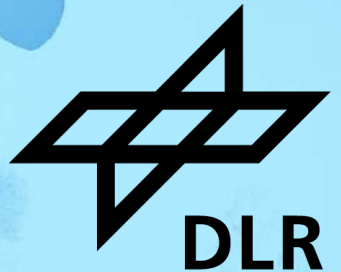


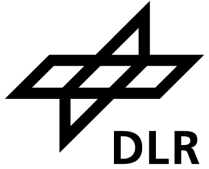
D250-TF-2040 EXACT

Daniel Silberhorn

18.12.2023



Acronym Definition

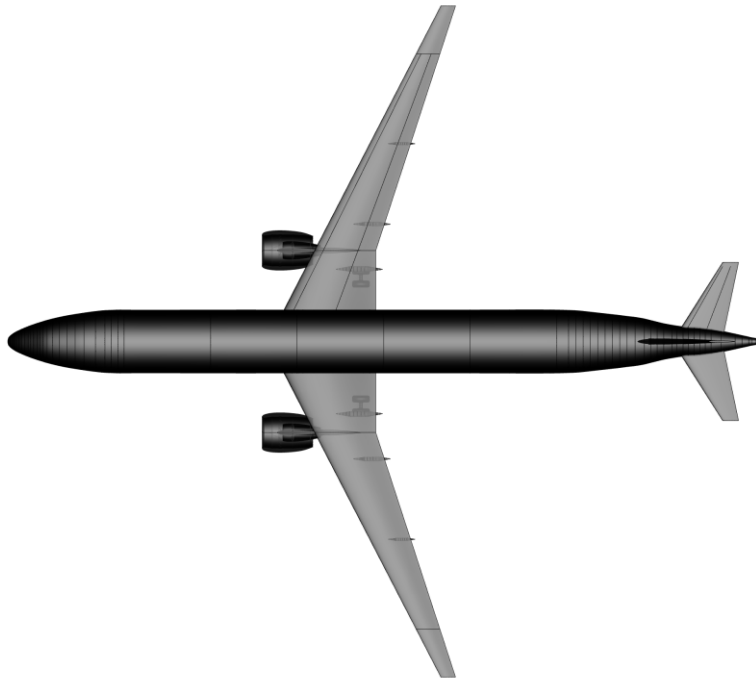
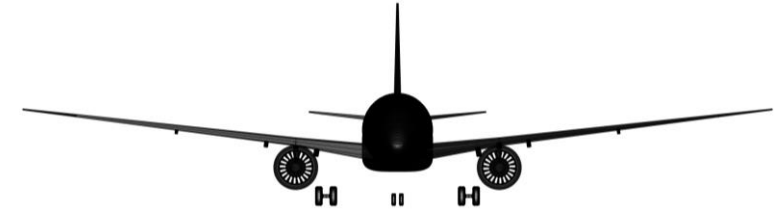
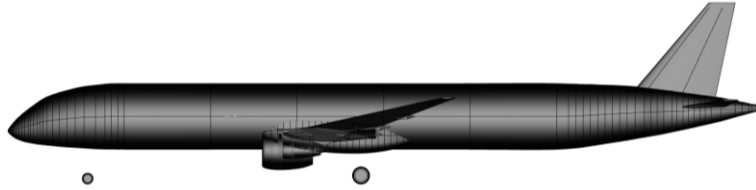
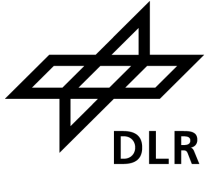


Acronym	Definition
A/C	Aircraft
AEO	All Engine Operating
AMC	Aircraft Mission Calculation
App	Approach
APU	Auxiliary Power Unit
Avg.	Average
BPR	Bypass Ratio
CAS	Calibrated Airspeed
CS 25	Certification Specifications for Large Aeroplanes
CFRP	Carbon-Fiber-Reinforced Polymers
CG	Centre of Gravity
CPACS	Common Parametric Aircraft Configuration Schema
DC	Drag counts
EIS	Entry Into Service
EOF	End of Field
FL	Flight Level
hAP	Airport Altitude
HiFi	High Fidelity

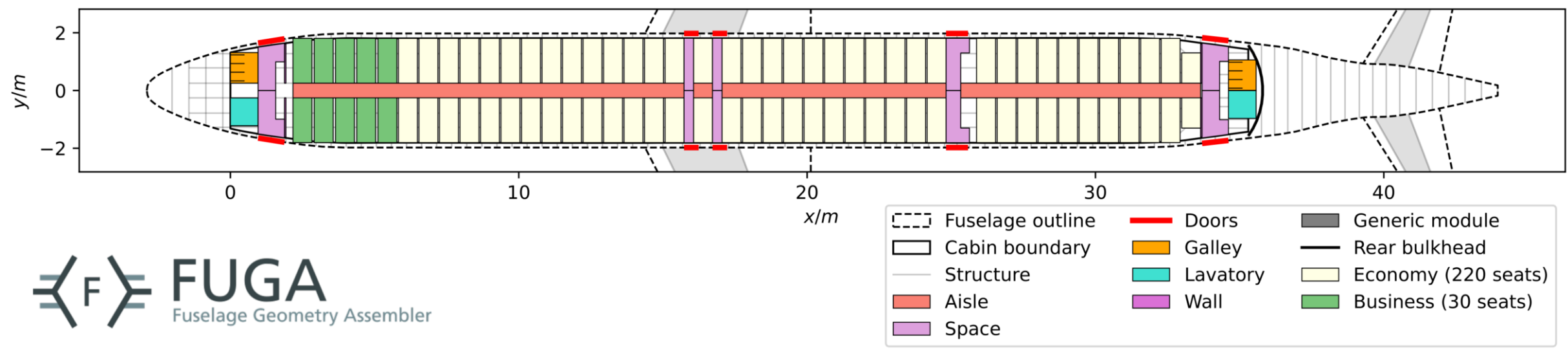
Acronym	Definition
HTP	Horizontal Tail Plane
ICA	Initial Cruise Altitude
ISA	International Standard Atmosphere
IPT	Intermediate Pressure Turbine
ITD	Intermediate Turbine Duct
JAR	Joint Aviation Requirements
klbf	Kilo Pound-Force
kn	Knots
LE	Leading Edge
LFL	Landing field length
LoFi	Low Fidelity
MCL	Maximum Climb Thrust
MCR	Maximum Cruise Thrust
MEM	Manufacturer Empty Mass
MLM	Maximum Landing Mass
MTO	Maximum Take-off Thrust
MTOM	Maximum Take-Off Mass
MZFM	Maximum Zero-Fuel Mass

Acronym	Definition
NM	Nautical Mile
OAD	Overall Aircraft Design
OEI	One engine inoperative
OEM	Operating Empty Mass
OPR	Overall Pressure Ratio
PAX	Passenger
RCE	Remote Component Environment
ROC	Rate of Climb
RTO	Reserve Take-off Thrust
RWY	Runway
SFC	Specific Fuel Consumption
SL	Sea Level
TE	Trailing Edge
TLARs	Top-Level Aircraft Requirements
TOC	Top of Climb
TSFC	Thrust Specific Fuel Consumption
VTP	Vertical Tail Plane

