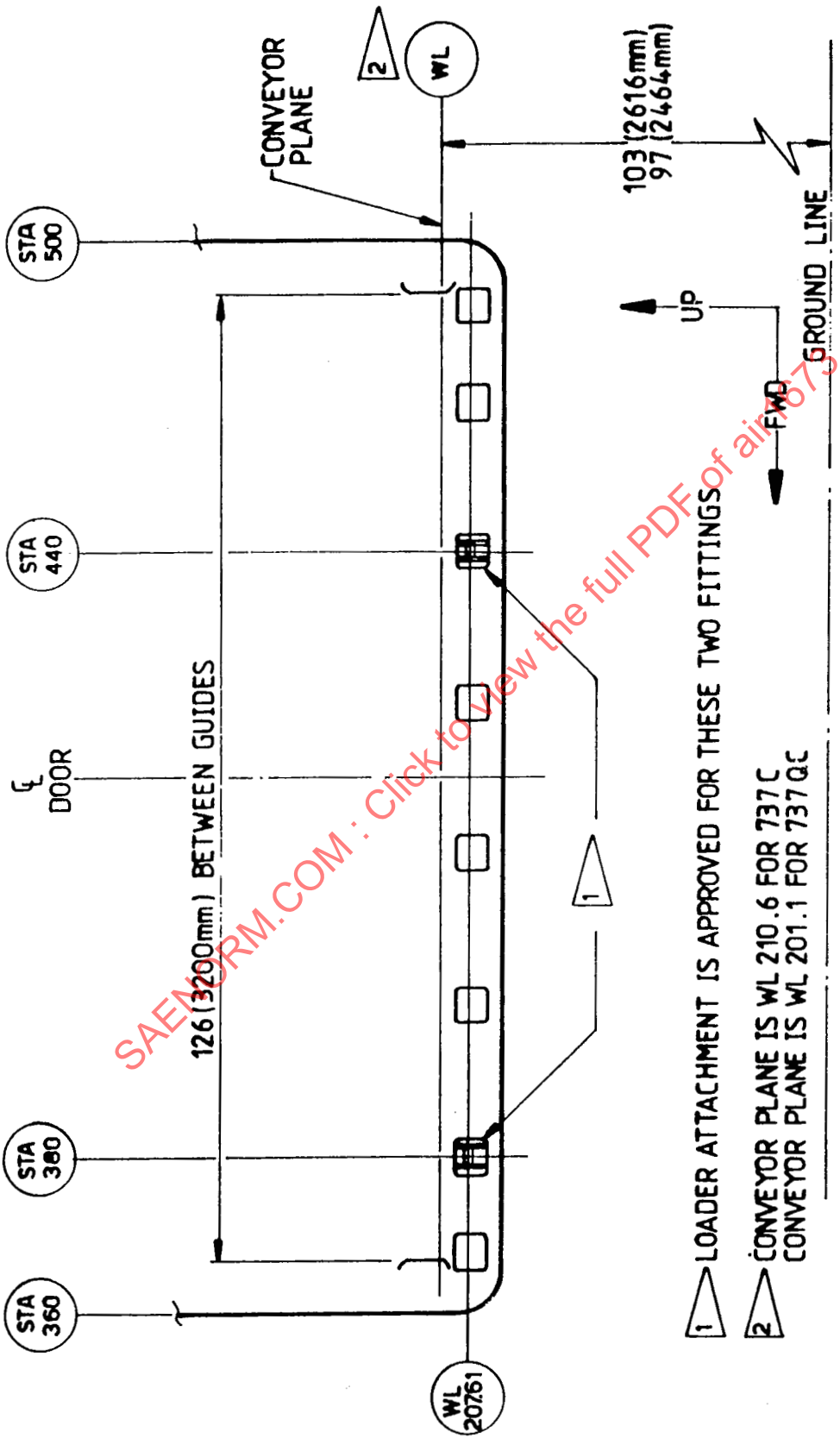
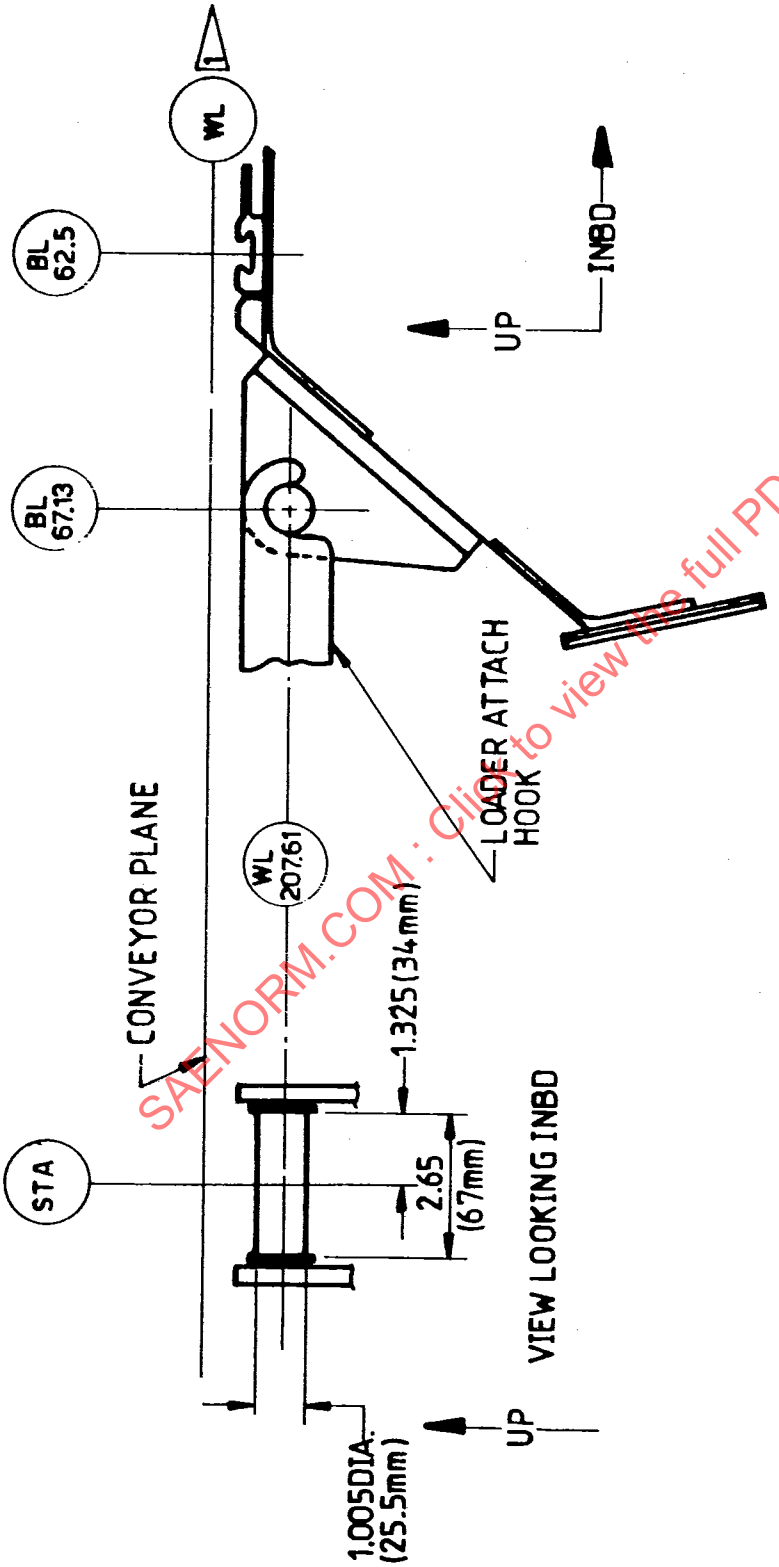


FIGURE 4A

B737 - LOADER ATTACHMENT. MAIN DECK CARGO DOOR

B.737



STA	MAXIMUM LOADS POUNDS (KILOGRAMS)		
	VERTICAL	FORE/AFT	INBD/OUTBD
380	2160 (980)	1000 (454)	1000 (454)
440	3890 (1764)	1000 (454)	1000 (454)

