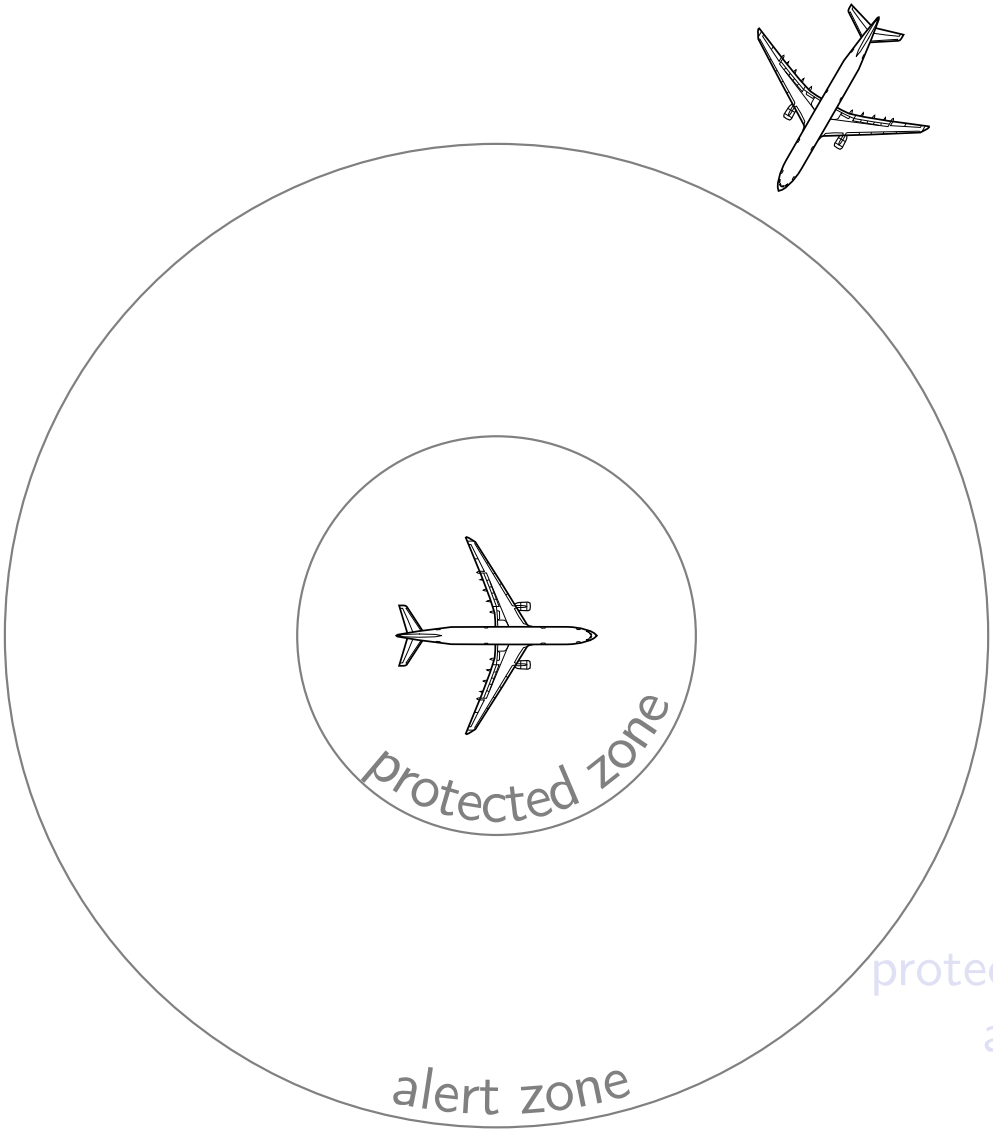
Air Traffic Conflict Resolution

C. Tomlin, G. J. Pappas, and S. Sastry. Conflict resolution for air traffic management: A study in multiagent hybrid systems. *IEEE Trans. Automatic Control*, 43(4):509–521, Apr. 1998.



