

Need for novel approach to aviation safety validation

Mariken Everdij

*NLR Safety and
Flight Operations*

Jos Nollet

*Directorate-General for Civil Aviation
and Freight Transport (DGTL)*

Co-authors: **Henk A.P. Blom (NLR)**
Bert Kraan (QSA)

Contents

Part 1:

■ **Motivation and objectives**

Part 2:

■ **General approach**

■ **Two main results**

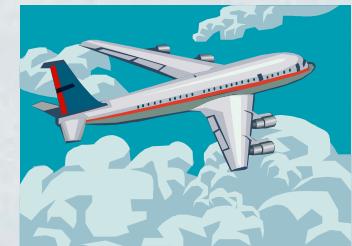
- **Safety validation Indicators**

- **Safety validation Framework**

■ **Conclusions and further work**

Motivation

- Air traffic expected to double in 20 years requires fundamental changes to the airspace structure and ATM
- Timely and adequate involvement and investment necessary of institutional parties, both at European and at National level
- Need for novel safety validation framework accepted by 35th ICAO Assembly of 2004
- To achieve international cooperation and acceptance, Eurocontrol, ECAC, EC and ICAO are actively involved



Objectives

To develop a safety validation framework for

- Safety assessment of known and **emergent hazards** (i.e. hazards that are not known from current operations)
- Giving effective **feedback to operation** designers, during all lifecycle stages of the design
- Incorporating and **strengthening best practices**
- Being acceptable for **International standardisation**

Part 1:

- **Motivation and objectives**

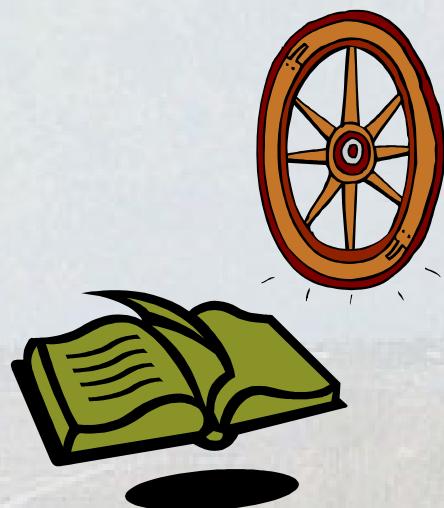
Part 2:

- General approach
- **Two main results**
 - **Safety validation Indicators**
 - **Safety validation Framework**
- **Conclusions and further work**

General approach

- **Build on and combine existing approaches:**
 - Do not try to re-invent the wheel
 - Additional verification of 'there is need for novel framework'
 - Answer to 'why exactly is existing material not satisfactory'

- **Combine into a framework**
 - Different actors recognise the activities they are already doing
 - Overall process manageability improves