1 CONVEYOR PLANE IS WL 210.6 FOR 737C
CONVEYOR PLANE IS WL 210.1 FOR 737QC

FIGURE 4B
B.737 LOADER ATTACHMENT

BOEING 747 - LOWER DECK CARGO DOOR SILL ATTACHMENT FITTING DETAILS FOR GROUND LOADING EQUIPMENT

B.747

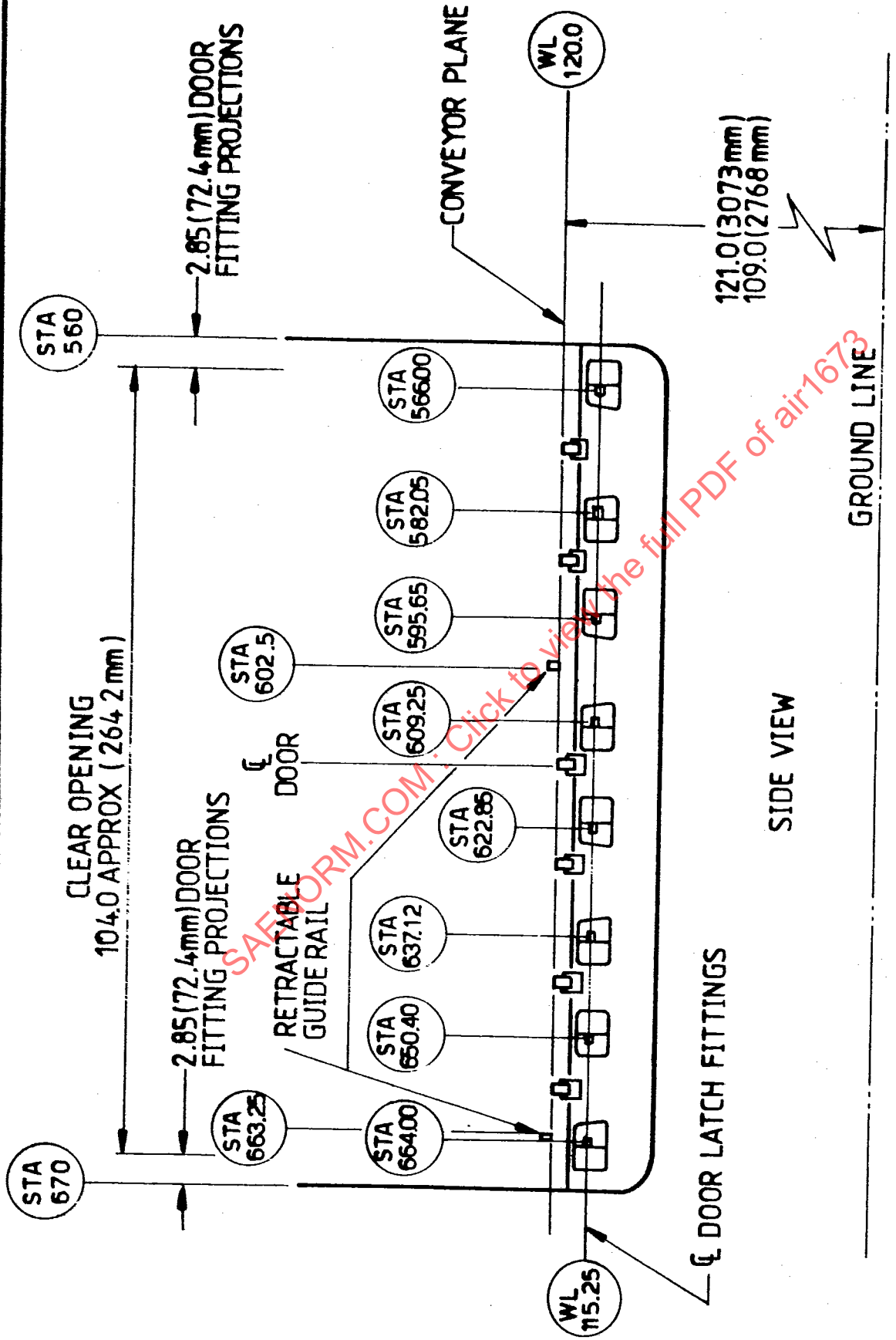


FIGURE 5A

BOEING 747 LOWER LOBE - FORWARD CARGO COMPARTMENT

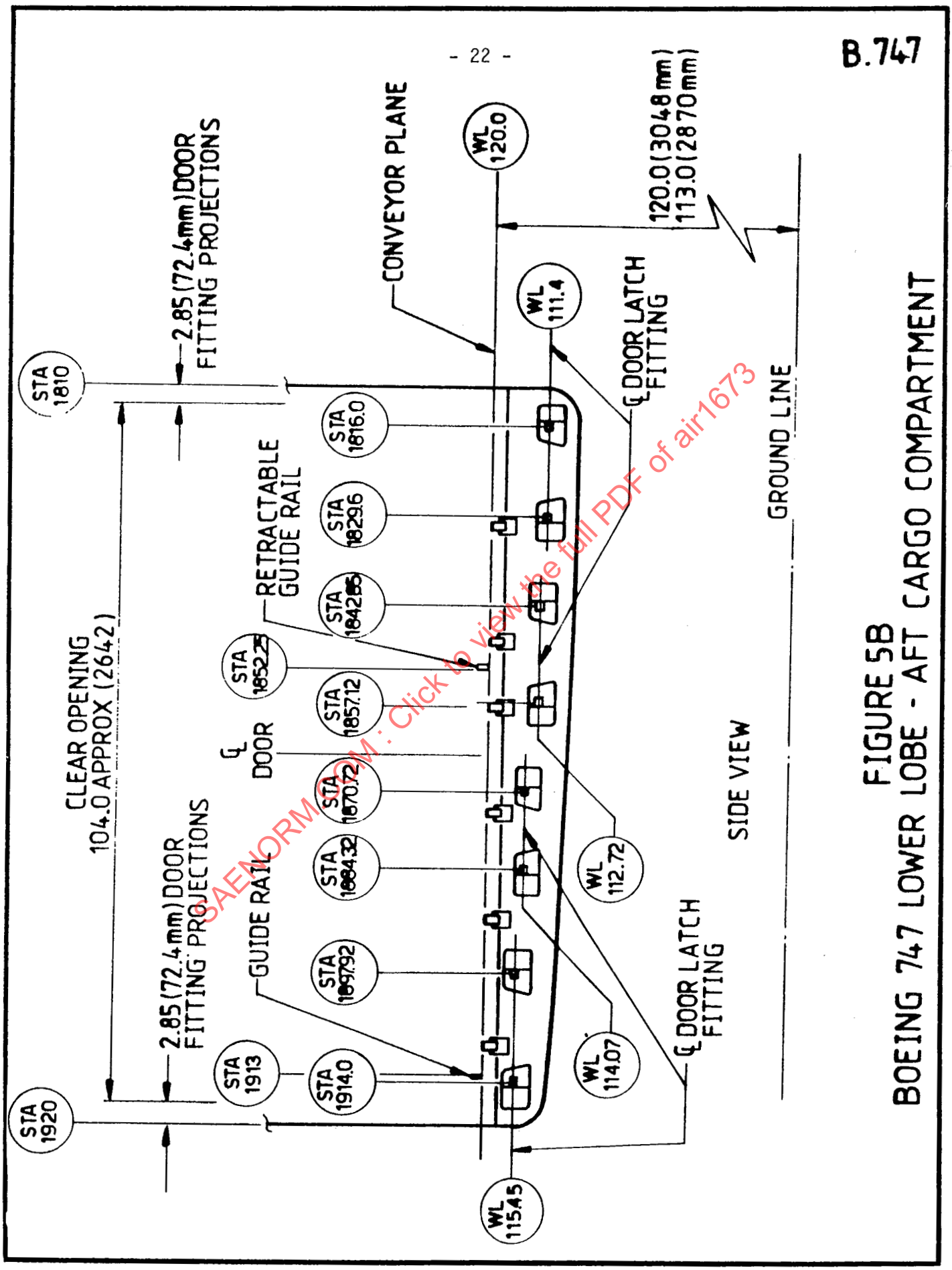


FIGURE 5B
BOEING 747 LOWER LOBE - AFT CARGO COMPARTMENT

B.747

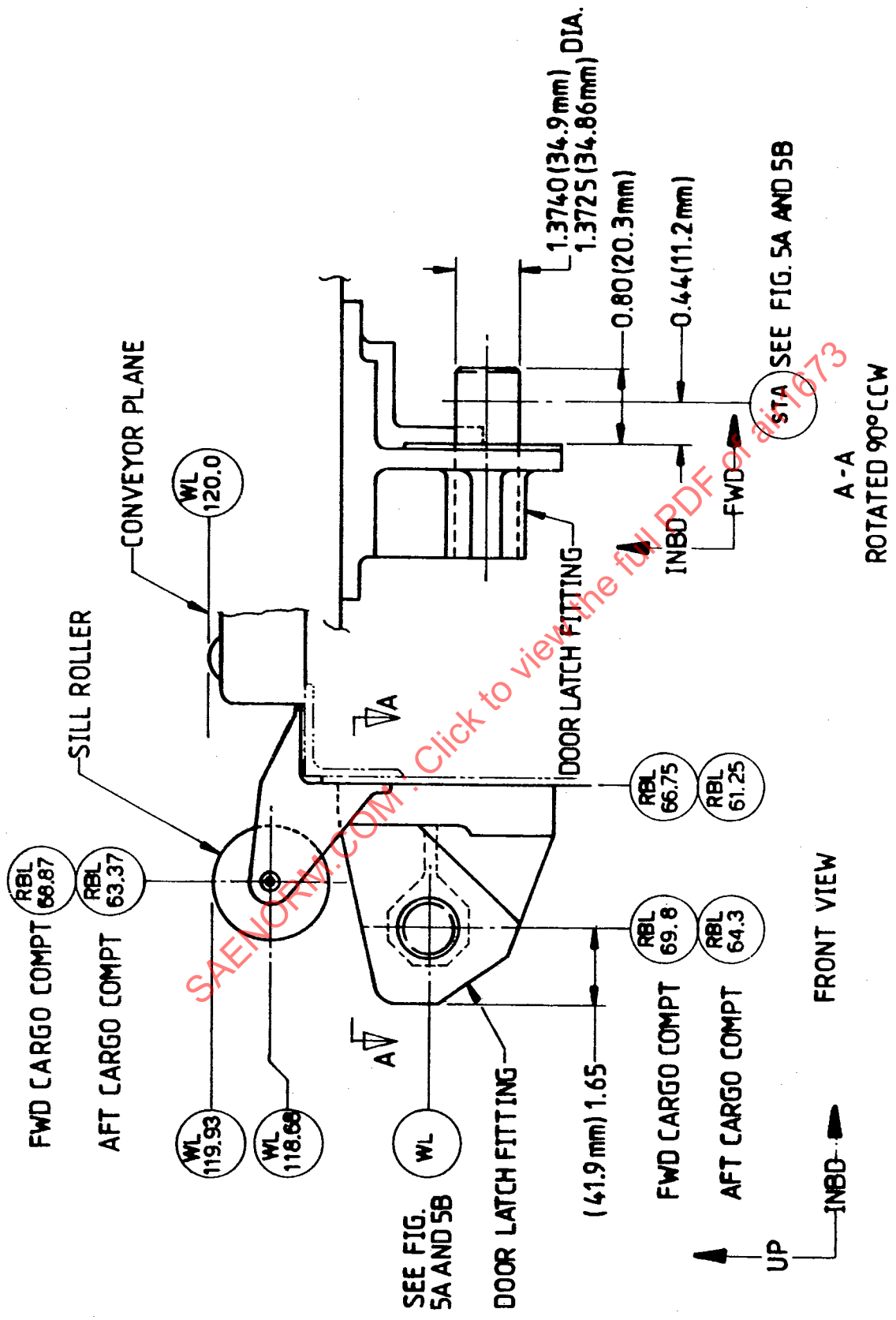
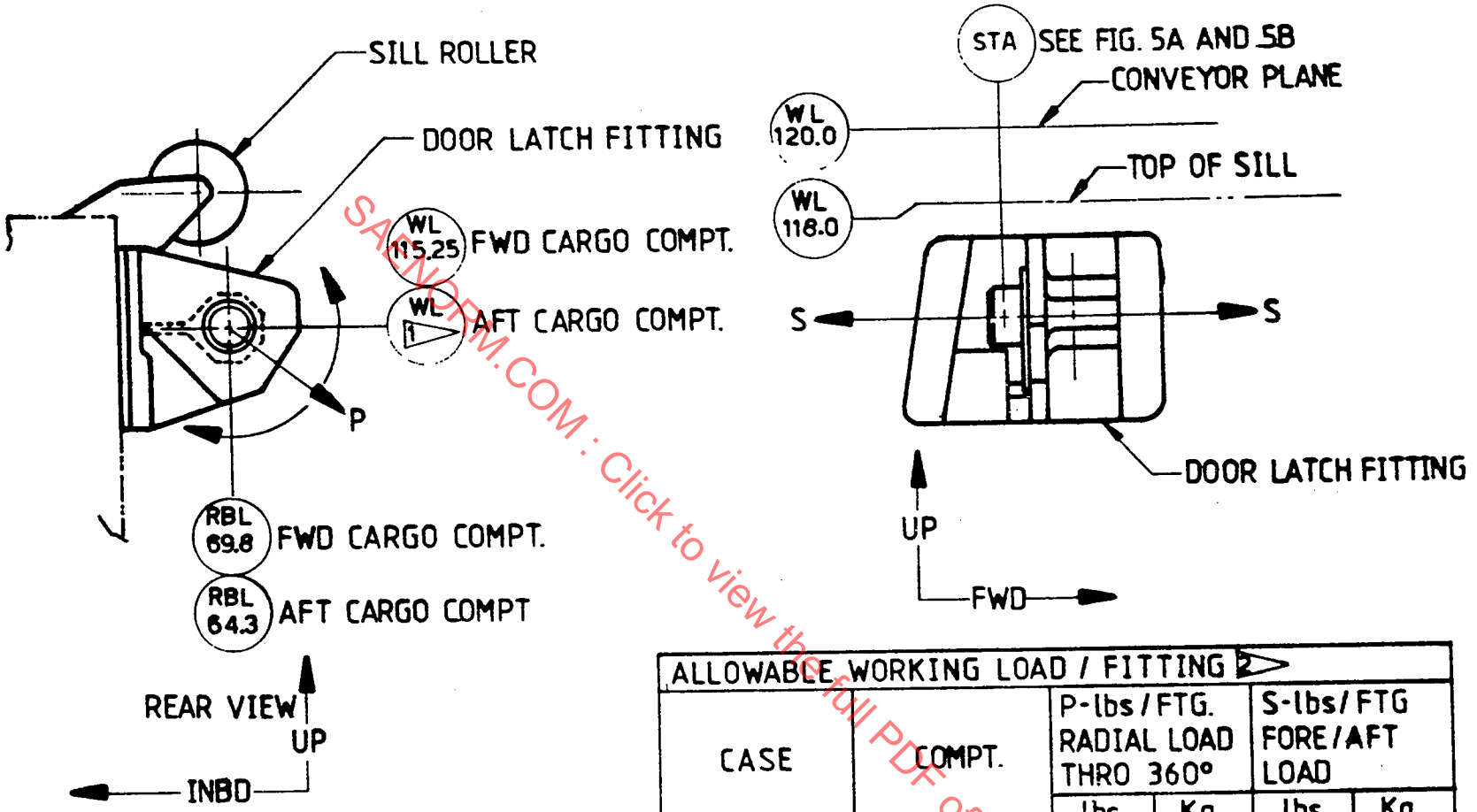


FIGURE 5C
BOEING 747 LOWER LOBE
GENERAL ARRANGEMENT OF DOOR LATCH FITTINGS



1 VARIABLE FROM FWD TO AFT 1 THRU 8 (SEE FIGURE 5B)

2 LOADS AS SHOWN FOR EACH CASE MAY BE APPLIED SIMULTANEOUSLY

ALLOWABLE WORKING LOAD / FITTING 2					
CASE	COMPT.	P-lbs / FTG. RADIAL LOAD THRO 360°		S-lbs / FTG FORE / AFT LOAD	
		lbs	Kg	lbs	Kg
1	FWD	5 300	2 404	2 000	907
2	FWD	0	0	13 400	6 077
3	AFT	12 300	5578	13 000	5 896
4	AFT	0	0	18 000	8163

FIGURE 5D
BOEING 747 LOWER LOBE, ALLOWABLE LOADS

B. 747

BOEING 747 - MAIN DECK, NOSE AND SIDE CARGO DOOR SILL ATTACHMENT FITTING DETAILS FOR GROUND LOADING EQUIPMENT

B.747

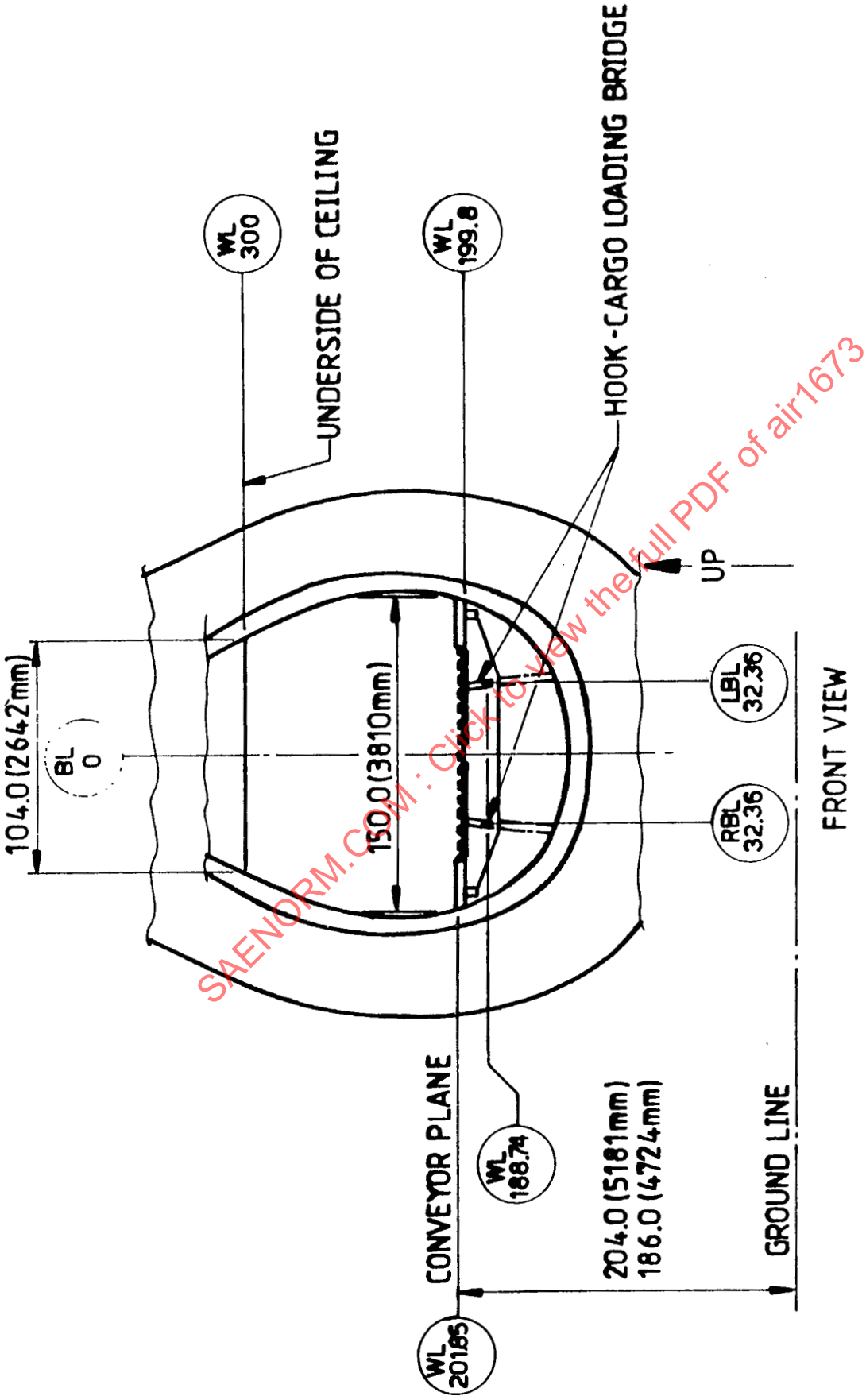


FIGURE 6A
BOEING 747 F AND C MAIN DECK NOSE DOOR
GENERAL ARRANGEMENT DOOR SILL INTERFACE

B.747

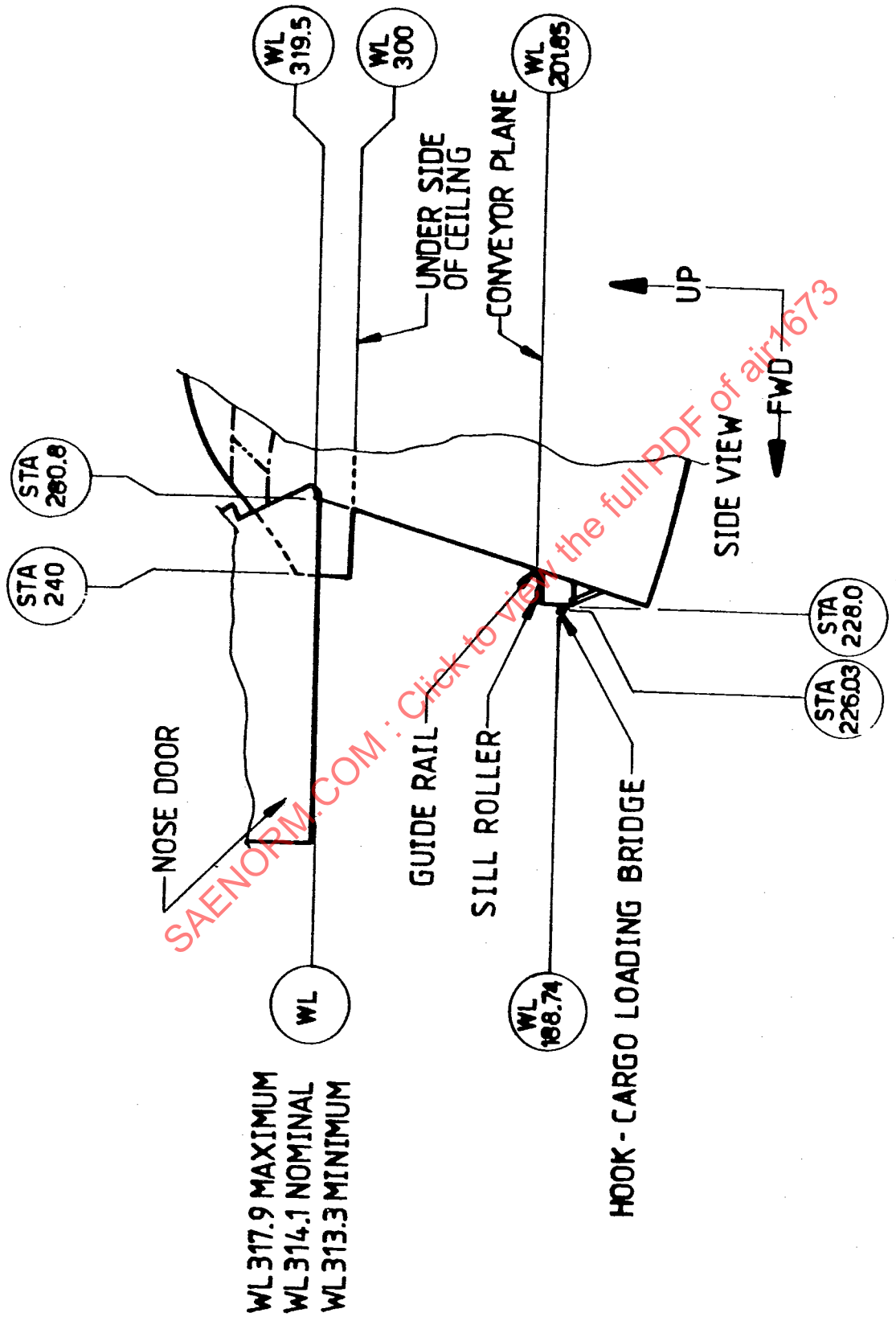
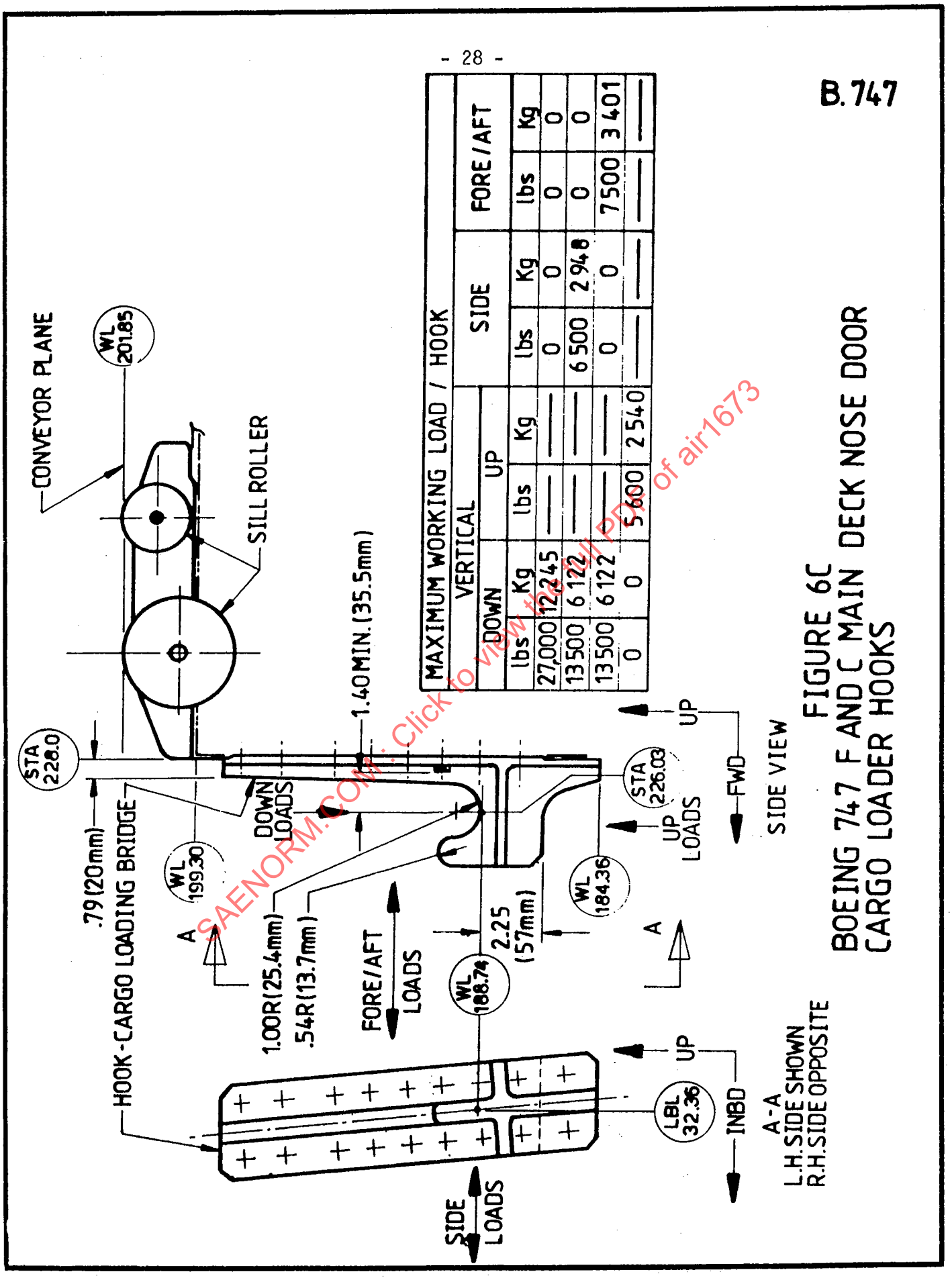


