
Evaluating of the Benefits of Allowing Flight Level and Mach Number Adjustment for Efficiency for Flight Operations in Oceanic Airspace

Tao Li

Department of Electrical Engineering,
University of Texas at Arlington

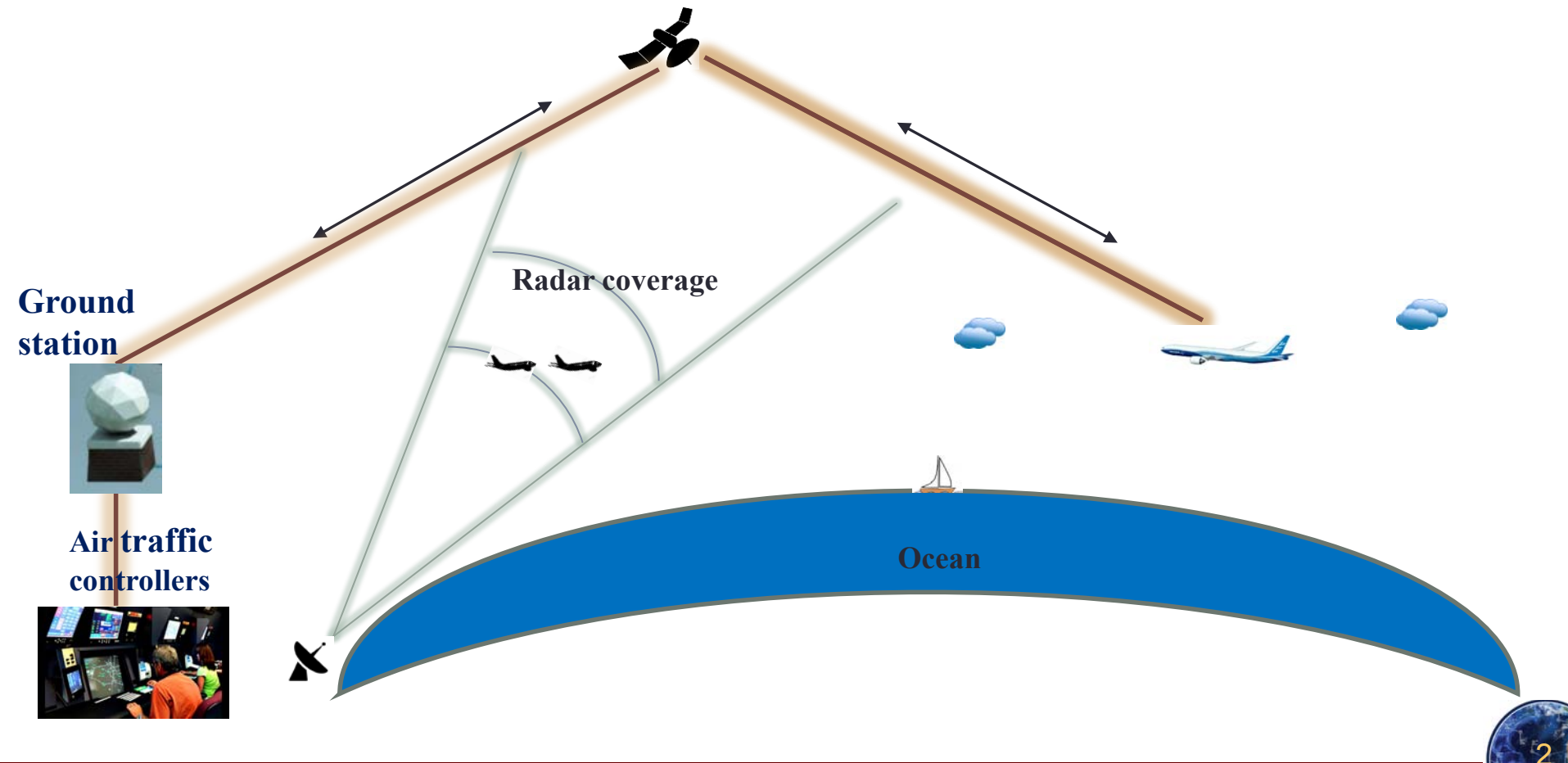
A.A. Trani

