



항공기 개념 설계 최종 발표



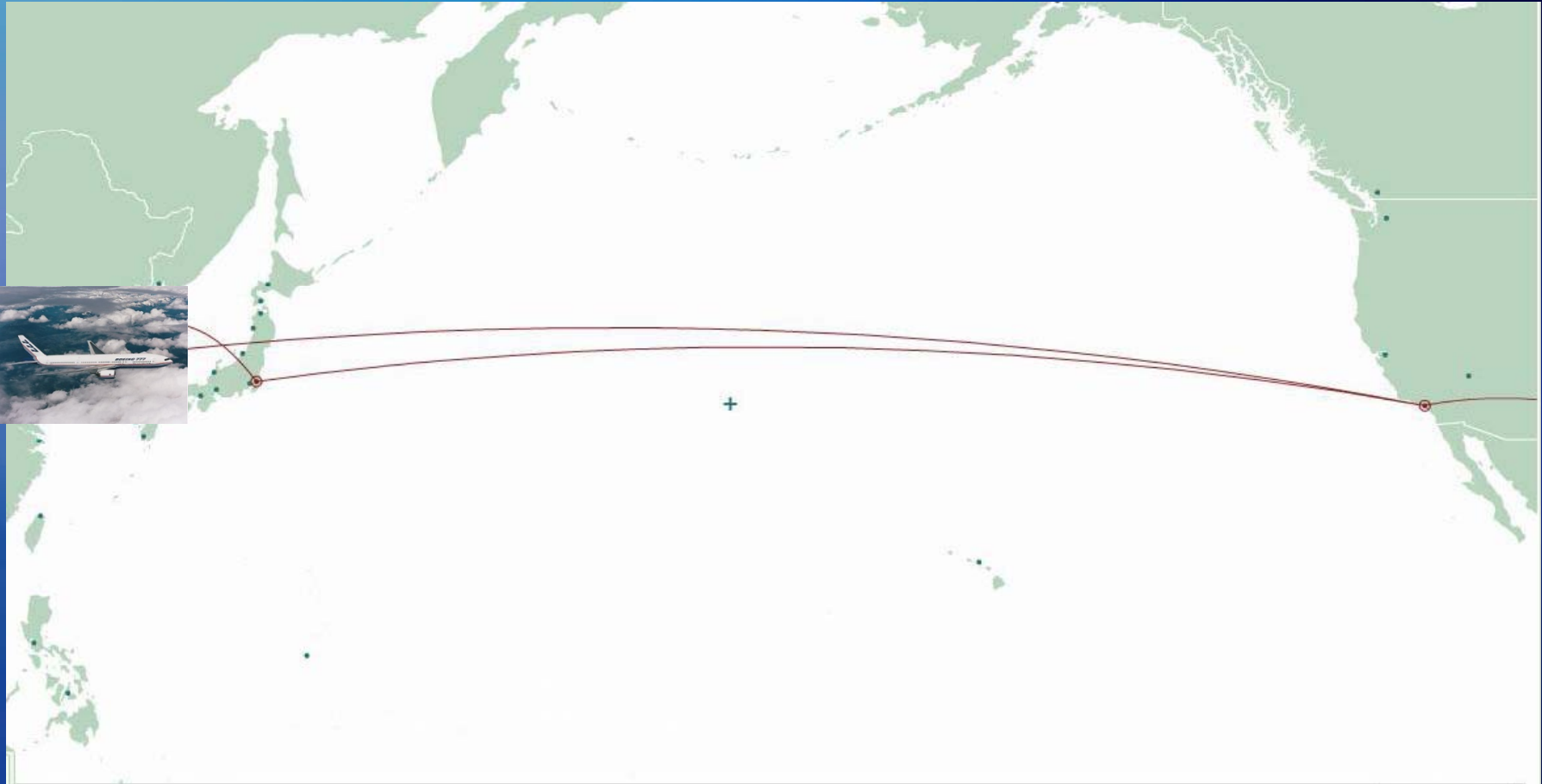


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설계 요구 조건





기준 항공기 선정

Model	777-200ER	A340-500/-500HGW
Passengers	301 (3-class)	313 (3-class)
Length	209 ft 1 in	222 ft 9 in
Wingspan	199 ft 11 in	208 ft 2 in
MTOW	656,000 lb	820,100 /837,800 lb
Max range, loaded	7,700 NM	8,650/9,000 NM
Thrust/weight Ratio	0.29	0.267 ~ 0.270

