AAD 실습

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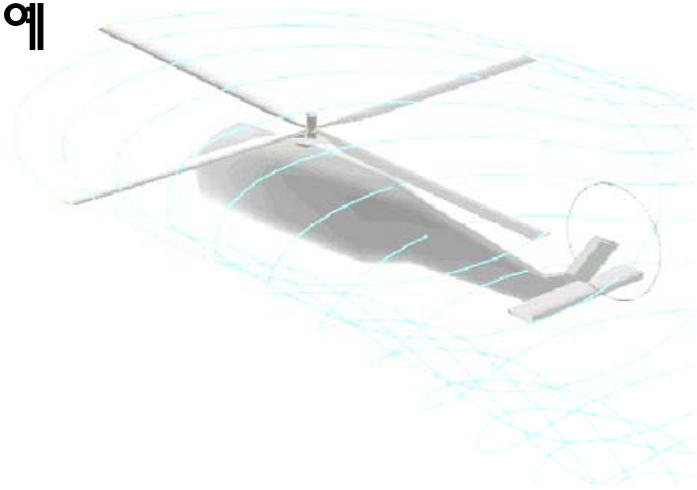
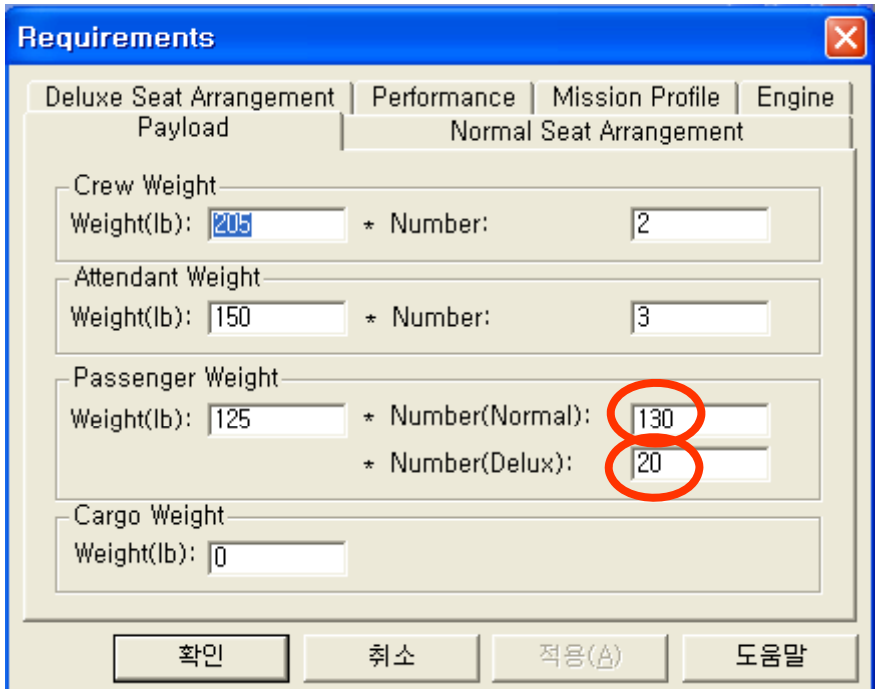
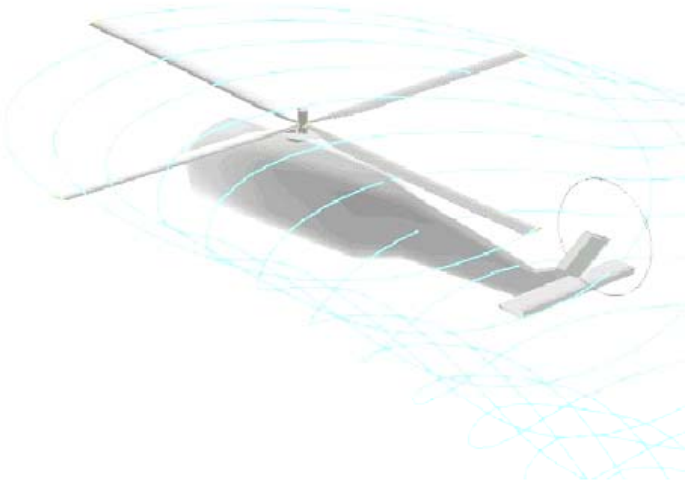


150인승 여객기의 설계

- Step 1. Requirement의 변경

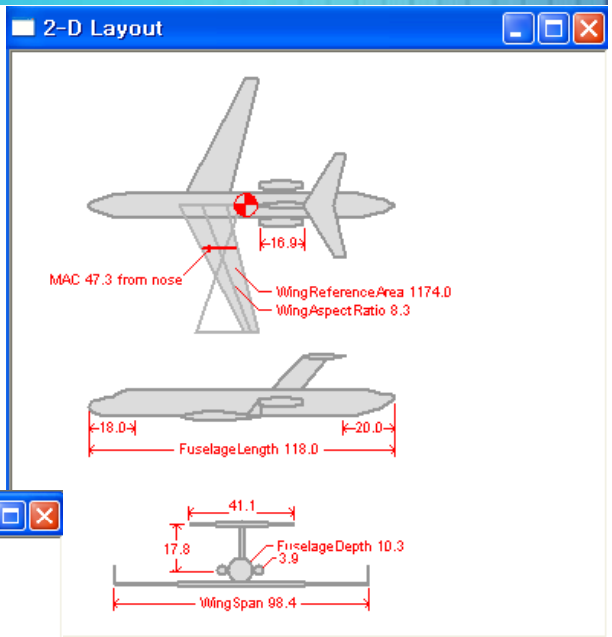
  - Passenger Number : Normal (90 -> 130), Deluxe (12 -> 20)

