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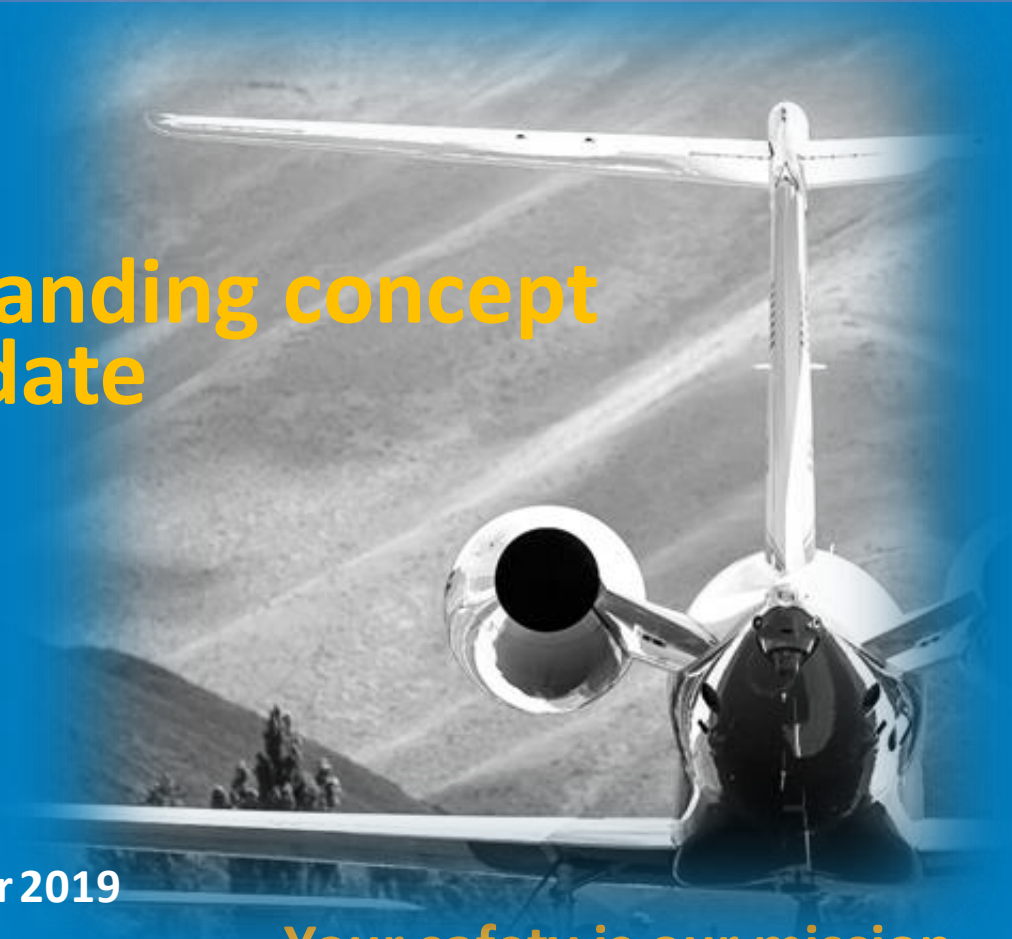
EFVS approach and landing concept
EASA update