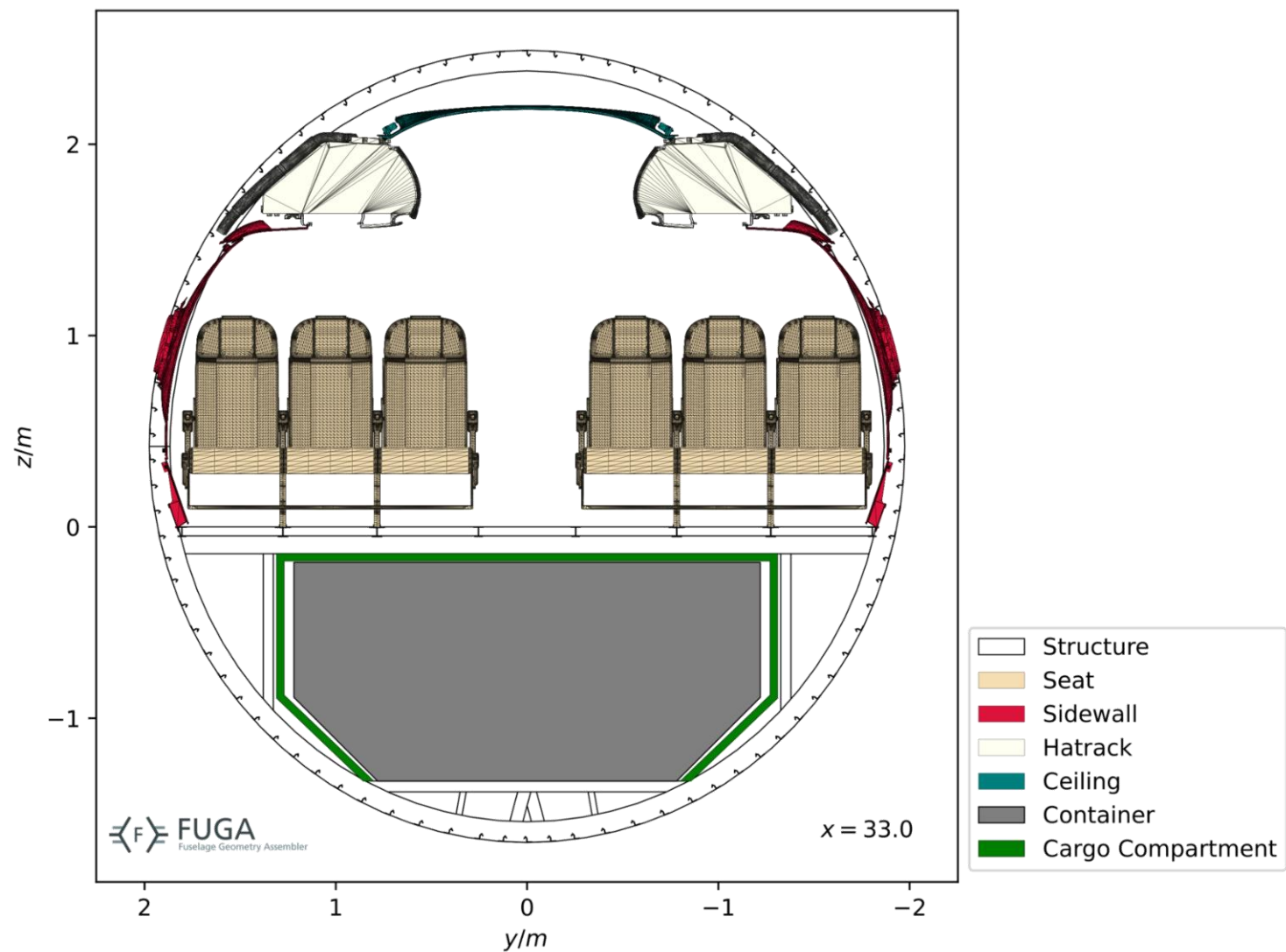
CPACS Output



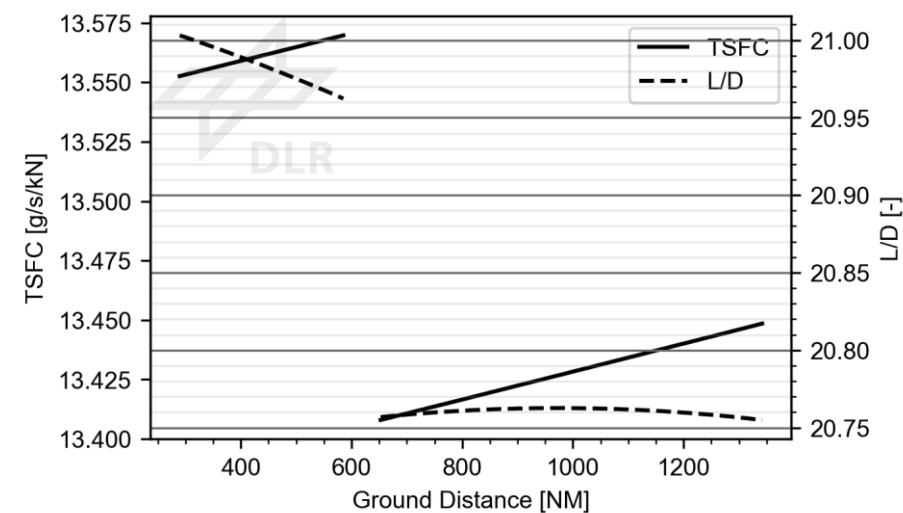
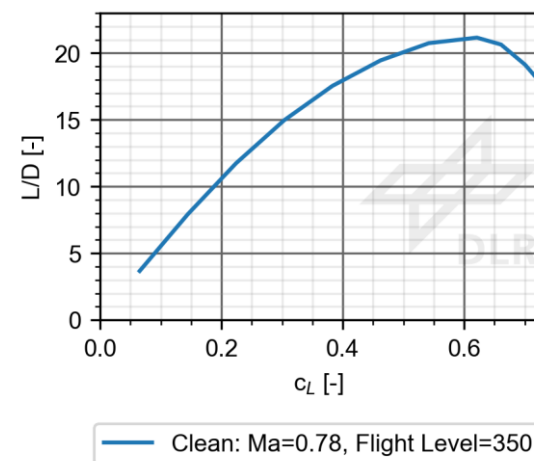
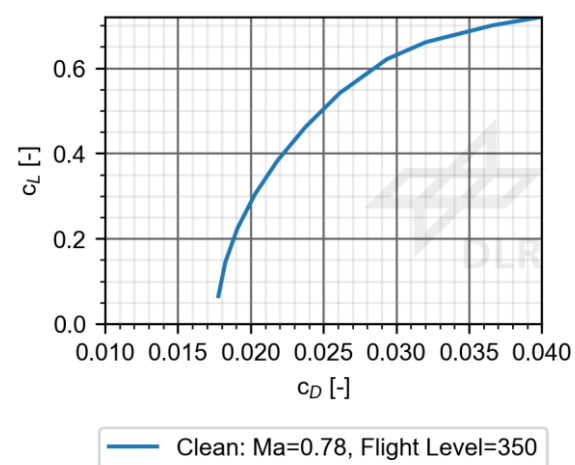
Cabin Layout