2조

AAD 설계

Initial requirement							
payload		Performance		Fuselage Build		Main Wing	
weight	220	Mach #	0.74	Parameter		Area	4600
number	3	L/D	12	length	158.58	AR	8.669
weight	220	TakeOff	10000	Depth	21.2589	TR	0.149
number	14	Landing	6667	Front length	18	LE Sweep Angle	31.6
weight	155	Stall speed	601.4	Clearance Angle	46.7476	incidence	1.5
number(Normal)	252	SFC	0.324	Other variable		Dihedral	7
number(Delux)	48	Max Load Factor	1.5	uninstalled Thrust	187400	Winglet	
Deluxe Seat Arrangement		Mission Profile		Takeoff gross weight	400000	low Wing	
number	2	Range	5200	Airfoil		control surface	
Number per section	6	Altitude	35000	wingAirfoil cl alpha	0.042	width	25%
Pitch	4.583	Mach #	0.74	wingAirfoil leading-edge radius	0.01004	height	20%
Width	2.5	climb Gradient	0.024	wing max thckness position	0.3936	Htail	
Normal Seat Arrangement		Engine		wing airfoil max Cl	2	Area	1089
Number	2	Engin on wing	2	Nacelle Design		AR	4.5
Width	1.25	Hgh Bypass Ratio TurboFan		position	wing mounted	TR	0.3
Number per section	10			Engin Design		LE Sweep Angle	35
pitch	3.33			Bypass Ratio	8.4	conventional	
Width	1.83					Vtail	
						Area	573
						AR	1.6
						TR	0.29
						LE Sweep Angle	46



AAD 설계

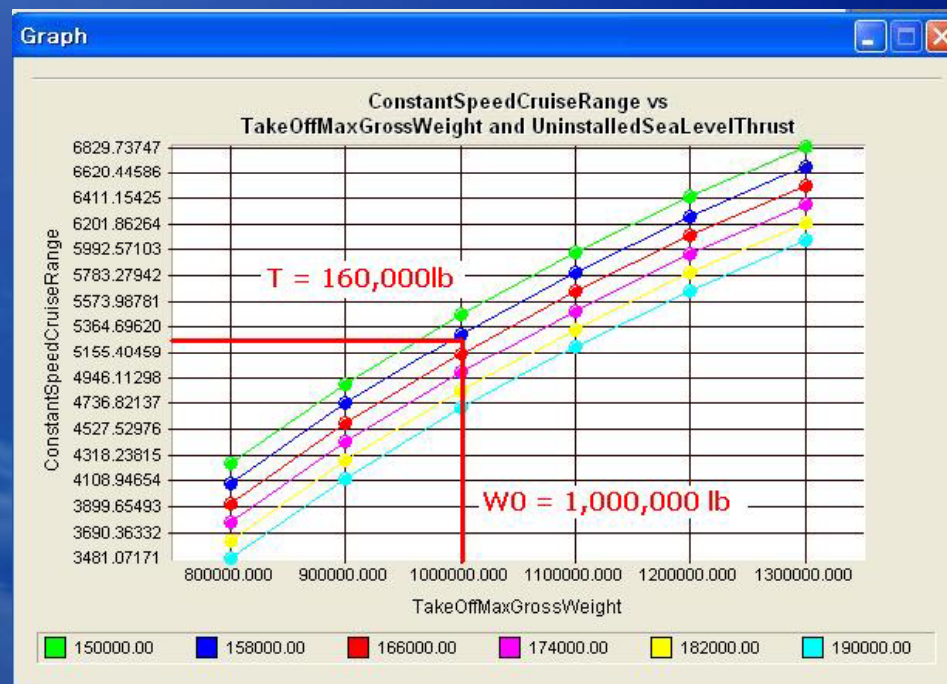




AAD 설계

parameter	변경 전	변경 값	비고
gross weight*	1,280,000	1,000,000	over design된 두 값을 줄이자.
thrust*	184,000	160,000	동일