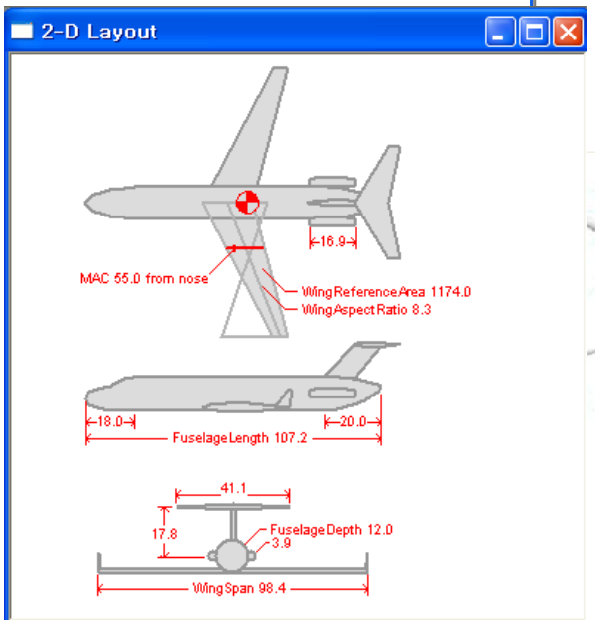


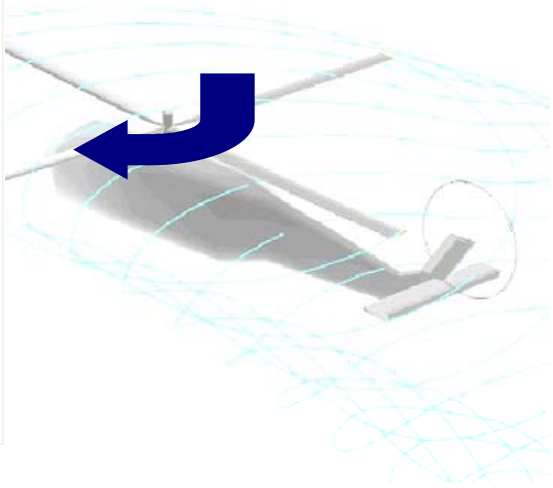


150인승 여객기의 설계

- Step 2-1. Information -> Layout -> 2D
  - 기본적인 항공기 형상을 가지도록 날개의 위치나 엔진의 위치를 재배열
  - Design Input -> Lifting Surface Bulid
    - Main Wing
      - X Position : 47.2999 -> 60.0
    - H Tail
      - X Position : 90 -> 105
    - V Tail
      - X Position : 75 -> 90
  - Design Input -> Component Build
    - Nacelle Design
      - X Position : 75 -> 90

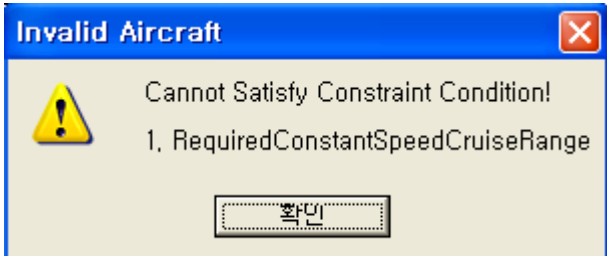


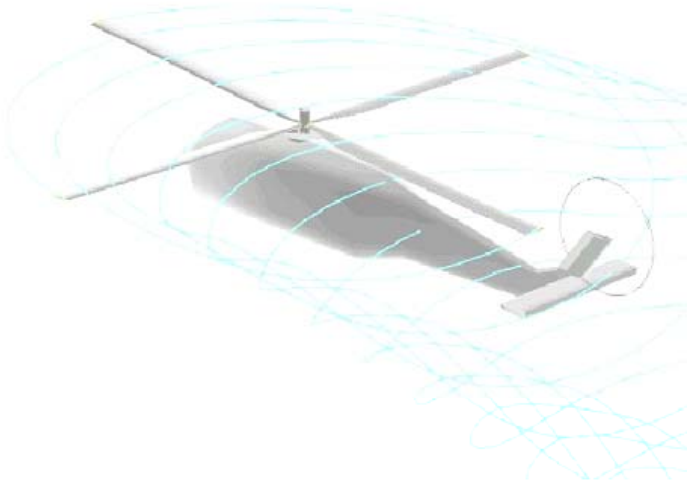




150인승 여객기의 설계

- Step 2-2. Report
  - Invalid Aircraft
  - Unsatisfied Constraint
    - Required Constant Speed Cruise Range