- Original: calculate a *maximal set of safe initial conditions for each aircraft* for a maneuver
- Simulation: single initial state, deterministic
- Focus on modeling resets in hybrid automata

- Two virtual cylinders around each aircraft:

protected zone zones must never overlap

alert zone must exchange information for conflict prediction and resolution

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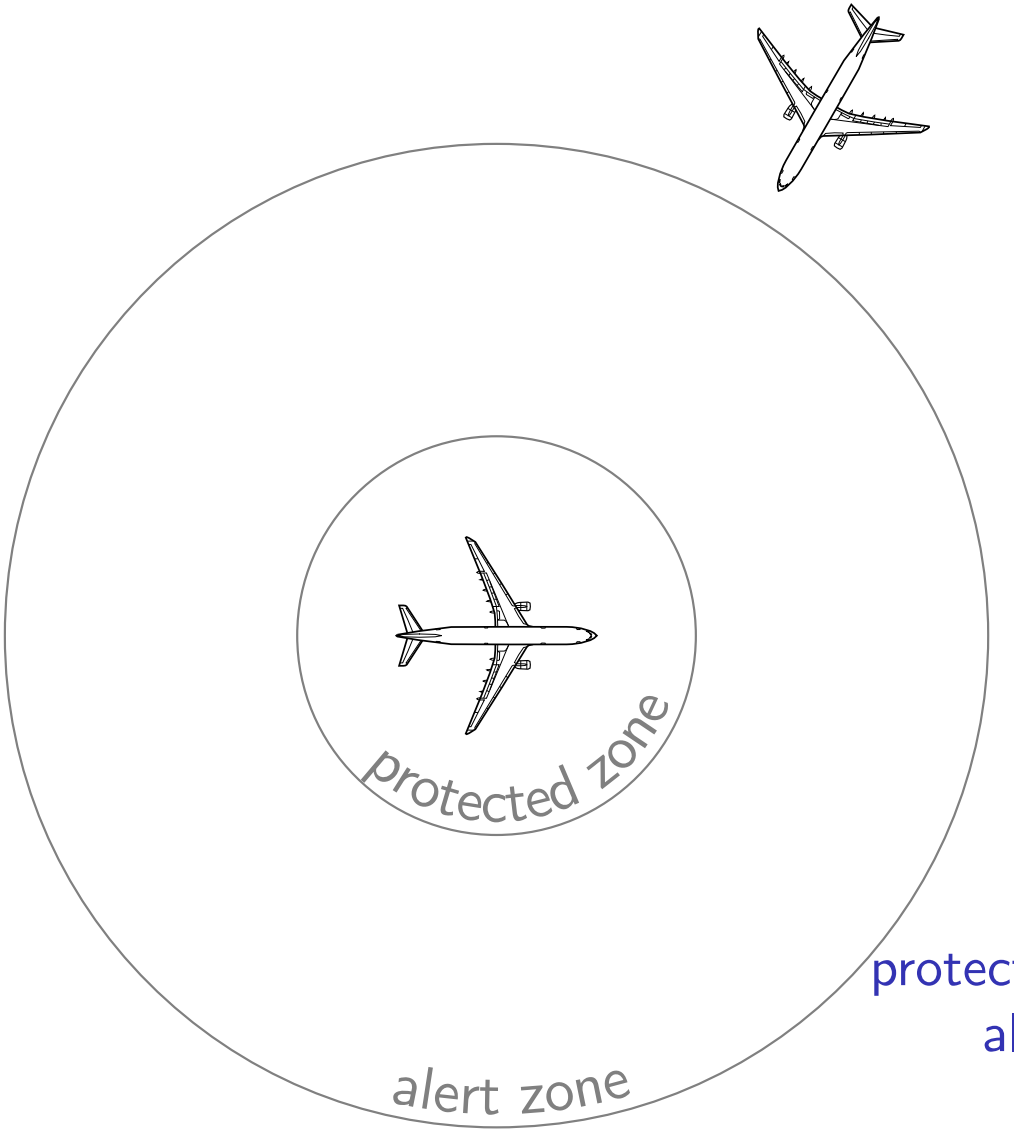

