

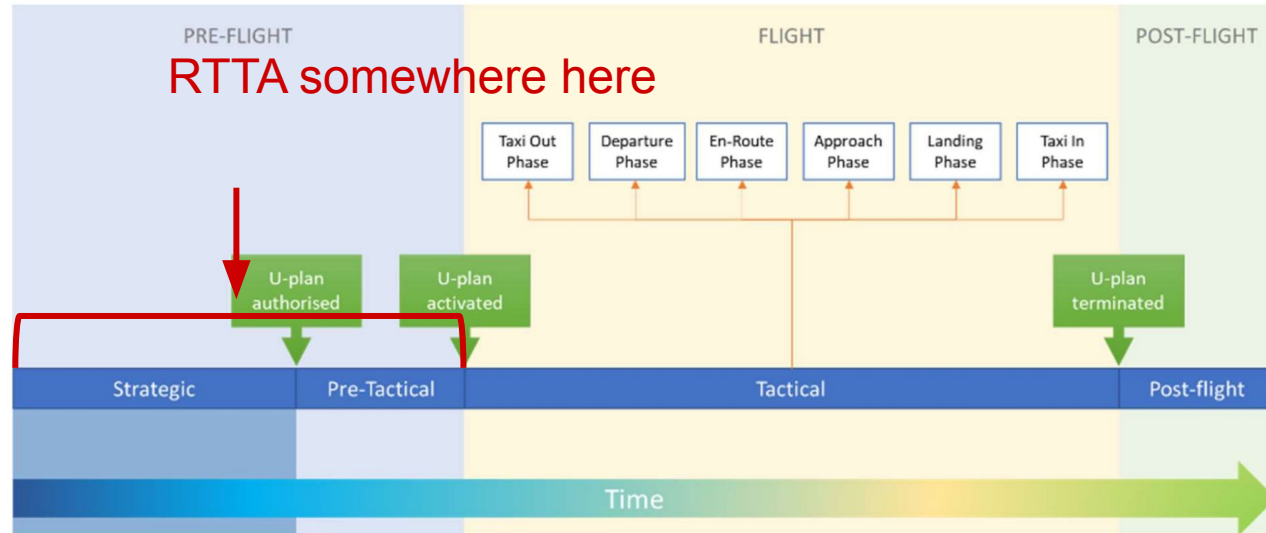
QWIRTTA

(Quantifying Weather Influence on RTTA)

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What is RTTA? (Reasonable Time to Act)

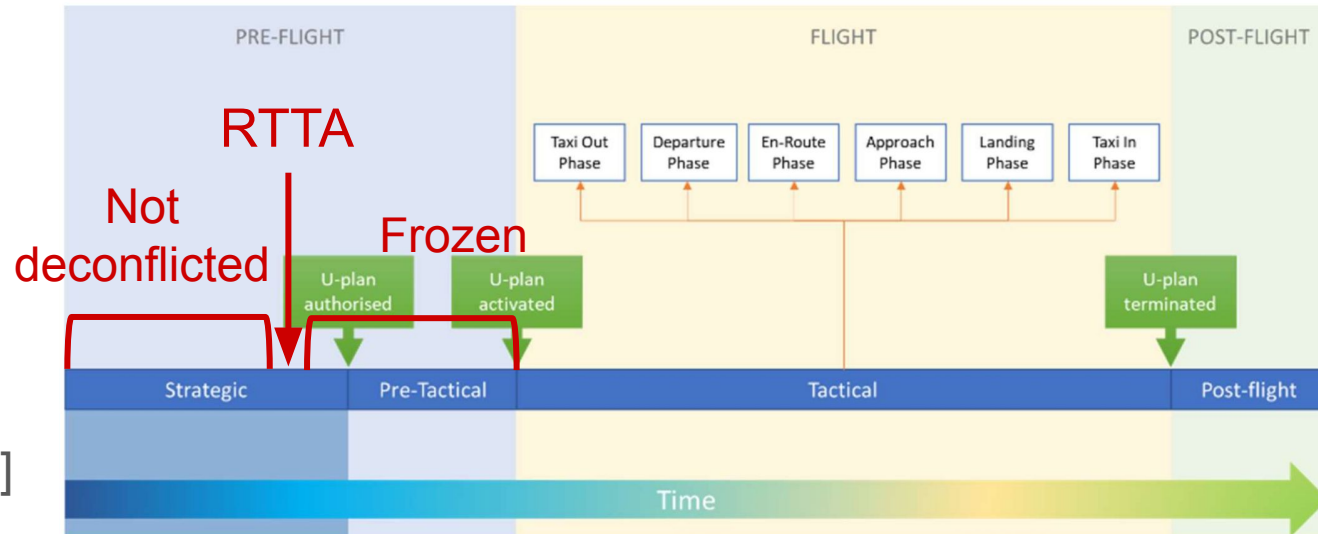
An agreed time is used as the moment to determine what is the demand and which if any U-plans are impacted if the demand exceeds the capacity. This agreed time is the “reasonable time to act,” (RTTA.) It is an **agreed amount of time before the activation**.