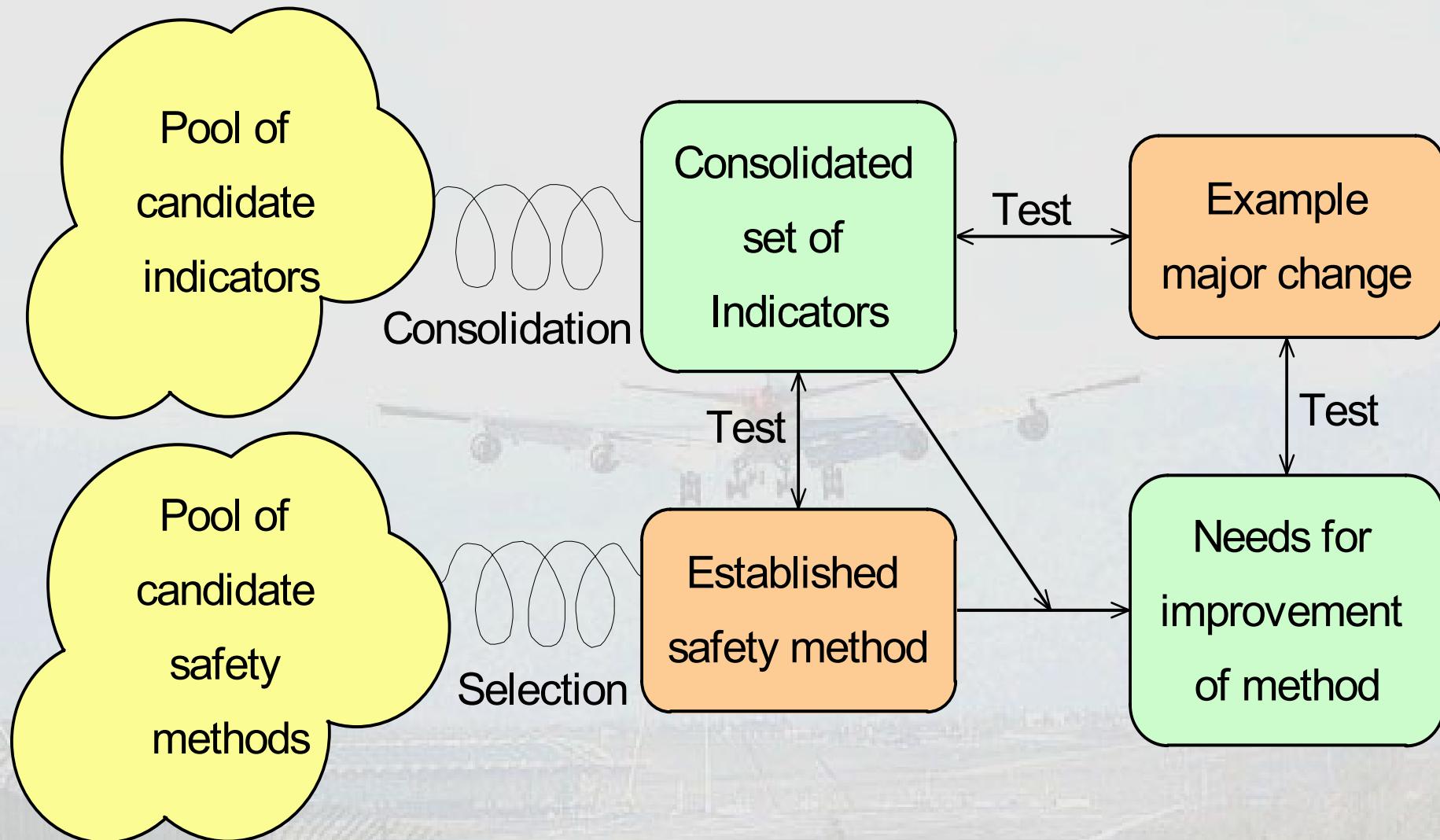
Part 1:

- **Motivation and objectives**

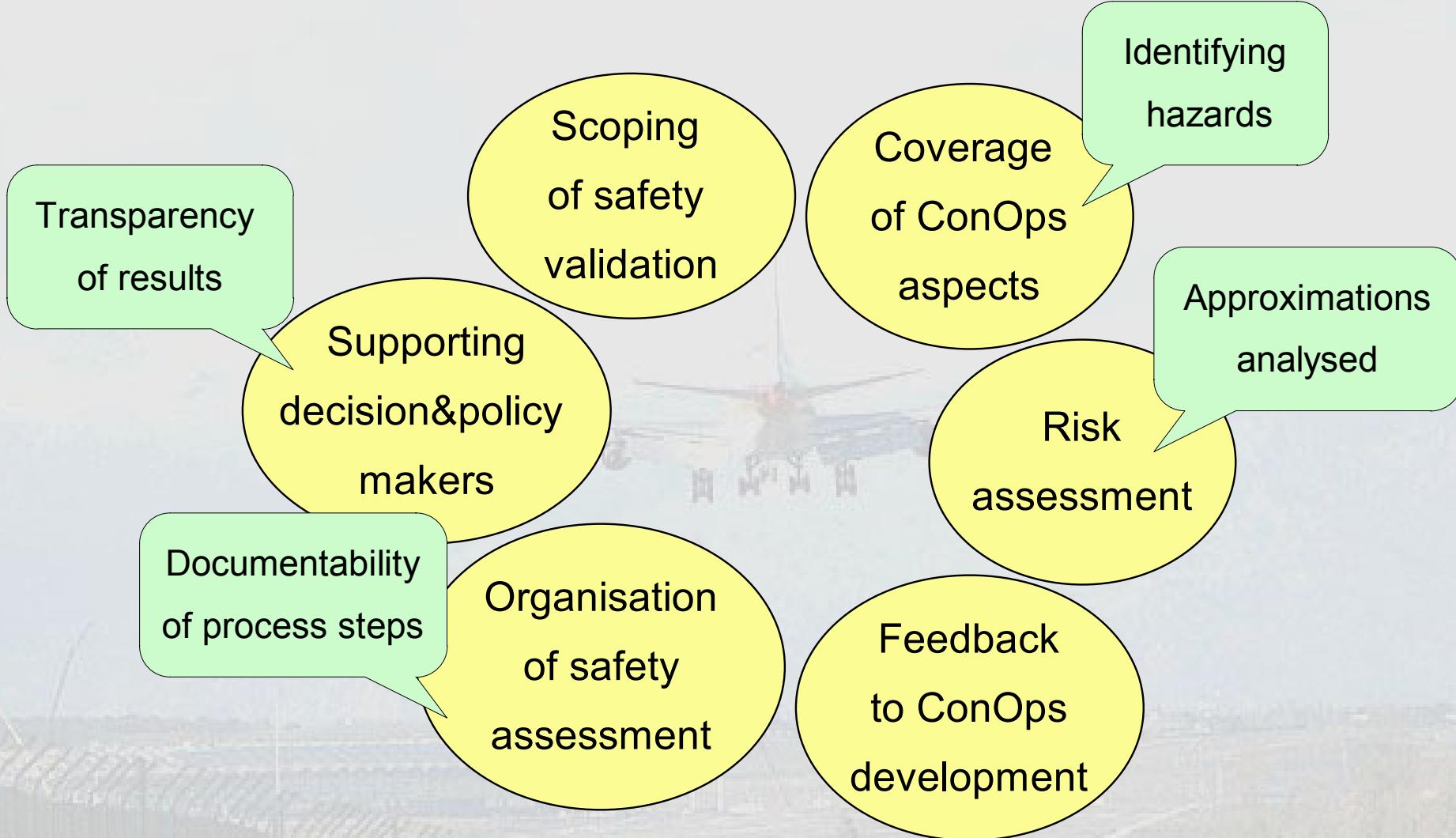
Part 2:

- **General approach**
- **Two main results**
 - **Safety validation Indicators**
 - **Safety validation Framework**
- **Conclusions and further work**

Approach to safety validation indicators



32 consolidated indicators, grouped



Evaluation against indicators of safety method for major changes:

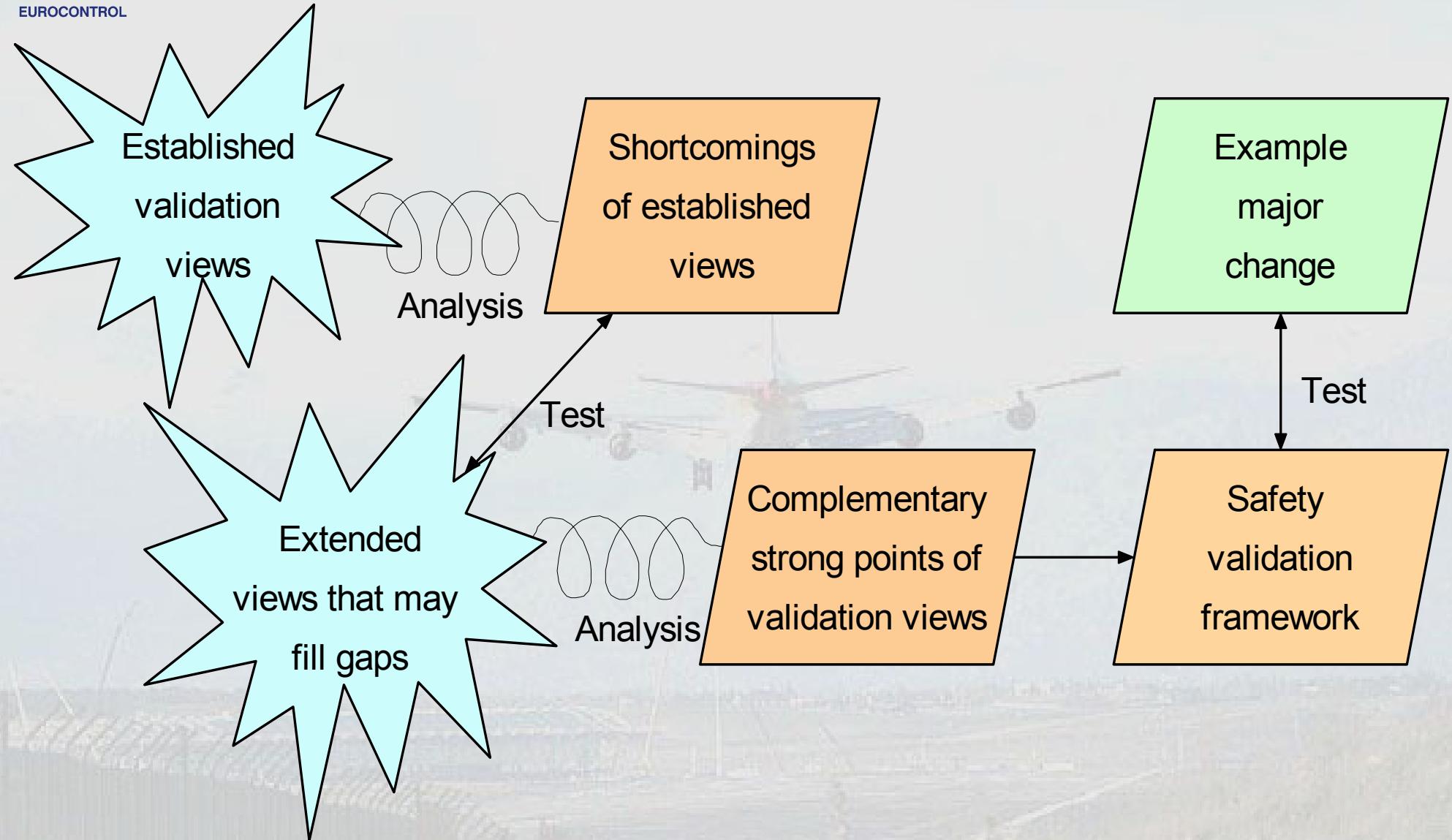
- **Work with operational concept description that is described in a goal-oriented way per human agent, which covers organisational and institutional aspects**
- **Use hazard identification methods that push the boundary from 'imaginable' towards 'unimaginable' hazards.**
- **Avoid the need for fixed event sequences in scenarios and cover hazards more explicitly**
- **Go beyond human error thinking, cover interactions between multiple agents of the operation, and with the environment**
- **Assess what has not been covered by the safety assessment (list of *all* assumptions) and communicate to operation concept designers**

Part 1:

- **Motivation and objectives**

Part 2:

- **General approach**
- **Two main results**
 - **Safety validation Indicators**
 - **Safety validation Framework**
- **Conclusions and further work**



- E-OCVM (European Operational Concept Validation Methodology)
- Design Control Practice (DCP) model
- Goal-oriented safety management
- Multi-actor safety management
- Roles of government