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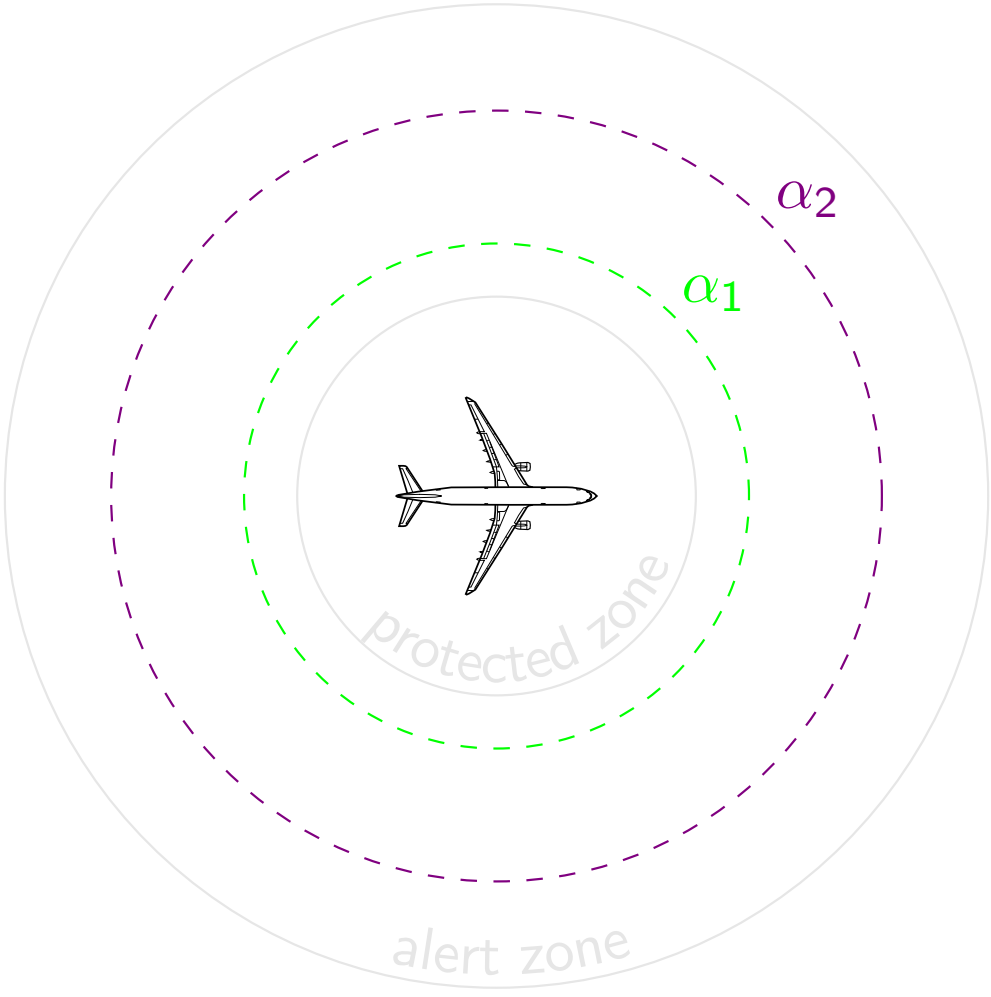


