# Contrail Avoidance Pitch Story (RL-Based Decision Support)

## Elevator pitch (30 seconds)

Airlines have optimized fuel and $CO_2$ for decades, but there's a major climate lever hiding in plain sight: **contrails**. On the wrong day, a thin layer of air at cruise altitude can turn a normal flight into a high-warming event. Today's approaches mostly **detect risk** and suggest generic altitude tweaks. We're building an **AI flight coach** that learns—under weather uncertainty and operational constraints—the best *sequence* of small actions (altitude, timing, and later speed/lateral options) to avoid the worst contrails while protecting fuel, punctuality, and ATC workload. Same aircraft, same network—just smarter decisions.

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## 3–5 minute pitch story (talk track)

### 1) Hook: "The invisible climate fingerprint"

Two identical flights can have very different climate impact—not because of the engine, but because of the **air** they fly through. Sometimes a thin band at cruise altitude turns exhaust water into ice crystals that spread into persistent contrails. You can't see that band from the ground. But the climate feels it.

### 2) The tension: "We already optimize fuel… but not warming"

Airlines have spent decades optimizing fuel burn: flight plans, cost index, route efficiency. That's measurable, predictable, and priced.

Contrails are different: they're **situational**, driven by humidity/temperature layers that are hard to forecast precisely. Even teams that want to reduce contrails face two blockers: - **Uncertainty:** the "risky air" shifts in space and time. - **Complexity:** you can't reroute everything—ATC constraints, sector capacity, safety margins, and schedule reliability matter.

### 3) Why now: "The data and pressure finally exist"

Now we have ingredients that didn't exist 10 years ago: - Better upper-air forecasting and satellite/meteorological products - More aircraft-based observations - Growing regulatory and corporate pressure to address non-$CO_2$ effects

The missing piece is an operational brain that can make decisions under uncertainty **without creating chaos**.

### 4) What exists today: “Tools that warn, but don’t truly decide”

Current approaches are mostly: **forecast contrail risk → apply a fixed rule** like “try a small altitude change.” That’s good for trials—but it treats the decision like a one-off.

Real operations are sequential: you deviate, the atmosphere changes, traffic changes, you rejoin the route… and every move has a cost.

### 5) Your twist: “Contrail avoidance as a learning control problem”

Our insight: contrail mitigation is not a single optimization—it’s a **control policy**.

We build a reinforcement learning agent that learns: - when to climb/descend, - how long to stay off-level, - when it’s not worth it, - and how to do this while respecting operational constraints.

Think of it as an autopilot for climate impact: not flying the aircraft, but **choosing smarter vertical/lateral micro-decisions** on top of the flight plan.

### 6) Why RL (simple, non-technical framing)

Why RL instead of classic optimization? - Optimization needs a clean model of the world. - This world is noisy: forecast error, evolving traffic, changing constraints.

RL can learn strategies that work **despite** uncertainty by training on historical weather + route data and penalizing fuel/time/ATC complexity.

So you don’t get a brittle plan—you get a robust policy.

### 7) What you deliver: “A decision-support layer airlines can actually use”

We’re not asking airlines to redesign aircraft or overhaul dispatch. We integrate into existing workflow: - **Pre-flight:** identify flights with high contrail risk and propose minimal-change options. - **In-flight:** provide a small set of safe, ATC-friendly alternatives (e.g., “top 2 altitude bands”) with estimated tradeoffs.

### 8) Proof plan: “Pilot where impact is concentrated”

Contrail impact is highly concentrated—some flights, some nights, some weather patterns. So we start targeted: - Choose a region + season where persistent contrails are common - Start with **altitude-only** actions - Measure outcomes: contrail-warming proxy reduction vs fuel/time impact

Then expand: lateral routing + network effects.

### 9) Close: “Low capex, fast climate wins”

This is one of the rare climate levers that can move **without** waiting for new aircraft or full SAF scale-up.

Same fleet, same airports—just better decisions.

**Ask:** We're looking for partners for a pilot: one airline + one ANSP/ATC collaboration + weather/provider access to prove measurable warming reduction with minimal operational disruption.

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## Slide-by-slide pitch spine (7 slides)

1. **Title:** Making contrail warming avoidable
2. **The invisible problem:** same flight, different warming
3. **Why it's hard:** uncertainty + operational constraints
4. **What exists today:** forecasting + simple rules + trials
5. **Our solution:** RL decision policy + DSS integration
6. **Pilot plan:** scope, KPIs, safety/ATC constraints, phases
7. **Ask:** data access + operational partner(s) + pilot corridor

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## Reusable lines & analogies

- **Analogy:** "Current systems are like a weather app that says 'it might rain.' We're building the GPS that reroutes you around the storm in real time, with the least delay."
- **One-liner:** "Same fleet—smarter decisions."

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## Suggested KPIs for a pilot (include on Slide 6)

- Reduction in **persistent-contrail risk** / warming proxy (model-based)
- Fuel/time penalty (per flight and aggregate)
- ATC feasibility metric: number/magnitude of deviations, sector constraint compliance
- Reliability: on-time performance impact

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## The ask (pick one)

- **Partnership:** Provide de-identified trajectory + fuel estimates + operational constraints; we deliver a pilot DSS for contrail-aware altitude optimization.
- **Funding:** Support a feasibility + simulation validation sprint to quantify benefit vs fuel/time, then a limited live trial.