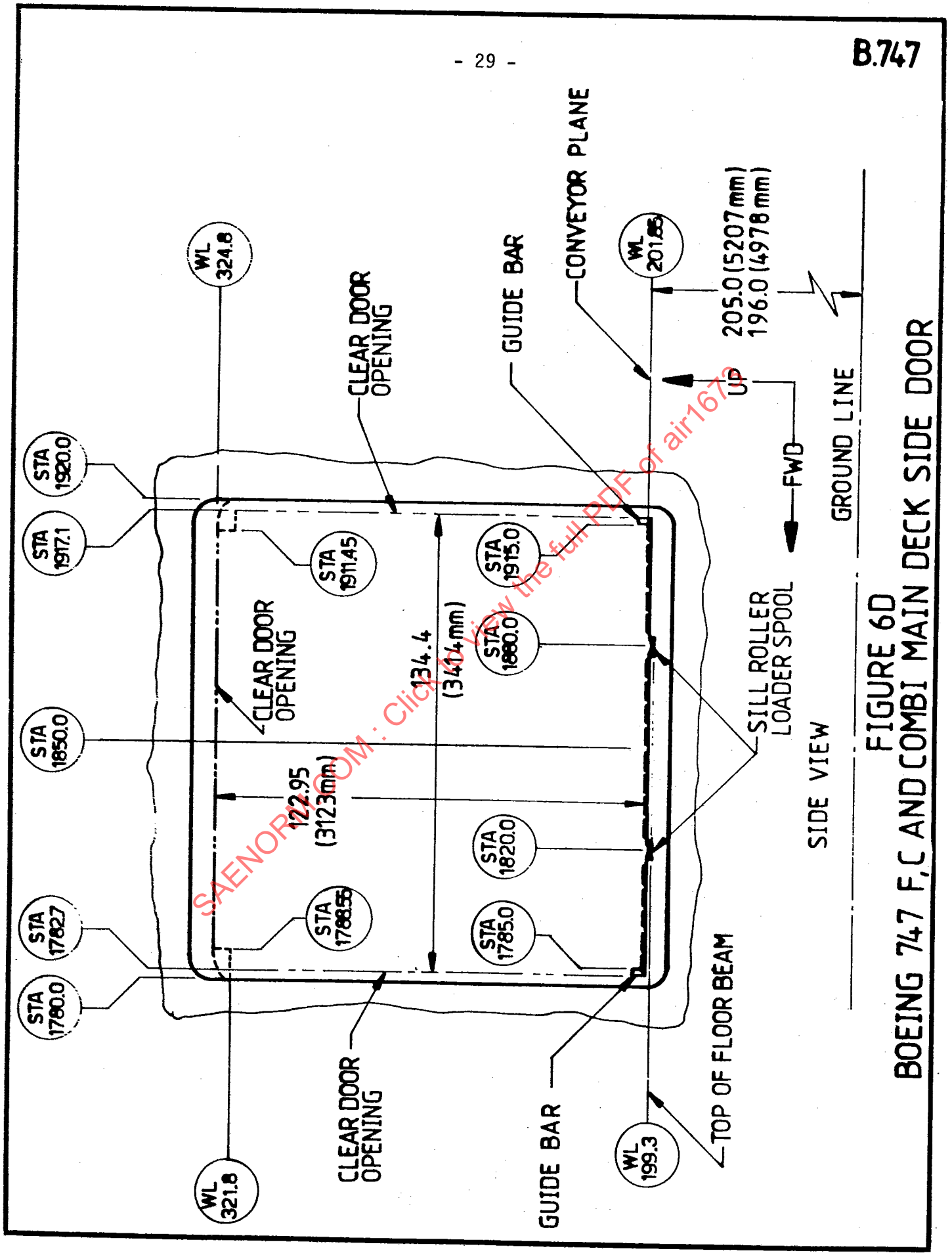
FIGURE 6B
BOEING 747 F AND C MAIN DECK NOSE DOOR
DOOR SILL INTERFACE

B.747



MAXIMUM WORKING LOAD / HOOK									
VERTICAL				SIDE		FORE/AFT			
DOWN		UP							
lbs	Kg	lbs	Kg	lbs	Kg	lbs	Kg		
27,000	12,245	—	—	0	0	0	0		
13500	6122	—	—	6500	2948	0	0		
13500	6122	—	—	0	0	7500	3401		
0	0	5600	2540	—	—	—	—		

FIGURE 6C
BOEING 747 F AND C MAIN DECK NOSE DOOR
CARGO LOADER HOOKS



B.747

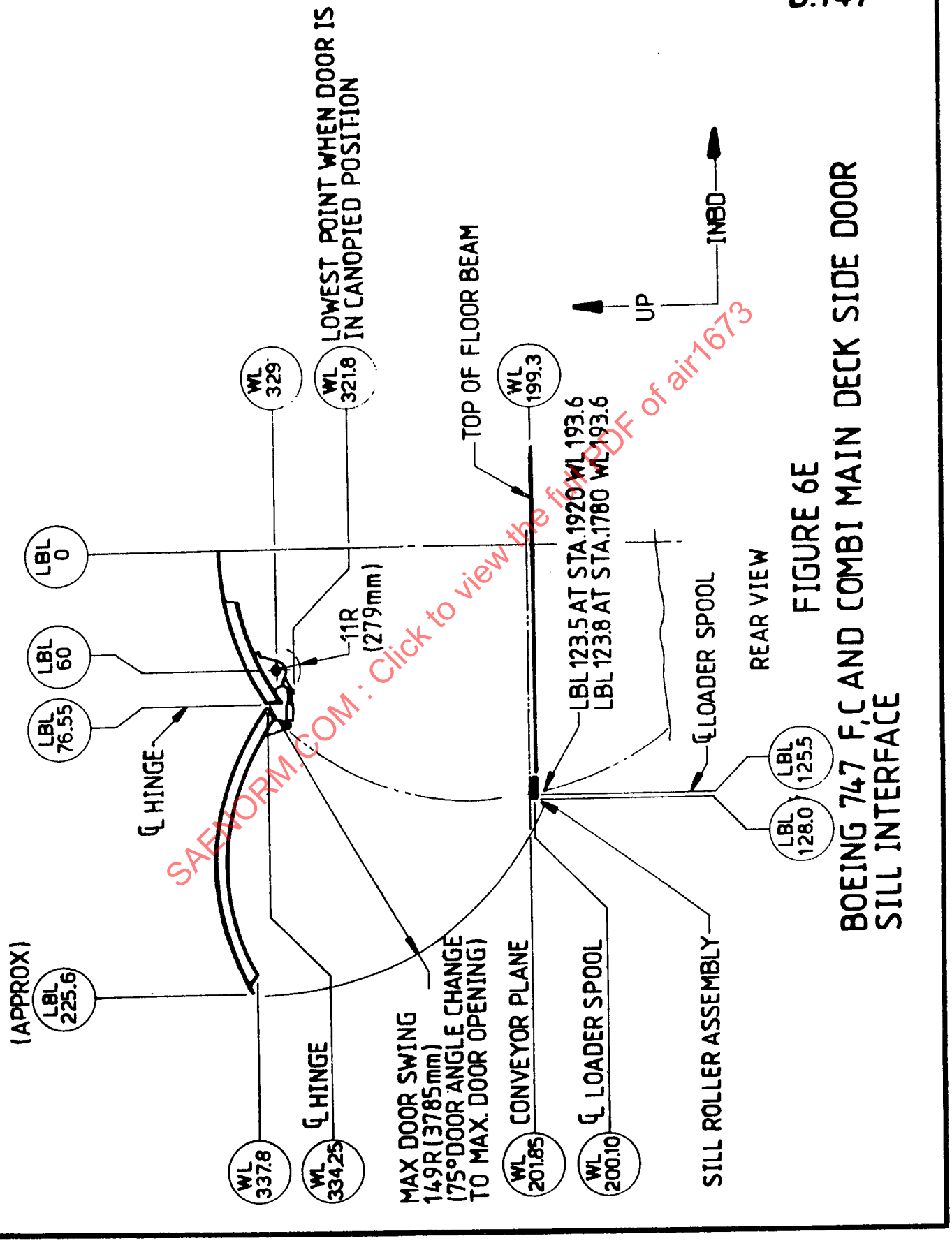


FIGURE 6E
BOEING 747 F,C AND COMBI MAIN DECK SIDE DOOR SILL INTERFACE

B.747

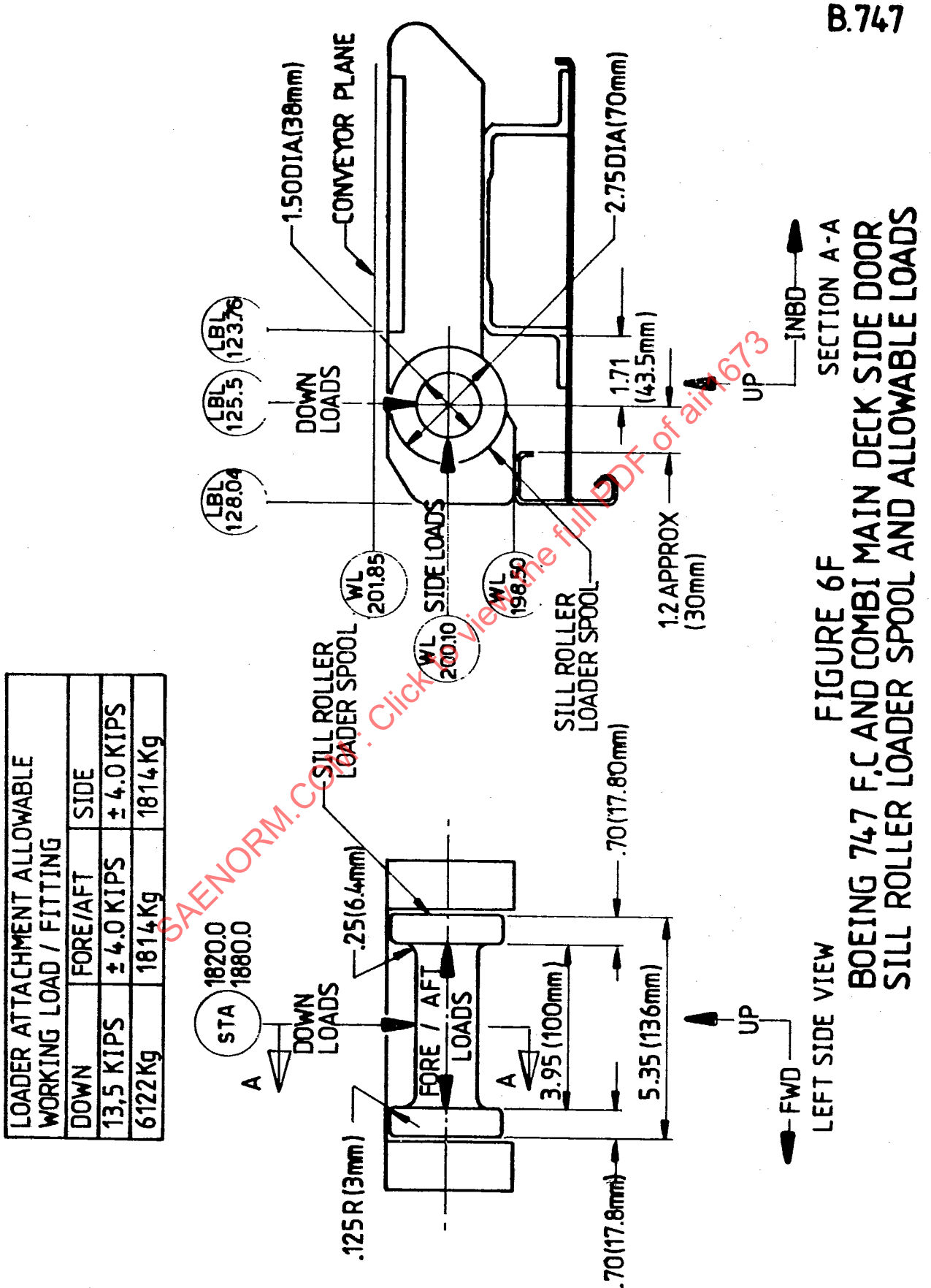


FIGURE 6F
BOEING 747 F,C AND COMBI MAIN DECK SIDE DOOR
SILL ROLLER LOADER SPOOL AND ALLOWABLE LOADS

BOEING 767 - LOWER DECK CARGO DOOR SILL ATTACHMENT FITTING DETAILS FOR GROUND LOADING EQUIPMENT

B767

STA	MAXIMUM LOADS POUNDS (KILOGRAMS)		
	VERTICAL DN	FORE/AFT	INBD/OUTBD
550	4500 (2041)	2000 (907)	±3600 (1633)
605	4500 (2041)	2000 (907)	±3600 (1633)
1280.50	4500 (2041)	2000 (907)	±3600 (1633)
1335.50	4500 (2041)	2000 (907)	±3600 (1633)