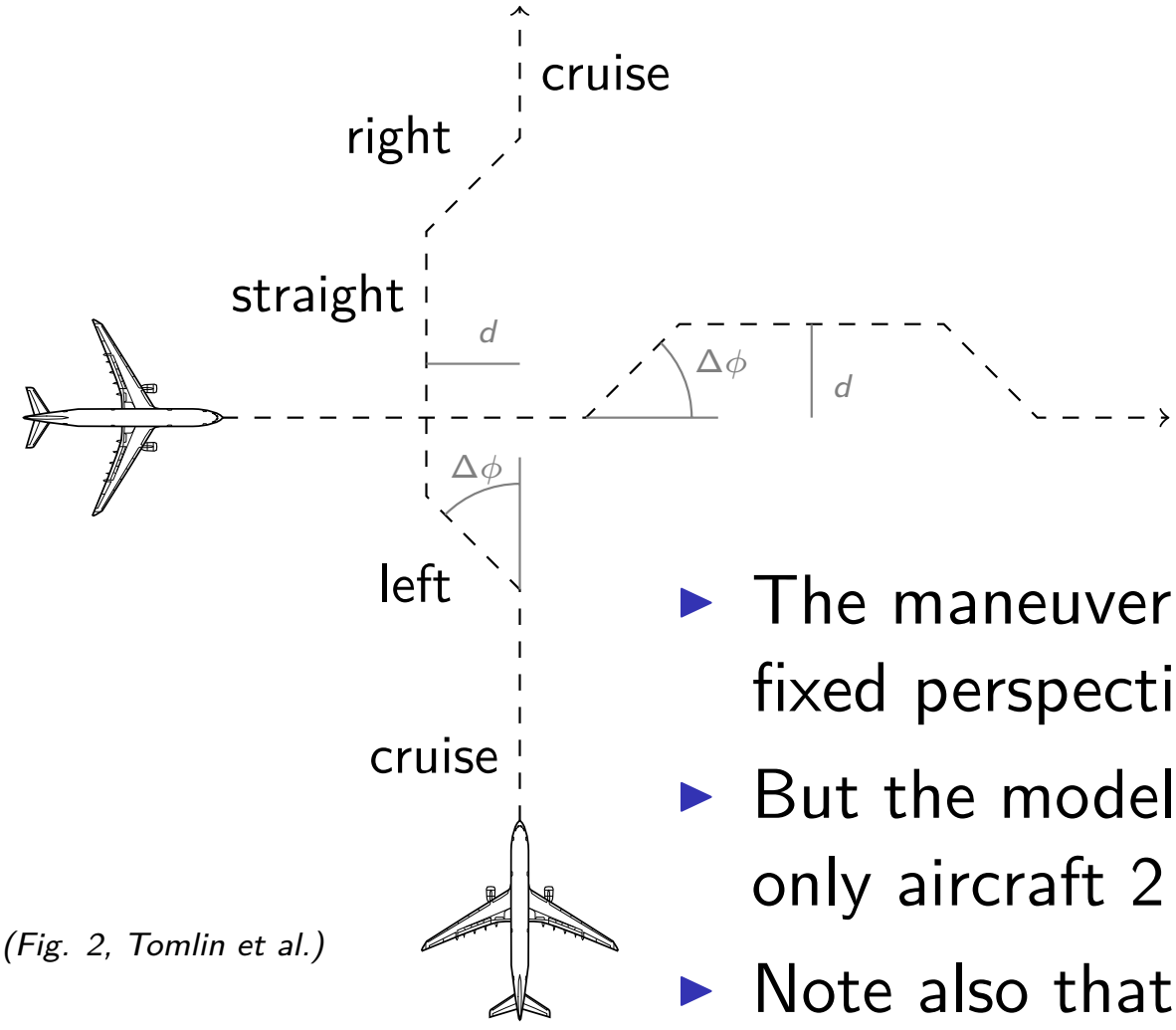
Cruise Cruise until aircraft are α_1 miles apart.

Left Each aircraft changes heading by Δ°. Both fly until d miles apart.

Straight Each returns to original heading. Both fly until α_2 miles apart.

Right Each changes heading by $-\Delta^\circ$ and returns to original flight path.