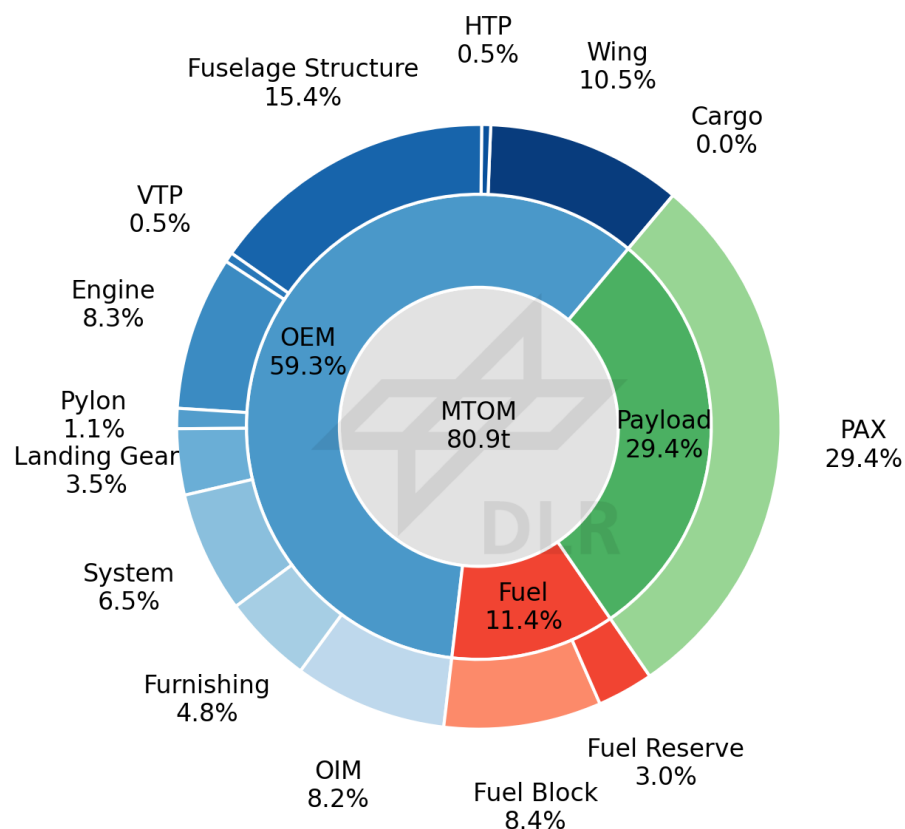
Cross-Section



Aerodynamic Performance

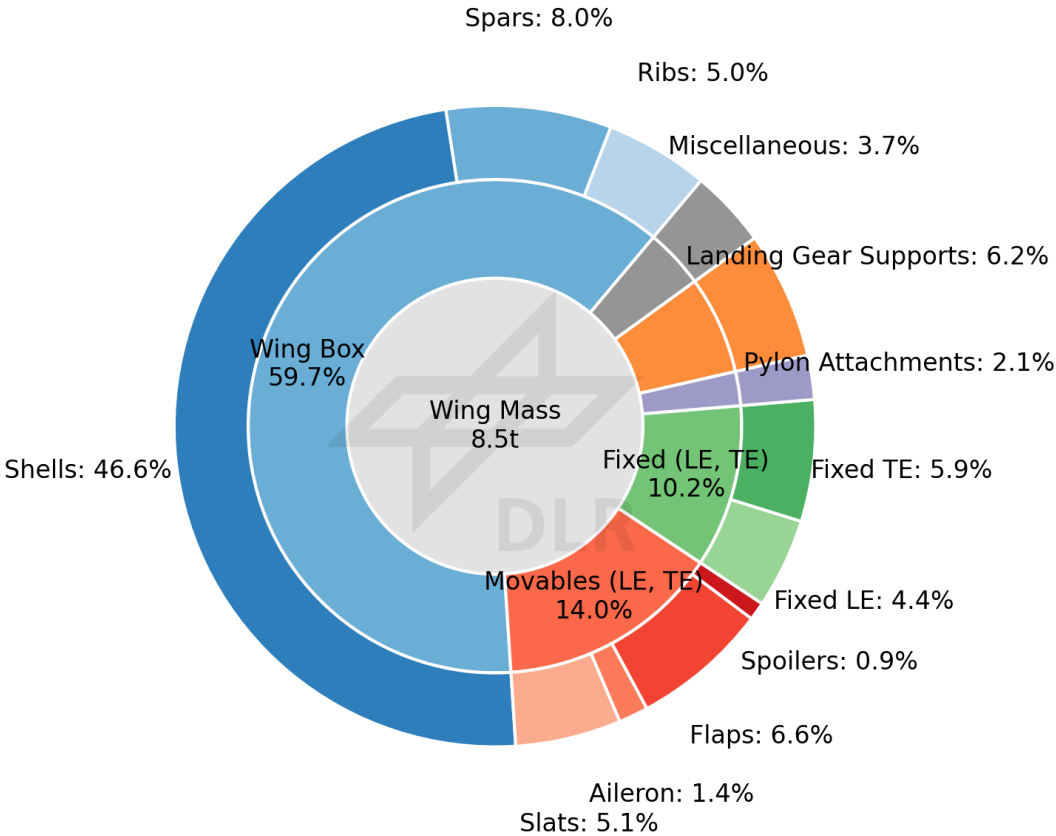


Mass Properties



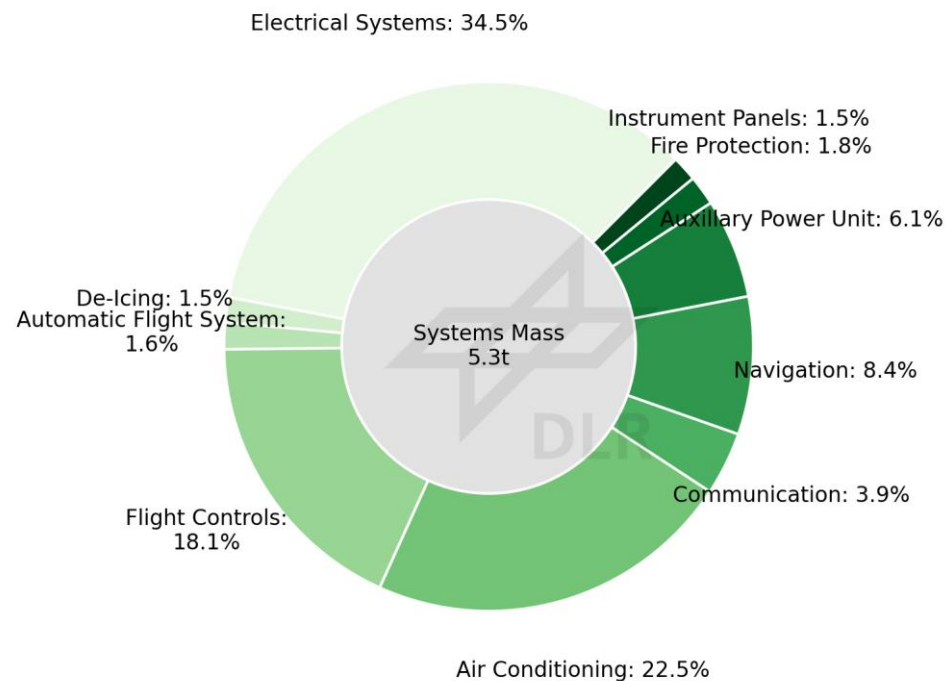
Component	Mass [kg]	x-Pos [m]
Wing	8491	22.54
Fuselage Structure	12487	21.77
HTP	388	43.74
VTP	421	42.99
Pylons	873	19.51
Power Units	6673	18.03
Main Gear	2457	22.11
Nose Gear	405	5.0
Systems	5258	16.57
Furnishings	3914	21.23
Manufacturer Empty Mass (MEM)	41367	-
Operator Items	6633	-
Operating Empty Mass (OEM)	48001	20.9
Maximum Payload	25000	21.23
Maximum Fuel	19070	20.15
Maximum Zero-Fuel Mass (MZFM)	73001	-
Maximum Landing Mass (MLM)	75931	-
Maximum Take-Off Mass (MTOM)	80887	20.91

