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THALES

Boom of airport capacity based on wake vortex hasards mitigation sensors and systems

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AGENDA

THALES

- Set up the scene
- What has been done
- What is to be done
- Enlarge the picture
- Questions

Setup the scene

- Operational context:
  - Gradual increase of traffic
  - Airport capacity: limited number of runways
  - Airspace design and route structure: organisation already optimised
- Effects
  - Congestions in Terminal Area
  - Airport become a bottleneck, delaying flights
  - Holding is a common occurrence for traffic (ARR/DEP)

Setup the scene

- Upcoming operational issues for airports
  - High density of traffic during rush hours
    - More dense mixed traffic pressure during rush hours (A380, B747-8)
  - Conservative Wake-Vortex Separation on the glide
    - Fixed ICAO Wake-Vortex Separation
  - Downgraded RWY capacity in adverse weather conditions
    - Extended Runway Occupancy Time (e.g. 80 s for A380 vs. 55 s for B747

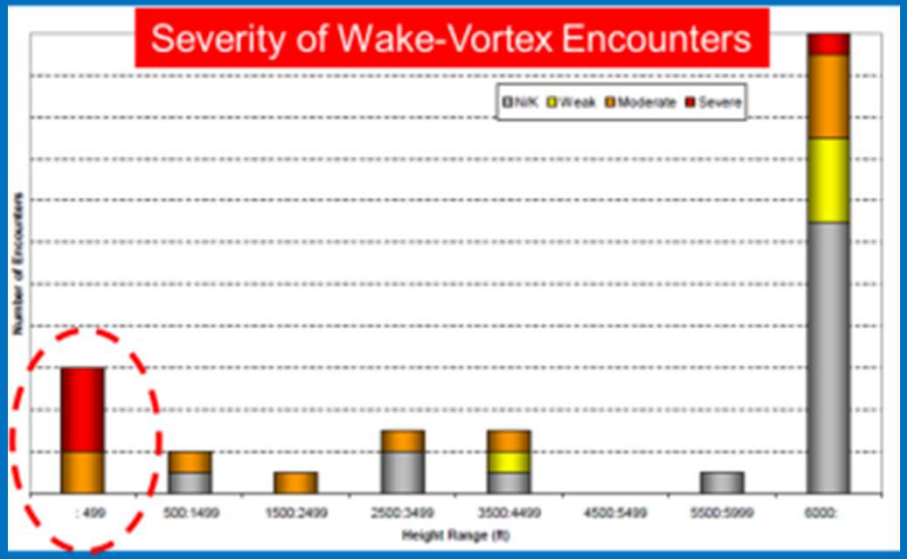
Wake vortex hazards

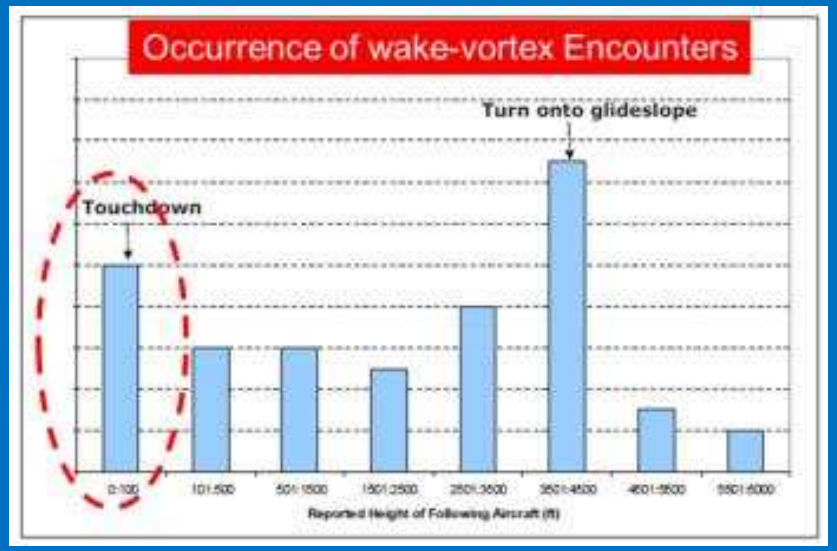
Wake-Vortex Hazards: Safety Issues

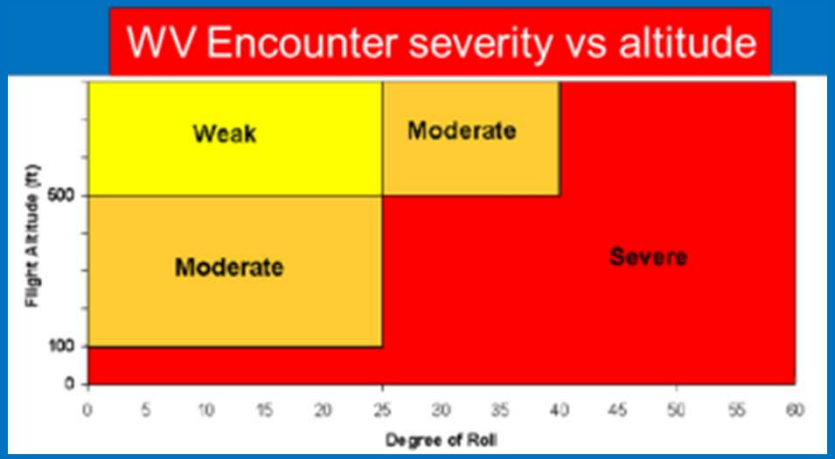
- Enquiry have shown that highest occurrence of wake-vortex encounters are:
  - At the touchdown (behind 100 feet in altitude)
  - At Turn onto glideslope (between 3500 -4500 feet in altitude)
- Severe wake-vortex encounters mainly occur under 500 feet in altitude
- Impact of wake-vortex encounter on follower aircraft is Roll Angle
- Due to flying command limits, critical Wake-Vortex Encounter is at low altitude during final approach and Initial Climb phases