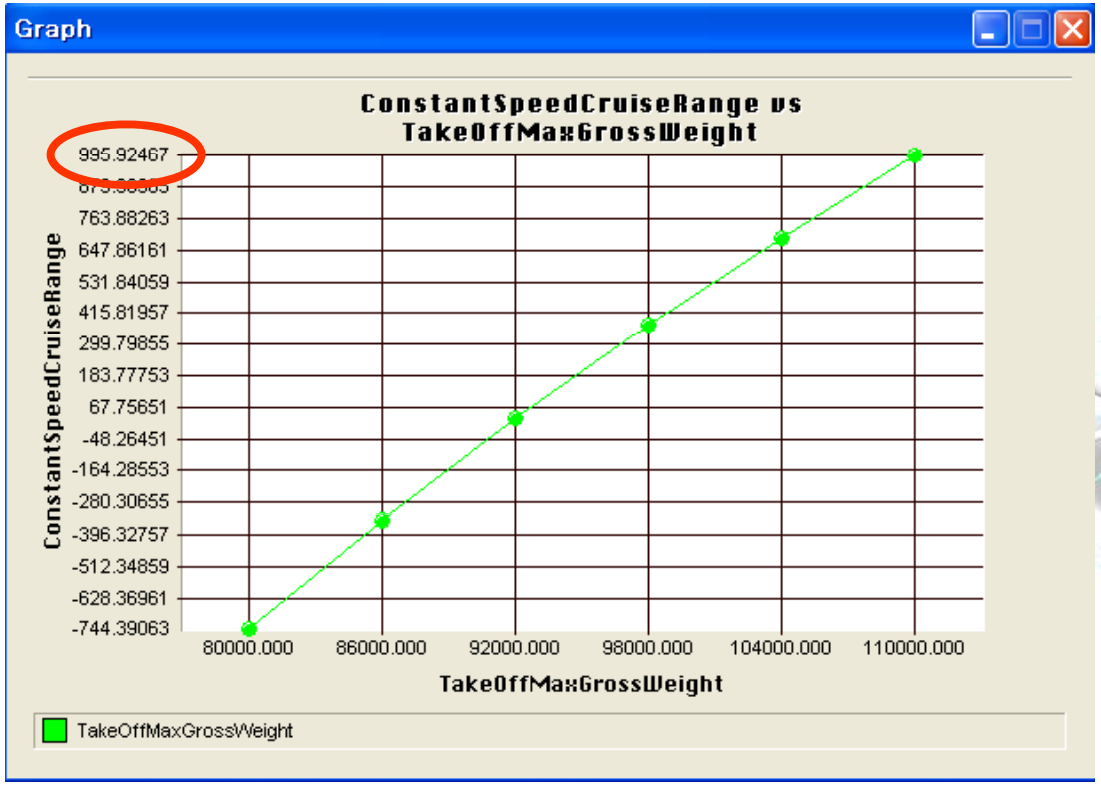


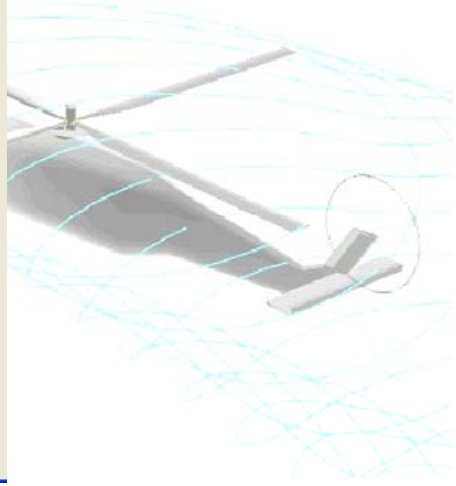


150인승 여객기의 설계

- Step 3. 1D Parametric Study – Constant Speed Cruise Range
  - 가장 심각한 문제라고 생각되는 항속거리 문제를 먼저 해결하기로 함.
  - 나머지 문제는 항공기 제어에 관련되는 변수로 주익의 위치 조절을 통해 해결 가능
  - 주어진 문제와 가장 관련이 깊은 설계 변수 선정 : Takeoff Max Gross Weight
  - 1D Parametric Study : Takeoff Max Gross Weight vs. Constant Speed Cruise Range