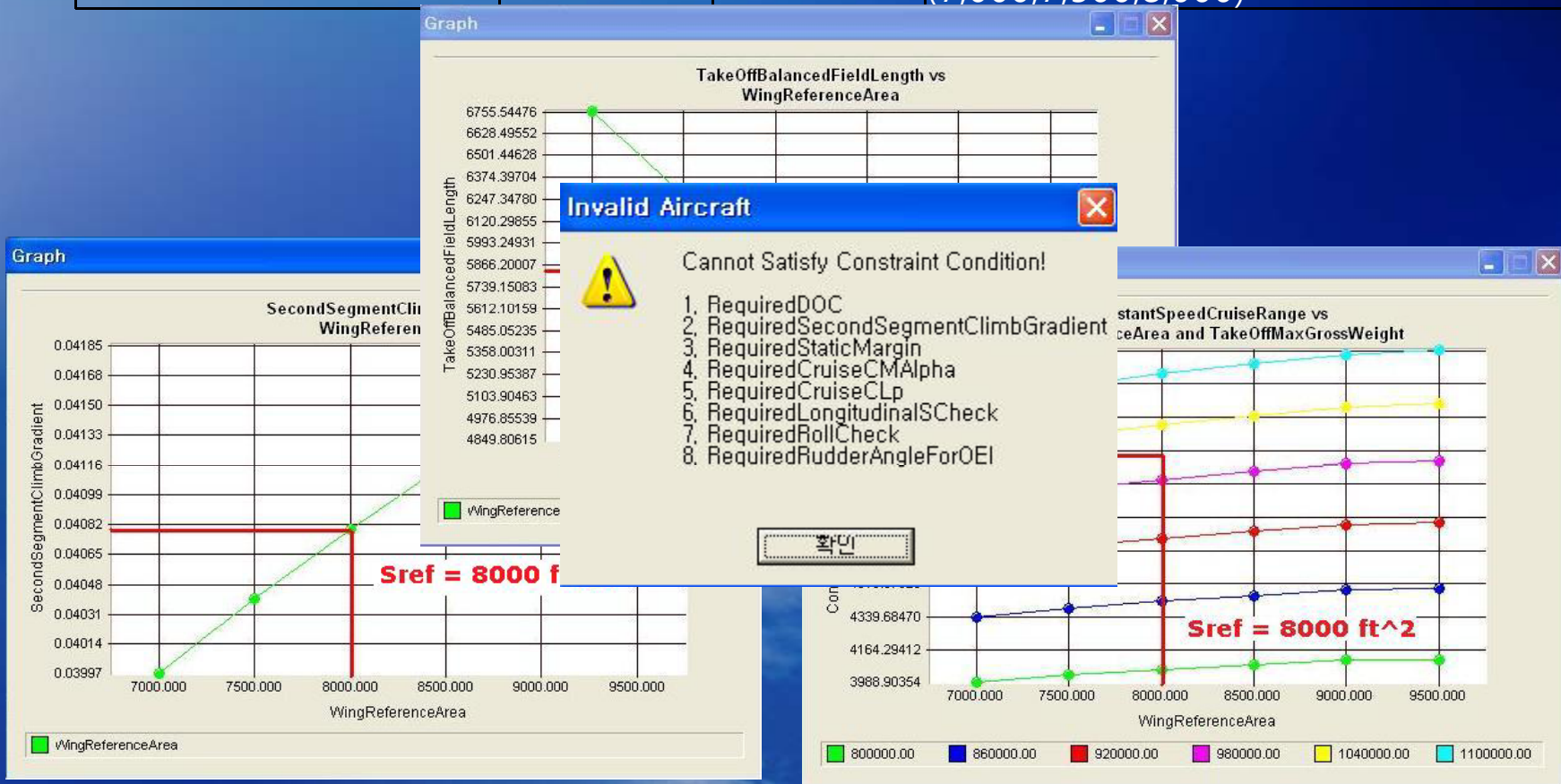
* 는 수정을 해서 결과를 얻은 parameter



2조

AAD 설계

parameter	변경 전	변경 값	비고
wing ref. area*	9,500	8,000	날개 면적을 더 줄이자. (7,000,7,500,8,000)



2조

AAD 설계

parameter	변경 전	변경 값	비고
gross weight*	1,000,000	830,000	
Thrust*	160,000	110,000	128,000까지 낮췄다가 실패.
Cruise Range*			
Climb Gradient*			
Field Length*			

Invalid Aircraft



Cannot Satisfy Constraint Condition!