[CORUS-XUAM ConOps]

What is RTTA?

- Until the RTTA a U-plan is not deconflicted.
- At RTTA, the flight is subject to a **conflict resolution** process and subject to measures to **balance demand and capacity**
- U-plans that have **passed RTTA** are “frozen”



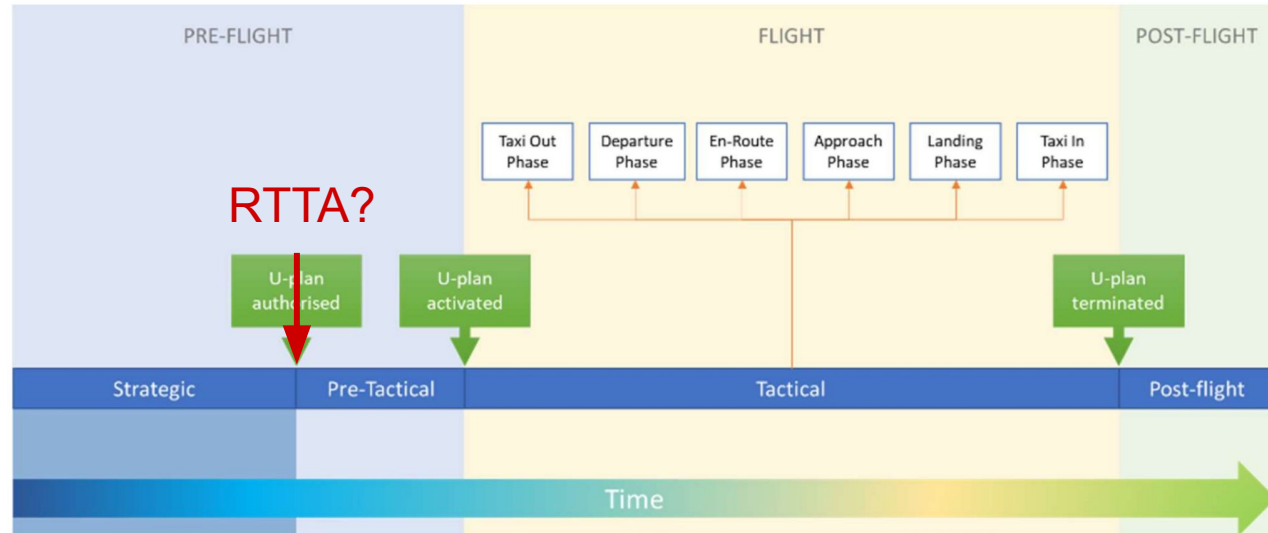
[CORUS-XUAM ConOps]

What is RTTA?

Is RTTA the boundary between Strategic and Pre-Tactical phases?

- It looks like no, RTTA can also be somewhere within the Pre-Tactical phase

To be demystified...



[CORUS-XUAM ConOps]

When RTTA too large (freeze flightplans too early)



Businesses that plan in advance

Happy:

- Prioritized
- Get approval early



On-demand businesses

Sad:

- Low priority
- Delayed or rerouted more



Airspace owners

Fine:

- Frozen flights may cancel => unused capacity
- Has time for DCB

When RTTA is 0 (plan right before departure)



Businesses that plan in advance

Very sad:

- Why plan early?
- Delays/changes at the last moment



On-demand businesses

Fine:

- Also learn about delays at the last moment



Airspace owners

Sad:

- Can't do DCB
- But good airspace utilization

QWIRTTA project

The \$1 billion question: how to choose RTTA?