Wing Mass Breakdown



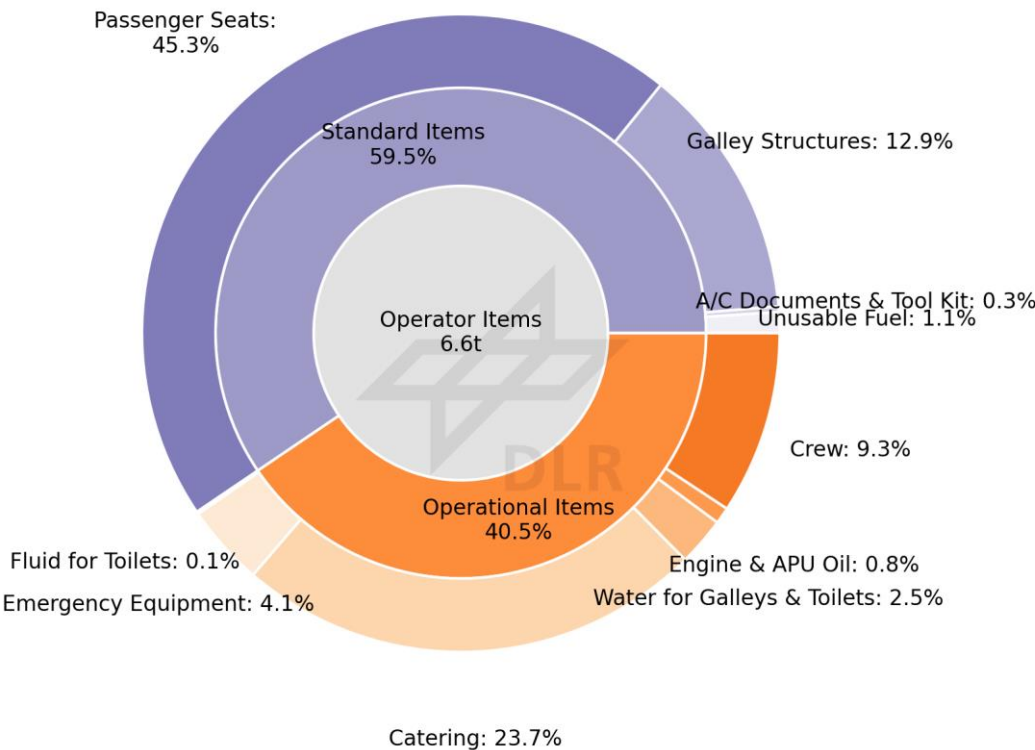
Component	Mass [kg]	Portion [%]
Wing Box	5066	59.7
Ribs	426	5.0
Shell	3960	46.6
Spars	679	8.0
Fixed Leading Edge	370	4.4
Fixed Trailing Edge	499	5.9
Movable Leading Edge	435	5.1
Slats	435	5.1
Movable Trailing Edge	758	8.9
Flaps	562	6.6
Aileron	121	1.4
Spoilers	74	0.9
Pylon Attachments	182	2.1
Landing Gear Support	523	6.2
Miscellaneous	318	3.7
Wing	8491	100.0

System Mass Breakdown



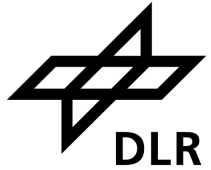
Component	Mass [kg]	Portion [%]
Air Conditioning	1184	22.5
Auxiliary Power Unit (APU)	320	6.1
Automatic Flight System	86	1.6
Communication System	203	3.9
De-Icing	80	1.5
Electrical System	1815	34.5
Flight Controls	950	18.1
Fire Protection	96	1.8
Hydraulic System	0	0.0
Instrument Panels	81	1.5
Navigation	443	8.4
Miscellaneous	0	0.0
Systems	5258	100.0

Operator Items Mass Breakdown

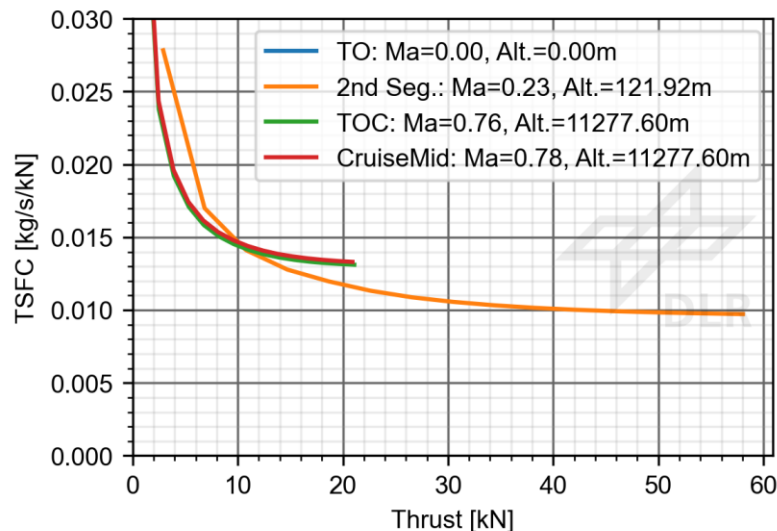


Component	Mass [kg]	Portion [%]
Unusable Fuel	70	1.1
A/C Documents & Tool Kit	19	0.3
Galley Structures	853	12.9
Passenger Seats	3003	45.3
Fluid for Toilets	9	0.1
Emergency Equipment	272	4.1
Catering	1573	23.7
Water for Galleys and Toilets	163	2.5
Engine & APU Oil	56	0.8
Crew	616	9.3
Operator Items	6633	100.0

Engine Performance Requirements



Parameter	Unit	Take-Off	EOF	2nd Seg.	TOC	Mid Cruise
Delta Temp. ISA	K	0.0	0.0	0.0	0.0	0.0
Mach-Number	-	0.0	0.23	0.23	0.76	0.78
Altitude	ft	0.0	35.0	400.0	35000	35000
Engine Rating	-	MTO	RTO	RTO	MCL	MCR
Thrust	N	117120.0	72933.0	78606.0	20899	18161
Shaft-Power Offtakes	kW	186.5	186.5	186.5	172.5	172.5
Bleed Air Offtakes	kg/s	0.0	0.0	0.0	0.0	0.0