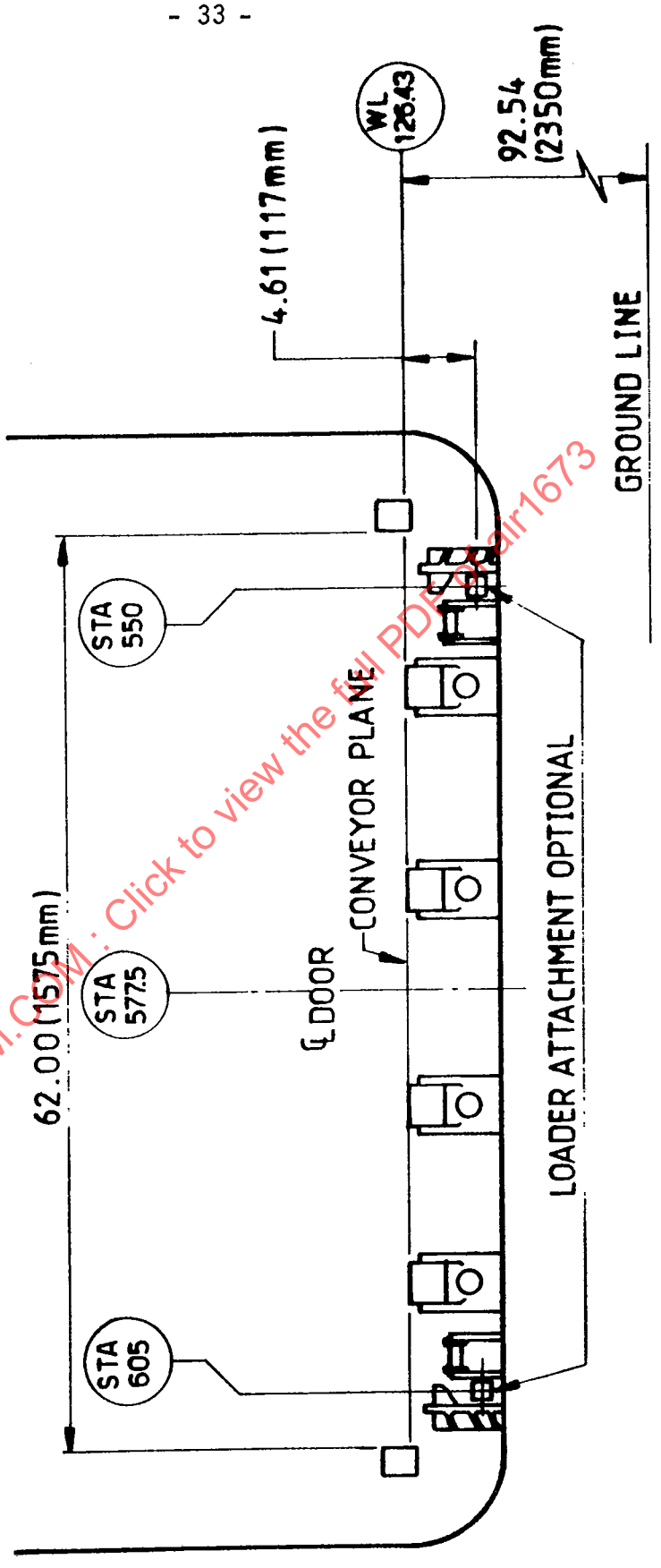


FIGURE 7A
BOEING 767 FORWARD AND AFT LOWER HOLD
OPTION FOR COMPATABILITY OF LOADERS USED ON DC10

B.767

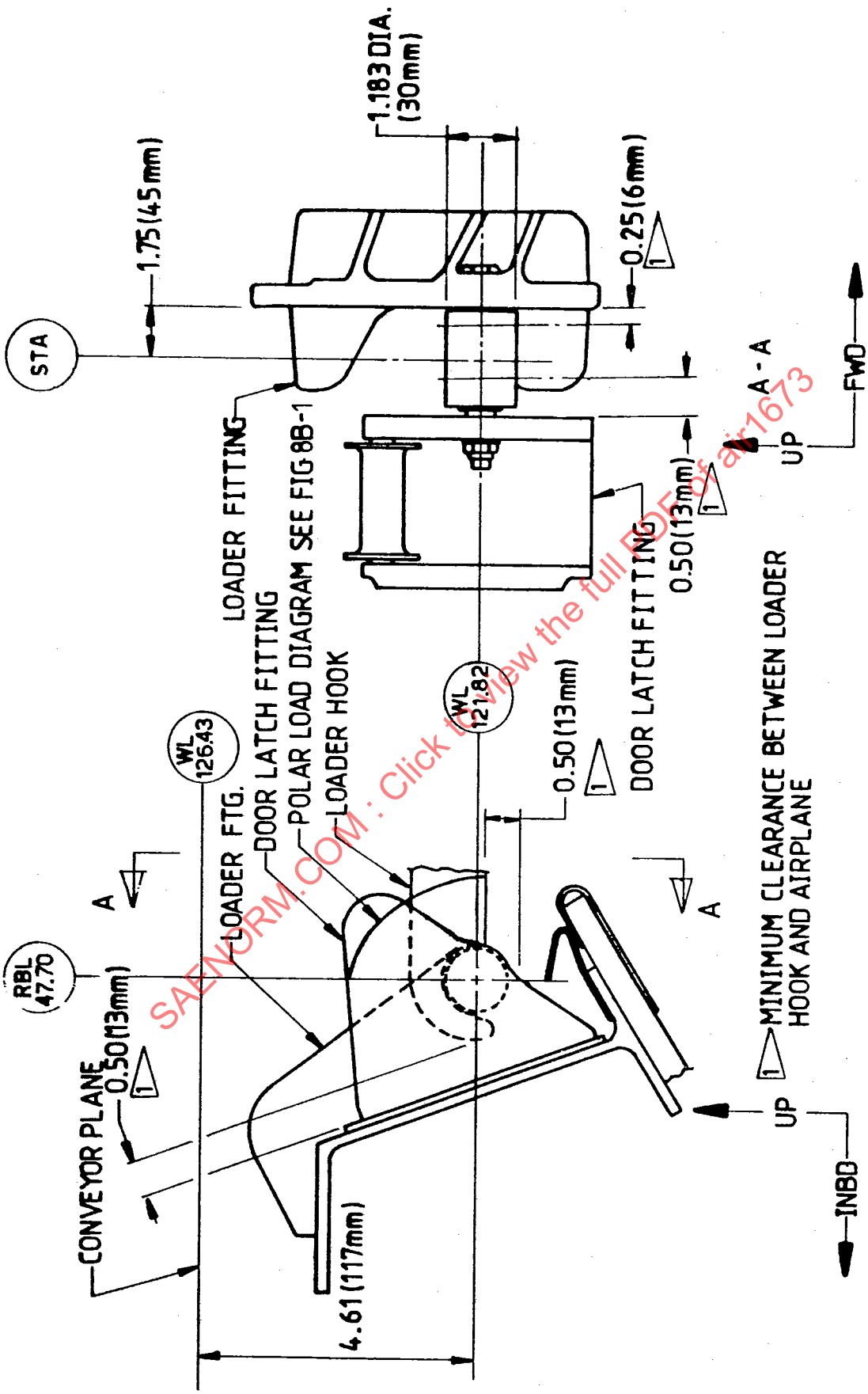
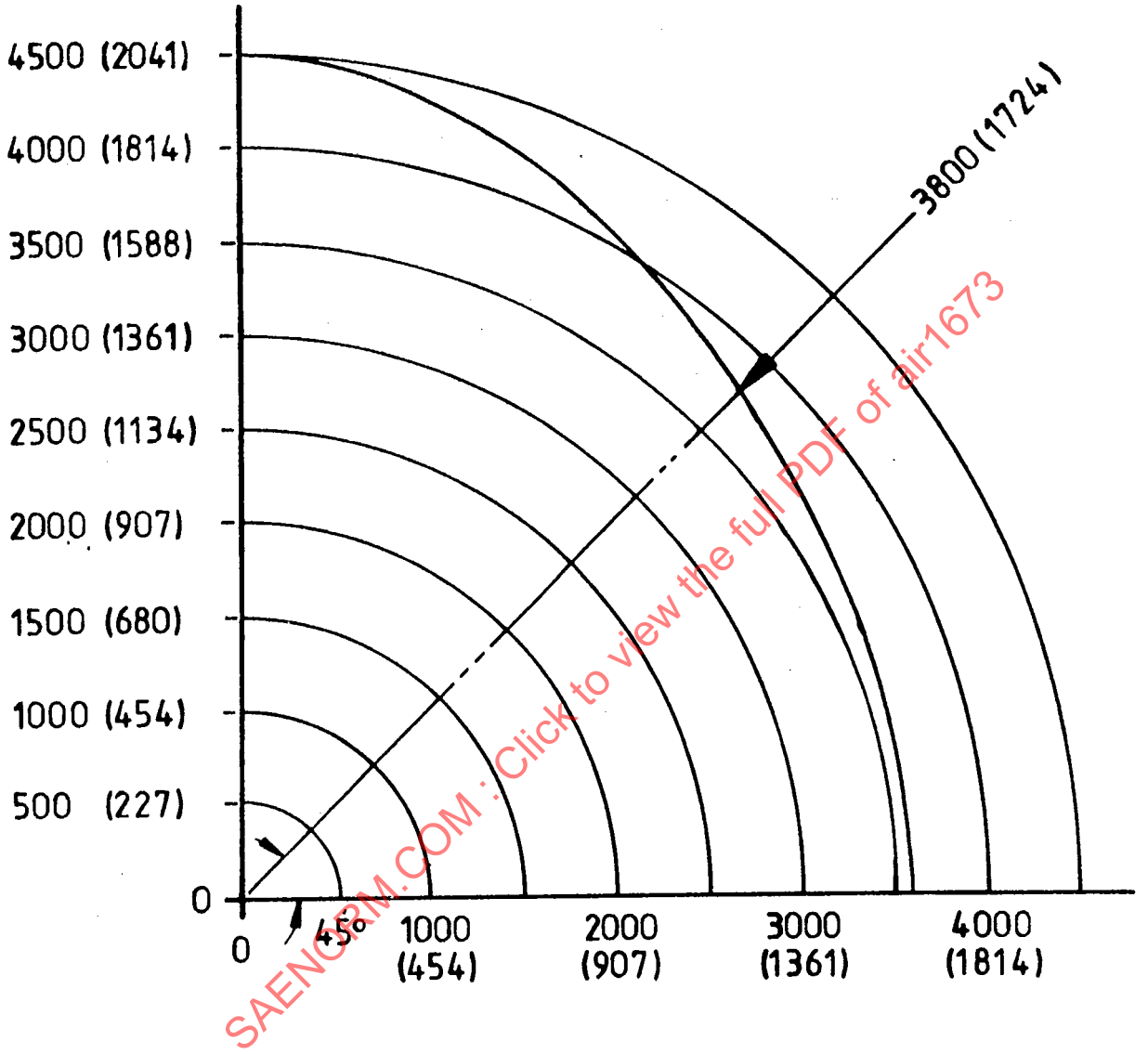


FIGURE 7B
BOEING 767 FORWARD AND AFT LOWER HOLDS
OPTION FOR COMPATIBILITY OF LOADERS USED ON DC10

B.767



POLAR LOAD DIAGRAM (ALLOWABLE) - LBS (KILOS)

FIGURE 7B-1

B.767

STA.	MAXIMUM LOADS POUNDS (KILOGRAMS)			
	VERTICAL DN	VERTICAL UP	FORE / AFT	INBD / OUTBD
549.12	3,500 (1588)	1 000 (454)	±1 000 (454)	±2 000 (907)
589.7	7000 (3175)	1 900 (862)	±1 900 (862)	±3 800 (1724)
1279.62	3500 (1588)	1000 (454)	±1000 (454)	±2 000 (907)
1320.2	7000 (3175)	1900 (862)	±1900 (862)	±3 800 (1724)

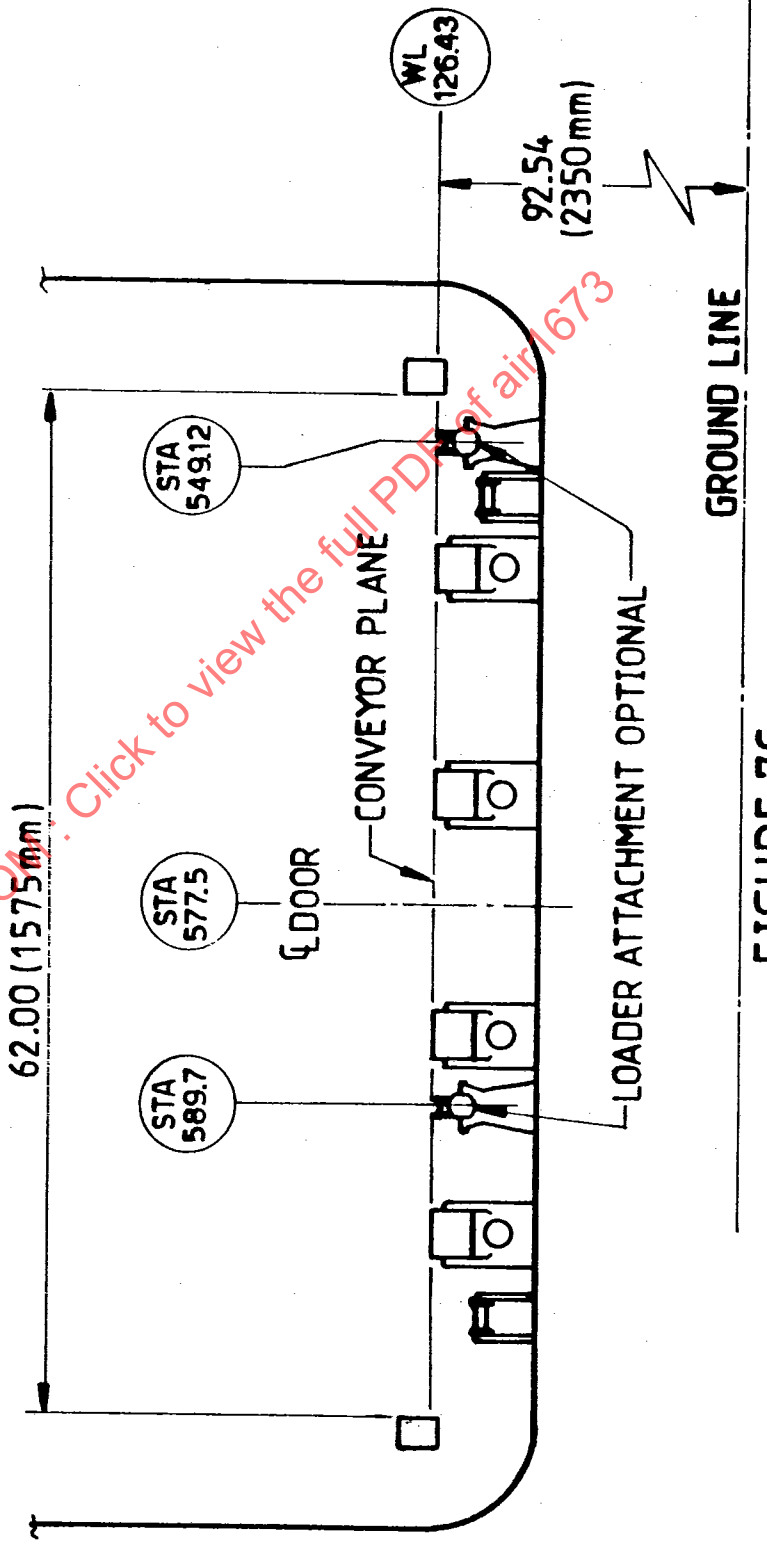


FIGURE 7C
BOEING 767 FORWARD LOWER HOLD
OPTION FOR COMPATIBILITY OF LOADERS USED ON L1011

B. 767

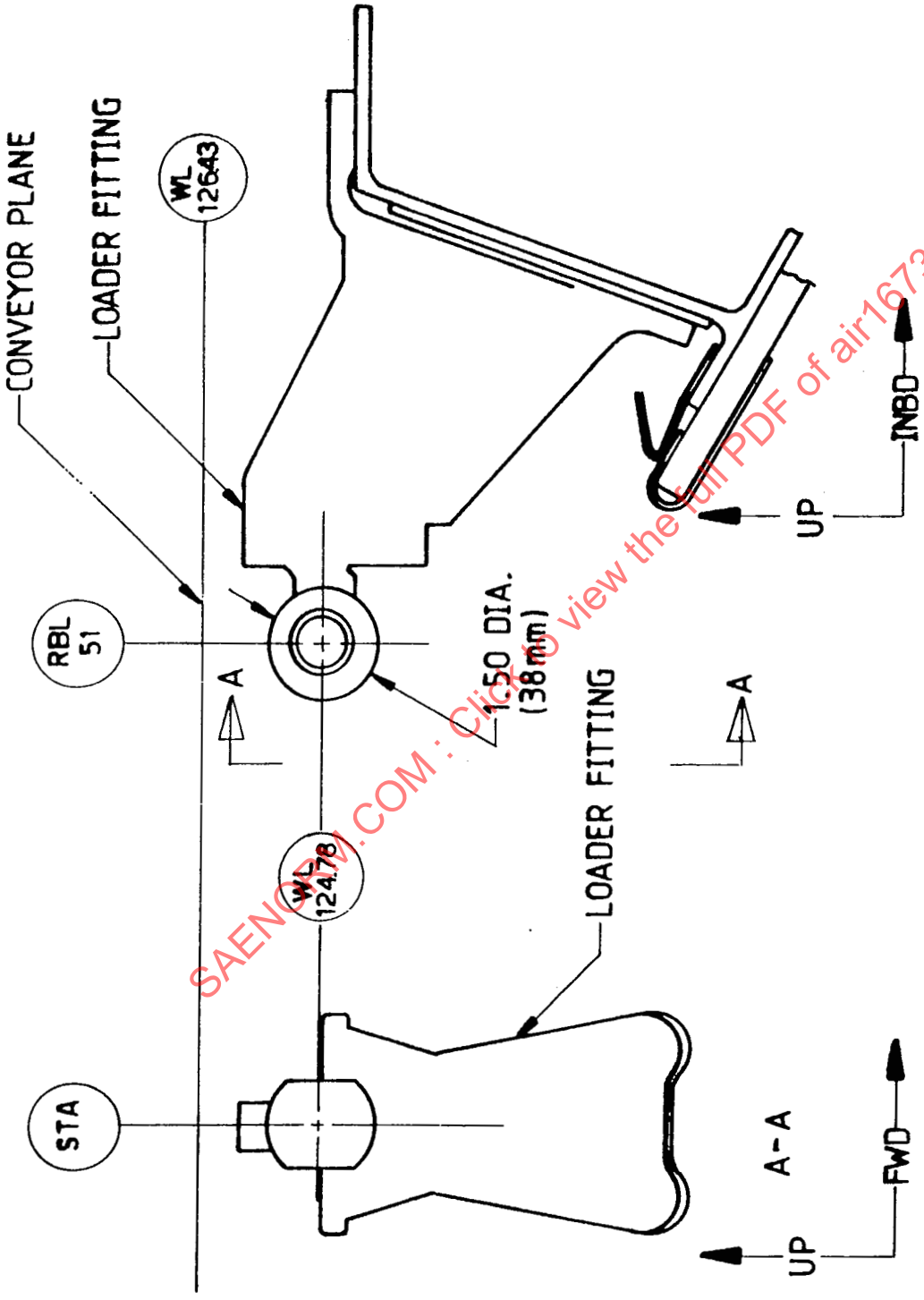


FIGURE 7D
BOEING 767 FORWARD AND AFT LOWER HOLD
OPTION FOR COMPATABILITY OF LOADER USED ON L1011

STA	MAXIMUM LOADS POUNDS (KILOGRAMS)		
	VERTICAL	FORE/AFT	INBD/OUTBD
487.71	6200 (2812)	2000 (907)	±3800 (1724)
500.29	3000 (1360)	1000 (454)	±1800 (816)
509.71	7000 (3175)	2300 (1043)	±4200 (1905)
544.29	7200 (3266)	2300 (1043)	±4200 (1905)
551.71	4500 (2041)	2000 (907)	±3800 (1724)
573.71	5300 (2404)	2000 (907)	±3800 (1724)
586.29	7000 (3175)	2300 (1043)	±4200 (1905)
595.71	3000 (1360)	1000 (454)	±1800 (816)
608.29	4500 (2041)	2000 (907)	±3800 (1724)

4

1. LOADER ATTACHMENT FOR PALLET LOADING
2. PREFERRED LOADER ATTACHMENT FOR CONTAINER LOADING
3. THREE POINT LOADER FOR PALLET AND CONTAINER LOADING
4. LOADS MAY BE APPLIED SIMULTANEOUSLY