Roll angle induced by wake-vortex :Critical at altitude

Wake vortex encounters



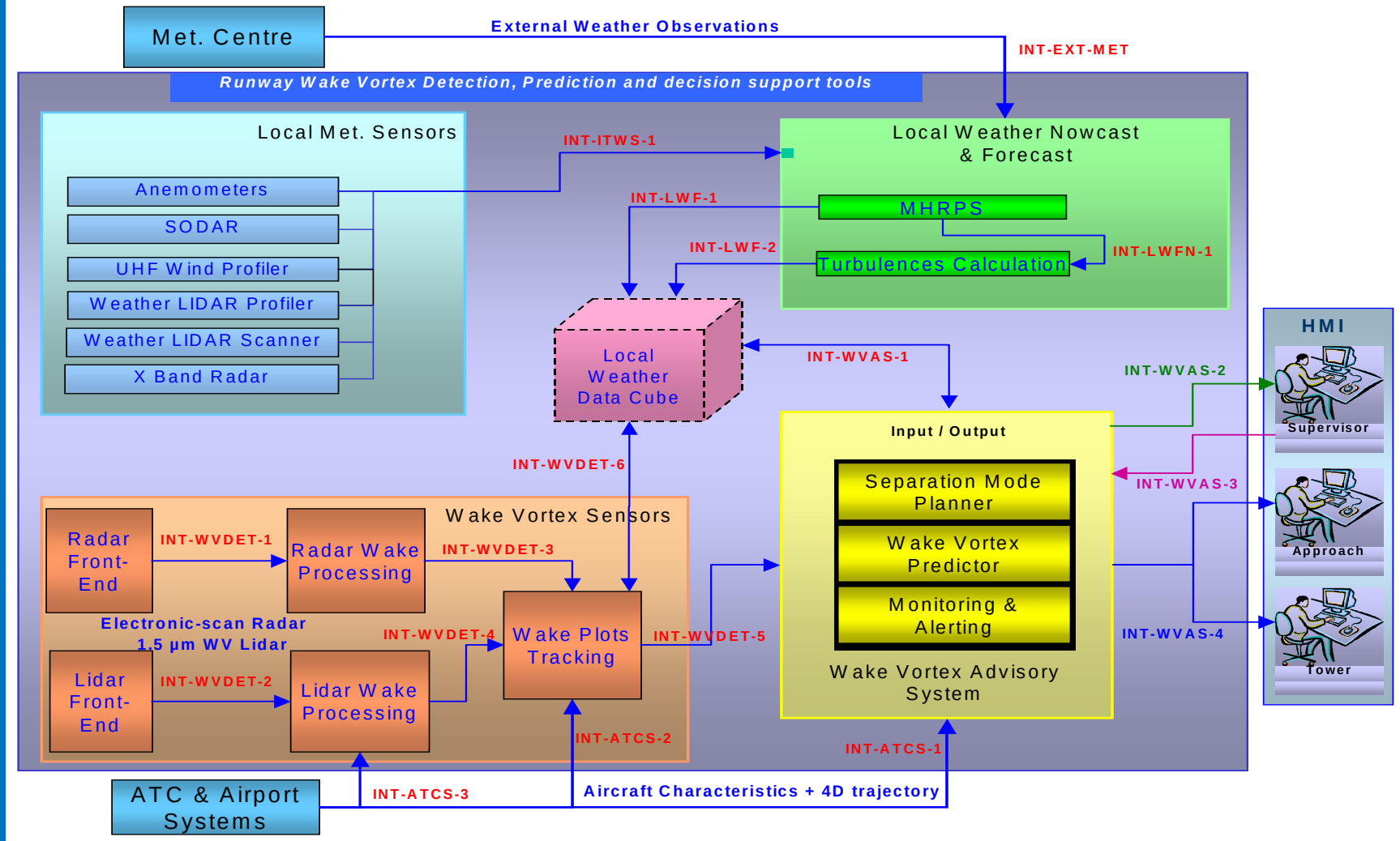




What has been done

- SESAR projects (P06.08.01&P12.02.02)
  - Operational needs
  - System definition
  - On field trial campaigns (2011, 2012)
- UFO project
  - Sensors improvement
  - Ongoing on field trial campaign
- ICAO evolution
  - RECAT 1, 2 & 3 concepts