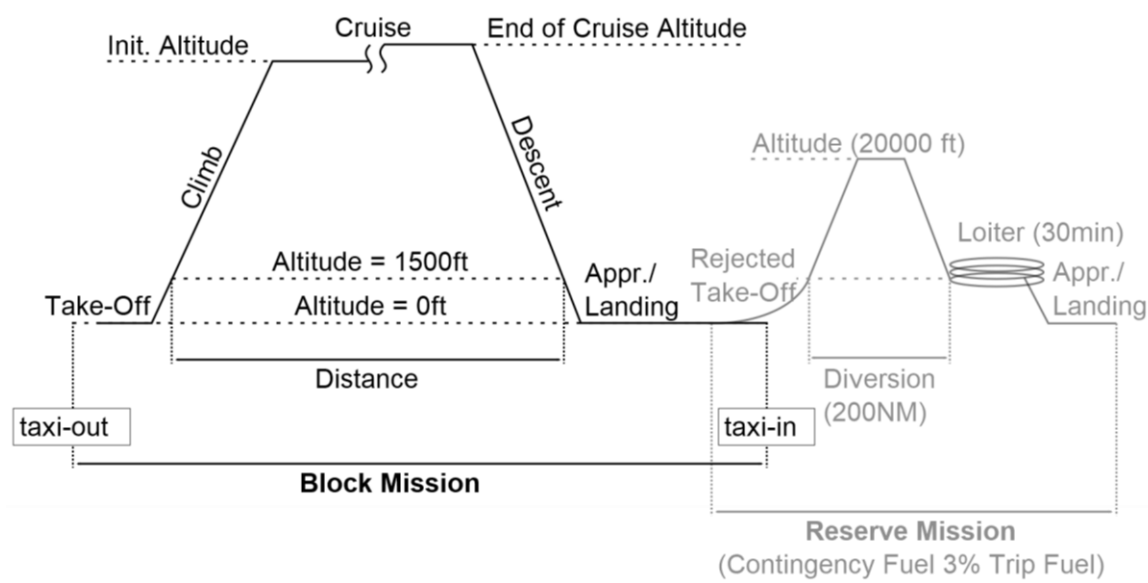
Description

- Take-Off:
 - at MTOM
- EoF (CS25.121a)
 - at approx. MTOM
 - Landing gear extended, Without ground effect
 - Critical engine inoperative
 - Gradient of Climb > 0%
- 2nd Segment (CS25.121b):
 - at approx. MTOM
 - Landing gear retracted , Without ground effect
 - Critical engine inoperative
 - at V2 Speed
 - Gradient of Climb > 2.4%
- TOC:
 - ROC ≥ 300 ft/min
- Cruise:
 - typically not a thrust sizing point but rather a efficiency related point

Mission Definition and Key Aircraft Characteristics



A design mission with a range of 1500NM and a number of passengers of 250PAX at 95 kg/PAX was defined according to D250-TF specification. For this design mission, all performance data are calibrated i.e. engine and aerodynamic performances

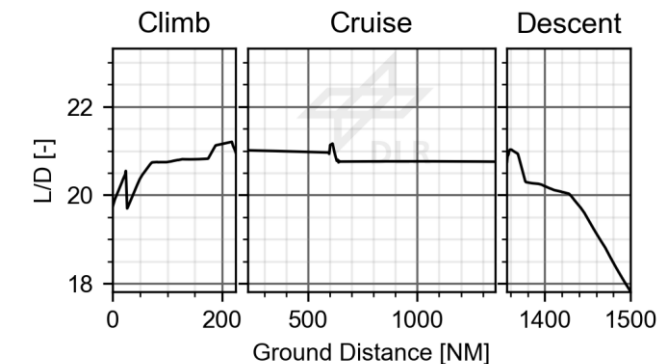
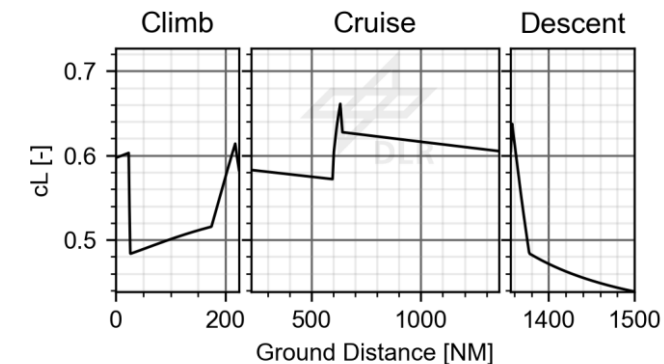
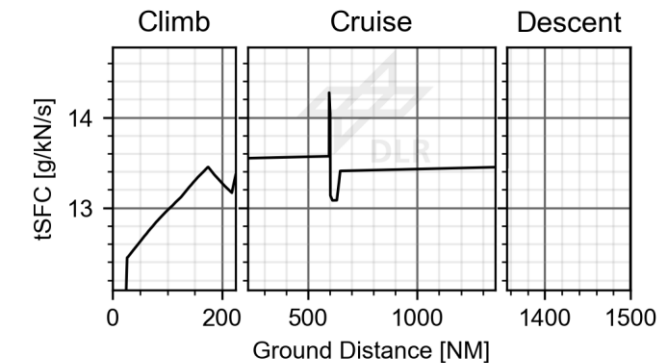
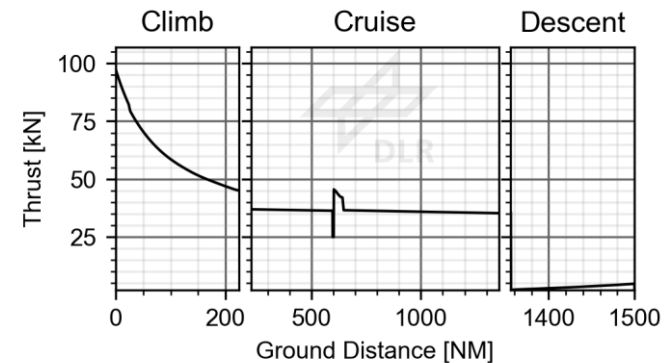
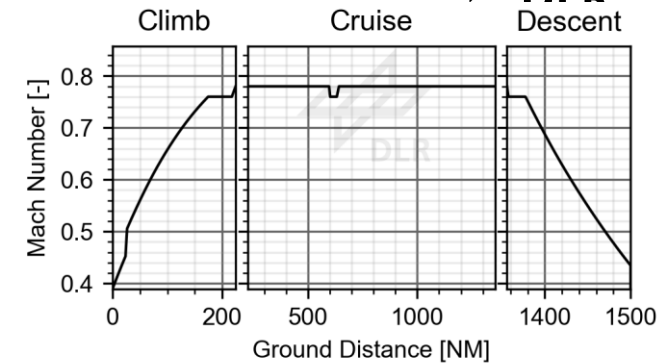
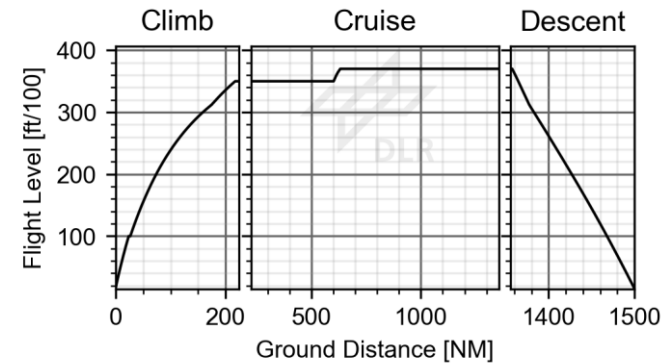