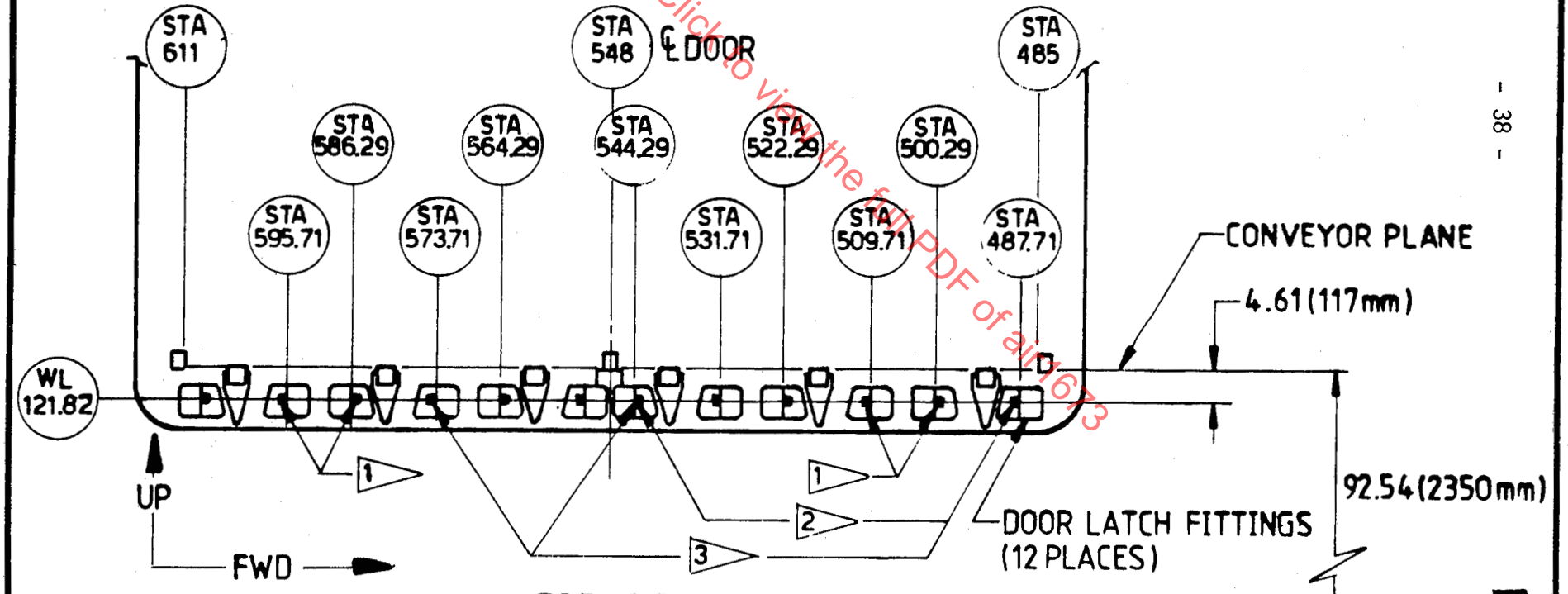


FIGURE 7E

BOEING 767 FORWARD LOWER HOLD WIDE DOOR OPTION

B767

B.767

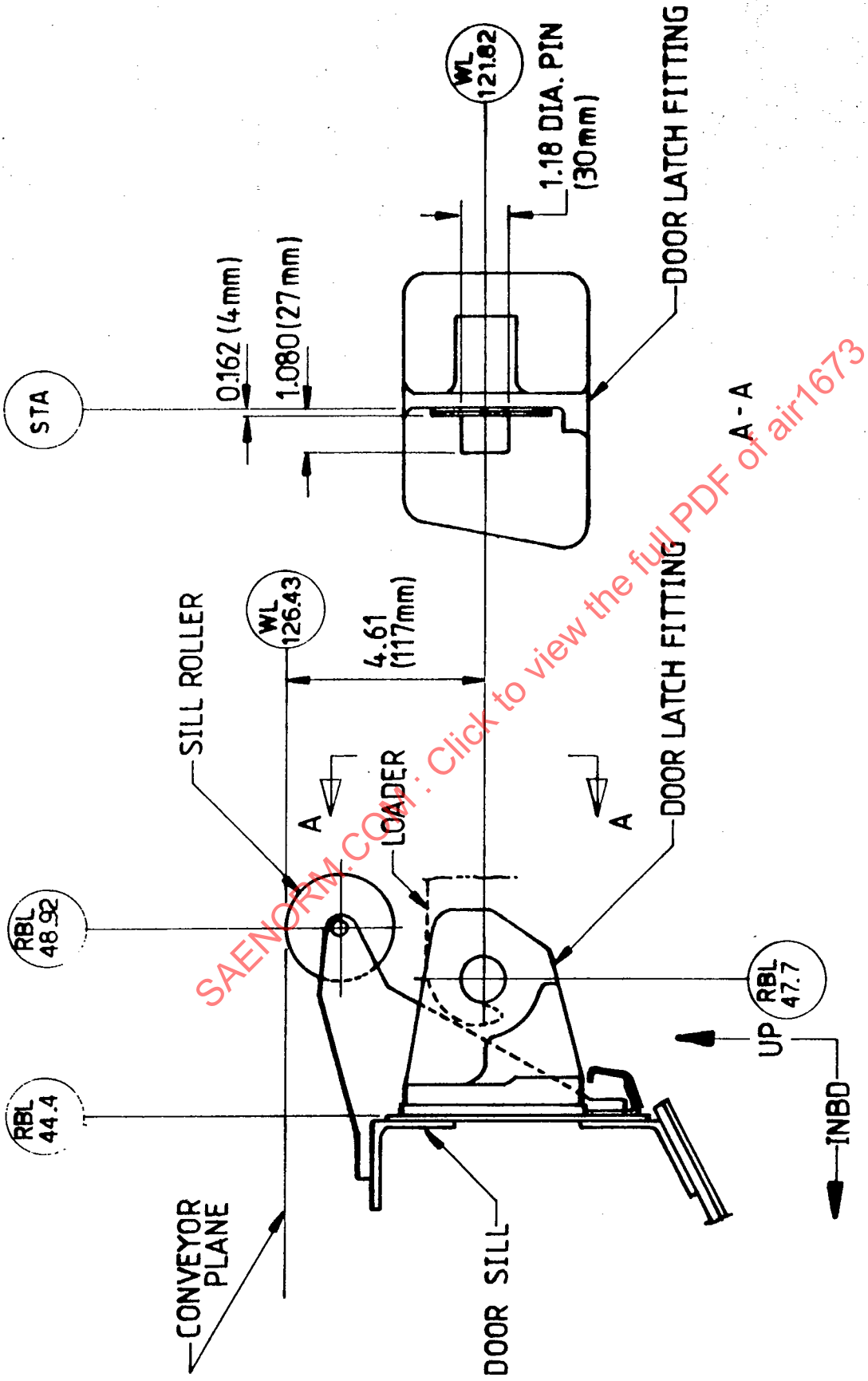


FIGURE 7F
BOEING 767 FORWARD LOWER HOLD-WIDE DOOR OPTION
GENERAL ARRANGEMENT OF GROUND LOADER LATCH ON FITTING

DOUGLAS DC-8 - MAIN DECK CARGO DOOR SILL ATTACHMENT FITTING DETAIL FOR GROUND LOADING EQUIPMENT

DC-8 MODEL 55F
CARGO LOADING ENVELOPE

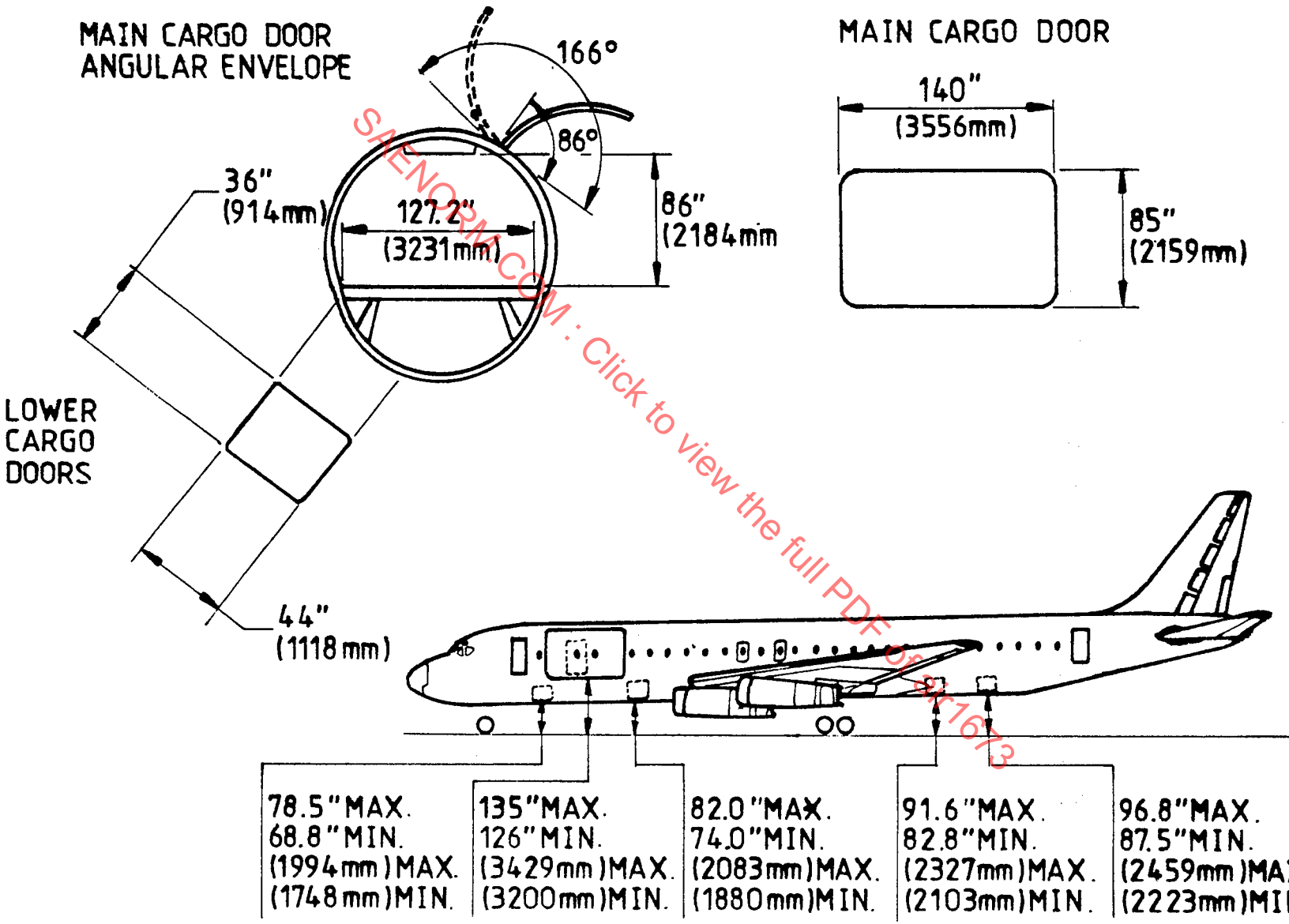


FIGURE 8A

DC.8

DC-8 MODEL 61F
CARGO LOADING ENVELOPE

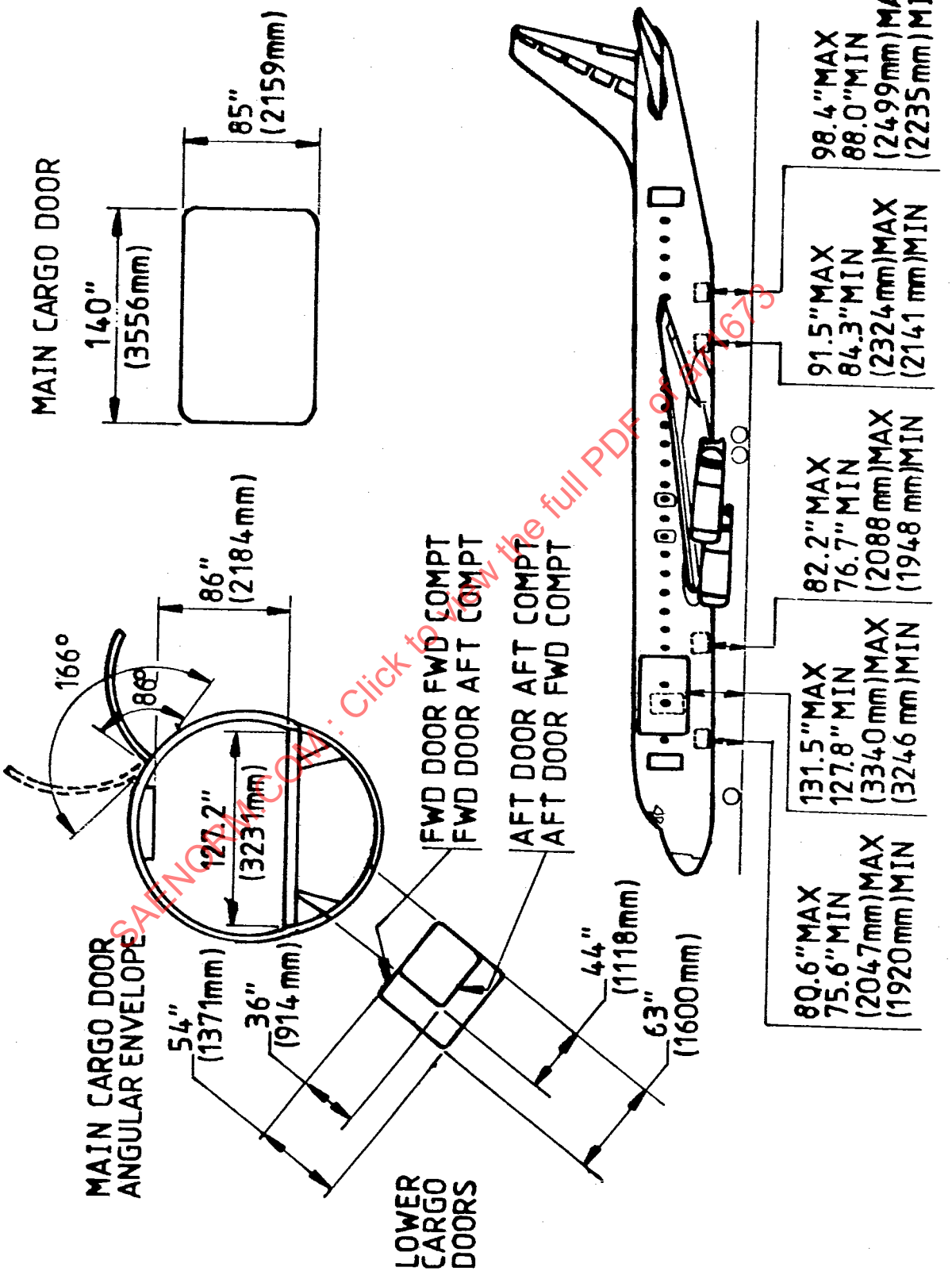


FIGURE 8B

DC.8

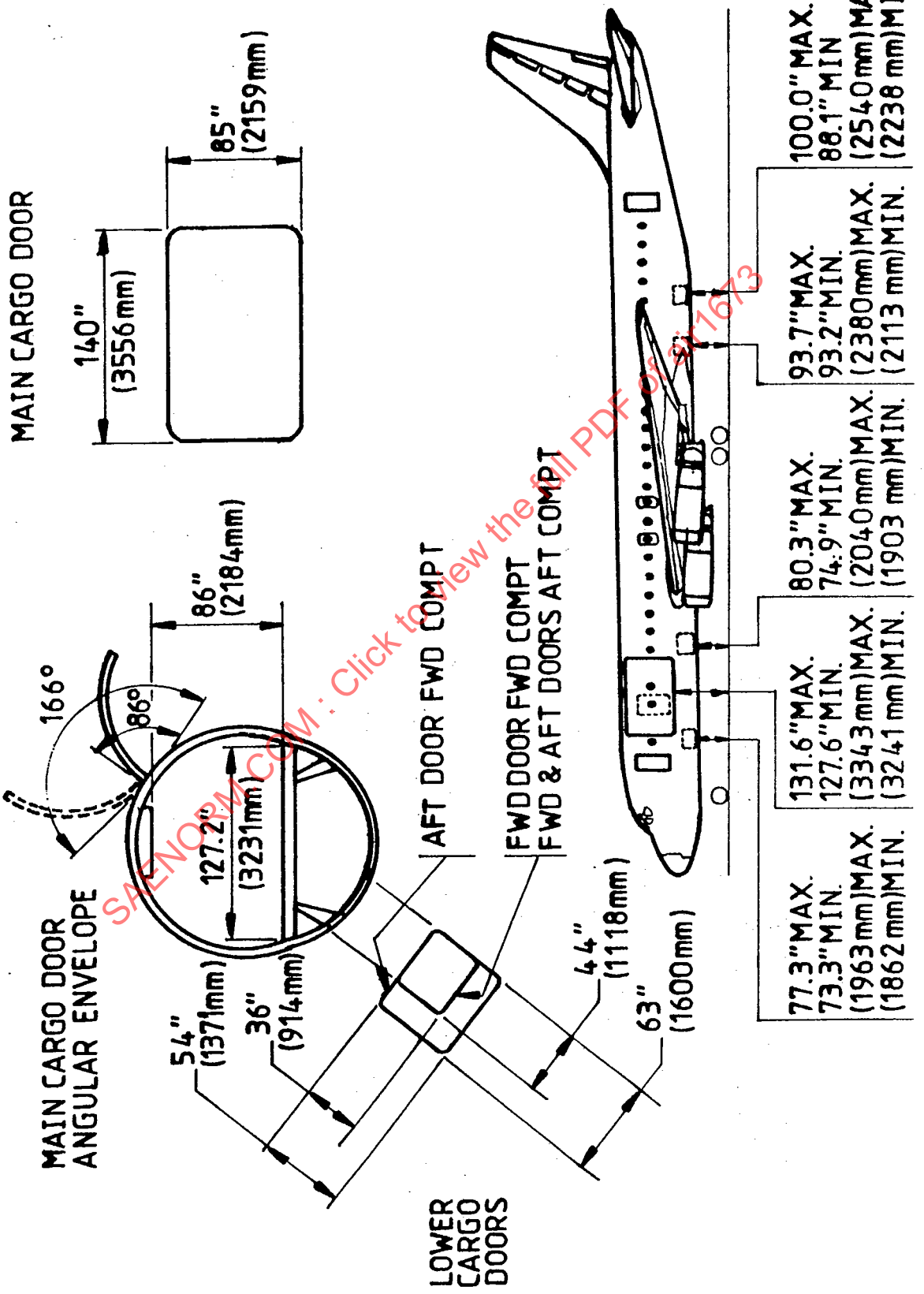


FIGURE 8C

DC.8

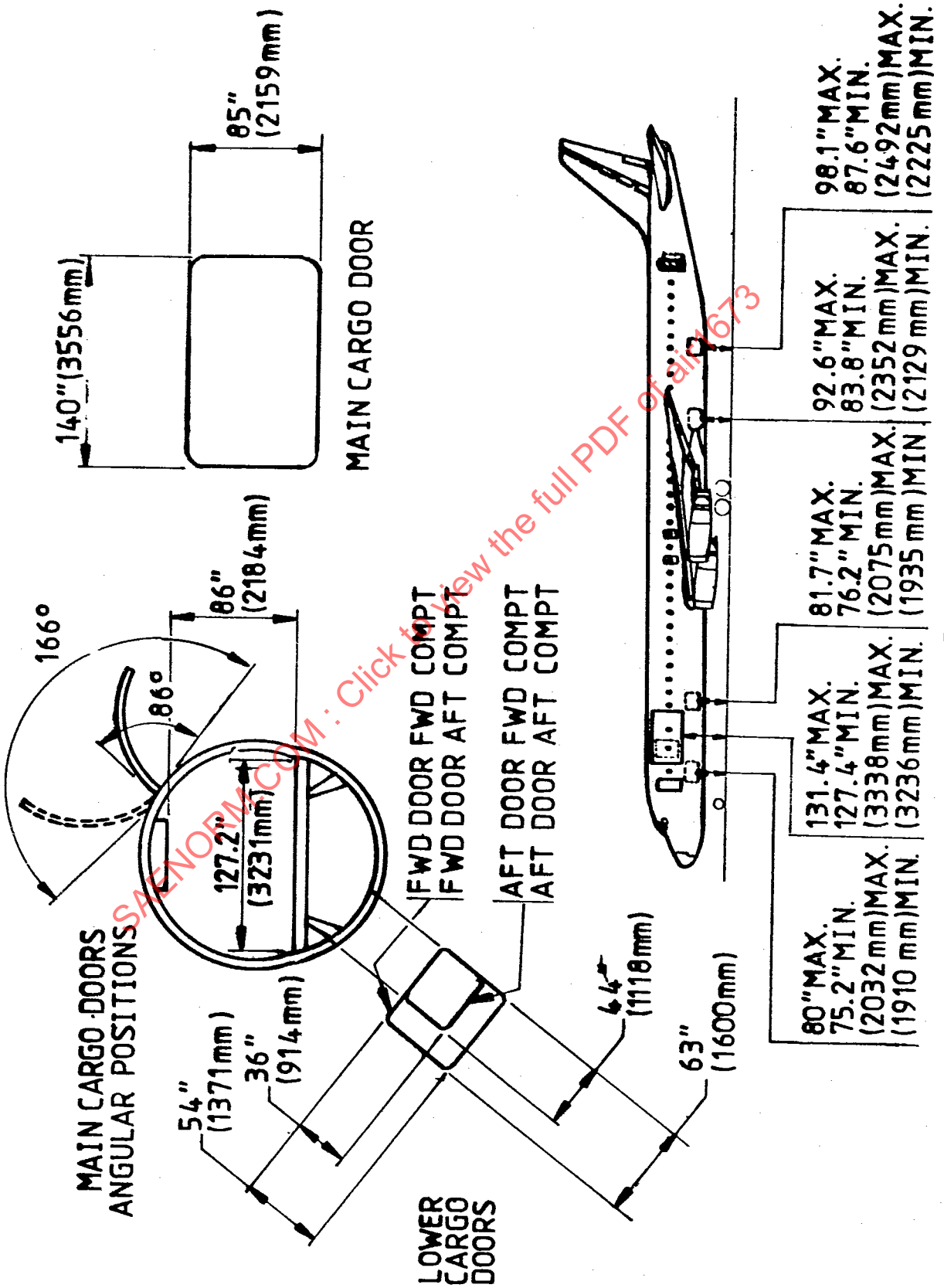
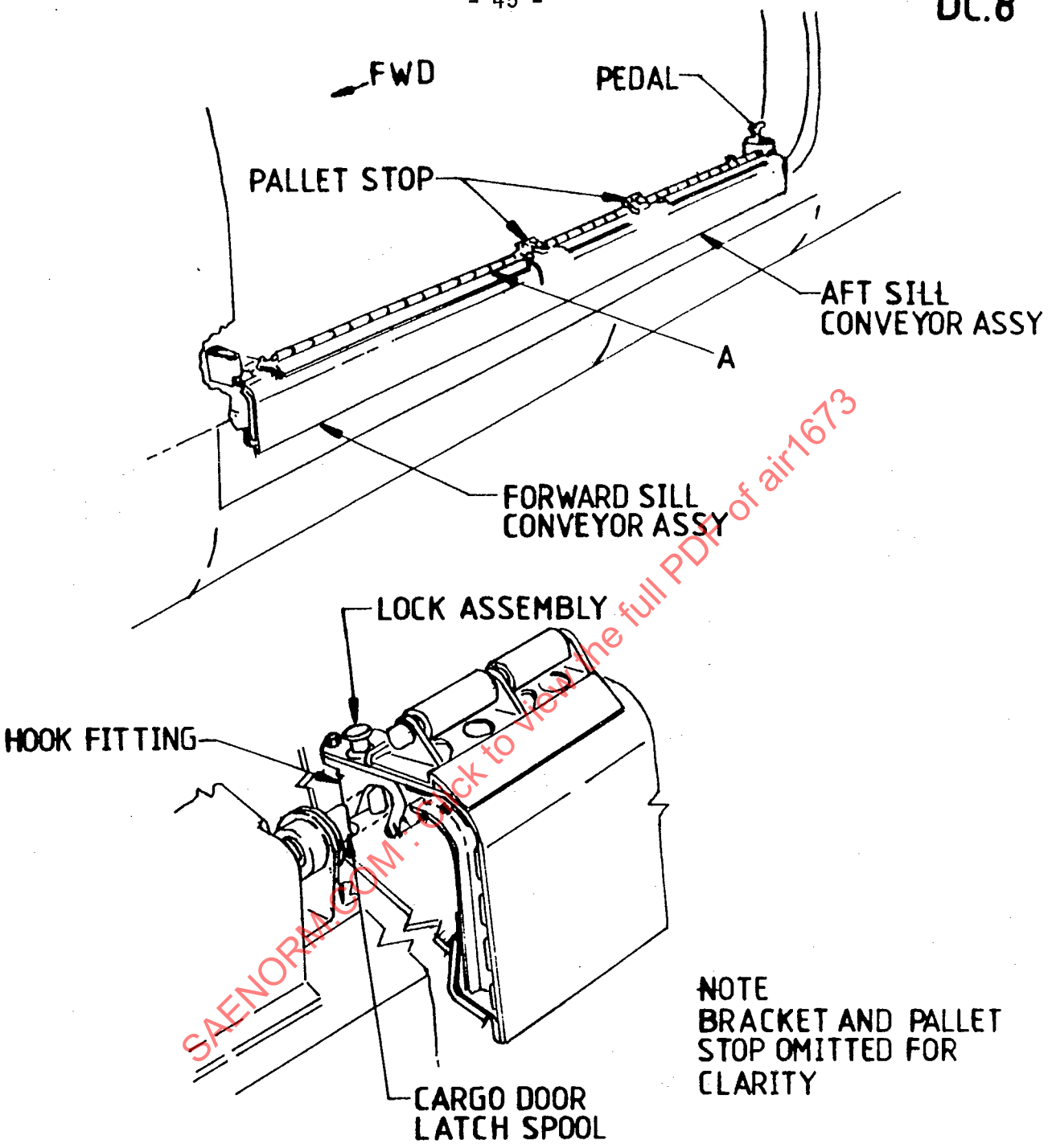