Department of Civil Engineering,
Virginia Tech



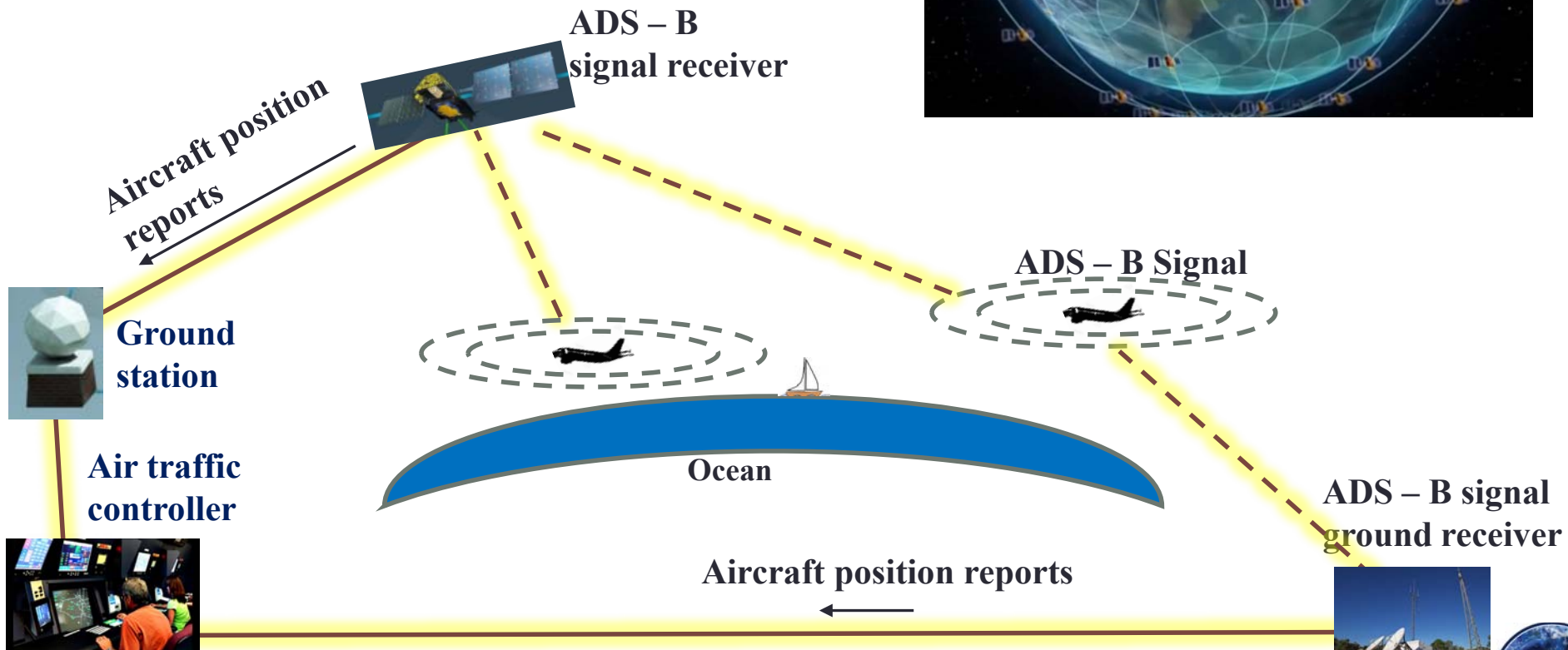
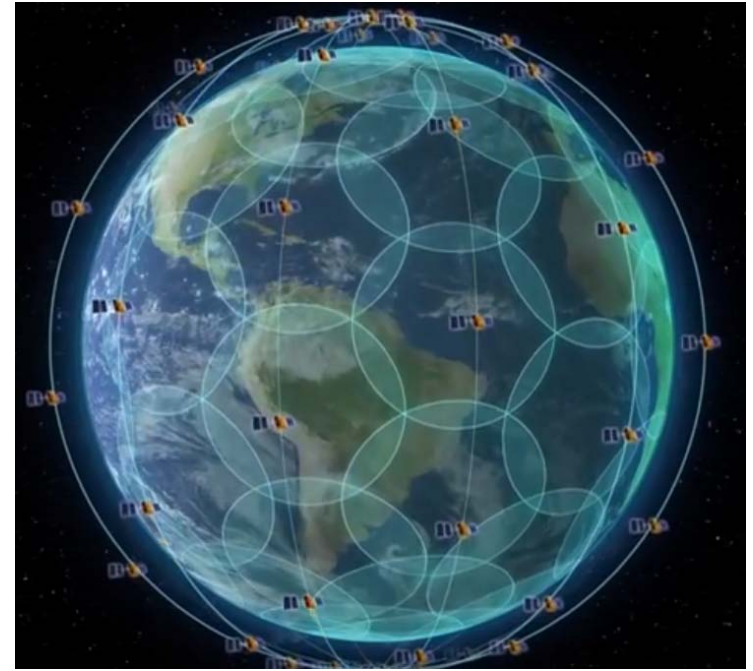
Background

- Satellite-based surveillance and communication technologies have been adopted for flight operations in oceanic airspace.



