FMRA
Fachgebiet Flugmechanik, Flugregelung und Aeroelastizität

Remarks on Models, Methods and Metrics for RECAT

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Modelling Approaches

Model Abstraction of physical reality

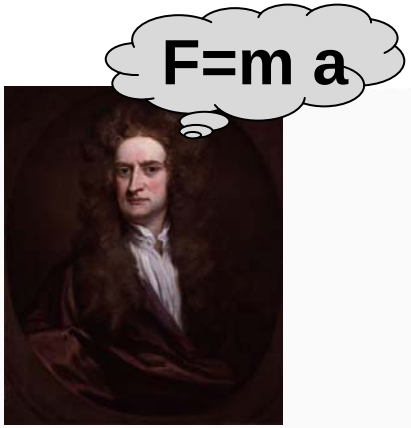
Objectives

- most accurate approximation of physical reality
- simplest possible model structure (for purpose)

Modelling approaches

- physical
- phenomenological

Modelling Approaches



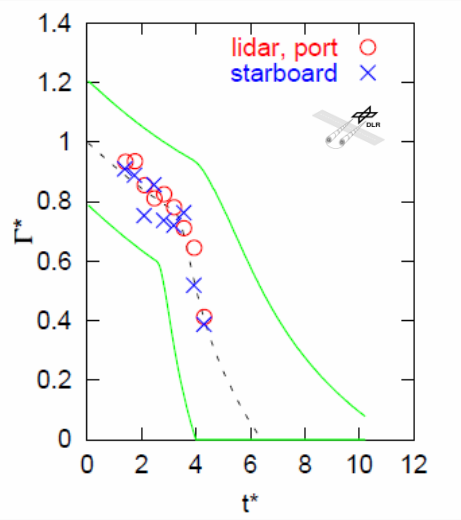
Physical modelling approach

- Model structure derived from a set of first principles
- Firm foundation in laws of physics

a first principle is a basic, foundational proposition or assumption that cannot be deduced from any other proposition or assumption.

Phenomenological modelling approach

- Empirical observations linked to mathematical structures
- Powerful, when the underlying principles are unknown



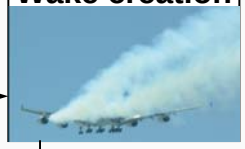
- Both approaches are successful
- Physical modelling approach is more powerful