1. RequiredDOC
2. RequiredStaticMargin
3. RequiredCruiseCMAAlpha
4. RequiredCruiseCLp
5. RequiredLongitudinalSCheck
6. RequiredRollCheck
7. RequiredRudderAngleForOEI

확인



AAD 설계

parameter	변경 전	변경 값	비고
main wing weep angle	31.6	30	
wing ref. area	8,000	7,000	날개 면적을 더 줄이자.
field length*			
gradient*			
range*			

Invalid Aircraft



Cannot Satisfy Constraint Condition!

1. RequiredDOC
2. RequiredStaticMargin
3. RequiredCruiseCMAAlpha
4. RequiredCruiseCLp
5. RequiredLongitudinalSCheck
6. RequiredRollCheck
7. RequiredRudderAngleForOEI

확인



AAD 설계

parameter	변경 전	변경 값
H tail X position	150	190
H tail AR	4.5	4.5
H tail Ref. area	1,089	1,900
Nacelle X position	65	95
Nacelle Y position	25	20
normal seat per section	10	9
normal seat pitch	3.33	4.583
delux seat pitch	4.583	5.5
V tail ref. area	573	1,000
V tail X position	135	185
gross weight	830,000	810,000
thrust	110,000	111,000
Taper ratio	0.149	0.250
field length*		
gradient*		
range*		

Invalid Aircraft

Cannot Satisfy Constraint Condition!

- 1. RequiredConstantSpeedCruiseRange
- 2. RequiredDOC
- 3. RequiredStaticMargin
- 4. RequiredCruiseCMAAlpha
- 5. RequiredCruiseCLp
- 6. RequiredLongitudinalSCheck
- 7. RequiredRollCheck
- 8. RequiredRudderAngleForOEI

확인

Invalid Aircraft

Cannot Satisfy Constraint Condition!

- 1. RequiredDOC
- 2. RequiredStaticMargin
- 3. RequiredCruiseCMAAlpha
- 4. RequiredLongitudinalSCheck
- 5. RequiredRollCheck
- 6. RequiredRudderAngleForOEI

확인

AD 설계

Graph



변경 값

105

15rudder angle

30rudder angle for OEI 해결

40

T-tail

215

135

29.2

0.0175

0.35

1,600cr

6,800

220

Tail type	conventional	T-tail
H tail X position	190	215
wing X position	120	135
wing sweep angle	30	29.2
DC controller Gain	0	0.0175
V tail taper ratio	0.29	0.35
H tail ref. area	1,900	1,600cr
wing ref. area	7,500	6,800
H tail X position	215	220

Invalid Aircraft



Cannot Satisfy Constraint Condition!

1. RequiredDOC
2. RequiredStaticMargin
3. RequiredCruiseCMAAlpha
4. RequiredLongitudinalSCheck
5. RequiredRollCheck

확인

Invalid Aircraft



Cannot Satisfy Constraint Condition!

1. RequiredDOC
2. RequiredStaticMargin
3. RequiredCruiseCMAAlpha
4. RequiredLongitudinalSCheck

확인



AAD 설계

탑항공 가격 기준(비수기)	
6월 13일 기준 환율 : 1,029.90원	
1,008,400	원
979.1241868	달러
97,912.41868	cent
5,968	mile
DOC(일반석기준)	16.4062364
대한항공 가격 기준(비수기)	
6월 13일 기준 환율 : 1,029.90원	
1,130,400	원
1,097.58229	달러
109,758.229	cent
5,968	mile
DOC(일반석기준)	18.3911242