Required Cruise Range : 1500



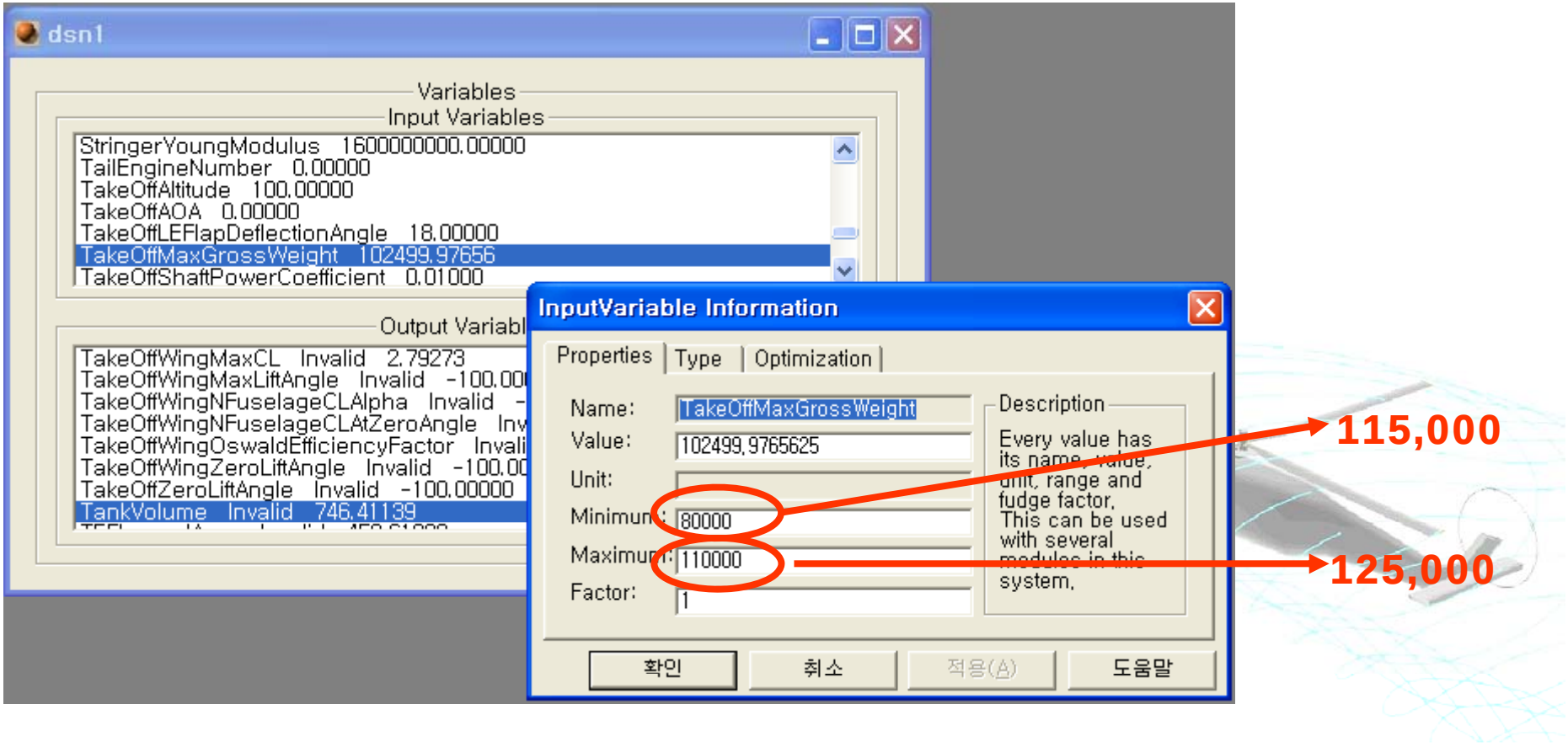


150인승 여객기의 설계

- Step 3-1. Design Variable Min/Max Value Change

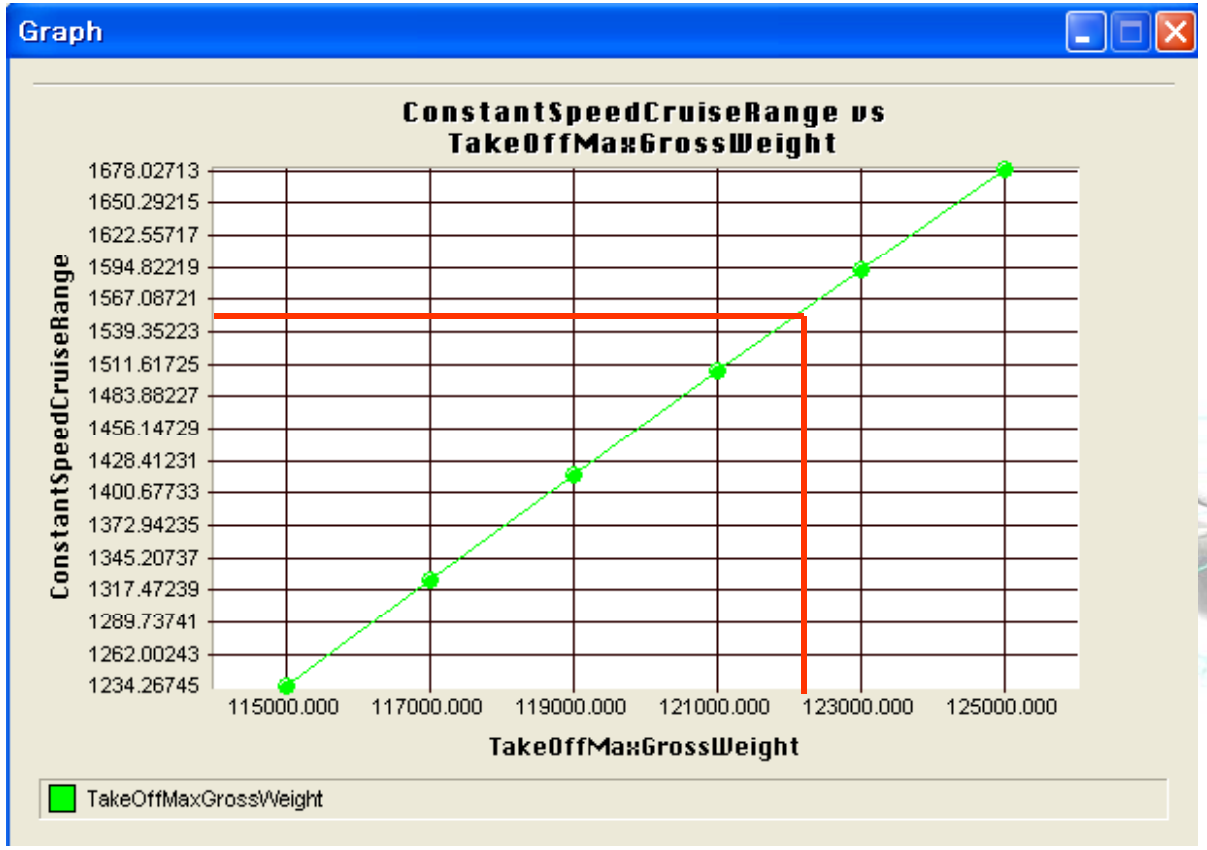
  - 이륙중량의 최대값이 110,000 으로 되어 있어 원하는 범위의 데이터를 보지 못함

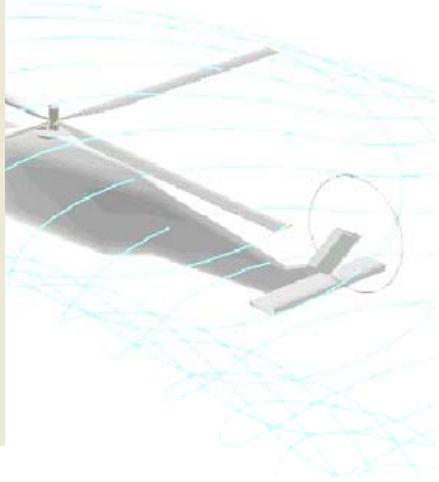
  - 이륙중량의 범위를 조절하여 원하는 범위까지 볼 수 있도록 설정할 필요성 제기



150인승 여객기의 설계

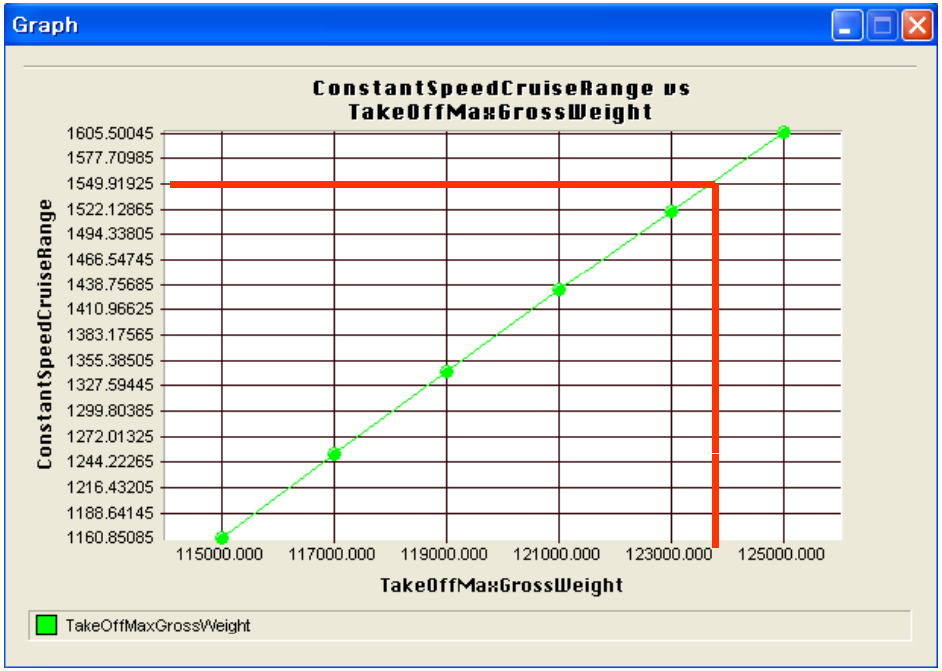
- Step 3-2. 1D Parametric Study – Constant Speed Cruise Range
  - 요구되는 항속거리를 만족시키기 위해서는 120,500 정도의 이륙중량이 요구
  - 이륙중량을 122,000으로 수정하여 입력