From Wake Generation to Encounter Risk

Air Traffic	Atmosphere	Aircraft Fleet	Aircraft Operations

Wake generating aircraft

Wake creation



Initial rolled-up vortex

Wake evolution

Evolved & aged vortex

Wake encounter

vortex impact on follower aircraft

Aircraft reaction

Reaction of follower aircraft

Encounter hazard

Hazard

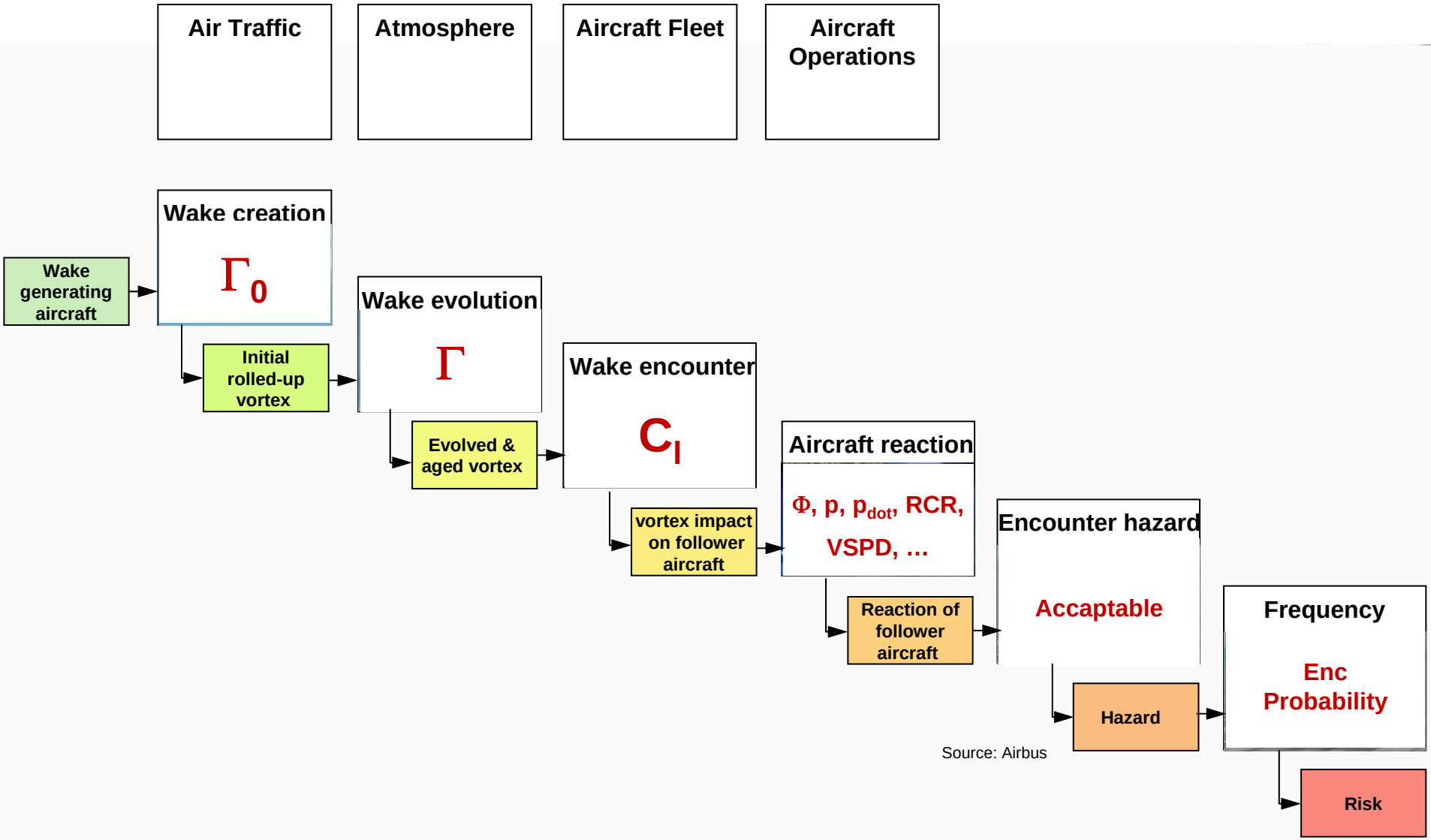
Frequency

Risk

Models needed for a quantitative safety and risk assessment of new separation standards