The goal of the project: to quantify the influence of **weather** (uncertainty) on RTTA.

First results: [Paper at SciTech'25](#)

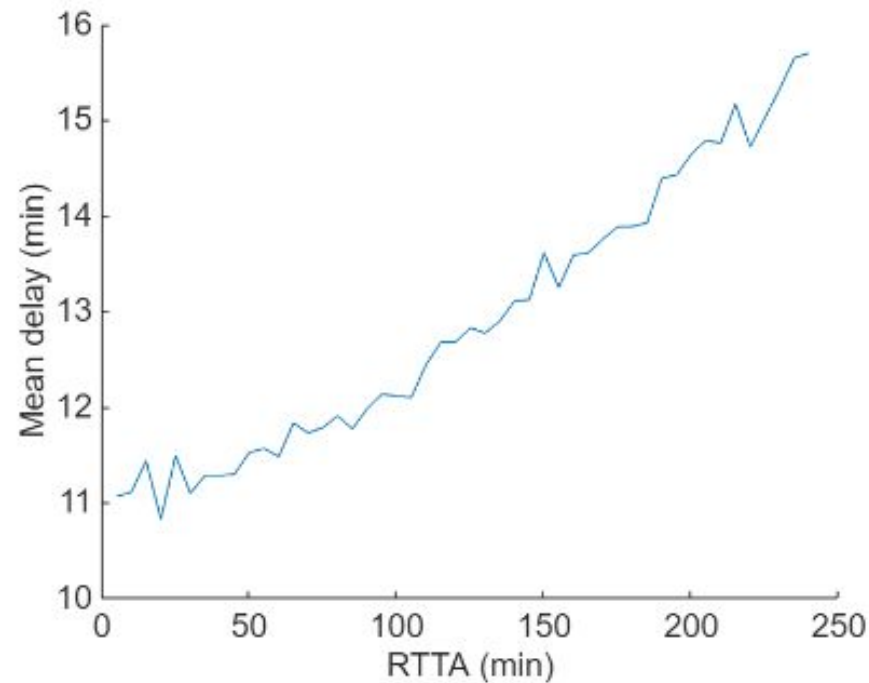
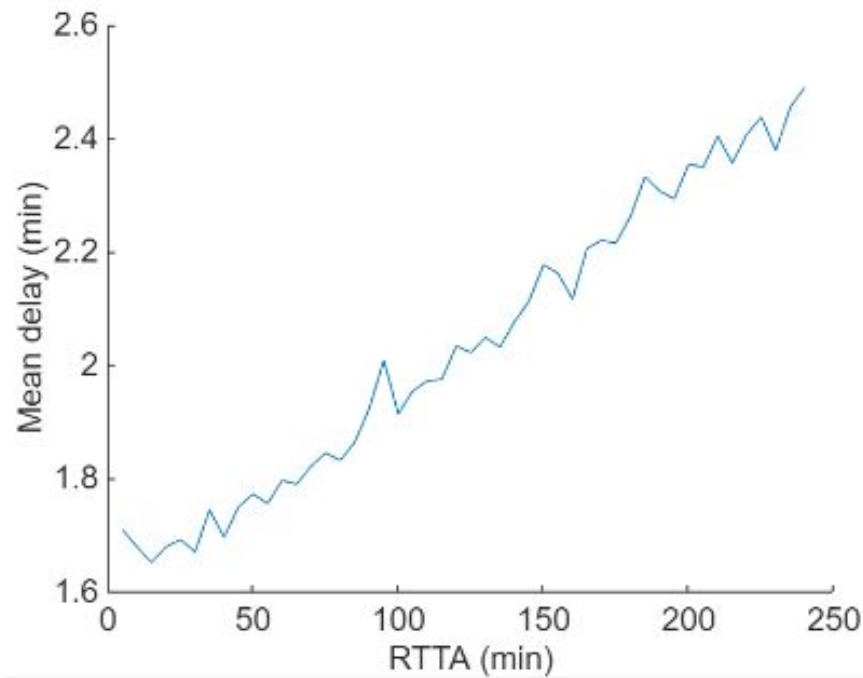


Fig. 5 Average delay per flight. Left: 850 requests/hr. Right: 1700 requests/hr.