Wake Vortex Decision Support System



3D wake vortex monitoring

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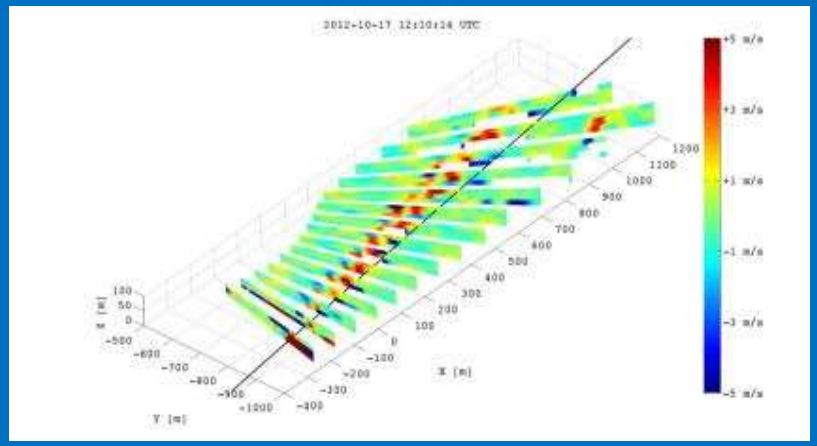
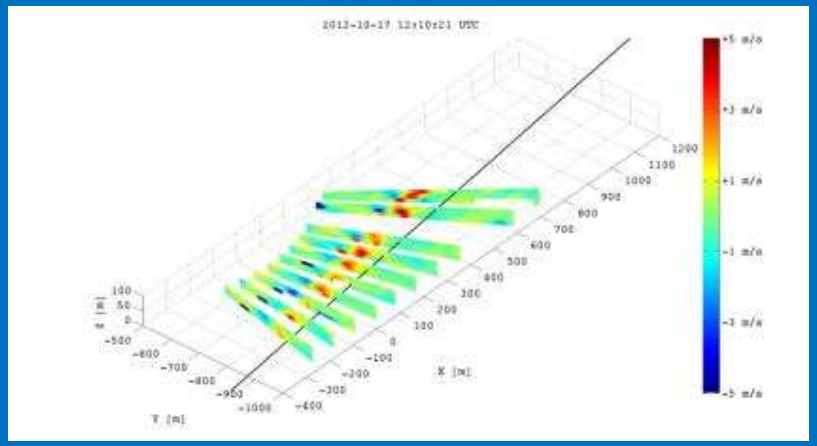
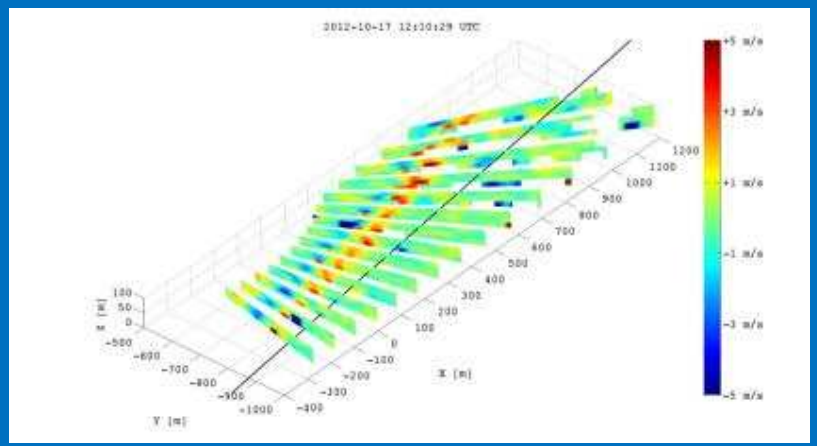
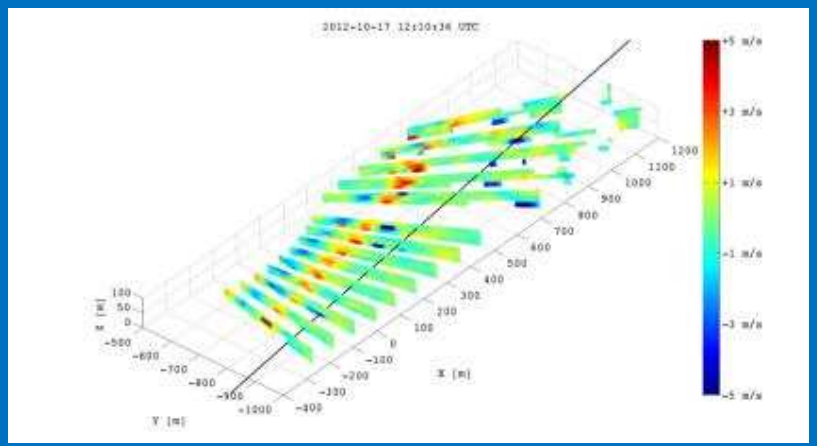
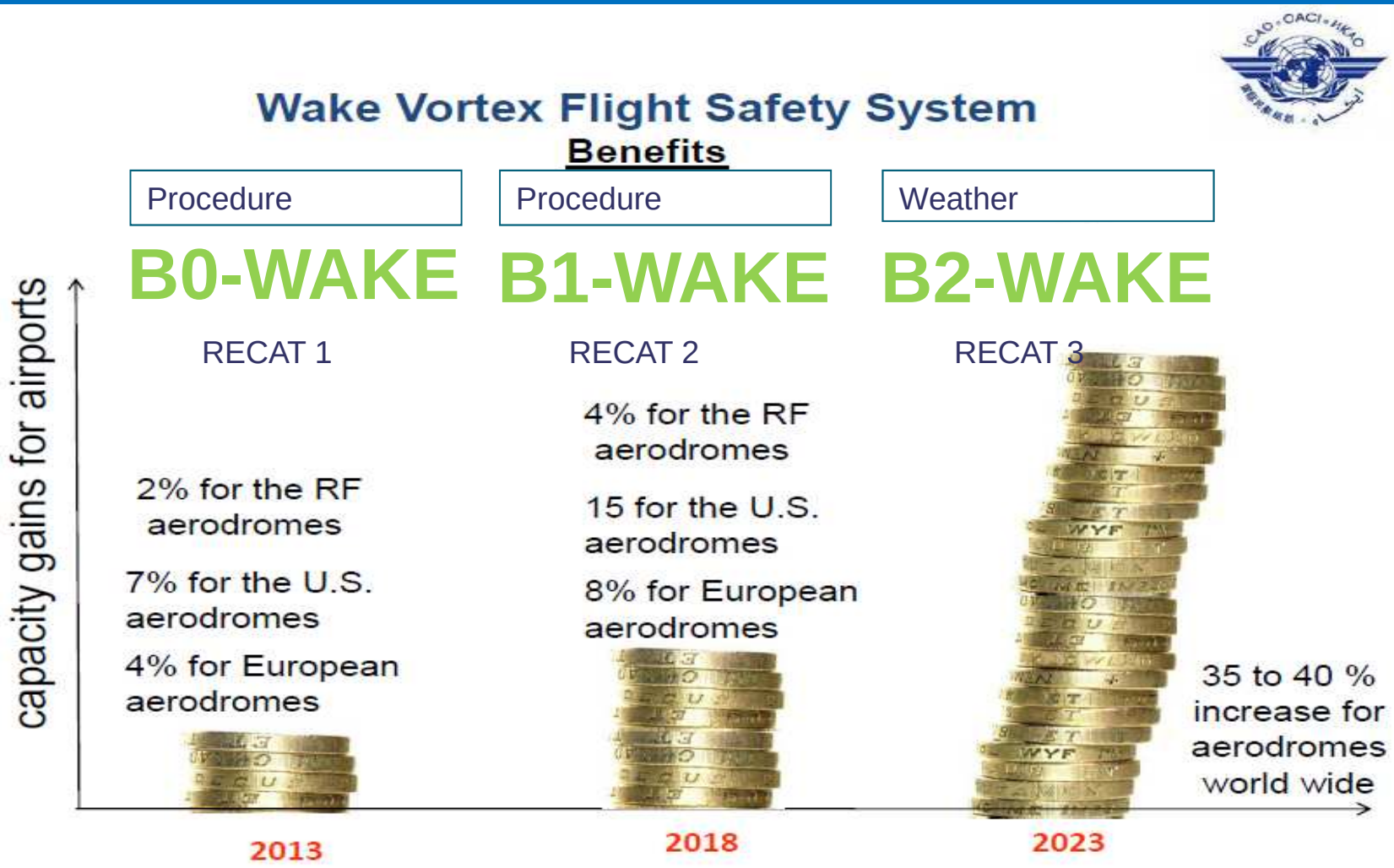