Parameter	Unit	Value
Design Range	NM	1500
Design Passenger Capacity	-	250
Design Cruise Mach Number	-	0.78
Max. Take-Off Mass	t	80.9
Max. Landing Mass	t	75.9
Max. Zero-Fuel Mass	t	73.0
Operating Empty Mass	t	48.0
Max. Fuel Mass	t	19.1
Max. Payload	t	25
Wing Area	m	131.0
Wing Span	m	42.0
Mean Aerodynamic Chord	m	3.8
Wing Loading (@MTOM)	kg/m ²	617.6
Thrust-to-Weight Ratio (@ISA)	-	0.295
Engine Type	-	Turbofan
Thrust (Sea Level Static, ISA)	kN	117.1

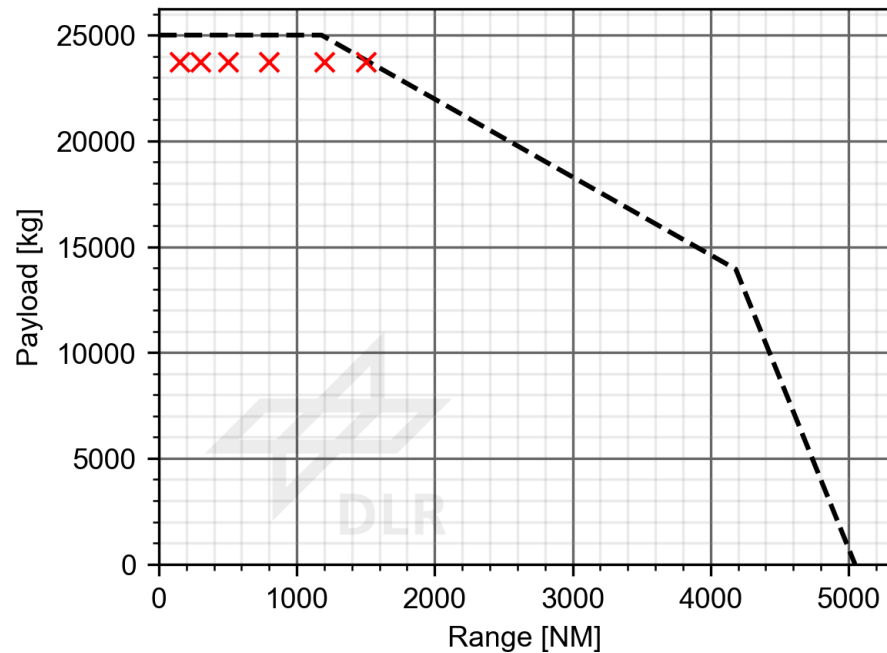
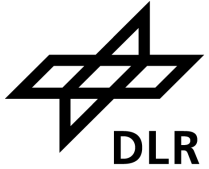
Design Mission Performance



Mission Phase	FLight Time [min]	Fuel Mass [kg]	Distance [NM]
Block Mission	230.6	6823.5	1500.1
Taxi-Out	9.0	121.3	0.0
Take-Off	2.0	201.2	0.0
Climb	35.3	1689.3	224.0
Cruise	151.7	4450.3	1132.0
Descent	23.7	199.4	144.1
Approach & Landing	4.0	94.6	0.0
(Taxi-In)	5.0	67.4	0.0
Reserve Mission	85.8	3172.8	405.1
Go-Around	1.6	181.0	0.0
Diversion Climb	16.3	893.1	91.0
Diversion Cruise	2.5	71.9	16.4
Diversion Descent	31.8	837.2	183.4
Holding	30.0	897.5	114.3
Diversion Approach & Landing	3.6	93.1	0.0
Contingency	0.0	199.0	0.0



Payload-Range Characteristics



General Information:

- Max. Payload: 25000 kg
- Design No. PAX: 250 @ 95 per PAX
- Design Mission: 1500NM @ 23750 kg Payload

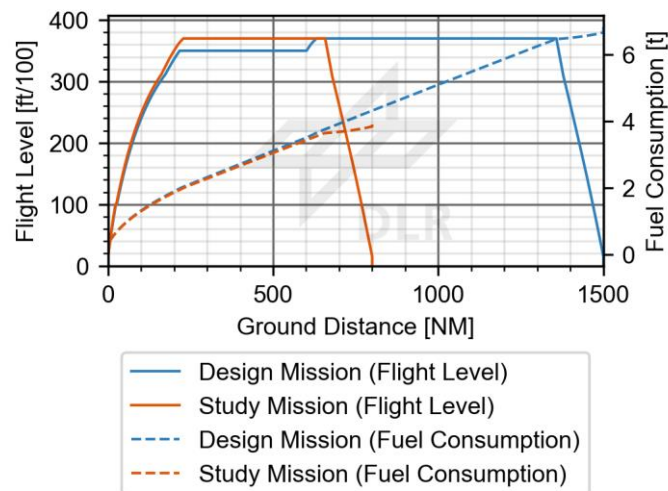
Mission Profile:

- Start/Arrival: Typical Long-Range Allowance
- Climb: 280kts
- Cruise: Mach 0.78
- Descent: 280kts

Reserve:

- No wind, ISA condition
- 200NM Alternate Airport
- 30min Holding @1500 ft
- Contingency Fuel: 3.0% Trip Fuel