FIGURE 8D

DC.8



VIEW A

FIGURE 8E
DC-8 MAIN CABIN CARGO DOOR SILL CONVEYOR - REMOVABLE

DC8

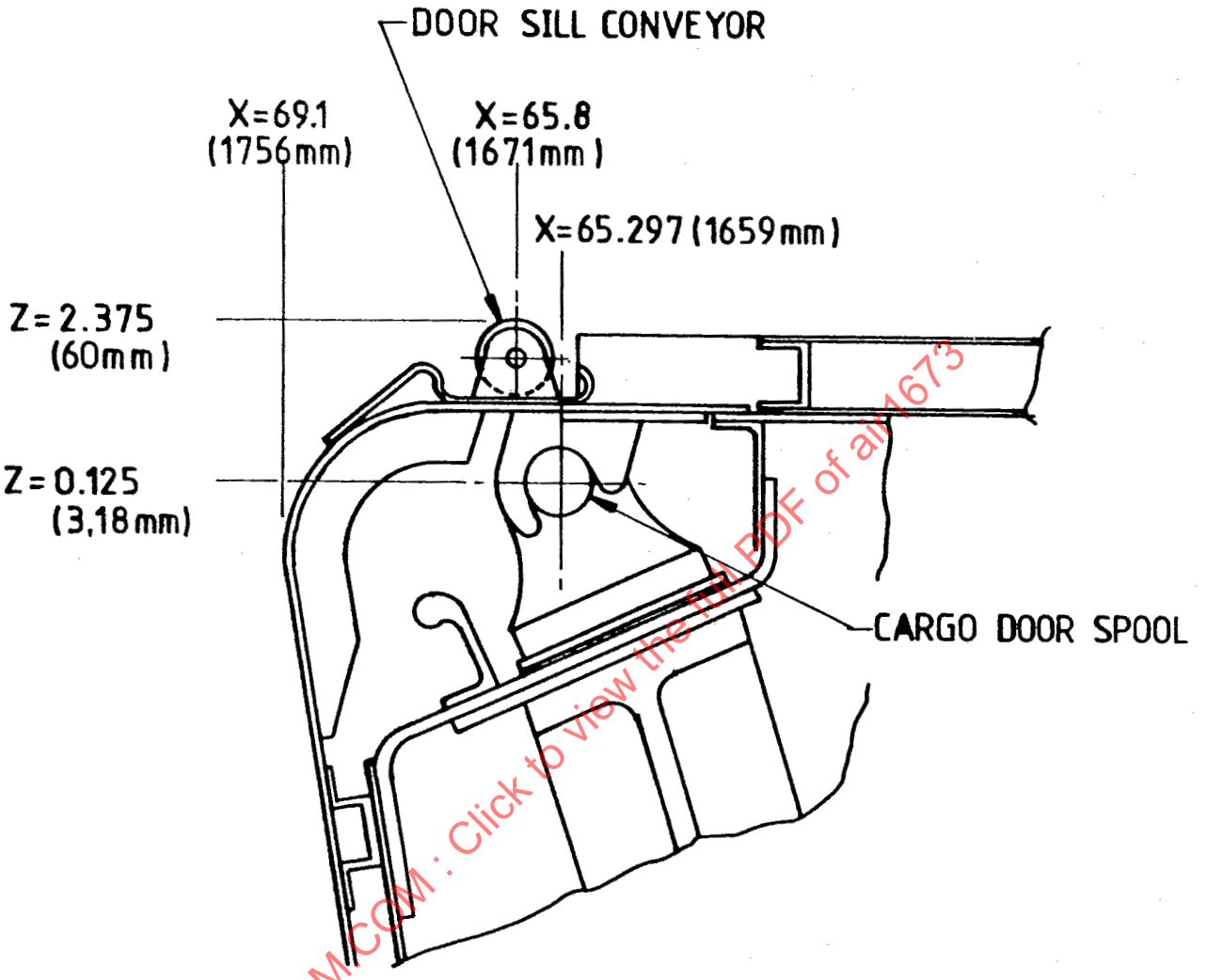


FIGURE 8F
DC-8 CROSS SECTION THRU MAIN CABIN
DOOR SILL CONVEYOR - REMOVABLE

DC 8

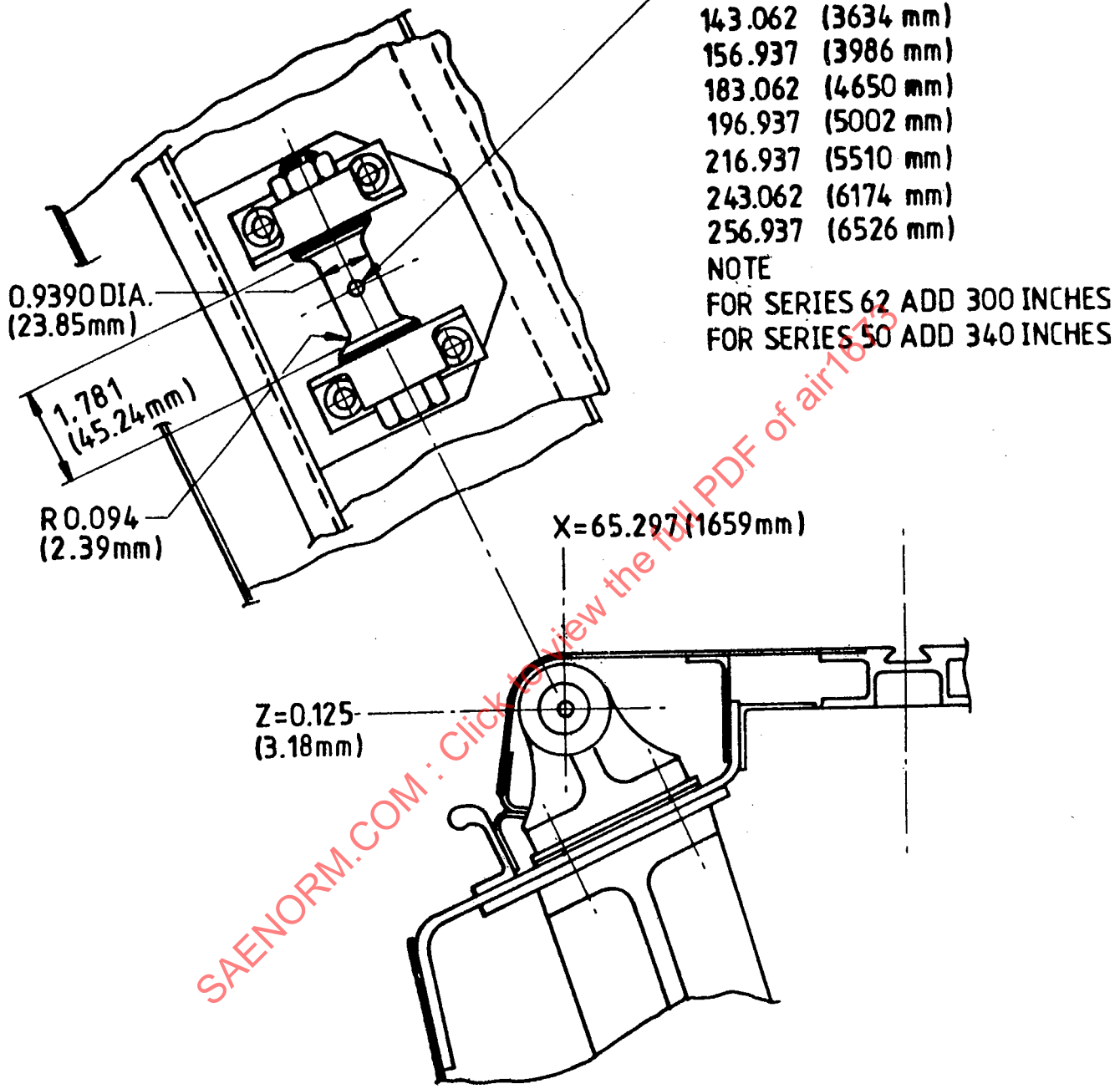


FIGURE 8G
DC-8 CROSS SECTION THRU MAIN CABIN DOOR JAMB

DOUGLAS DC9 - MAIN DECK CARGO DOOR SILL ATTACHMENT FITTING DETAILS FOR GROUND LOADING EQUIPMENT

DC.9

DC-9 SERIES
CARGO LOADING ENVELOPE

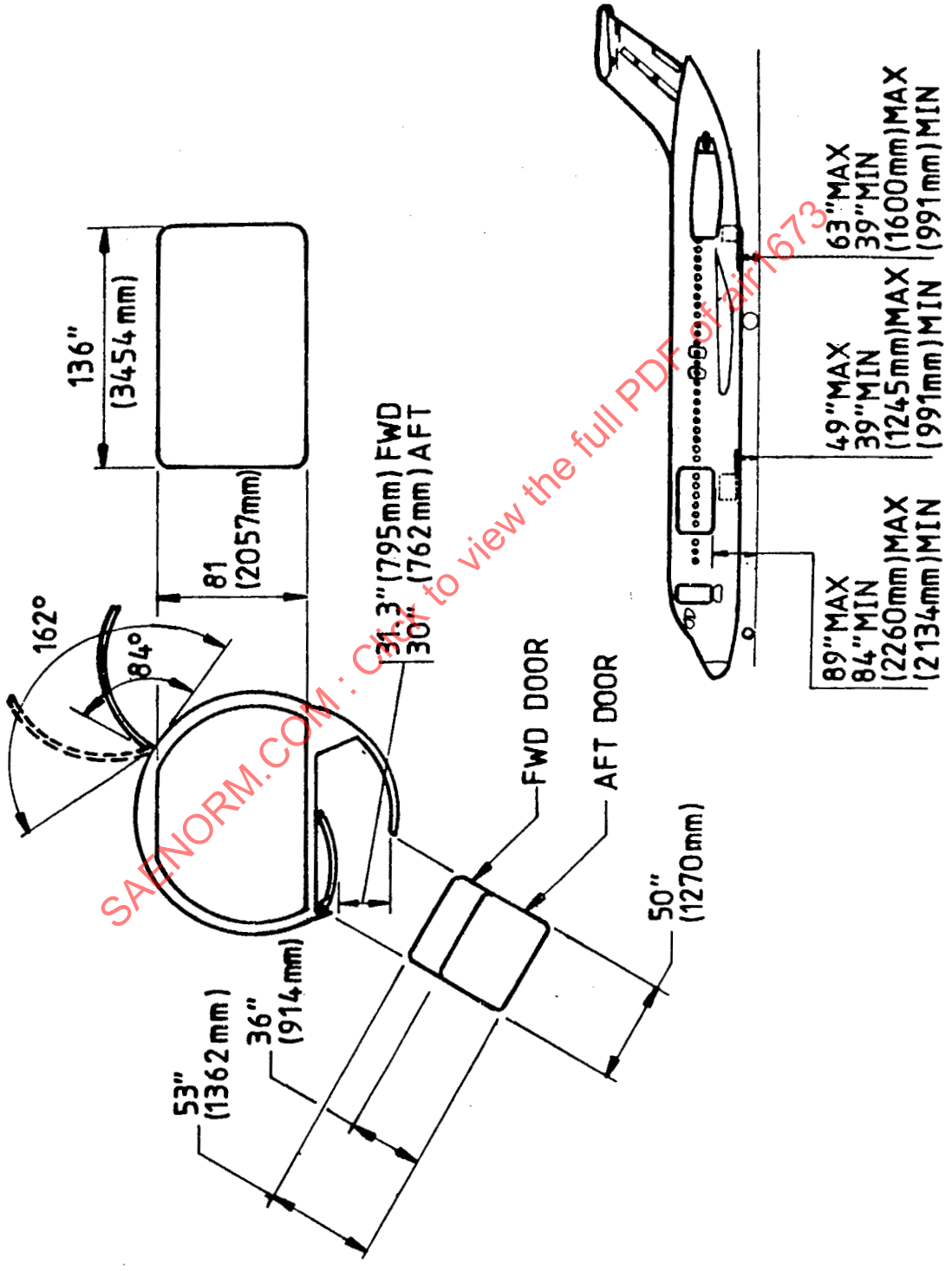


FIGURE 9A

DC.9

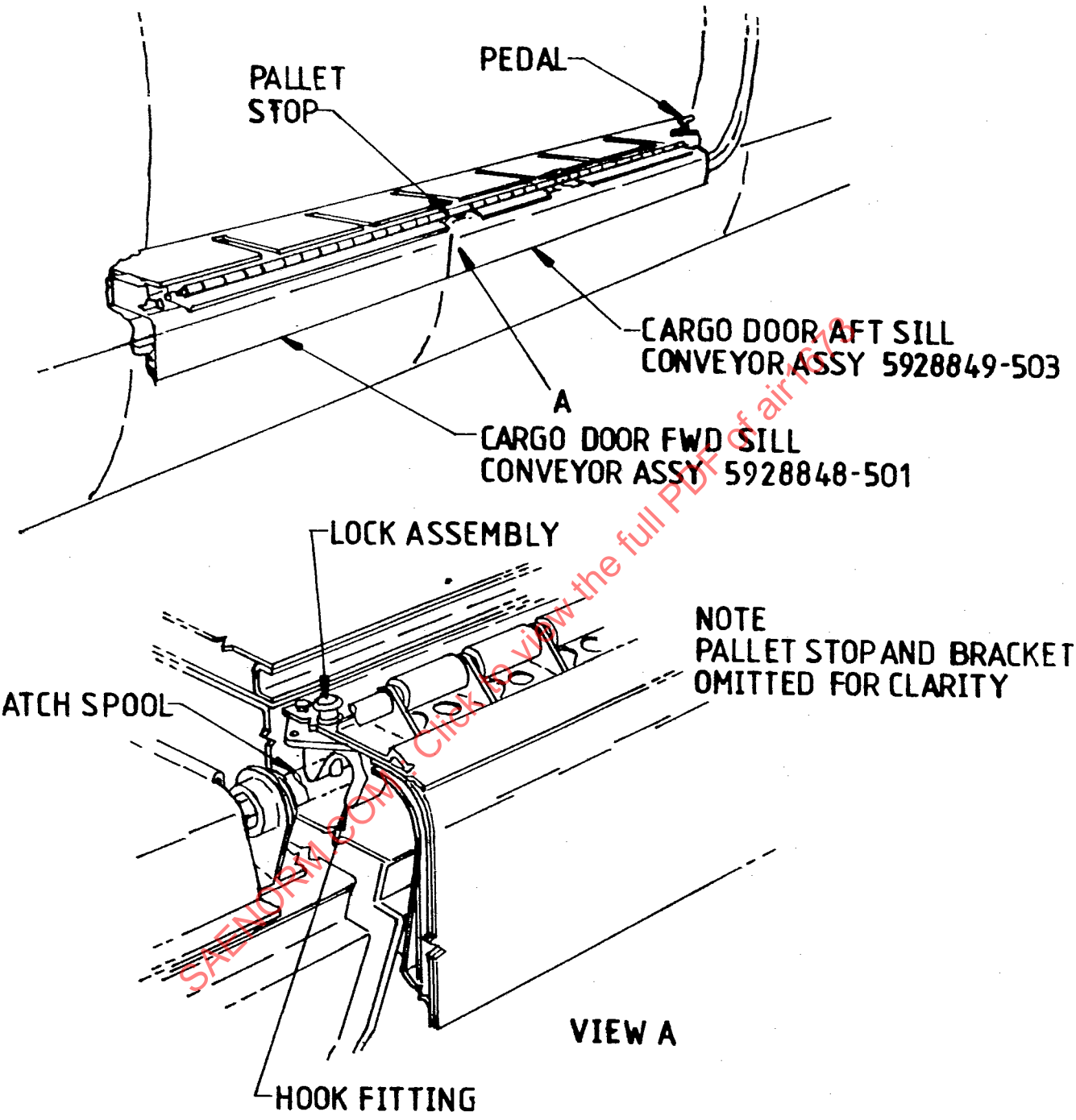


FIGURE 9B
DC-9 MAIN CABIN CARGO DOOR
SILL CONVEYOR - REMOVABLE

DC 9

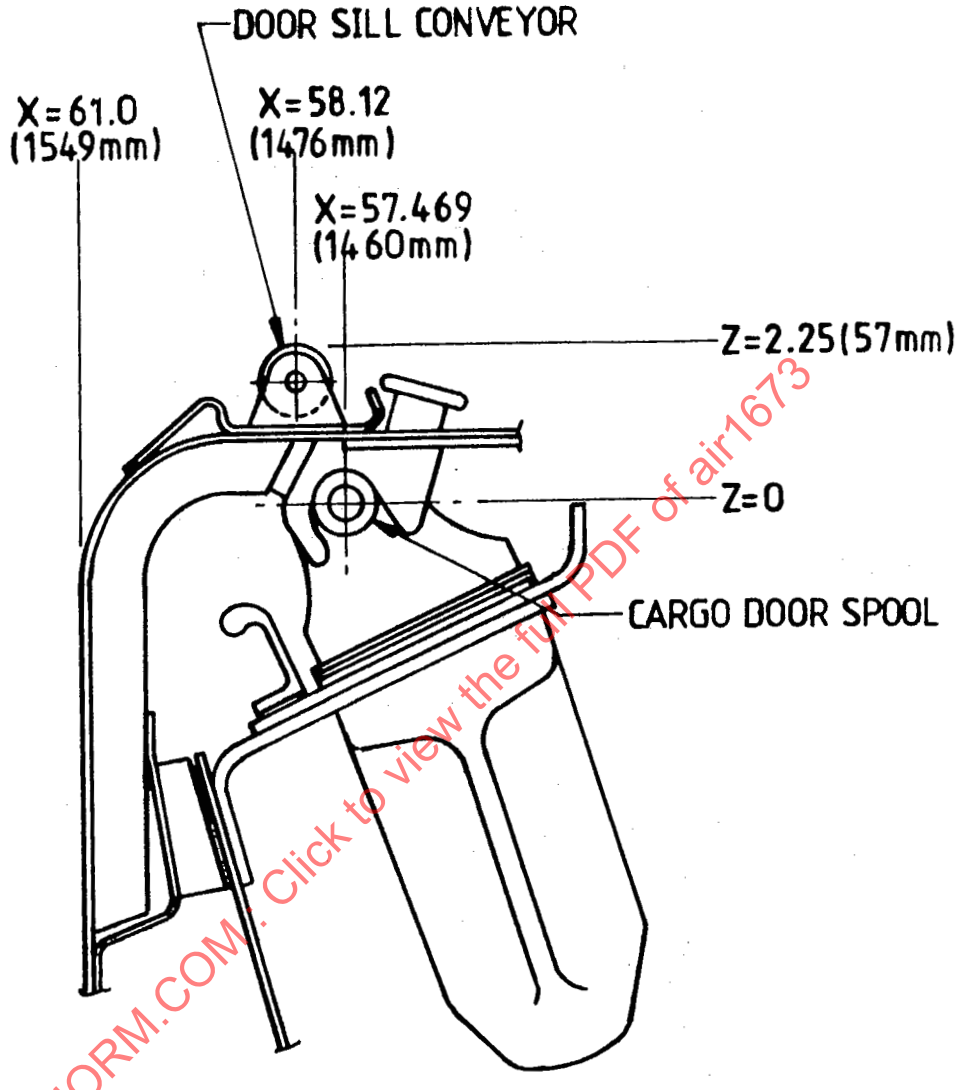


FIGURE 9C
DC-9 CROSS SECTION THRU MAIN CABIN
DOOR SILL CONVEYOR - REMOVABLE

DC 9

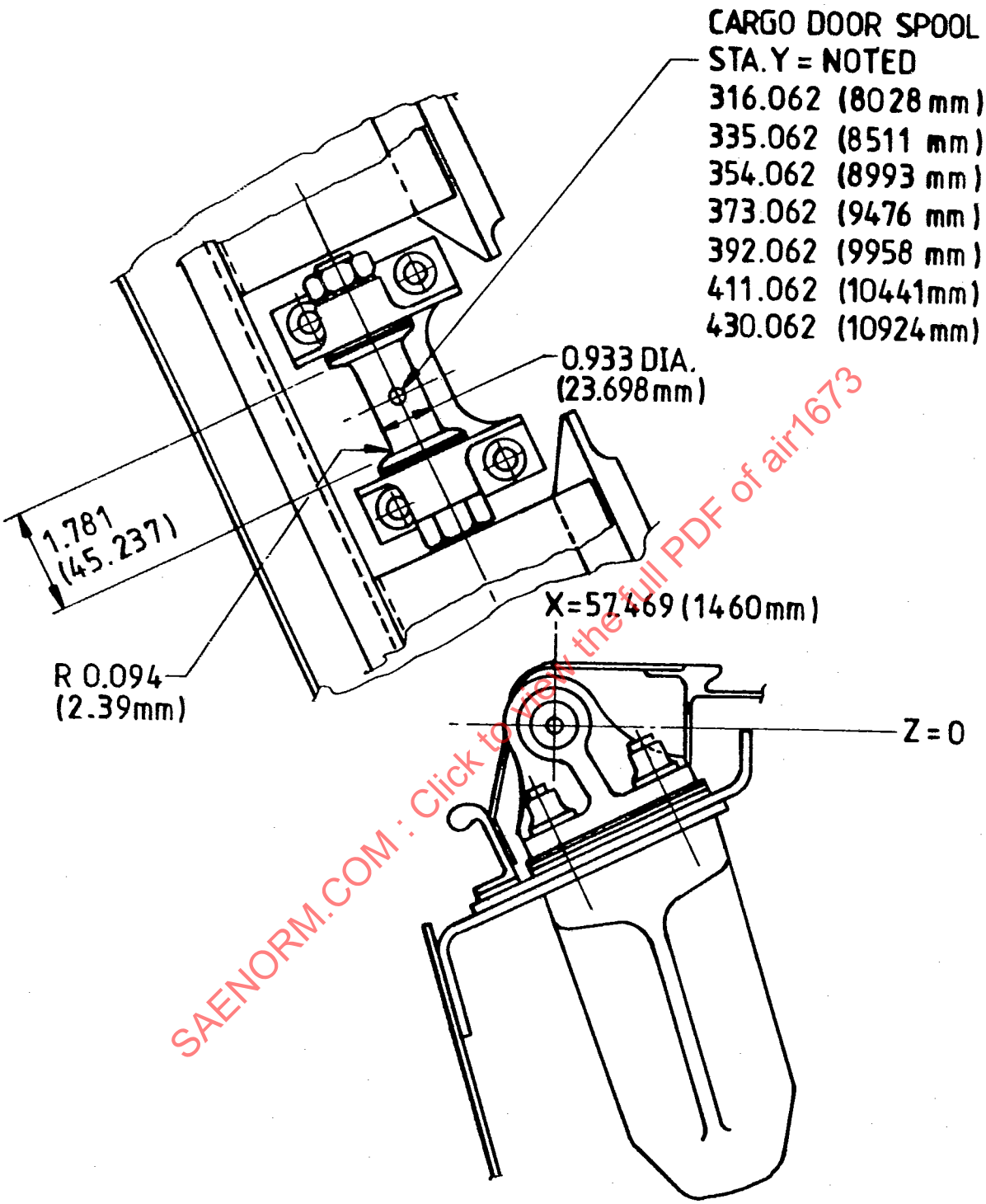


FIGURE 9D
DC-9 CROSS SECTION THRU MAIN CABIN DOOR JAMB