Space-based ADS-B surveillance

- ADS-B receivers on 66+ Low Earth Orbit Satellites to offer a global ADS-B flight surveillance coverage.
- Space-based ADS-B is expected to provide a better surveillance capability.



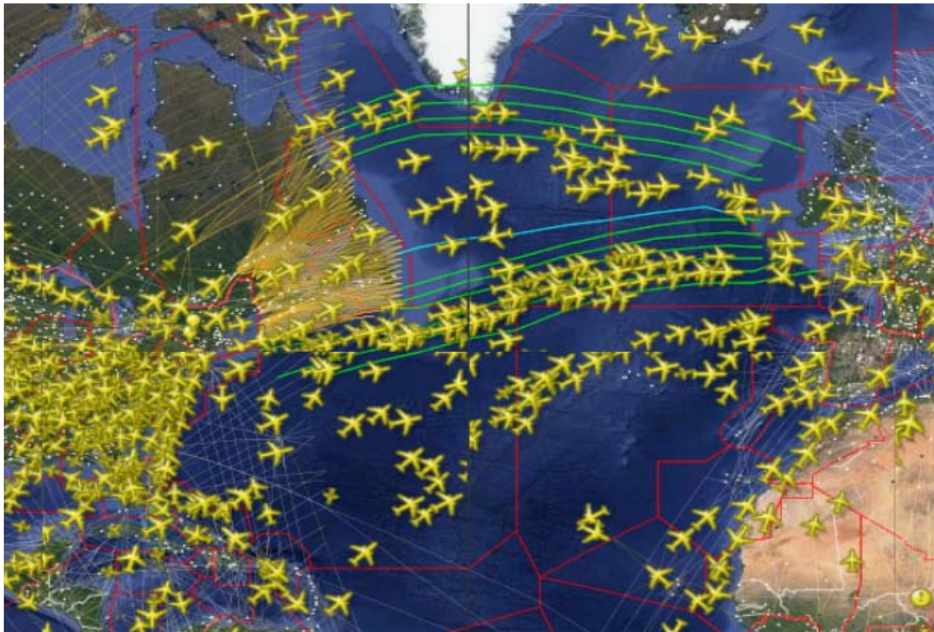
Improvements in the Air Traffic Management

- Reducing separation standards.
- Allowing flight level and Mach number adjustment for fuel and time efficiency without reducing separation standards.
- Fuel consumption rate is lower at higher flight levels
- Higher Mach numbers will increase fuel consumption rate but will also reduce travel time.