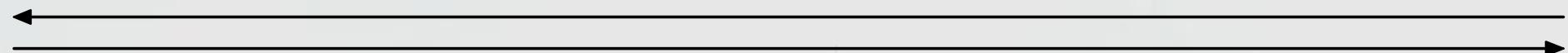
DCP model

Design

Control

Life-cycle: coordination

design development construction operation modification



goal

macro

function

meso

Design: innovation

micro

form

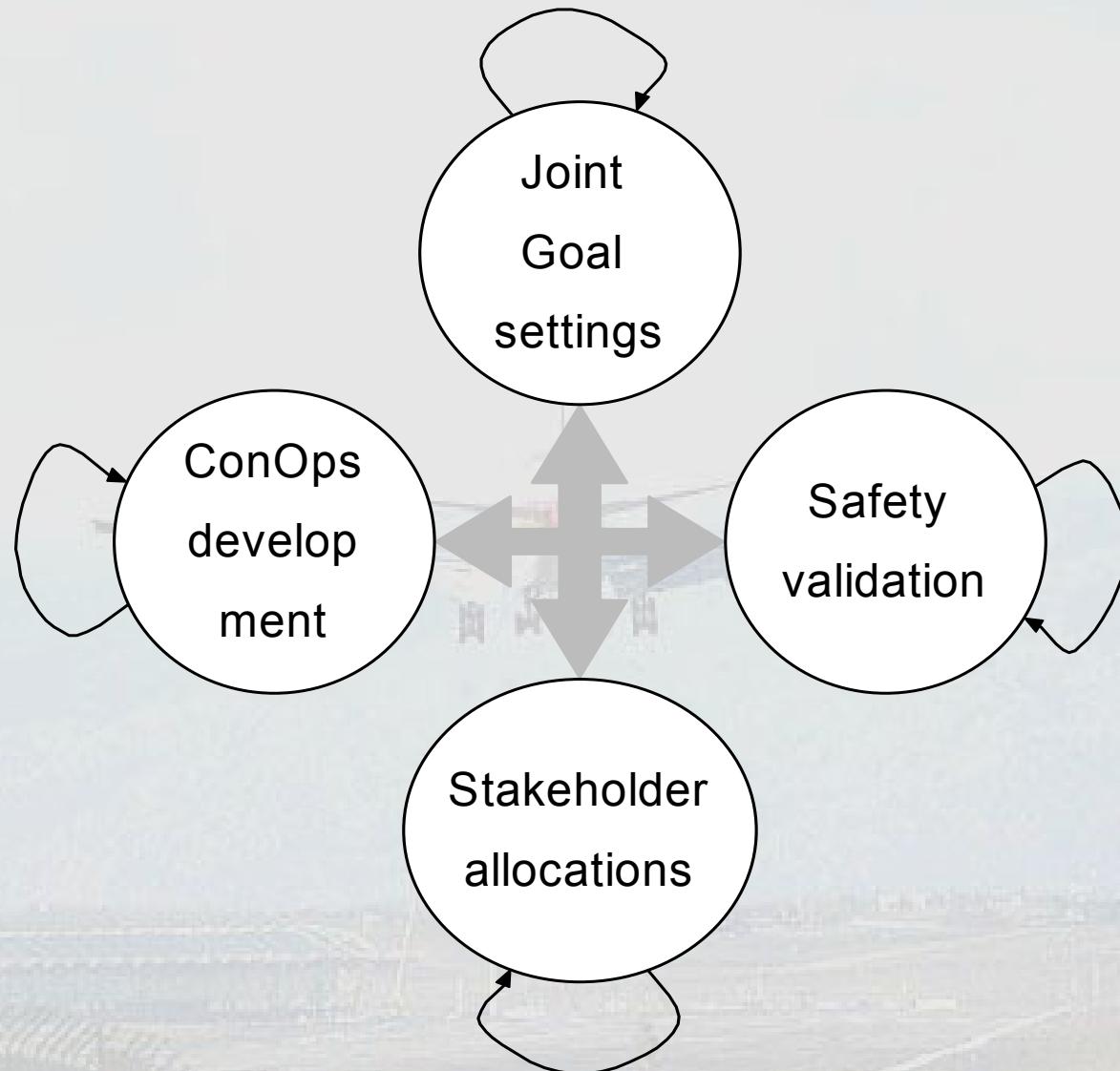
Systems-level:
integration

Practice

Copyright: J.A. Stoop, 1996

- Current way of working remains recognisable
- Different actors better see their roles at various concept lifecycle stages
- Overall design process becomes better manageable
- Avoid much higher cost due to late 'repairs' of design
- Four main processes maintained throughout lifecycle

Four processes



Part 1:

■ Motivation and objectives

Part 2:

■ General approach

■ Two main results

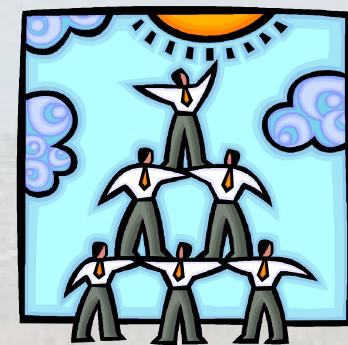
- Safety validation Indicators

- Safety validation Framework

■ Conclusions and further work

Conclusions

- This study has tested, improved and refined the international statement that there is a need for a novel safety validation framework for major changes in air transport operations
- Benefits:
 - Safety assessment of known and **emergent hazards**
 - Effective **feedback to operation** designers, during all lifecycle stages
 - Incorporating and **strengthening best practices**
- Further work:
 - Investigate additional safety methods
 - Embedding safety methods into framework
 - International standardisation
 - Application to an interesting major change



Questions / Remarks ?