AAD 설계

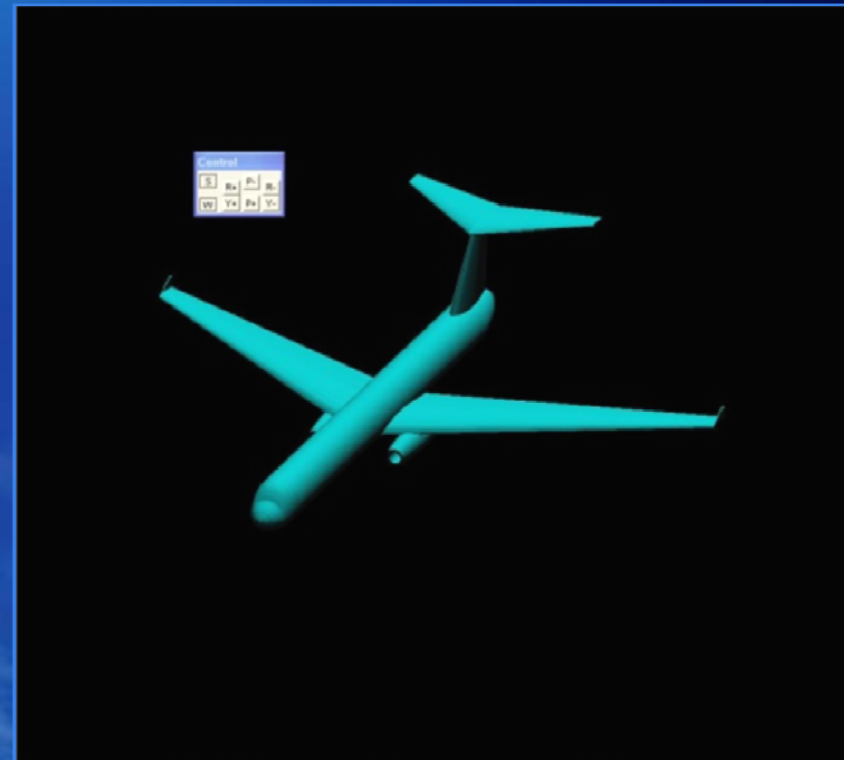
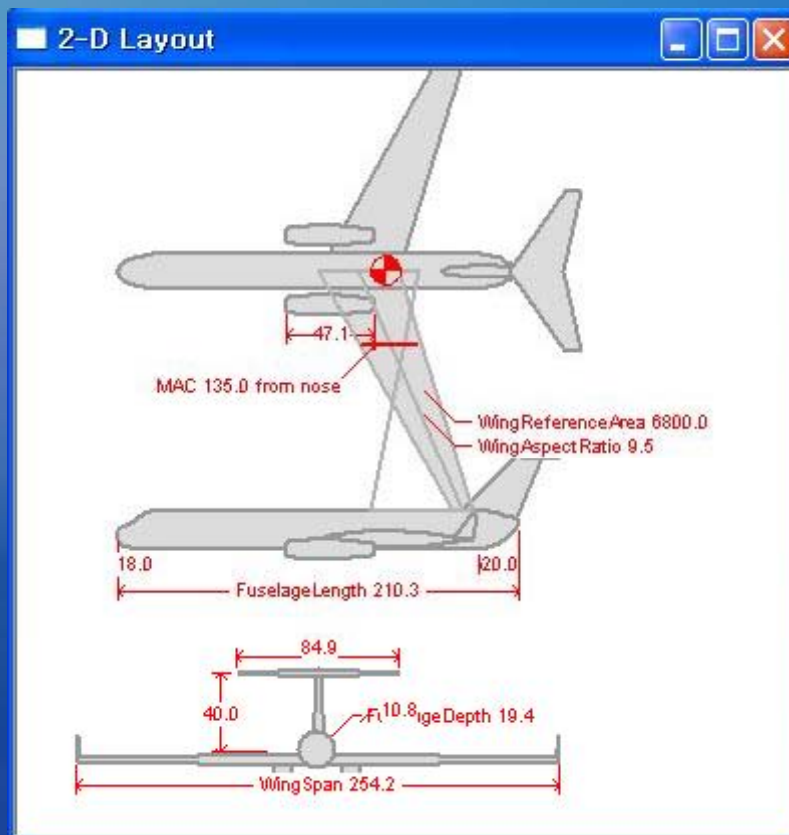
parameter	변경 전	변경 값	비고
H tail ref. area	1,900	1,600	
Nacelle X position			
Nacelle Y position			
DOC			
H tail X position			

Advanced Aircraft Design [X]

