



Estimating Expected Results

ICAO Secretariat





- About expected results
- Examples by measure



- Expected results are the effect on the baseline of the implementation of the measures selected
- In other words, projected fuel consumption, CO₂ emissions, and traffic for the same future years as the baseline should be shown



- Only aggregate expected results need to be submitted
- However, the techniques shown in the guidance allow the incremental benefits of each measure to be calculated



- The following slides present calculations for each category of measure using rules of thumb from Appendix C
- In some cases a more robust answer is available using one of ICAO's tools or more sophisticated techniques, if available
- **By following the guidance, all States should be able to quantify the expected results from their measures**



- Before making an investment in one of the measures, the State may want to conduct a cost-benefit analysis
 - This is not a requirement for the action plans
- This seminar will only focus on the benefits from measures
- Information on costs is provided in Appendix F of the Second Edition of the guidance document



- Data should be available from the manufacturer
- If not, rules of thumb are provided

Example: Purchase of new aircraft

Rule of Thumb: $FS = [0.9\% \text{ to } 1.05\%] * \text{a/c age (years)} * \text{old a/c fuel burn}$

- An airline has 5 narrow-body aircraft that are 10 years old with an average fuel consumption of 2.411 tonnes per hour. All 5 aircraft will be replaced with new aircraft
- Each aircraft in the fleet operates for an average of 2,700 hours per year
- The annual fuel savings can be estimated as:
 $0.009 * 10 * 5 * 2.411 * 2,700 = 2,929$ tonnes of fuel (low-end of range)



- Until international agreement is reached, sustainable alternative fuels are assumed to have 0 net CO₂ emissions

Example: Use of Biofuel

Rule of Thumb: CO₂ savings = utilization (%) * fuel burn * 3.157

- An airline has 5 aircraft with an average fuel consumption of 2.411 tonnes per hour that are used, on average, 2,700 hours per year. The airline intends to use a 20% blend of biofuel in all operations.
- The CO₂ savings can be estimated as:
 $0.2 * 5 * 2.411 * 2,700 * 3.157 = 20,551$ tonnes CO₂ saved per year

Note: this measure only reduces net CO₂ emissions, not fuel.



- Detailed modelling or IFSET are the preferred methods
- Rules of thumb are also available

Example: Use of Continuous Descent Operations

Rule of Thumb: Fuel Saved = 60 Kg (0.06 tonnes) of fuel * Number of CDOs

- A State averages 10,000,000 flights per year. Currently 120 of its airports offer CDO which account for approximately 4,800,000 arrival movements. Expert judgment is that CDO at these airports is operating in off peak hours which account for approximately 35% or 1,680,000 traffic movements.
- The annual fuel savings can be estimated as:
 $0.06 * 1,680,000 = 100,800$ tonnes of fuel saved



- Close cooperation with the operator is strongly advised
- Rules of thumb are provided

Example: Weight reduction

Rule of Thumb: Fuel Saved = weight reduction * flight time * 1.95%

- An airline has 5 aircraft that are used, on average, 2,700 hours per year. The airline intends to reduce weight by 20 Kg (0.02 tonnes) on all 5 of these aircraft.
- The annual fuel savings can be estimated as:
 $5 * 0.02 * 2,700 * 0.0195 = 5.25$ tonnes fuel saved



- Close cooperation with the airport and operator is strongly advised
- Many improvements can be modelled with IFSET, rules of thumb are also provided

Example: Use of pre-conditioned air and fixed electrical ground power

Rule of Thumb: Fuel Saved = time with APU off (hours) * 106 Kg (0.106 tonnes) of fuel per hour

- An airport with an average of 100,000 narrow-body departures annually plans to install gate power and pre-conditioned air that will reduce APU operating times by 0.5 hours per departure
- The annual fuel savings can be estimated as:
 $0.5 * 0.106 * 100,000 = 5,300$ tonnes fuel saved



- Economic and market-based measures are policy tools that are designed to achieve environmental goals at a lower cost and in a more flexible manner than traditional regulatory measures
- As a result, the CO₂ emissions reductions achieved will be equal to the objective selected





Expected Results Format

Year*	Total RTKs (tonne-kilometres)	International RTKs* (tonne-kilometres)	Total fuel (litres)	International fuel (litres)*	Total CO ₂ emissions (metric tonnes)	International CO ₂ emissions* (metric tonnes)
Future year						
2020						
Future year						
2050						

*Minimum data to be entered.

Note: the future years should match the baseline's future years.

Note: the traffic data (RTK) may not be identical to the baseline. Some measures may enable an increase in traffic or aim to reduce demand.



- See Chapter 4 and Appendix C of the Guidance, Second Edition