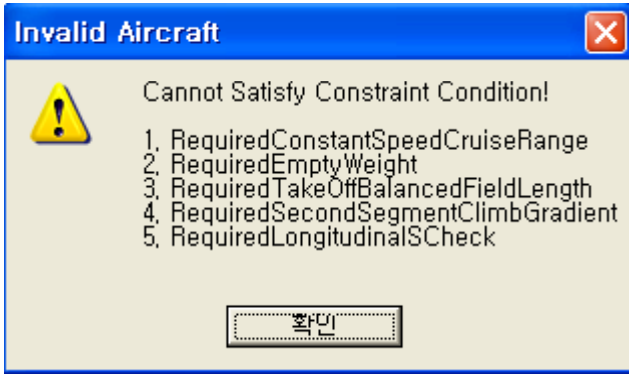


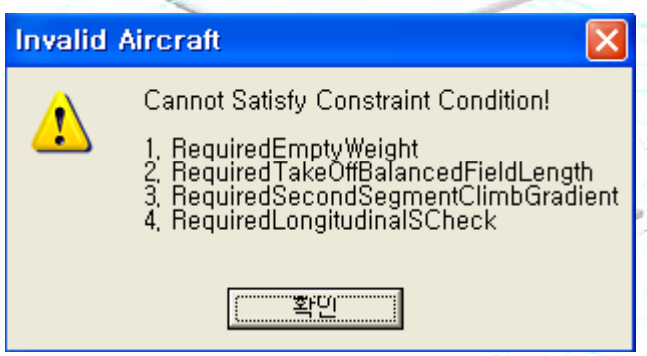


150인승 여객기의 설계

- Step 4. Report
  - Invalid All
  - **항속거리 여전히 만족 못함**
  - 1D Parametric Study : **이륙중량을** 124,000**으로 수정**
    (**이륙중량의 범위를** 124,000 ~ 130,000 **으로 수정**)

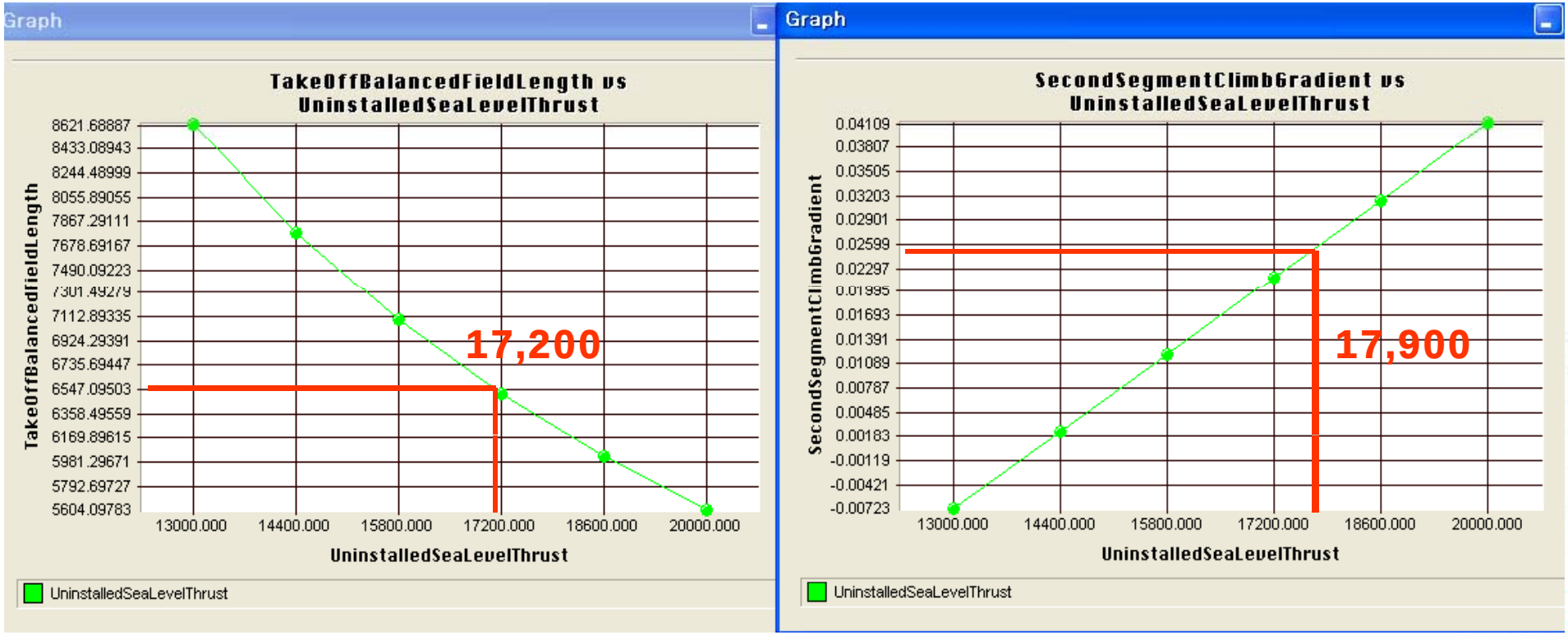






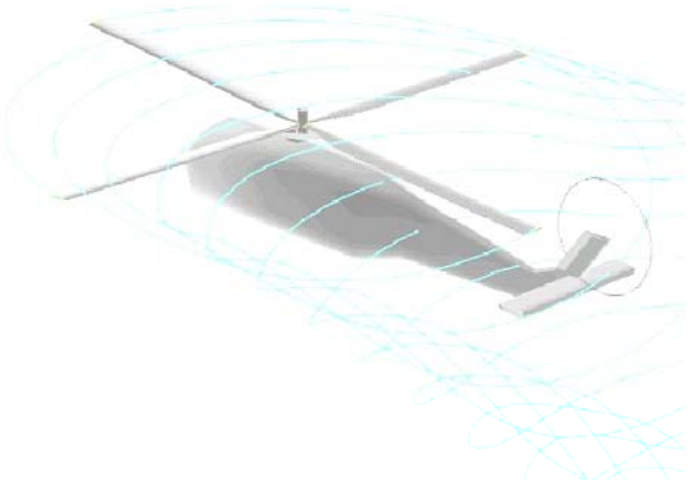
150인승 여객기의 설계

- Step 5. 1D Parametric Study – Take off Balanced Field Length, Climb Gradient
  - 가장 관련이 깊은 변수가 엔진의 추력이므로 Uninstalled Sea Level Thrust 선택
  - 두 요구조건을 만족시키도록 하는 값인 17,900 을 추력으로 입력 (최소값을 16,000 으로 변경해둠)