RECAT expected benefits



What is to be done

- SESAR projects (P06.08.01&P12.02.02)
  - Updated operational needs and system
  - Validation exercises (2014 & 2015)
  - Long term trial campaign (2014-2015)
- ICAO evolution
  - RECAT 1 deployment support
  - RECAT 2 integration (AMAN, DMAN, WVDSS)
  - RECAT 3 concept evolution

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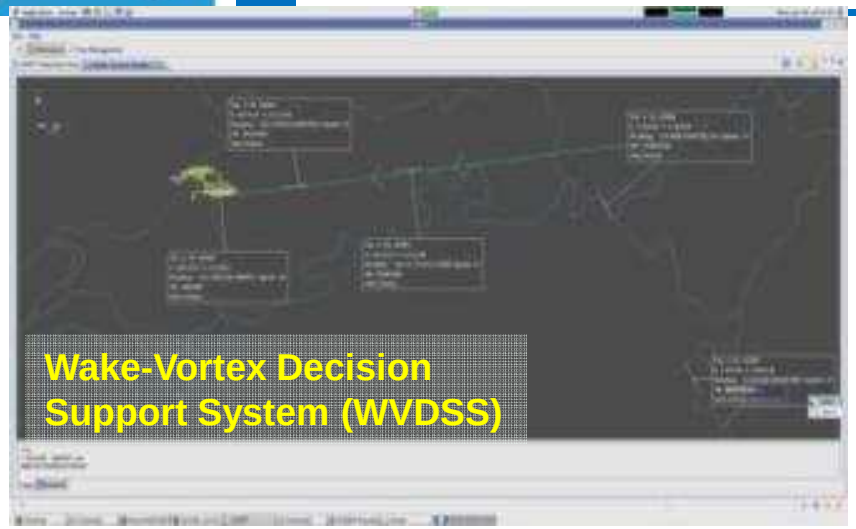
Current Thales solution

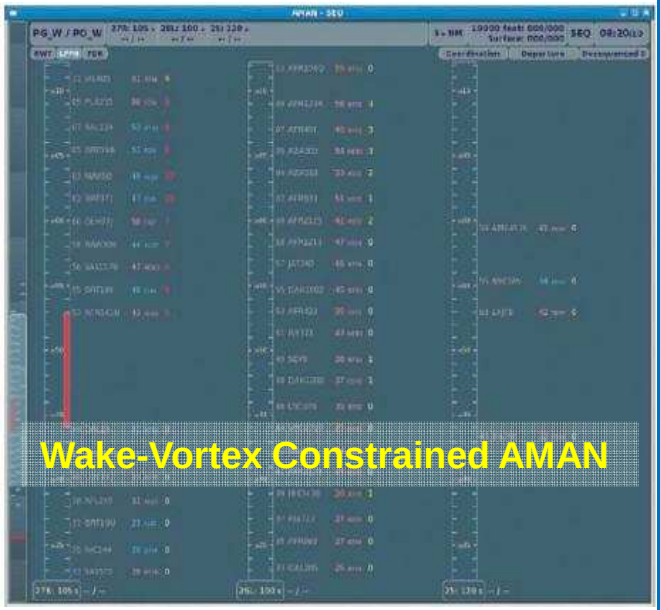
- **High Resolution Weather Forecast Model for Airport**
  - Weather Forecast Model providing weather profils in the glide (1 profil every 0.5 NM)