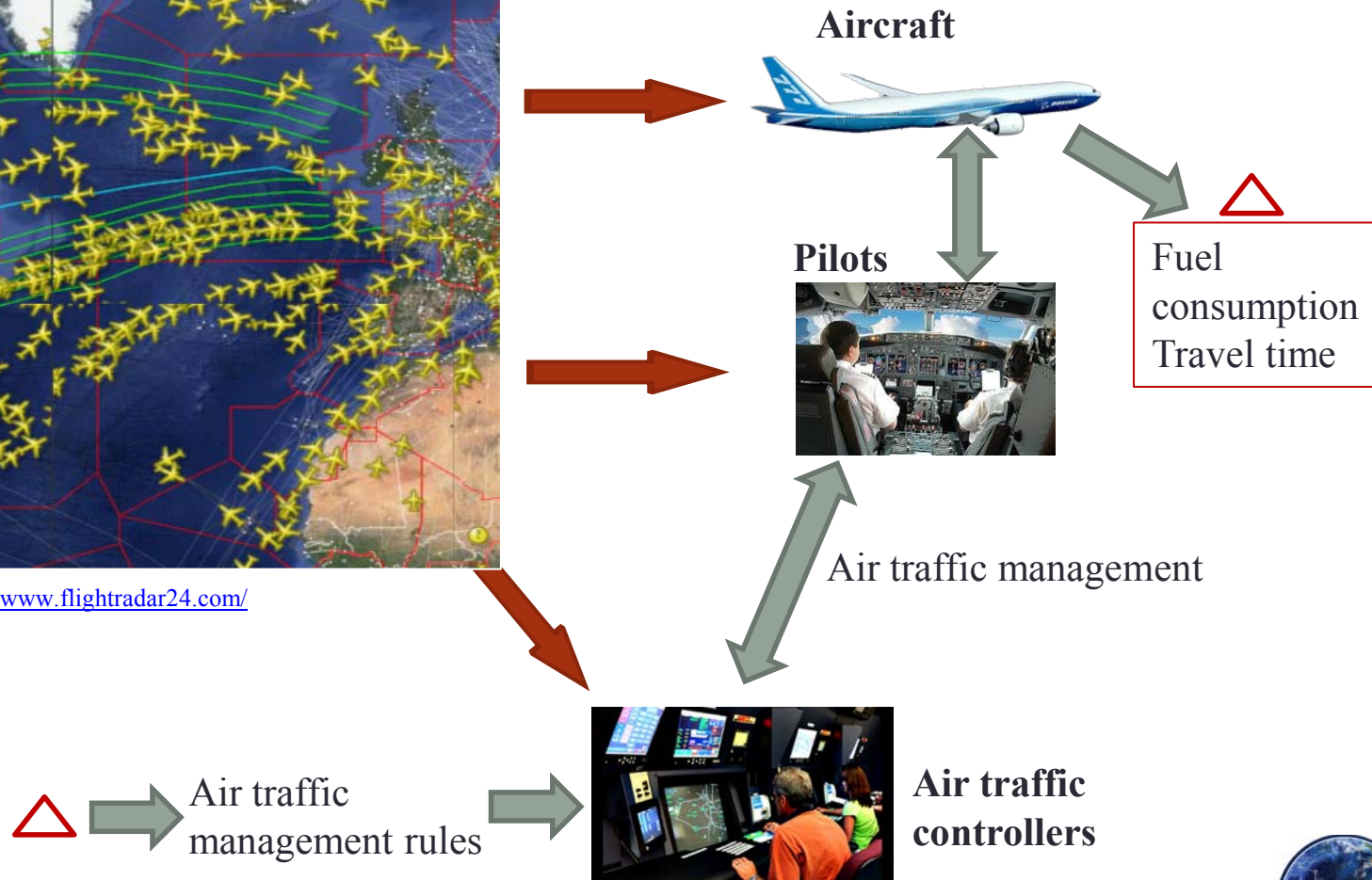


Global Oceanic Model

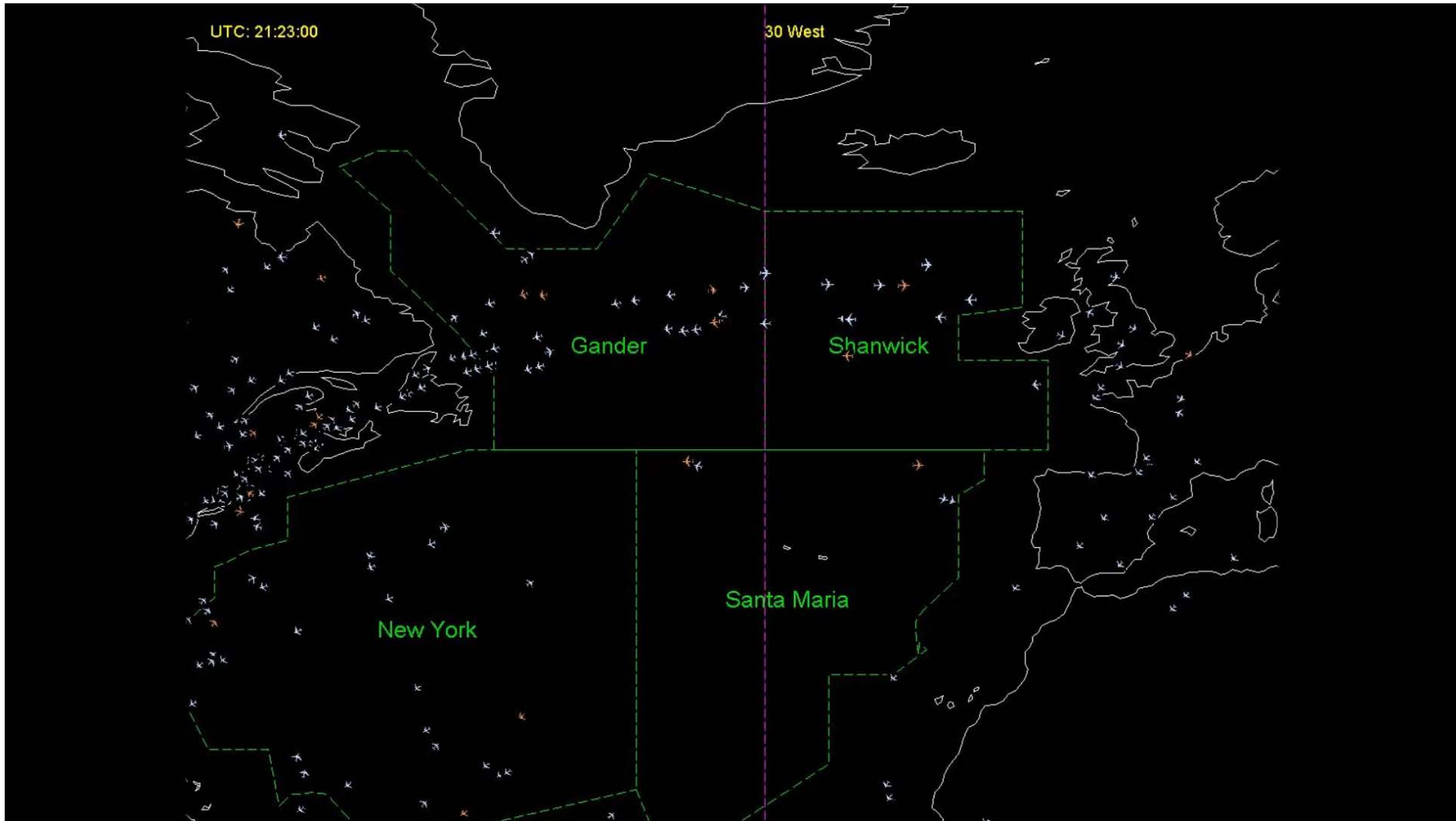
➤ A microscopic discrete time flight simulation model developed to evaluate the system-wide benefits of improvements in the air traffic management in the oceanic airspace.