DOUGLAS DC10 - LOWER DECK CARGO DOOR SILL ATTACHMENT FITTING DETAILS FOR GROUND LOADING EQUIPMENT

DC10

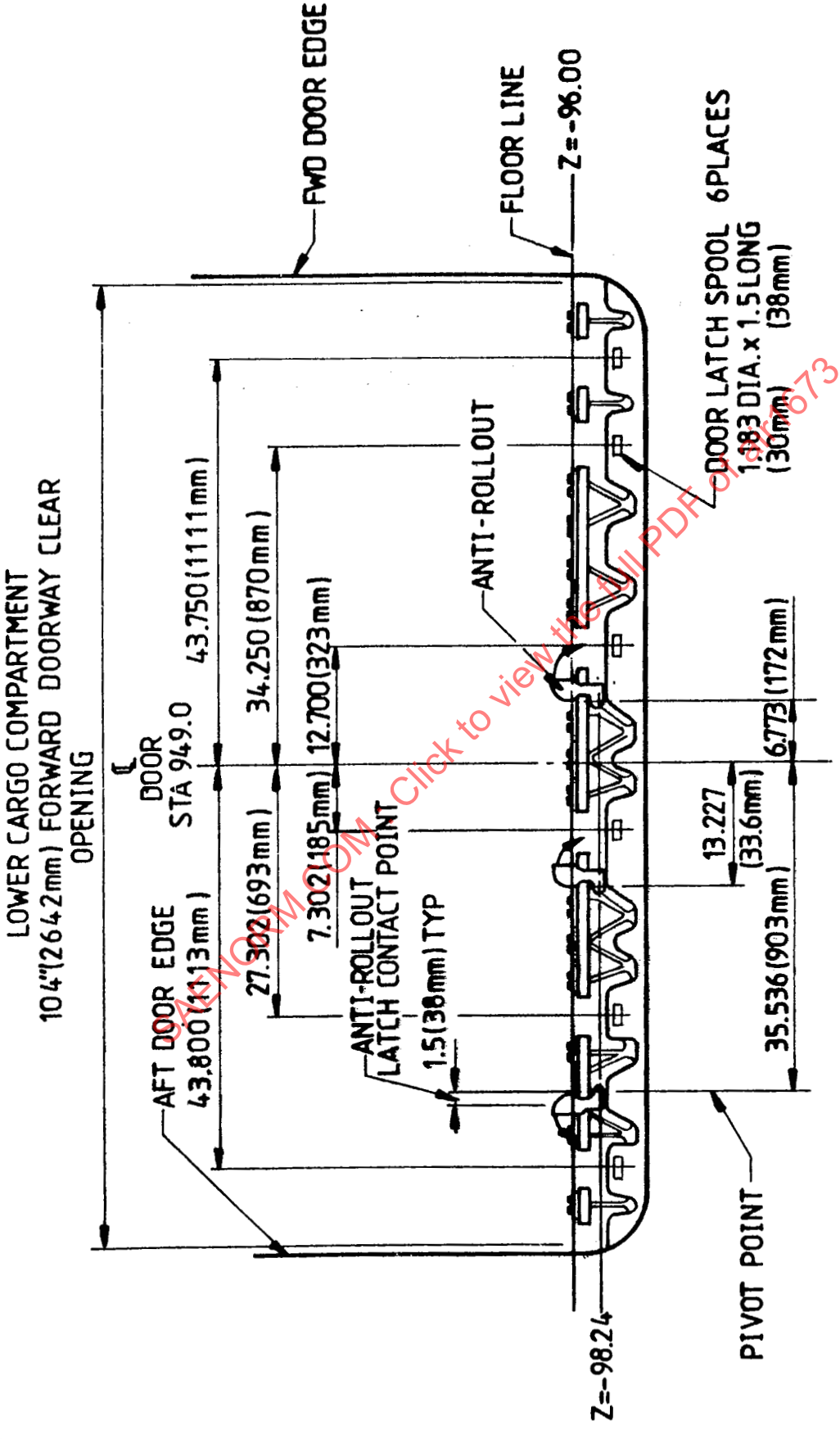


FIGURE 10A

DC10 LOWER COMPARTMENT DOOR

DC10

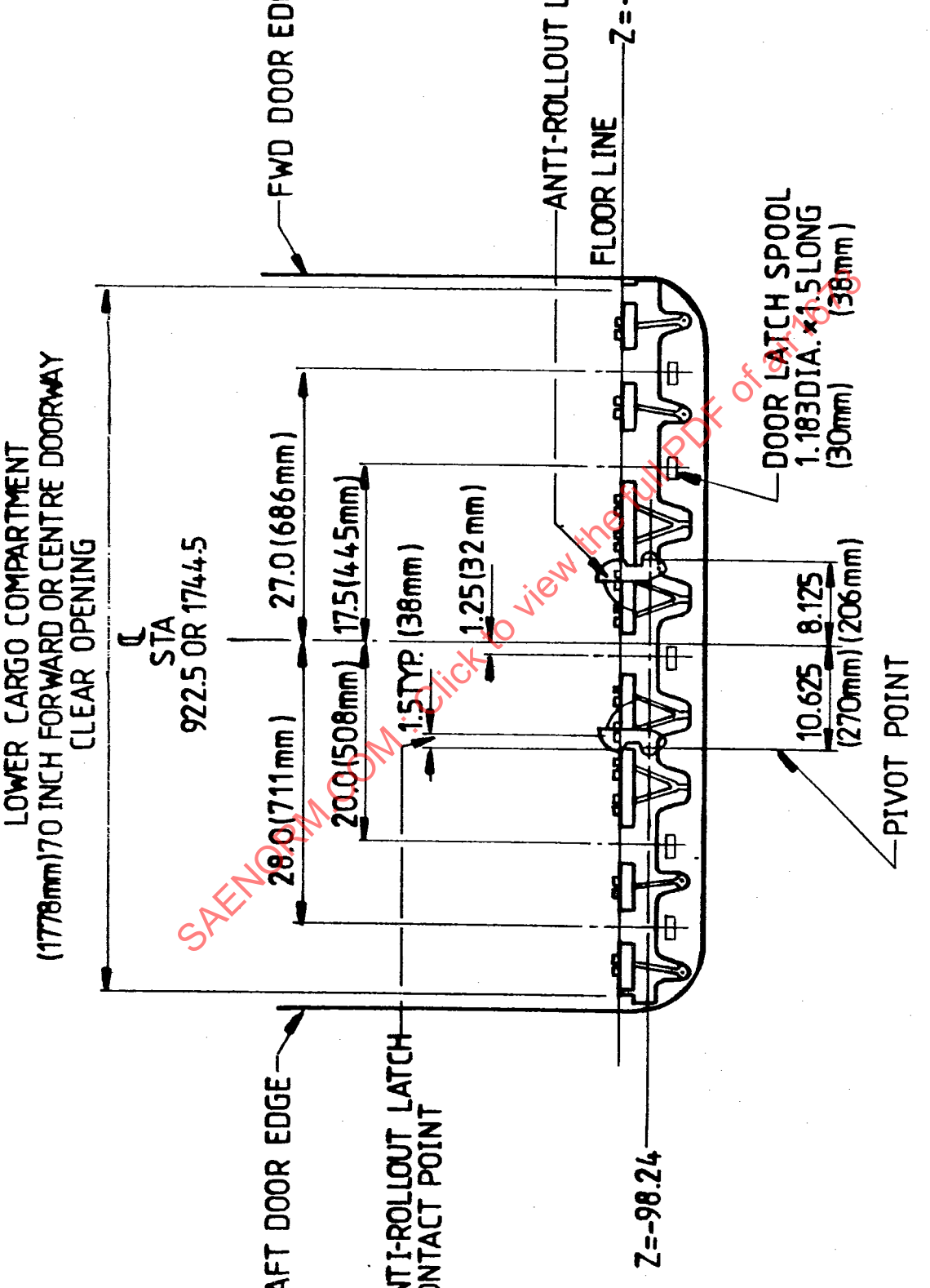


FIGURE 10B
DC10 LOWER COMPARTMENT DOOR

DC10

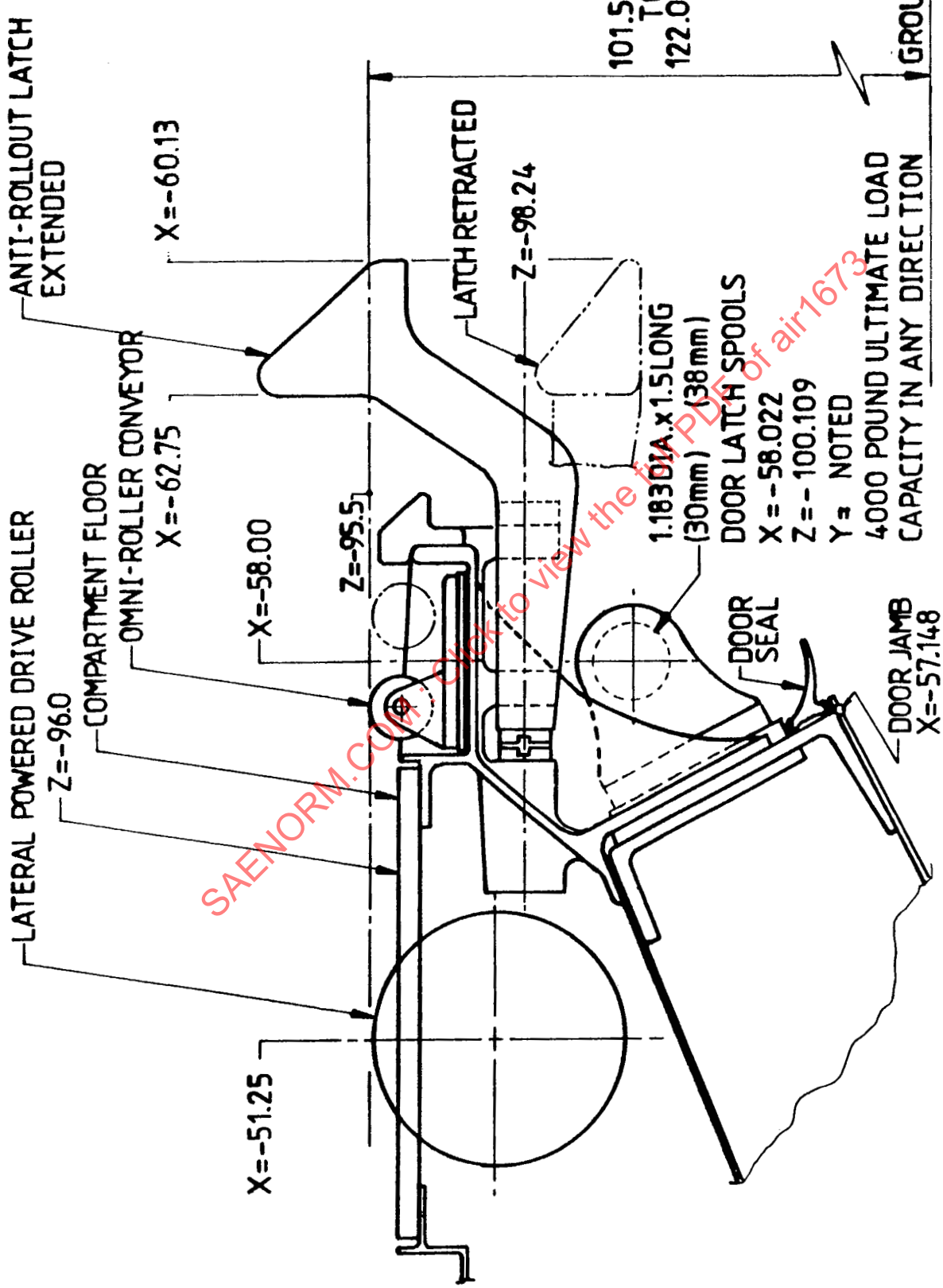
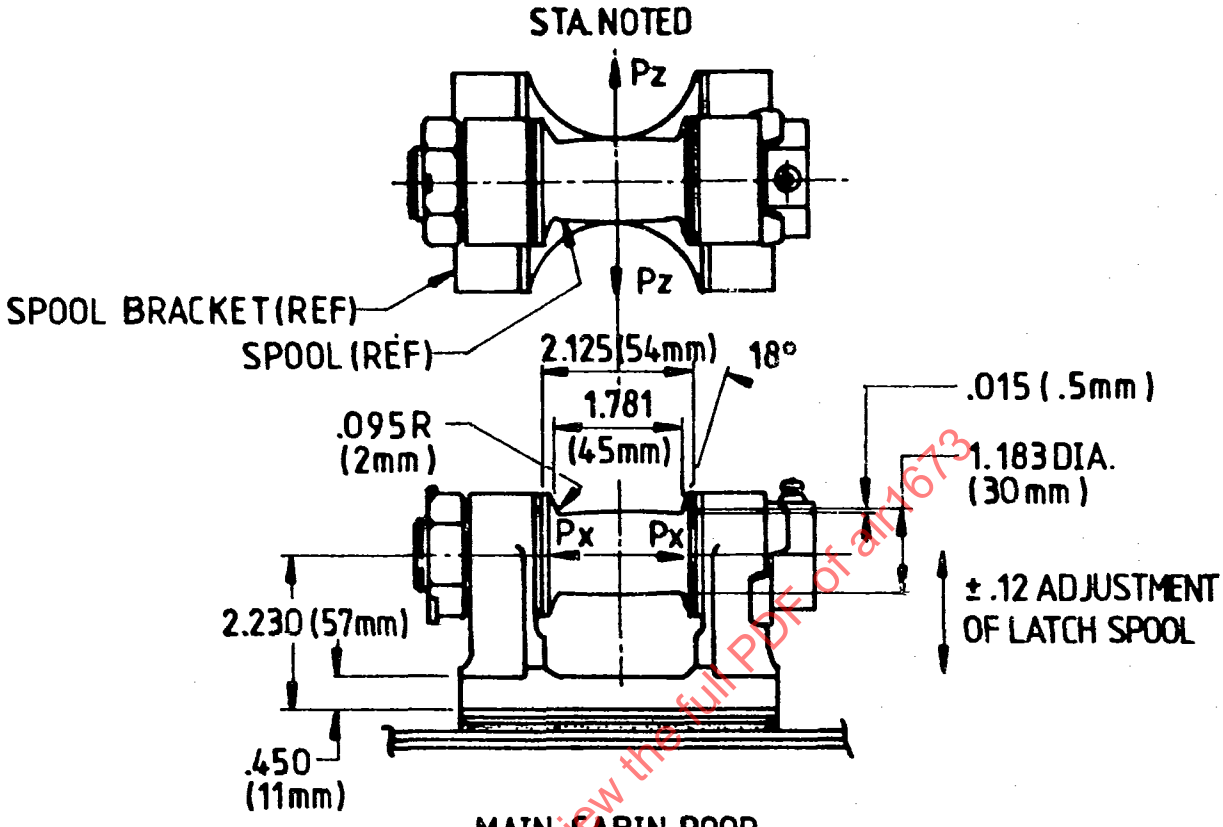


FIGURE 10C

DC10 CROSS SECTION THRU LOWER CARGO DOOR JAMB

DC 10



MAIN CABIN DOOR
LATCH SPOOL

NOTE
VARIATION FROM TABLE 1 WILL REQUIRE APPROVAL FROM DOUGLAS AIRCRAFT STRUCT. MECH. GROUP.

ULT = L5 (LIMIT DESIGN)

TABLE 1 - LATCH SPOOL LOAD CAPABILITY, POUNDS
UPPER CARGO DOOR (SERIES 300F)

SPOOL NO & STA	±PzULT	±PxULT	±PzULT	±PxULT	±PzULT	±PxULT	±PzULT	±PxULT
NO 1 - 632.292	15 000	10 000	15 000	5 000	0	0	0	0
NO 2 - 644.792	15 000	0	15 000	5 000	0	0	0	0
NO 3 - 666.292	15 000	0	15 000	0	0	4 500	12 000	1 500