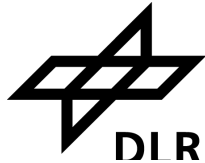
Cruise Performance Comparison



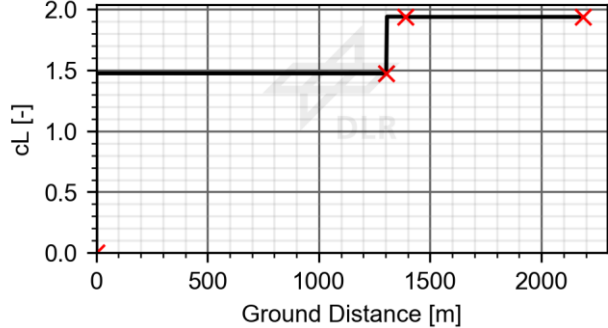
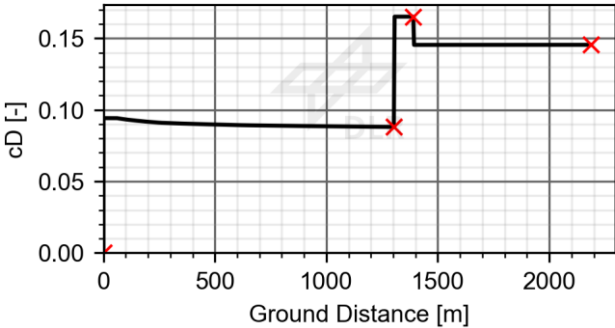
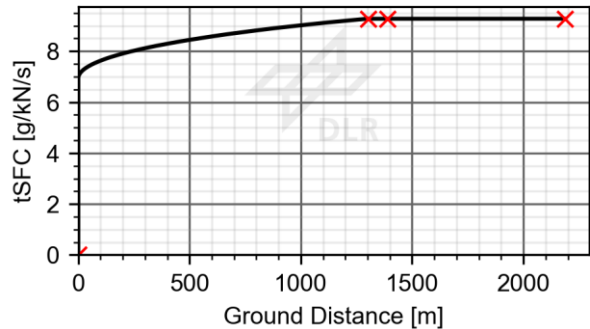
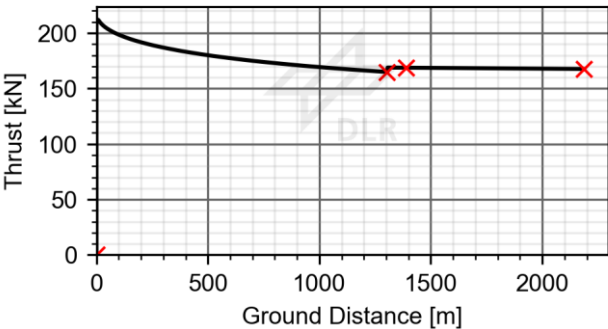
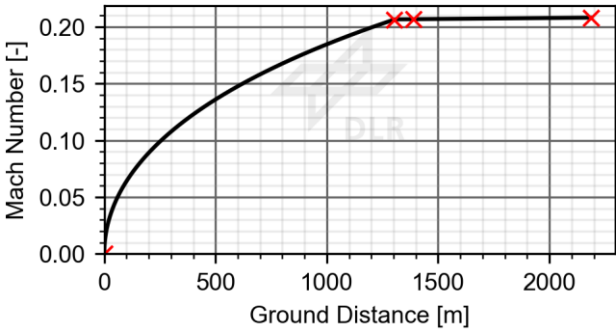
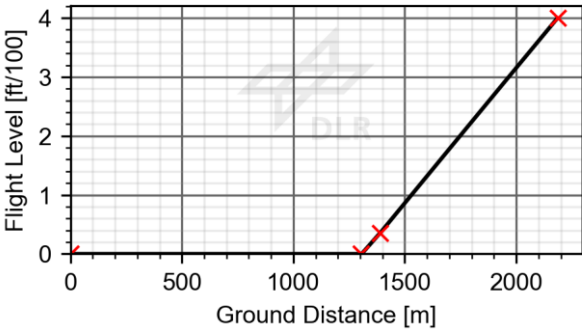
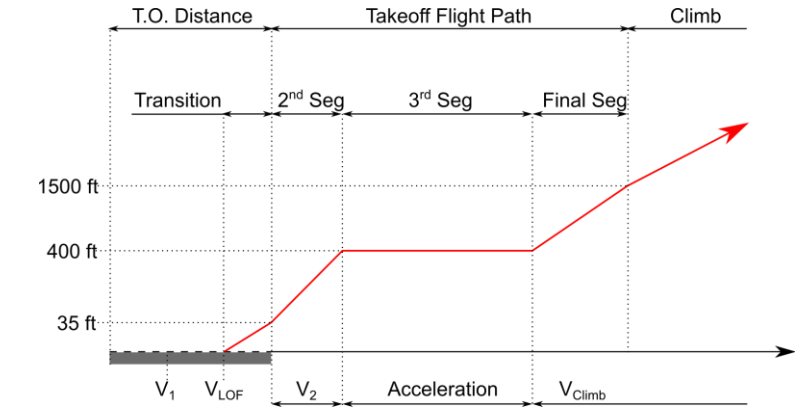
Parameter	Design Mission	Study Mission
Range [NM]	1500.0	800.0
Payload [t]	23.8	23.8
Mach Number (Cruise) [-]	0.78	0.76
Init. Cruise Altitude [FL]	350.0	370.0
Mid Cruise Altitude [FL]	350.0	370.0
End of Cruise Altitude [FL]	370.0	370.0
No. of Cruise Steps [-]	1.0	0.0

Parameter	Design Mission	Study Mission
Mid Cruise Performance		
Lift Coefficient [-]	0.573	0.644
Drag Coefficient [-]	0.027	0.031
L/D Ratio [-]	20.96	20.84
CAS [m/s]	136.0	126.9
TAS [m/s]	231.3	225.4
Angle of Attack [deg]	-0.6	0.2
Thrust [kN]	36.3	42.1
Thrust max. [kN]	45.2	42.1
tsfc [g/kN/s]	13.57	13.15
Avg. Cruise Performance		
Lift Coefficient [-]	0.604	0.611
Drag Coefficient [-]	0.029	0.0294
L/D Ratio [-]	20.83	20.78
CAS [m/s]	131.9	129.9
TAS [m/s]	230.3	230.2
Thrust [kN]	36.3	35.6
tsfc [g/kN/s]	13.46	13.44

Take-Off Performance



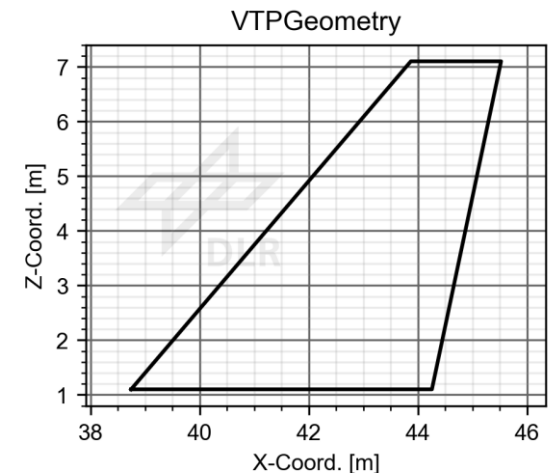
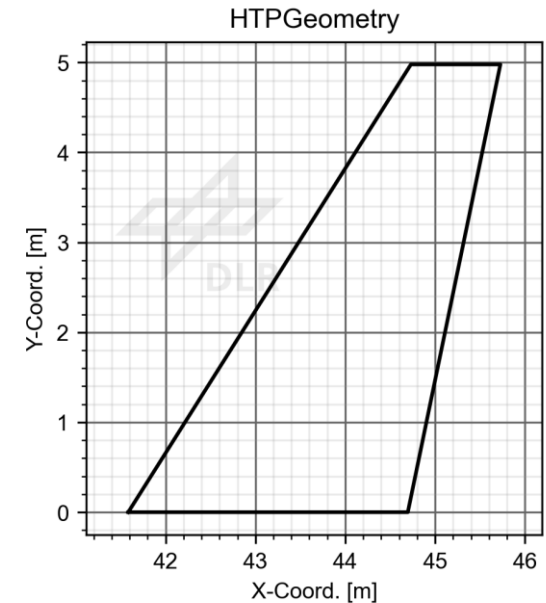
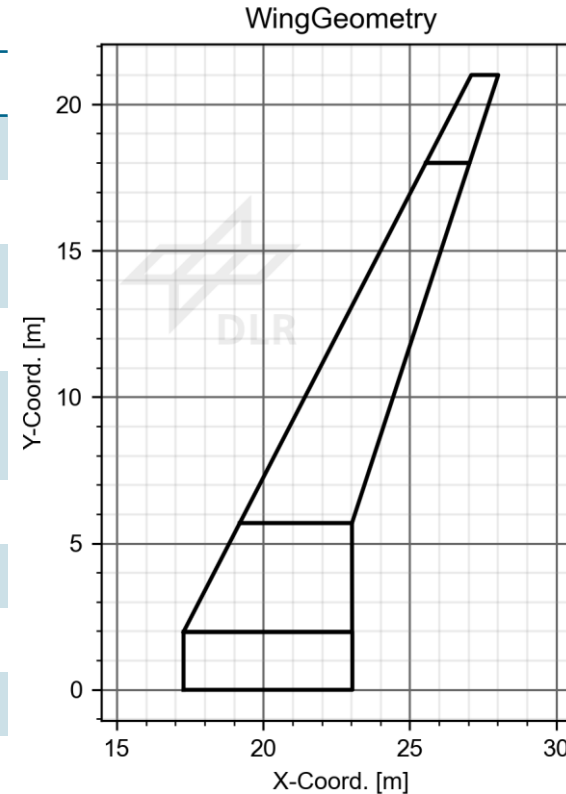
Mission Segment	FLight Time [min]	Fuel Mass [kg]	Distance [NM]
Break Release	0.0	0.0	0.0
Take-Off GroundRoll	0.6	52.1	0.7
Transition Segment	0.0	1.9	0.0
2nd Segment	0.2	17.8	0.4