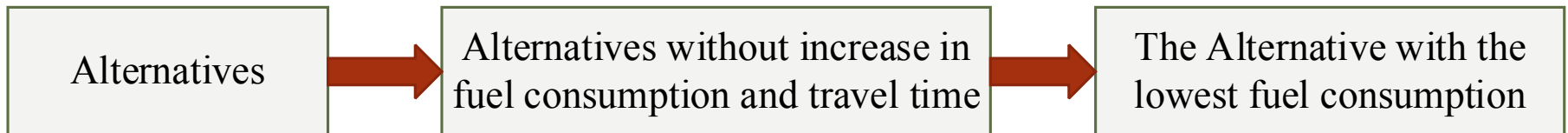
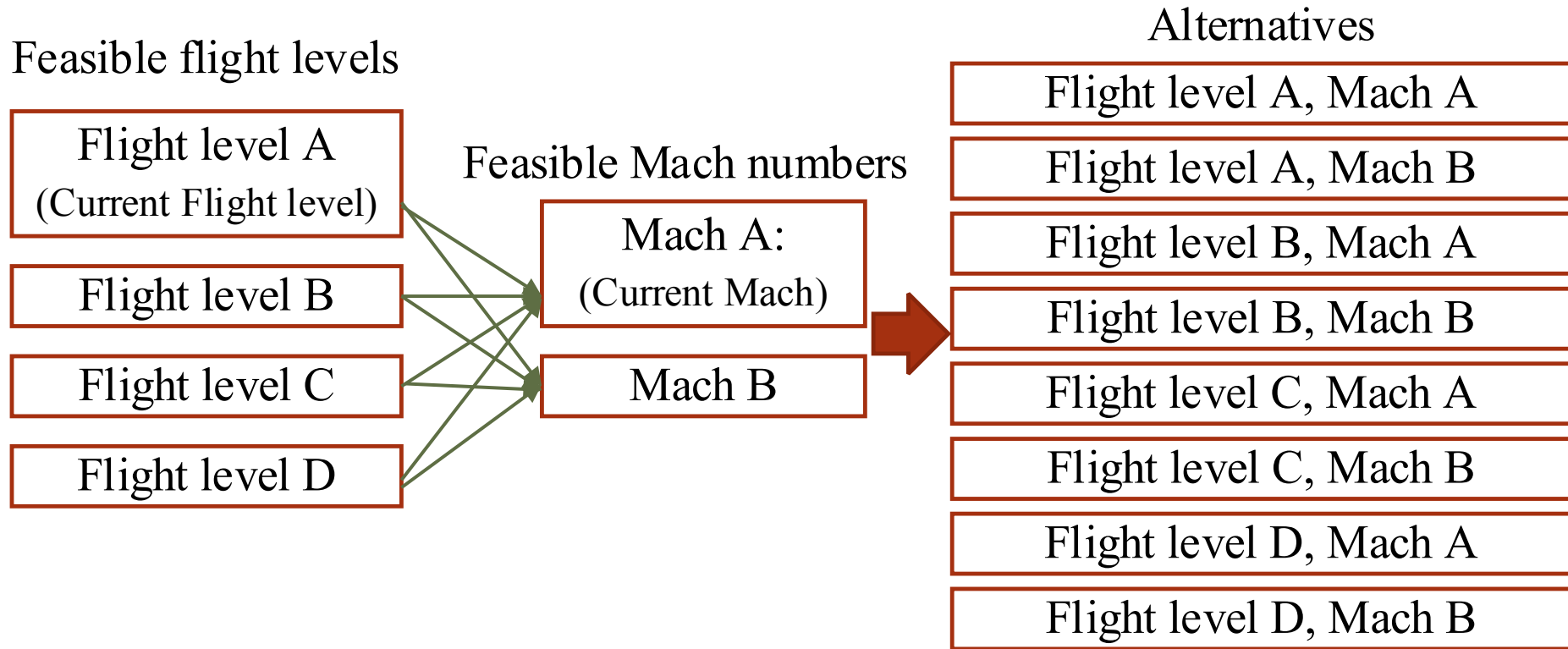
Screenshot from flightradar24 <https://www.flightradar24.com/>