NO 4 - 692.292	15 000	0	15 000	0	0	0	0	0
NO 5 - 712.292	15 000	0	15 000	0	0	4 500	12 000	1 500
NO 6 - 737.708	15 000	0	15 000	5 000	0	0	0	0
NO 7 - 757.708	15 000	10 000	15 000	5 000	0	0	0	0
	CASE 1 - COMBINED ULT. LOADS		CASE 2 - COMBINED ULT. LOADS		CASE 3 - COMBINED ULT. LOADS		CASE 4 - COMBINED ULT. LOADS	

FIG. 10D - DC10 DOOR SPOOL LOADS

DOUGLAS DC10 - MAIN DECK CARGO DOOR SILL ATTACHMENT FITTING DETAILS FOR GROUND LOADING EQUIPMENT

DC10

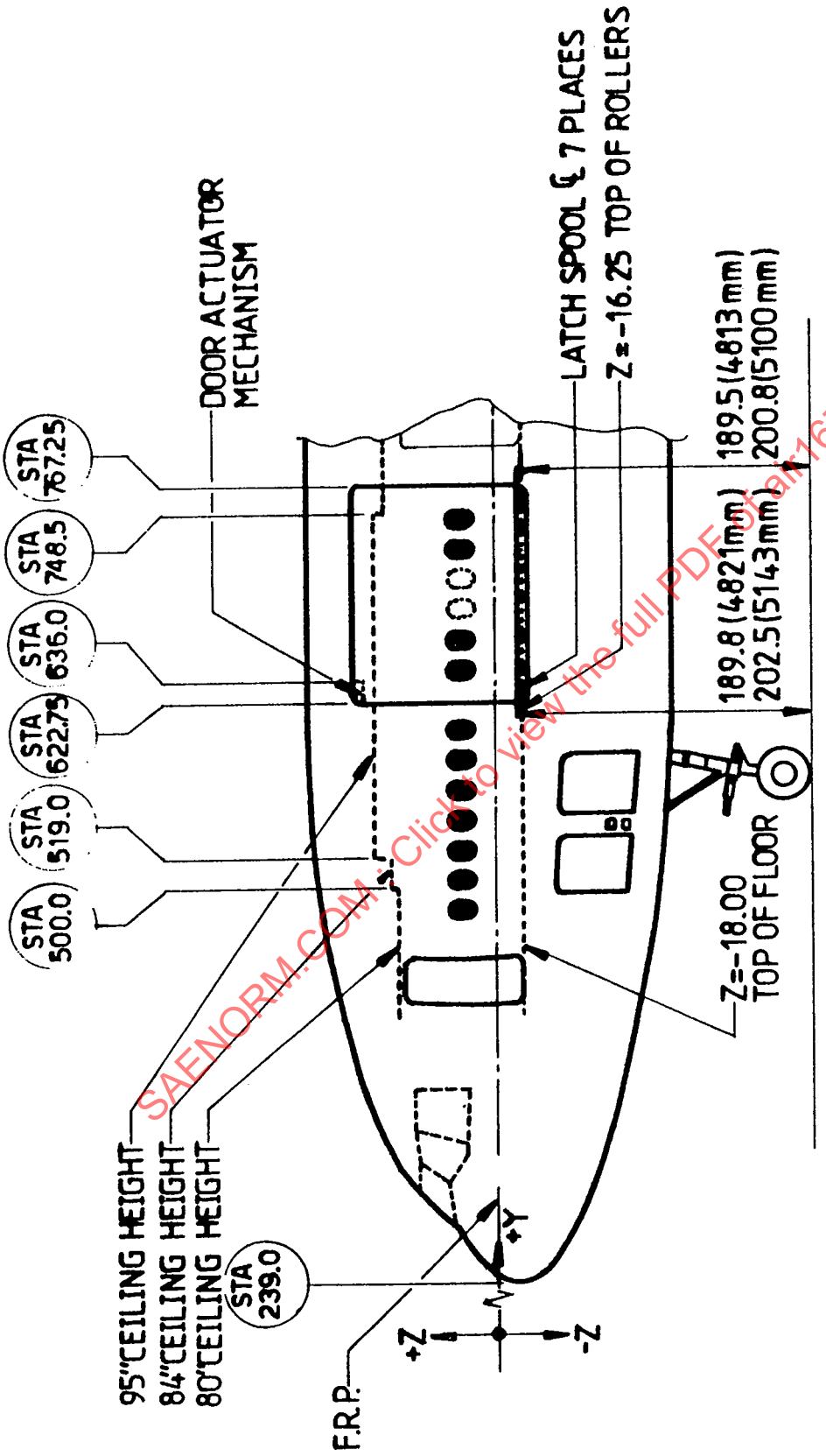


FIGURE 11A
DC-10 MAIN DECK CARGO DOOR

DC10

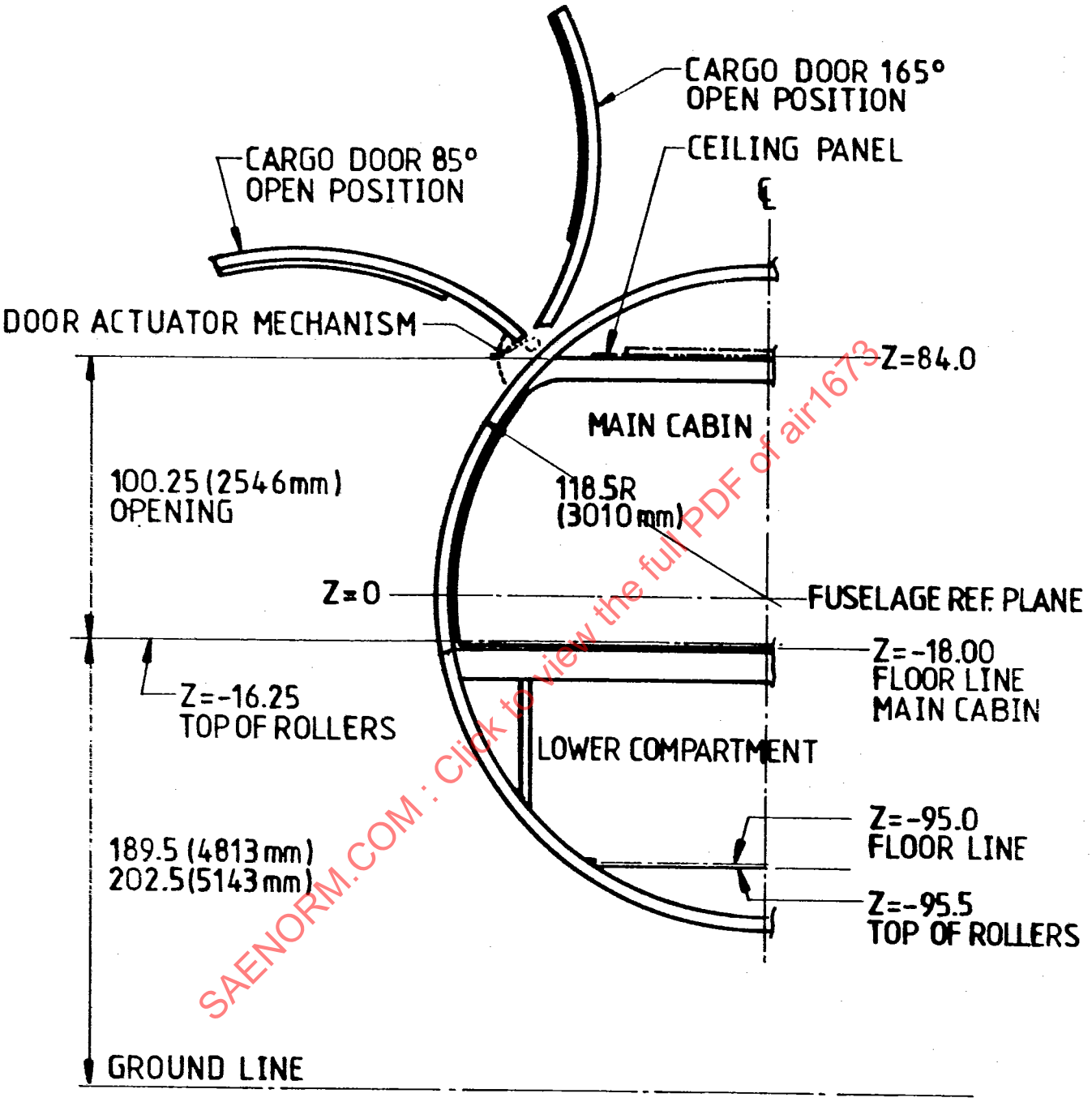
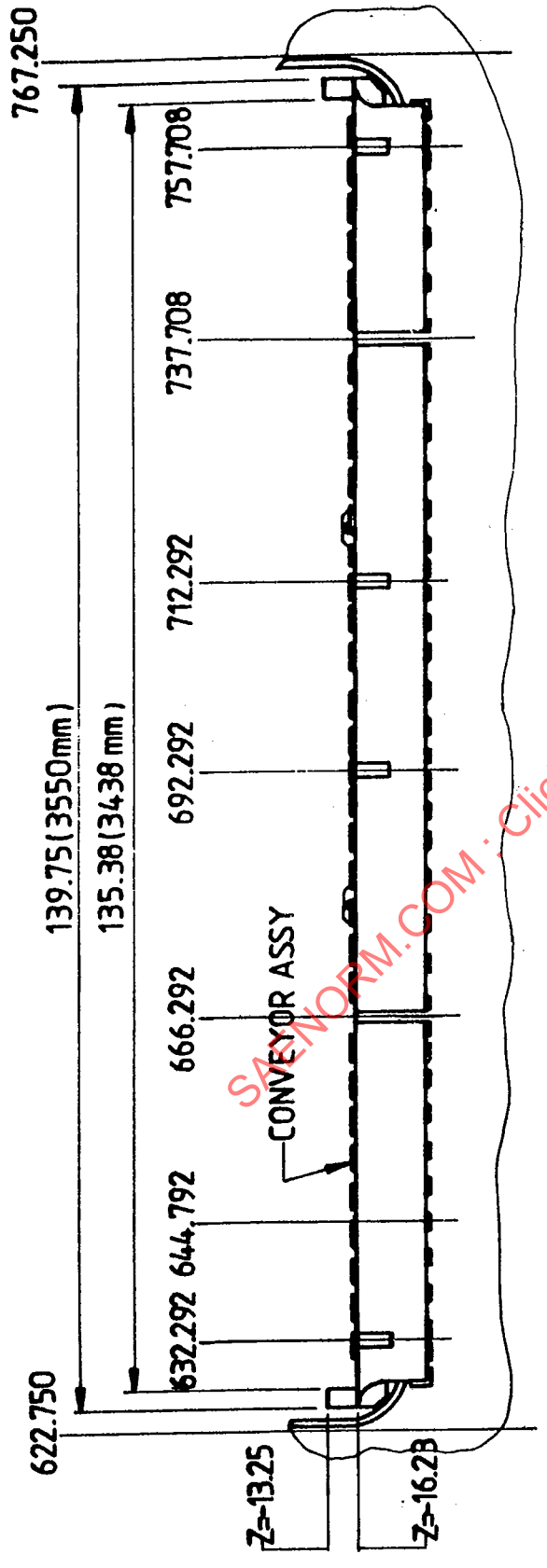
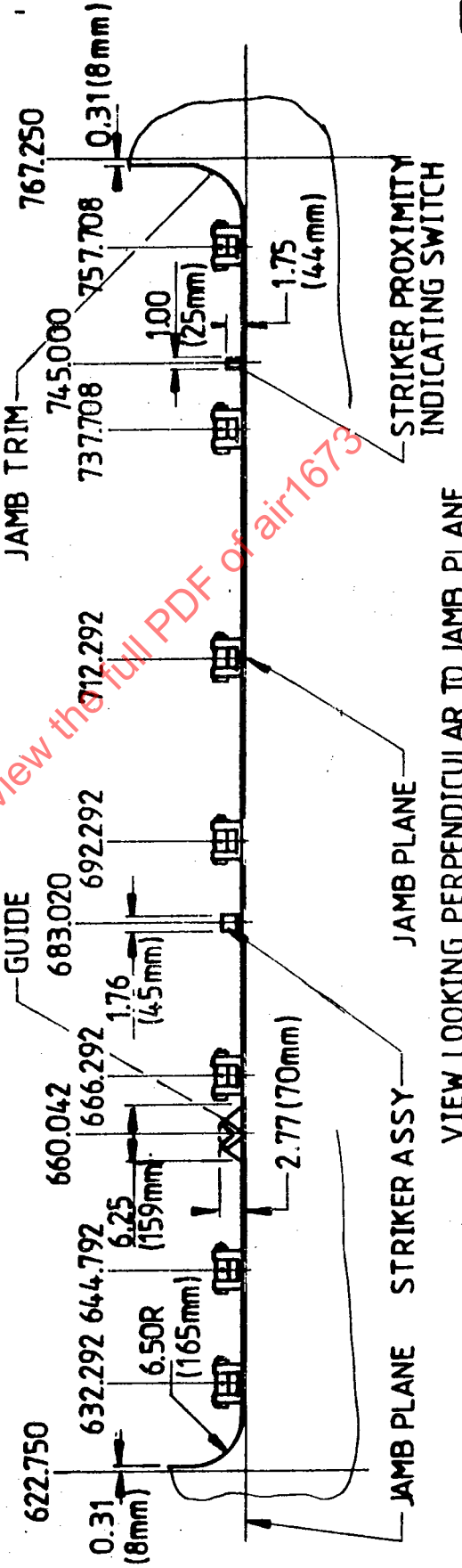


FIGURE 11B
DC10 CROSS SECTION

DC10



VIEW LOOKING PERPENDICULAR TO CONVEYOR ASSY PANELS



VIEW LOOKING PERPENDICULAR TO JAMB PLANE

FIGURE 11C

DC10 MAIN CABIN DOOR JAMB