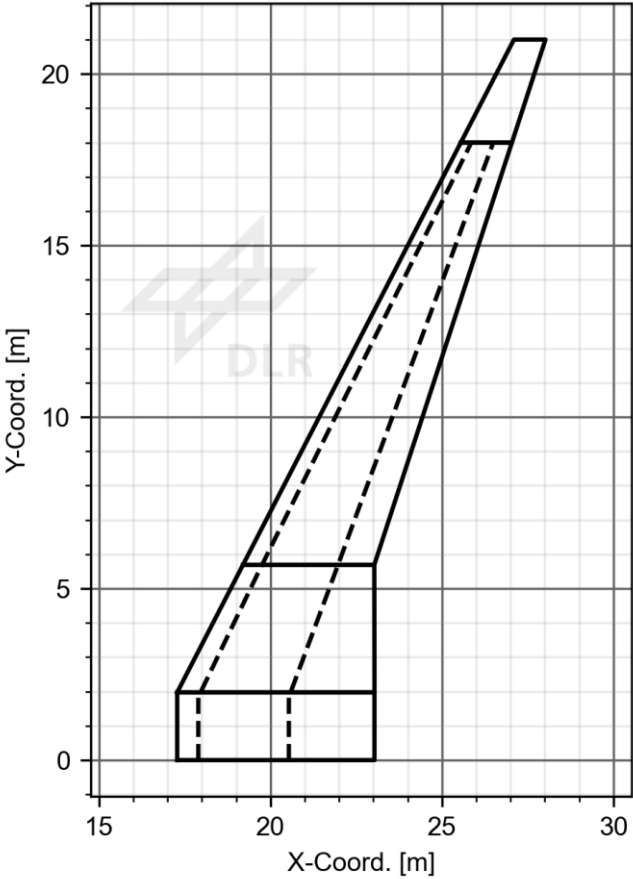
Lifting Surface Geometry Overview



Parameter	Unit	Wing	HTP	VTP
Reference Area	m ²	130.97	20.34	21.51
Span	m	42.00	9.90	6.00
Aspect Ratio	-	13.47	4.82	1.68
Taper Ratio	-	0.16	0.32	0.30
Mean Aerodynamic Chord	m	3.80	2.24	3.93
Avg. 1/4 Chord Sweep	deg	24.93	27.71	34.73
Avg. Dihedral	deg	8.06	6.00	-
Lever Arm	m	-	22.16	20.55
Volume Coefficient	-	-	0.9063	0.0804
Material	-	FILL	FILL	FILL

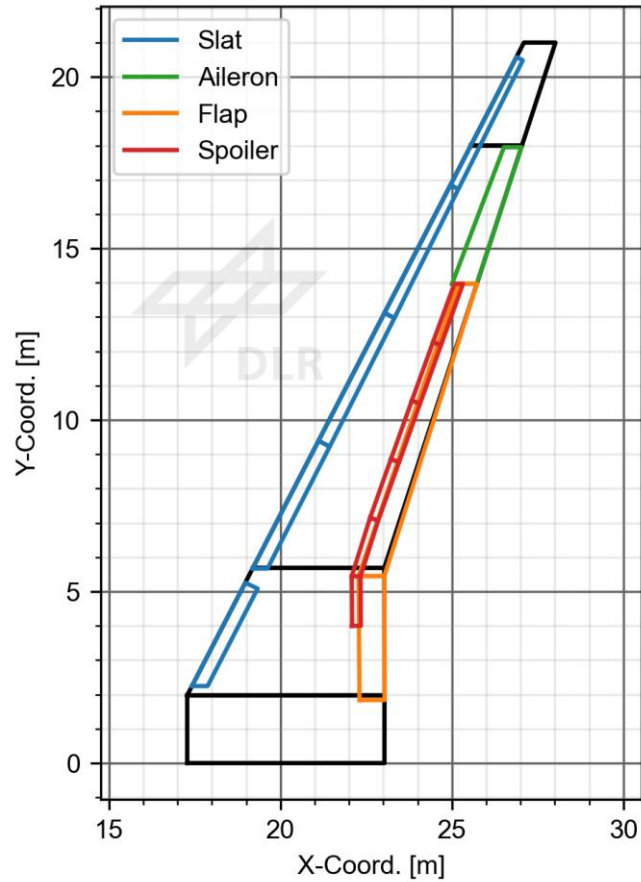
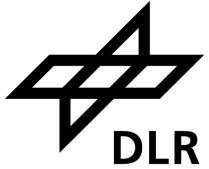


Wing Box Geometry Overview



Wing Section	Unit	Center	Root	Kink	Mid	Tip
Position	m	0.00	1.98	5.69	18.00	21.00
Rel. Position	%	0.00	9.40	27.10	85.70	100.00
Chord	m	5.75	5.75	3.83	1.49	0.92
1/4 Chord Sweep	deg	0.00	0.00	21.16	25.11	25.11
LE Sweep	deg	0.00	0.00	27.30	27.30	27.30
TE Sweep	deg	0.00	0.00	0.00	18.06	18.06
Dihedral	deg	0.00	0.00	10.00	7.00	7.00
Twist Angle	deg	2.80	2.80	1.10	1.00	0.00
Thickness Ratio	%	15.00	15.00	13.00	12.00	11.00
Rel. Spar Position						
Front Spar	%	10.70	10.70	14.19	20.54	27.00
Rear Spar	%	56.60	56.60	70.99	63.58	56.10

Wing Movable Arrangement Overview



Control Surface	y Inboard	y Outboard	Chord Inboard	Chord Outboard
Slat1	2.245	5.257	0.45	0.44
Slat1	5.669	9.396	0.43	0.41
Slat2	9.396	13.123	0.41	0.36
Slat3	13.123	16.85	0.36	0.29
Slat4	16.85	20.577	0.29	0.23
Aileron	13.969	17.95	0.72	0.51
Flap1	1.838	5.453	0.73	0.75
Flap1	5.446	13.969	0.75	0.54
Spoiler1	4.0	5.446	0.25	0.26
Spoiler1	5.446	7.151	0.26	0.26
Spoiler2	7.151	8.856	0.26	0.27
Spoiler3	8.856	10.56	0.27	0.27
Spoiler4	10.56	12.265	0.27	0.26
Spoiler5	12.265	13.969	0.26	0.25