- **Ultra Fast (< 10 s) Airport Wake-Vortex/Wind Monitoring Sensors**
  - Radar/Lidar Wake-Vortex Sensors on final approach (alt. < 100 m) and on runway
  - Radar/Lidar Wind/EDR Sensors on the Glide until 5 NM range (alt. < 500 m)

Current Thales solution

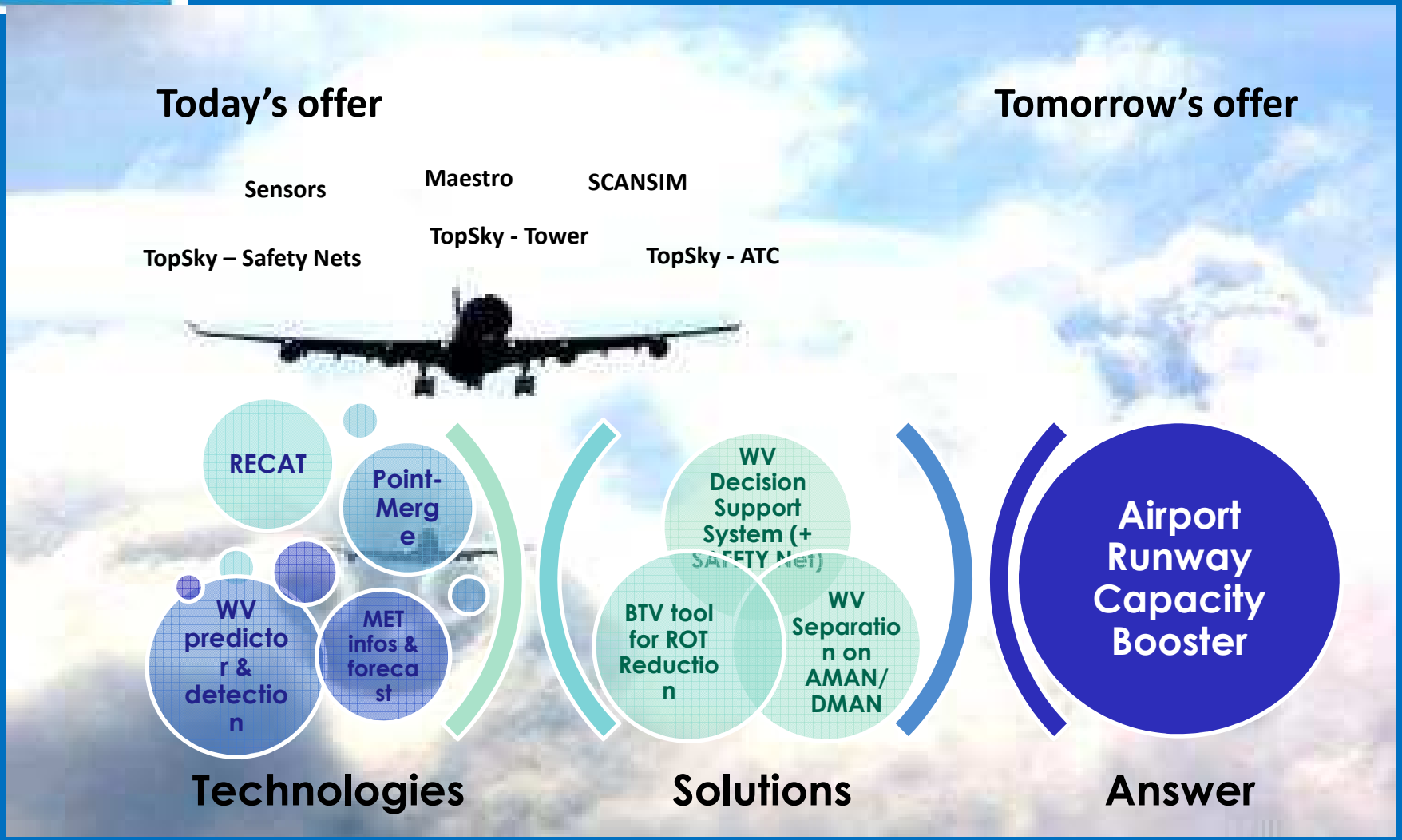


- **Wake-Vortex Decision Support System**
  - Dynamic Separation Regulation in the glide by Automation System to reduce buffers



- **New Generation AMAN with Optimal Sequencing**
  - AMAN Maestro taking into account RECAT separations for optimized sequencing
  - New procedures for sequence optimization (e.g. Point merge)

Enlarge the picture



Questions?