Constraints are satisfied! Value: 0,1731

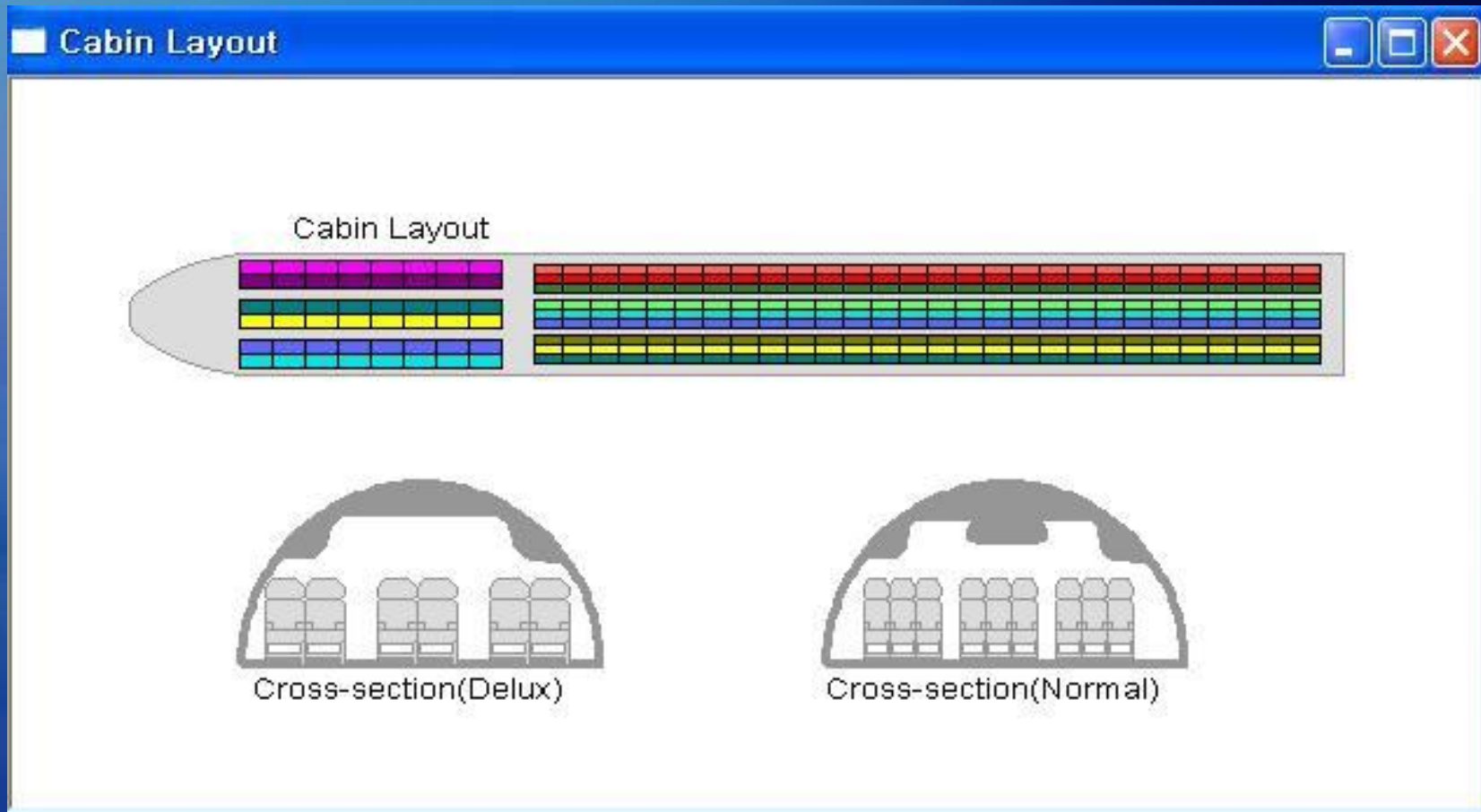
2조

최종 설계 형상 및 성능비교



2조

최종 설계 형상 및 성능비교



2조

최종 설계 형상 및 성능비교

Specifications	B777-200ER	A340-500	Hong3
Take off Gross Weight(lb)	545,000	820,100	810,000
Uninstalled Sea level Thrust(lb)	154,000	223,600	111,000
Thrust to weight ratio	0.283	0.273	0.137
Empty weight(lb)	307,000	375,668	309,364
fuselage length(ft)	209.083	222.864	210.324
Wing ref. area(ft ²)	4,604	4707.058	6,800
Wing Span(ft)	200.7874	197.833	254
Wing loading	118.375	174.23	119.12
Wing AR	8.669	8.565	9.500
Wing taper ratio	0.149	0.220	0.250
Wing dihedral angle(deg)	7.000	5.000	7.000
Wing sweep angle(deg)	31.6	31.1	29.2
Cruise Mach number	0.840	0.82	0.740