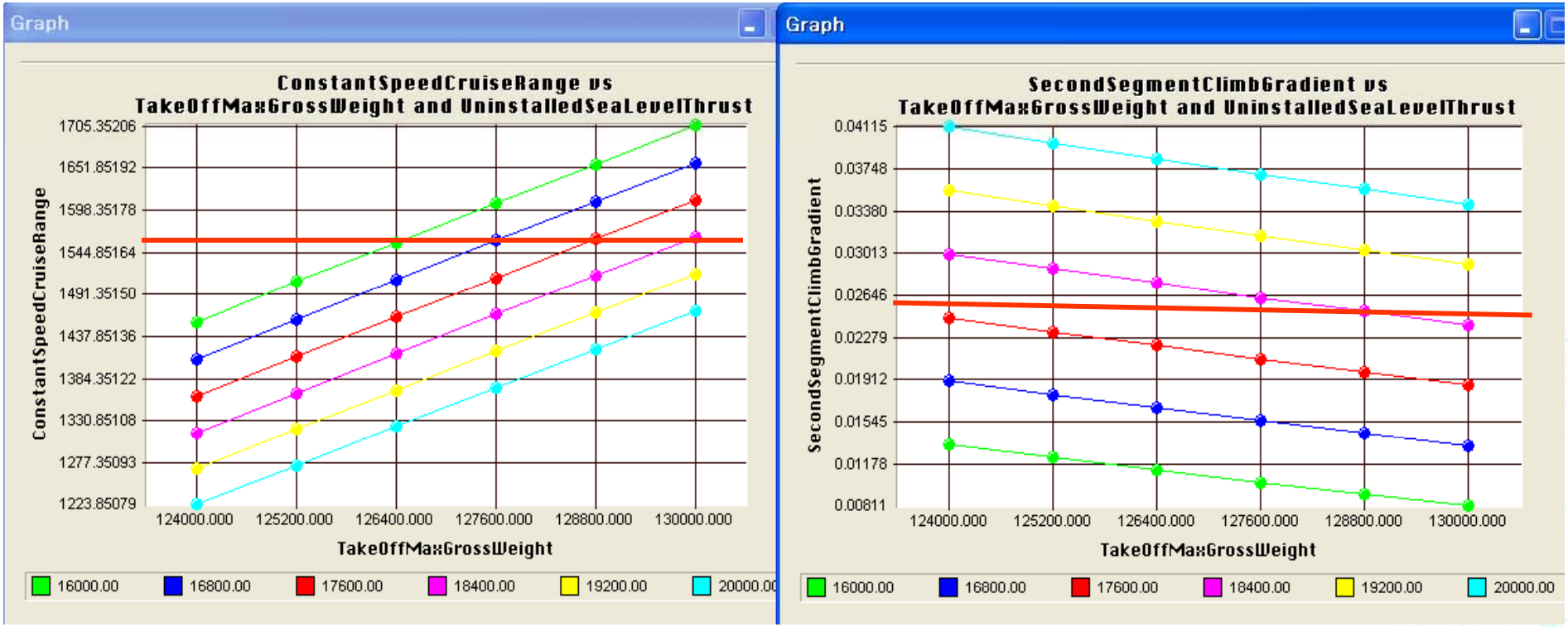
150인승 여객기의 설계

- Step 6. Report
  - Required Constant Speed Cruise Range
  - Required Empty Weight



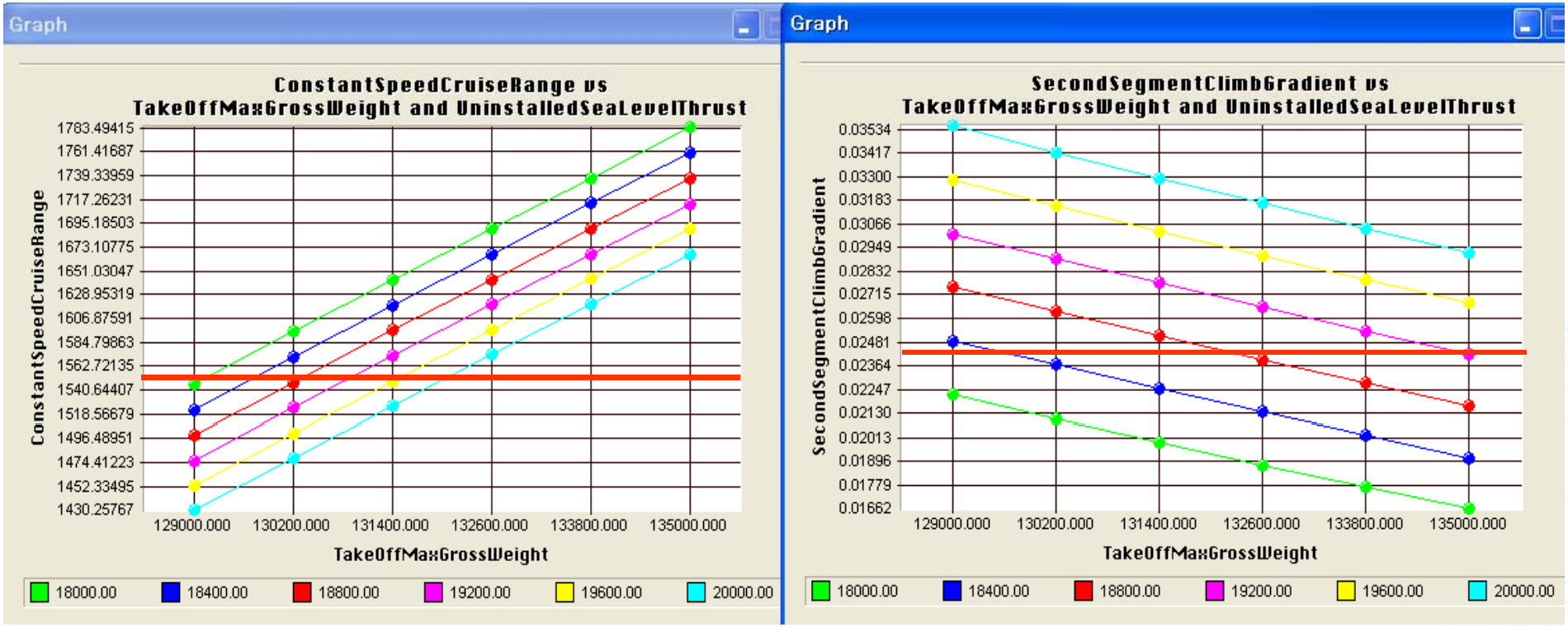
150인승 여객기의 설계

- Step 7. 2D Parametric Study
  - 반복적인 과정을 피하기 위하여 Takeoff Max Gross Wight / Uninstalled Sea Level Thrust vs. Cruise Range
  - Takeoff Max Gross Wight / Uninstalled Sea Level Thrust vs. Climb Gradient
  - 이륙중량 범위를 129,000 ~ 135,000으로, 엔진 추력을 18,000 ~20,000 으로