Small RTTA: $< \text{approved}$, $< \text{delay}$. Larger RTTA: $> \text{approved}$, $> \text{delay}$, but:
 Ops know about delay earlier $\Rightarrow$ they're happier (can replan)

Price $P(D, \text{RTTA}) = [D - c \cdot \text{RTTA}]_+ \quad \forall \text{ flight} \quad (c: D \text{ vs RTTA importance})$

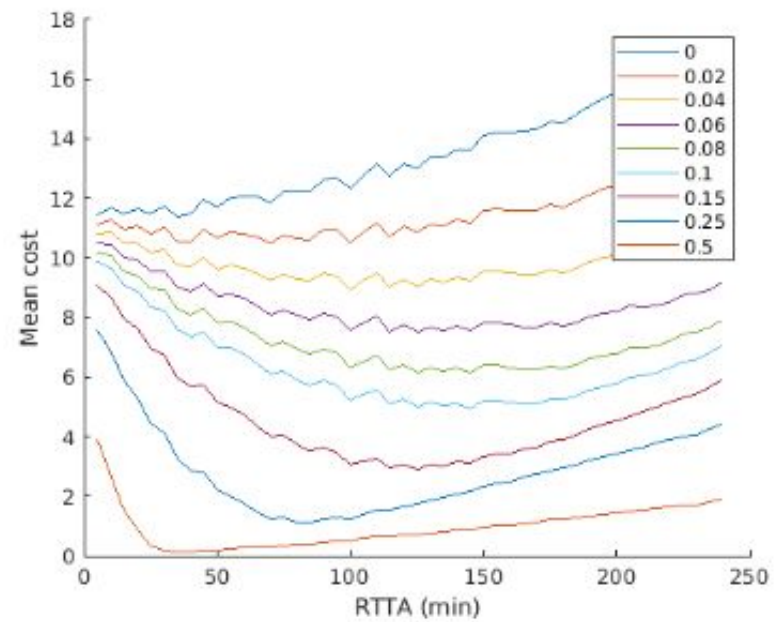
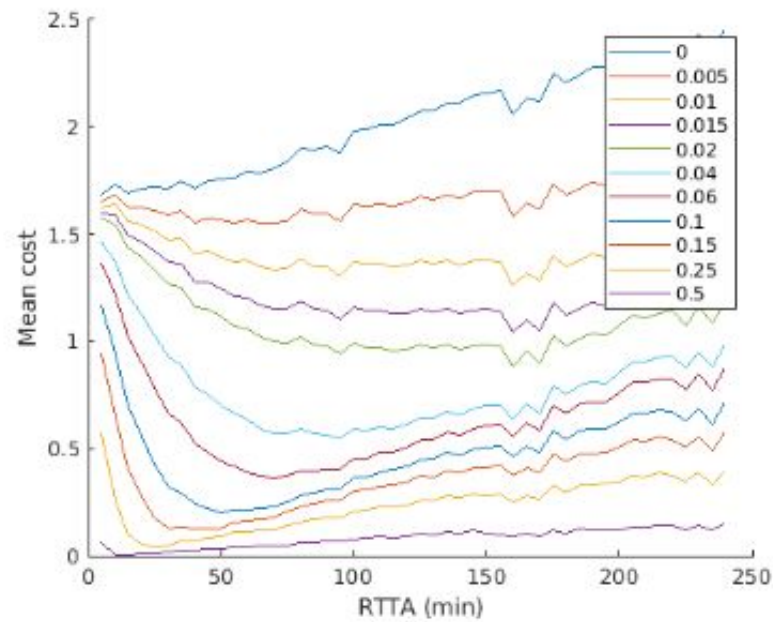


Fig. 7 The price as a function of RTTA for various c (one graph per value of c). Left: 850 requests/hr. Right: 1700 requests/hr. $c=0 \Rightarrow P=D$ (top lines = previous slide) $\Rightarrow$ min P is at $RTTA = 0$

$c \nearrow \Rightarrow$ RTTA importance (knowing about D earlier) $\nearrow \Rightarrow$ optRTTA $\nearrow$