결론

1. 순항 마하수

- Airfoil 형상

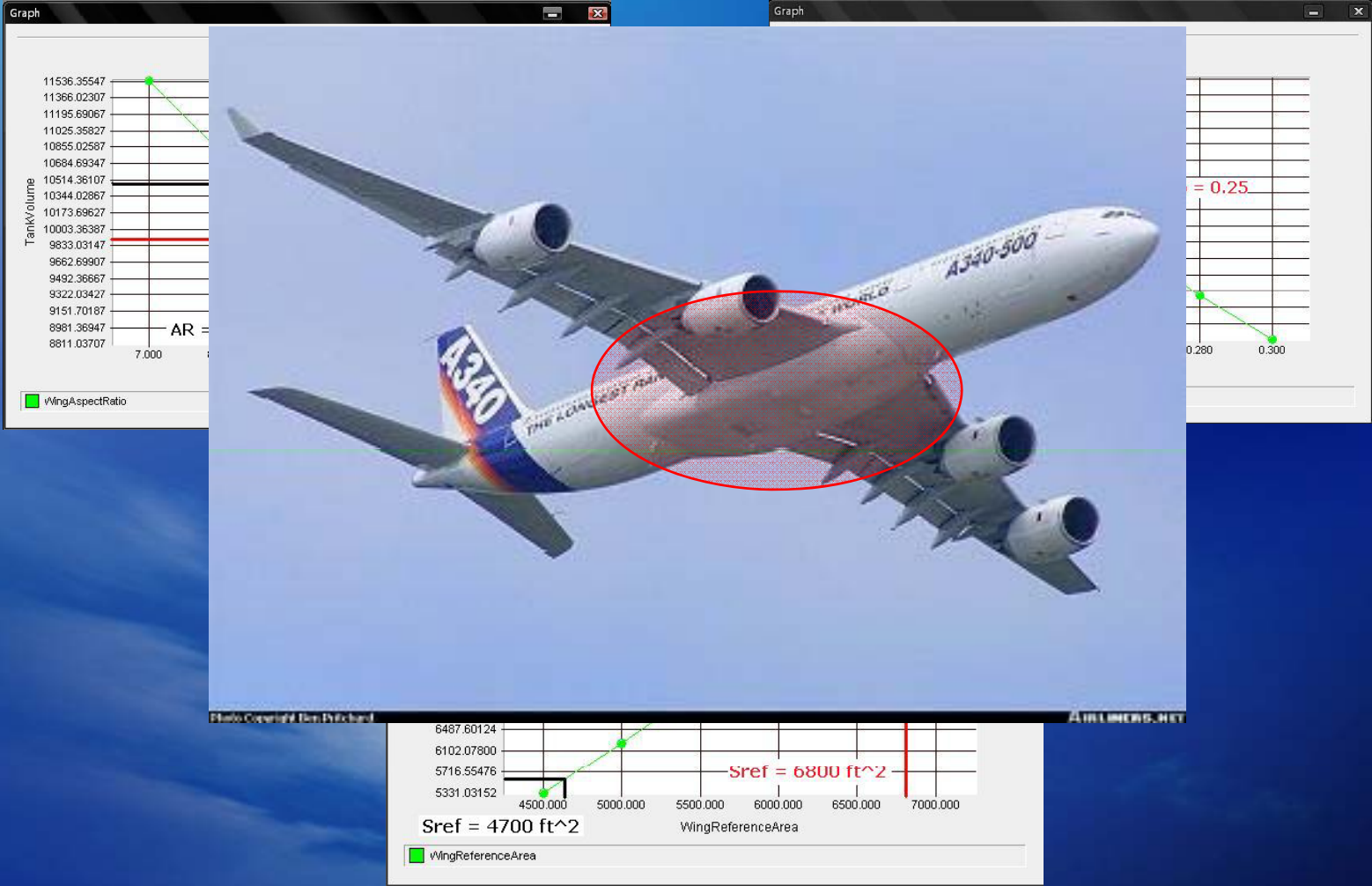
2. 설계시 사용된 Engine의 성능

- 우리 설계에 맞는 engine data를 입력할 수 없었음

3. Tank volume Vs. Wing



결론





Thank You !



Any Question?