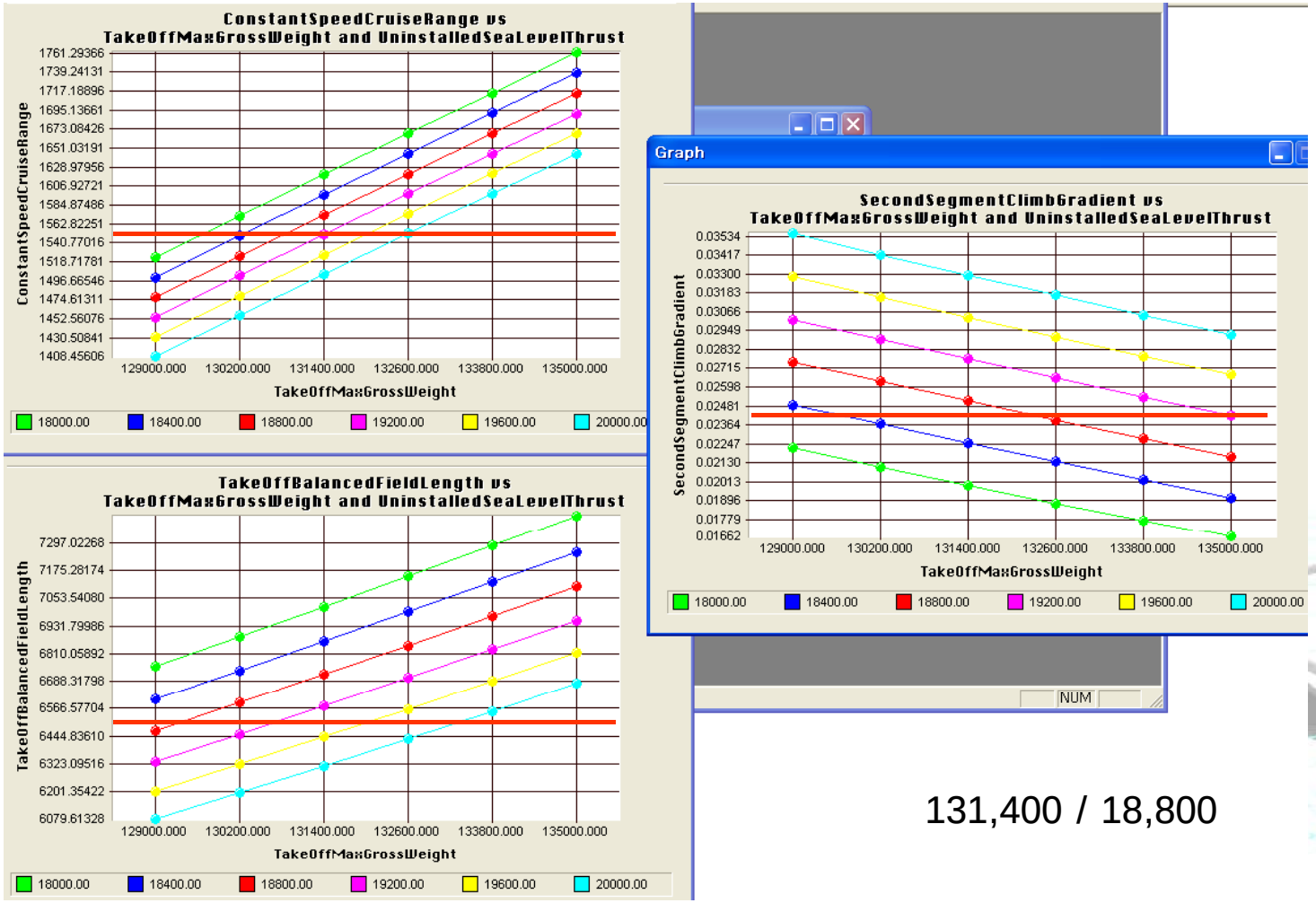
150인승 여객기의 설계

- Step 7-1. 2D Parametric Study
  - Takeoff Max Gross Wight / Uninstalled Sea Level Thrust vs. Cruise Range
  - Takeoff Max Gross Wight / Uninstalled Sea Level Thrust vs. Climb Gradient
  - **이륙중량** 130,800**으로, 엔진 추력을** 18,800 **으로**



150인승 여객기의 설계

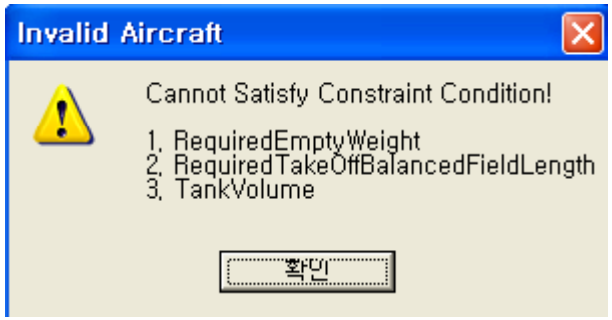
- Step 7-2. 2D Parametric Study

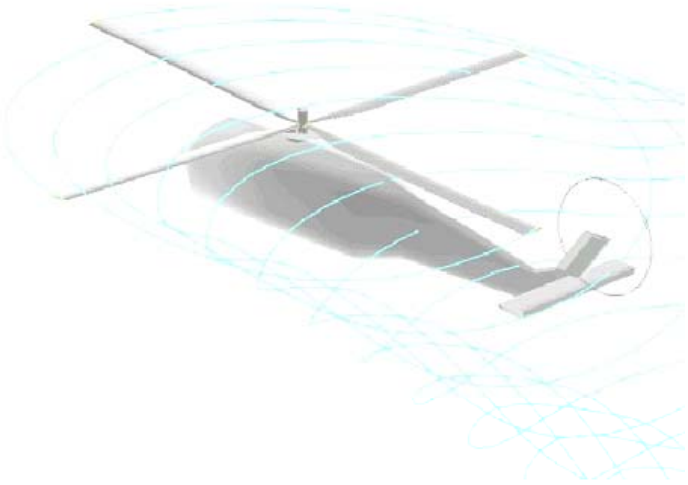


131,400 / 18,800

150인승 여객기의 설계

- Step 8. Report
  - Required Empty Weight
  - Required Takeoff Balanced Filed Length
  - Tank Volume