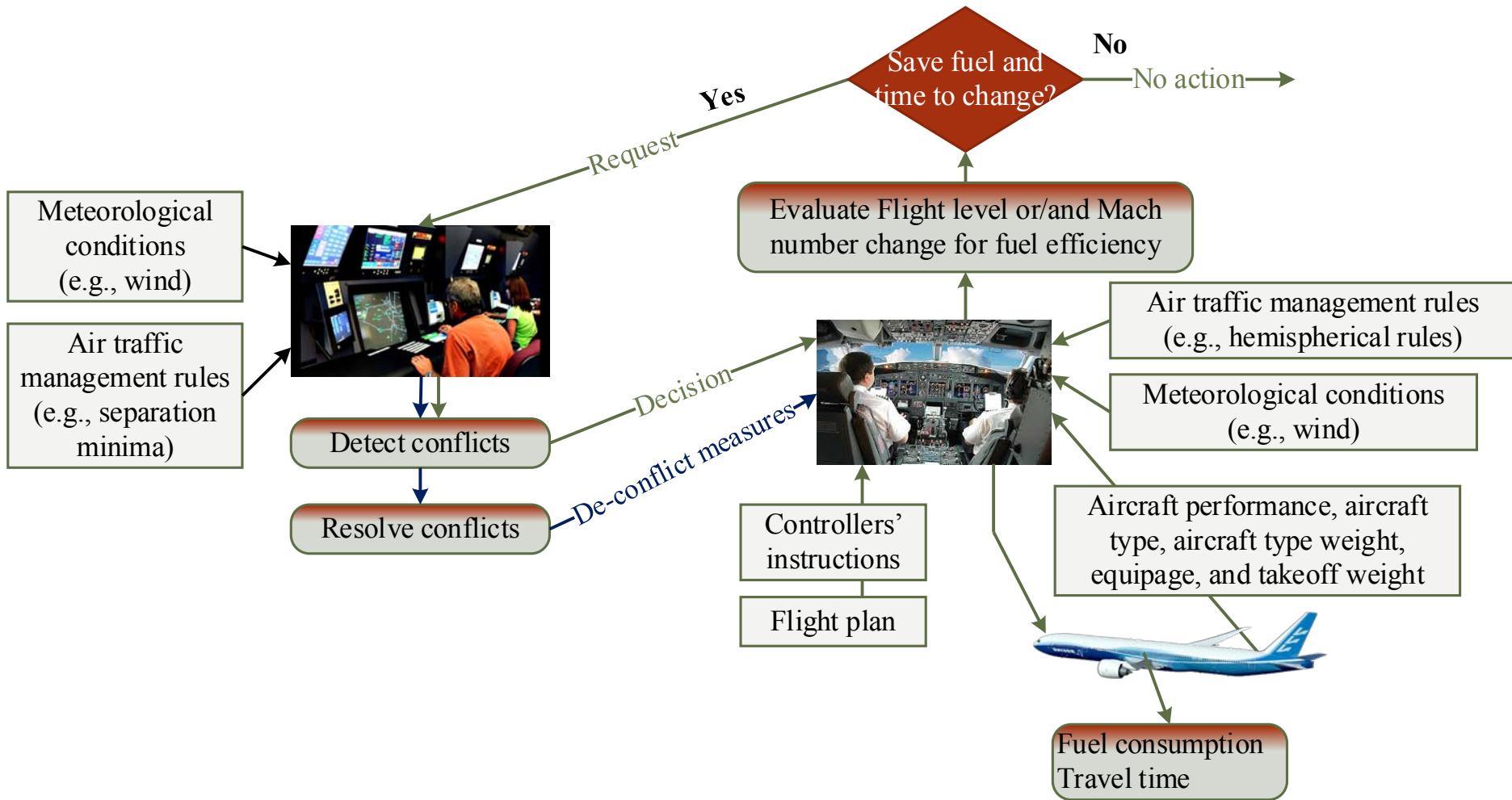
Global Oceanic Model (Cont.)