Source: Airbus

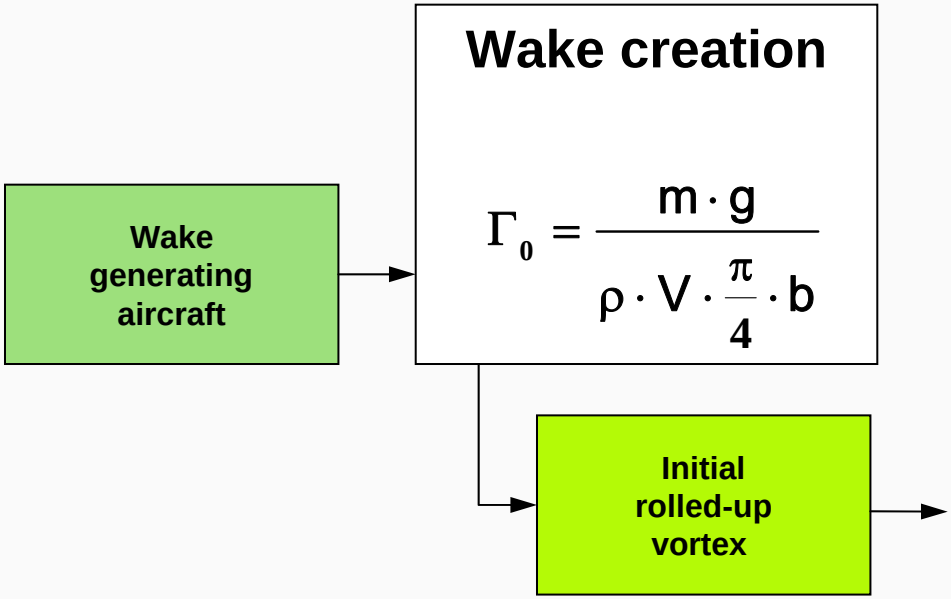
From Wake Generation to Encounter Risk



Source: Airbus

From Wake Generation to Encounter Risk

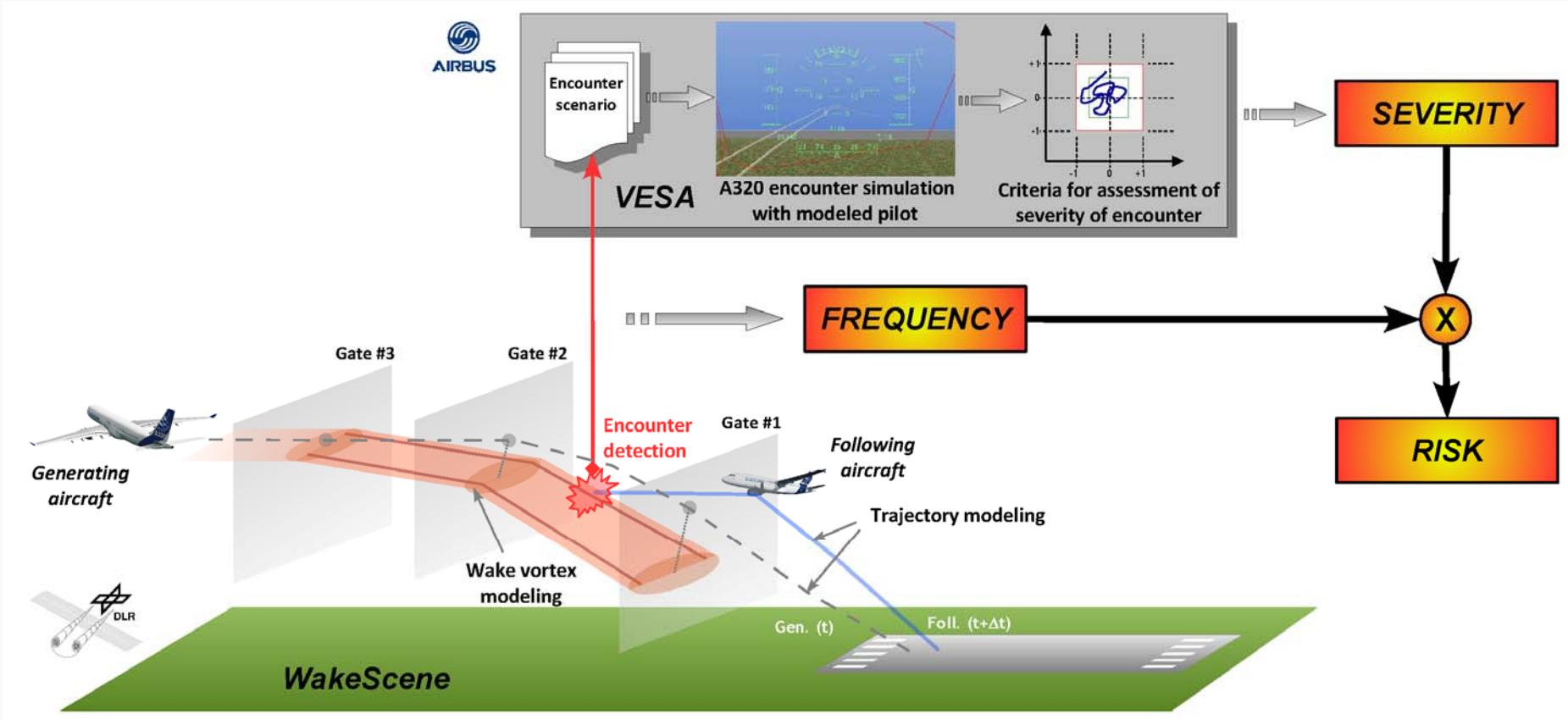
Simple models: e.g. initial circulation Γ_0



From Wake Generation to Encounter Risk

Total Process Modelling

VESA (Airbus) - WakeScene (DLR) Coupling



Remarks on Transparency

Transparency

- simple
- understandable
- open

What if process is highly complex (too complex)?

- qualified personnel
- responsibility
- formally documented process