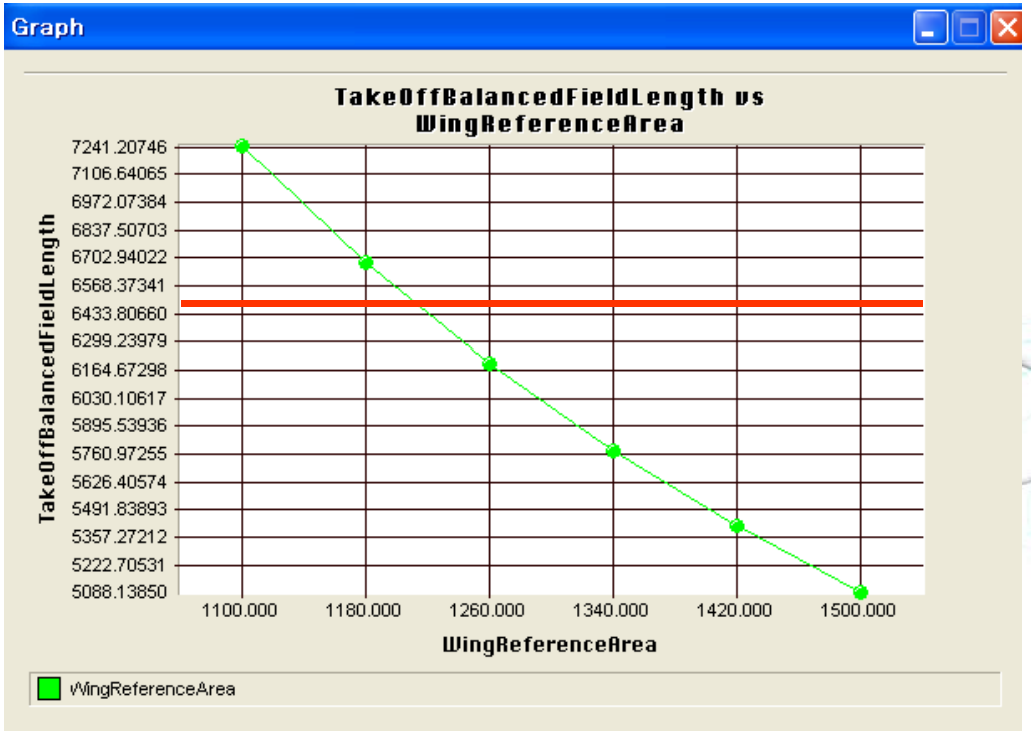


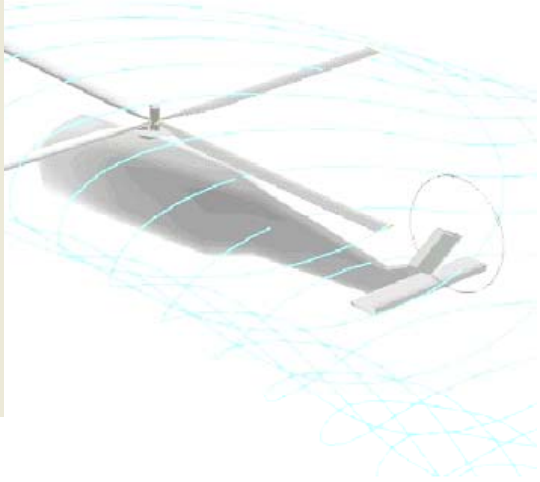


150인승 여객기의 설계

- Step 9. 1D Parametric Study

  - Wing Reference Area vs. Takeoff Balanced Field Length
  - Wing **면적의 범위를** 1100 ~ 1500**으로 변경**
  - Wing Reference Area : 1220





150인승 여객기의 설계

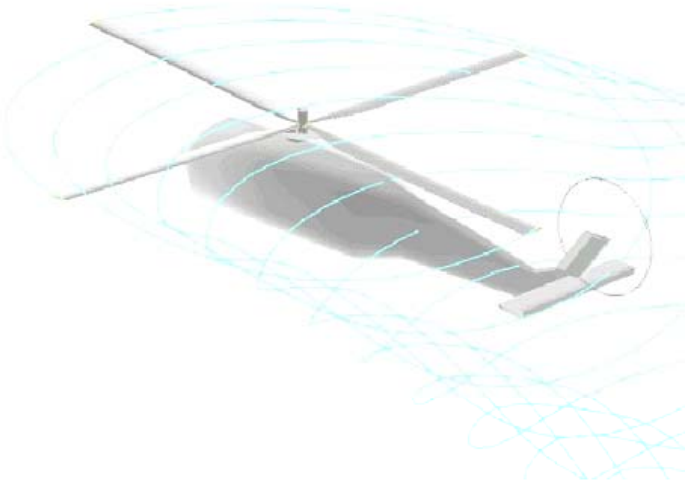
- Step 10. Report

  - Empty Weight

-A320 150인승 항공기 중량데이터

DESIGN WEIGHTS

	metric	imperial
Maximum ramp weight	73.9 (77.4) tonnes	162.9 (170.6) lbs. x 1000
Maximum takeoff weight	73.5 (77) tonnes	162 (169.8) lbs. x 1000
Maximum landing weight	64.5 (66) tonnes	142.2 (145.5) lbs. x 1000
Maximum zero fuel weight	61 (62.5) tonnes	134.5 (137.8) lbs. x 1000
Maximum fuel capacity	23,860 (29,840) Litres	6,300 (7,885) US gal.
Typical operating weight empty	42.4 tonnes	93.5 lbs. x 1000
Typical volumetric payload	16.6 tonnes	36.59 lbs. x 1000



Required Empty Weight 65,000 -> 75,000 으로 변경

150인승 여객기의 설계

- Step 11. Report