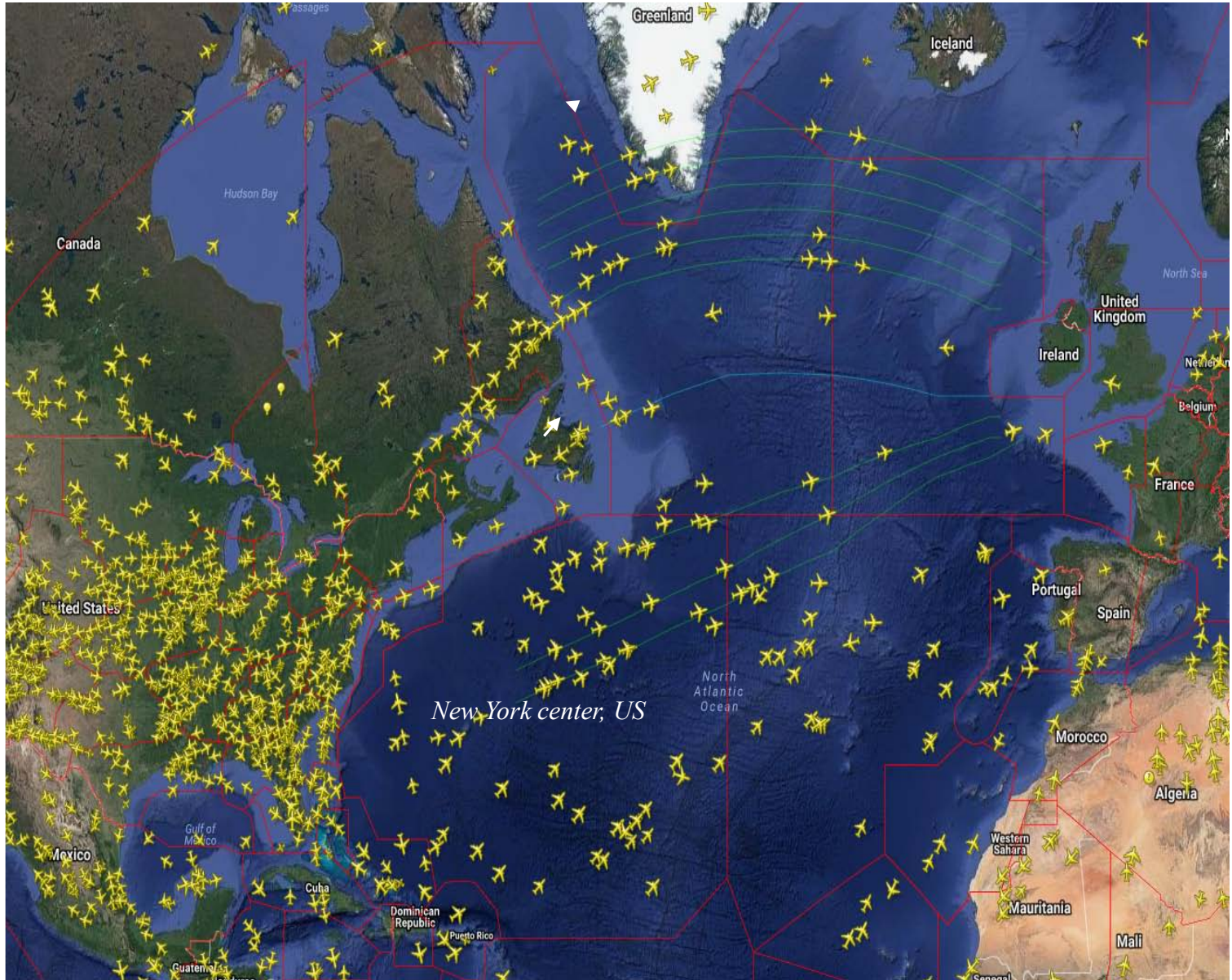
Modeling flight level and Mach number adjustment



Modeling flight level and Mach number adjustment (Cont.)



Benefits Evaluation



Screenshot from flightradar24 <https://www.flightradar24.com/>

Benefits Evaluation (Cont.)