$c \nearrow \nearrow \Rightarrow c \cdot RTTA > D \Rightarrow > \text{flights with } P=0$ (benefit from high RTTA) $\Rightarrow$ optRTTA $\searrow$

Overall: **no need to increase RTTA too much** (how much may depend on demand:
high intensity $\Rightarrow$ Ops may wanna know about delays earlier than in low-traffic scenario)

Weather Prediction

Forecast lookahead time $\nearrow \Rightarrow$
 uncertainty $\nearrow$ (prediction precision(time) $\nearrow$)
 $\Rightarrow$ separation $r \nearrow$
 (drones spacing $\nearrow$ to avoid collisions due
 unpredictable weather conditions)



earlier deconfliction
 (= RTTA $\nearrow$) $\Rightarrow r \nearrow$
 (we model: $r = r_0 + c_w \cdot \text{RTTA}$)
 $\Rightarrow$ capacity $\searrow \Rightarrow D \nearrow$

$c_w \nearrow$ (= weather influence $\nearrow$) $\Rightarrow$
 $\text{optRTTA} \searrow$

(deconflict closer to departure: we
 quantify intuition)

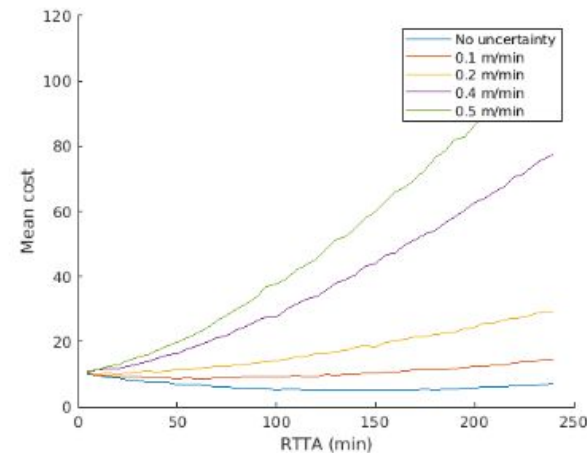
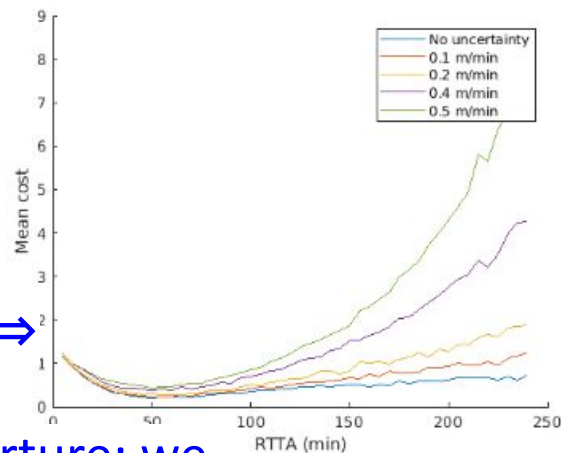
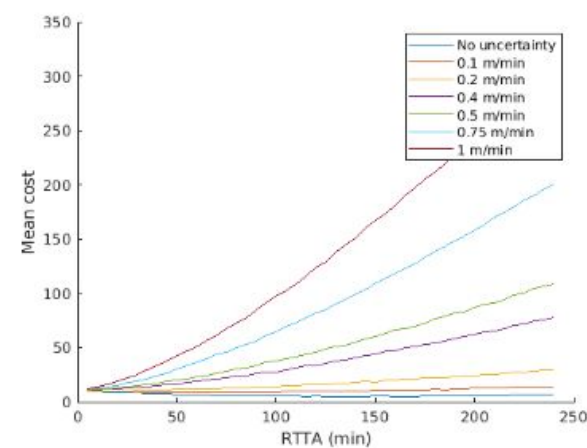
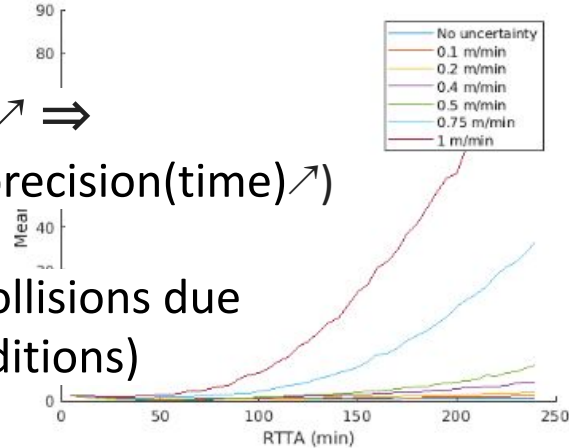