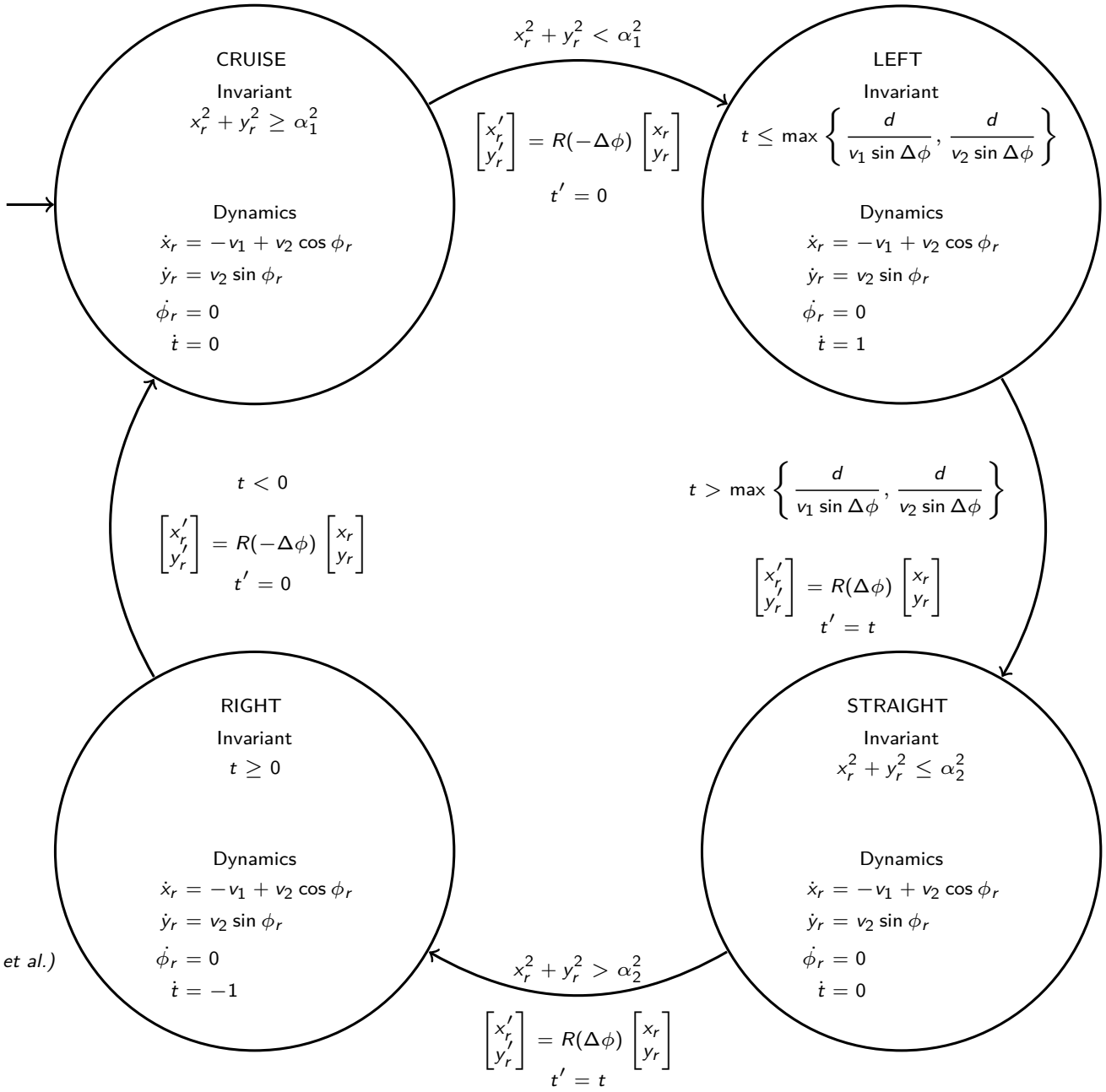
Air Traffic Conflict Resolution



(Fig. 2, Tomlin et al.)

- The maneuver looks like this from a fixed perspective
- But the model is relative to aircraft 1: only aircraft 2 appears to move
- Note also that heading changes are modeled as instantaneous and simultaneous

Air Traffic Conflict Resolution



(Fig. 8, Tomlin et al.)