Baseline: No flight level/Mach number adjustment for fuel efficiency

Scenario 1: FL only: Only flight level adjustment for fuel efficiency

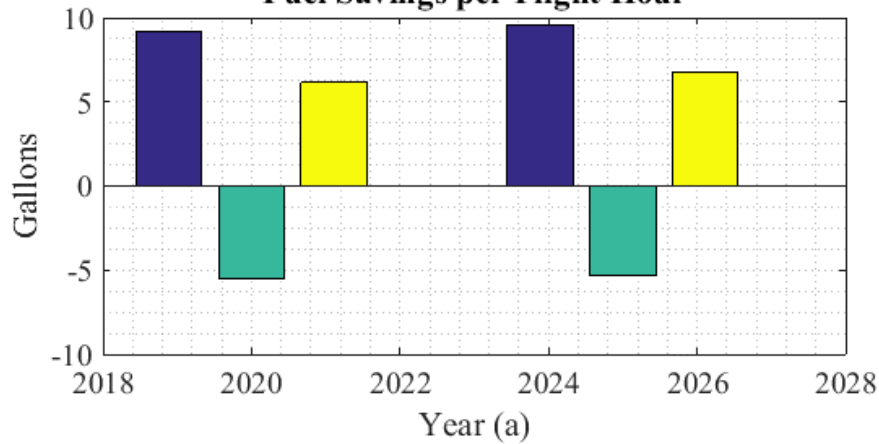
Scenario 2: M only: Only Mach number adjustment for fuel efficiency

Scenario 3 FL + M: Flight level and Mach number adjustment for fuel efficiency

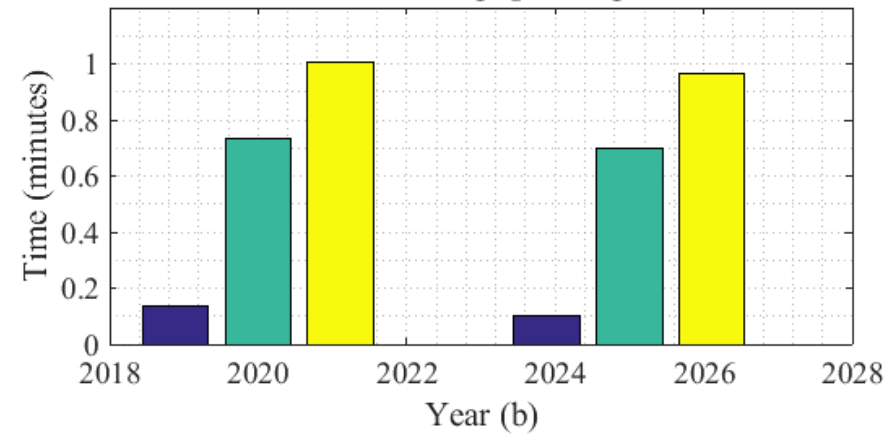
We compared the fuel consumption and travel time of the three scenarios with those in the baseline in 2020 and 2025.

Results

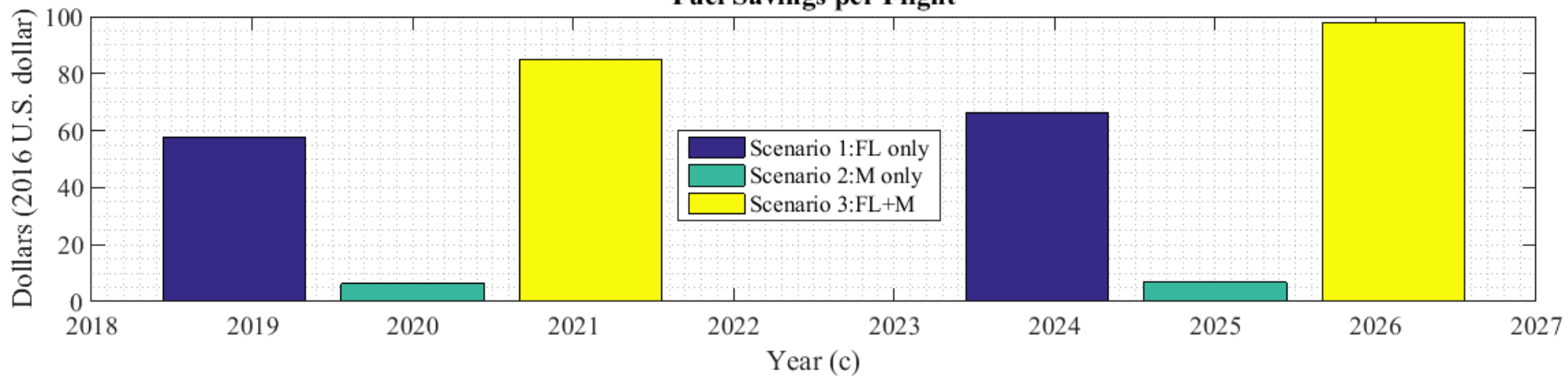
Fuel Savings per Flight Hour



Time Savings per Flight



Fuel Savings per Flight



- The benefit estimates are for the oceanic airspace managed by ZNY.
- The forecast of Jet-A fuel price in 2020 is \$2.11/gallon and \$2.39/gallon in 2025. The prices are from the reference case in Annual Energy Outlook 2017.



Thank you very much!
Questions and Comments?