Fig. 8 The price as a function of RTTA for various coefficients of weather uncertainty c_w (one graph per value of c_w). Left: 850 requests/hr. Right: 1700 requests/hr. The bottom row is the same as the top row but zoomed in on the lower values of c_w .

Also wind uncertainties

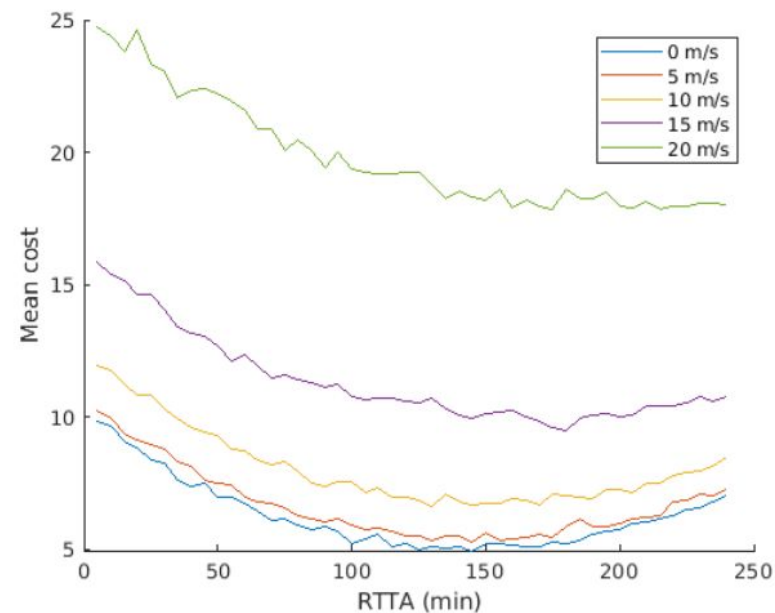
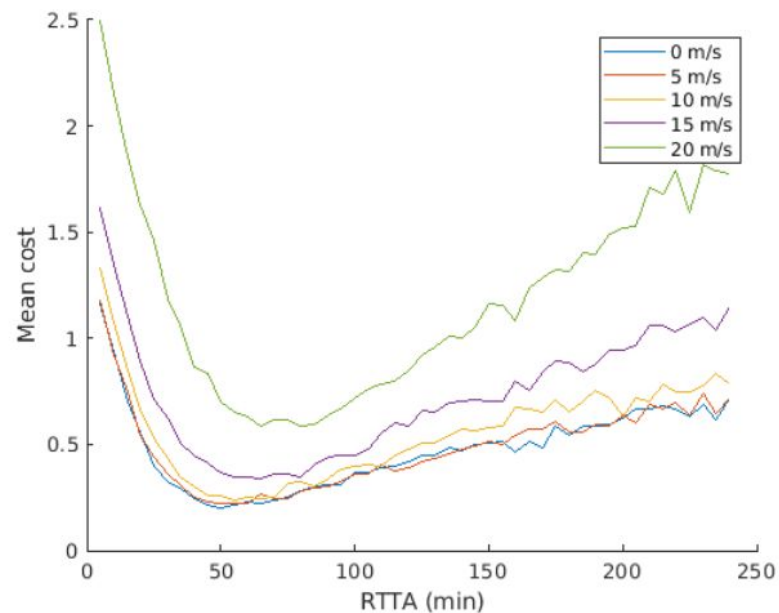


Fig. 10 The price as a function of RTTA for various wind uncertainties w (one graph per value of w). Left: 850 requests/hr. Right: 1700 requests/hr.

Future workforce?

Transportstyrelsen (The Swedish Transport Agency) @ CORUS-XUAM demo in Linköping-Norrköping said that they would need more budget to hire more people to process SORA's and other.

My vote goes to full digitalization and no new human workforce where it is not necessary (robots are fine)