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Content and objective

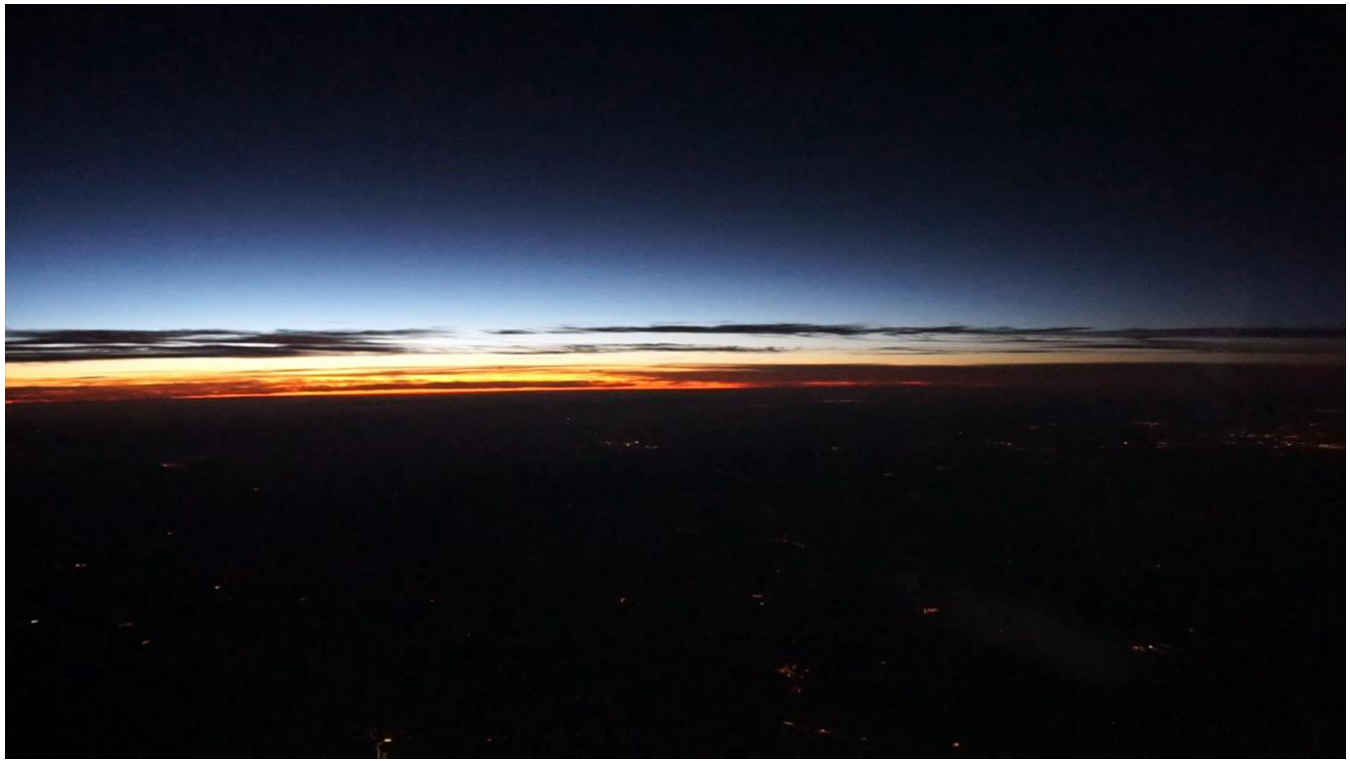
- Present a general overview of
  - Enhanced Flight Vision System (EFVS):
    - EFVS approach and landing concept and operational credit
    - Visual advantage (concept, testing, AFM entry)
  - EFVS regulations ICAO, FAA, TCAA and EASA.
    - ICAO – AWO subgroup of the Flight Ops panel. Update of the AWO manual.
    - Close cooperation with FAA.
    - EASA regulatory update
      - CS-AWO publication 1Q/2Q 2020
      - OPS + FCL + ADR opinion 3Q2020 – adoption 3Q2021.
        - OPS includes in addition to CAT, helicopters, NCC, NCO.

Enhanced Flight Vision System

Enhanced Flight Vision System (EFVS) is a system to display electronic real-time images of the external scene achieved through the use of image sensors

An EFVS is an EVS that is integrated with a **flight guidance system**, which presents the image from sensors to the pilot on a **head-up display (HUD)** or equivalent display

Enhanced Flight Vision System



Enhanced Flight Vision Systems
EFVS (EVS +HUD/HMD)

The EFVS enhances a pilot's ability to safely fly an aircraft by providing increased flight visibility for improved situation awareness and for ops credit.

Allows a pilot to identify runway lights and ground features under low visibility conditions and at night by adjusting to current conditions in real time to maintain optimal detection capability

EFVS Operation

- An operation that requires the use of an EFVS to provide enhanced flight visibility to perform the visual segment of an instrument approach procedure.

- The EVFS operation concept is to mitigate currently required ground infrastructure for Low visibility (CAT II/III ILS, etc.) by use of airborne systems.

EFVS operational credit

- EFVS Operational Credit is the ability to dispatch or begin an approach when weather is reported to be BELOW the authorized IAP visibility minimums.

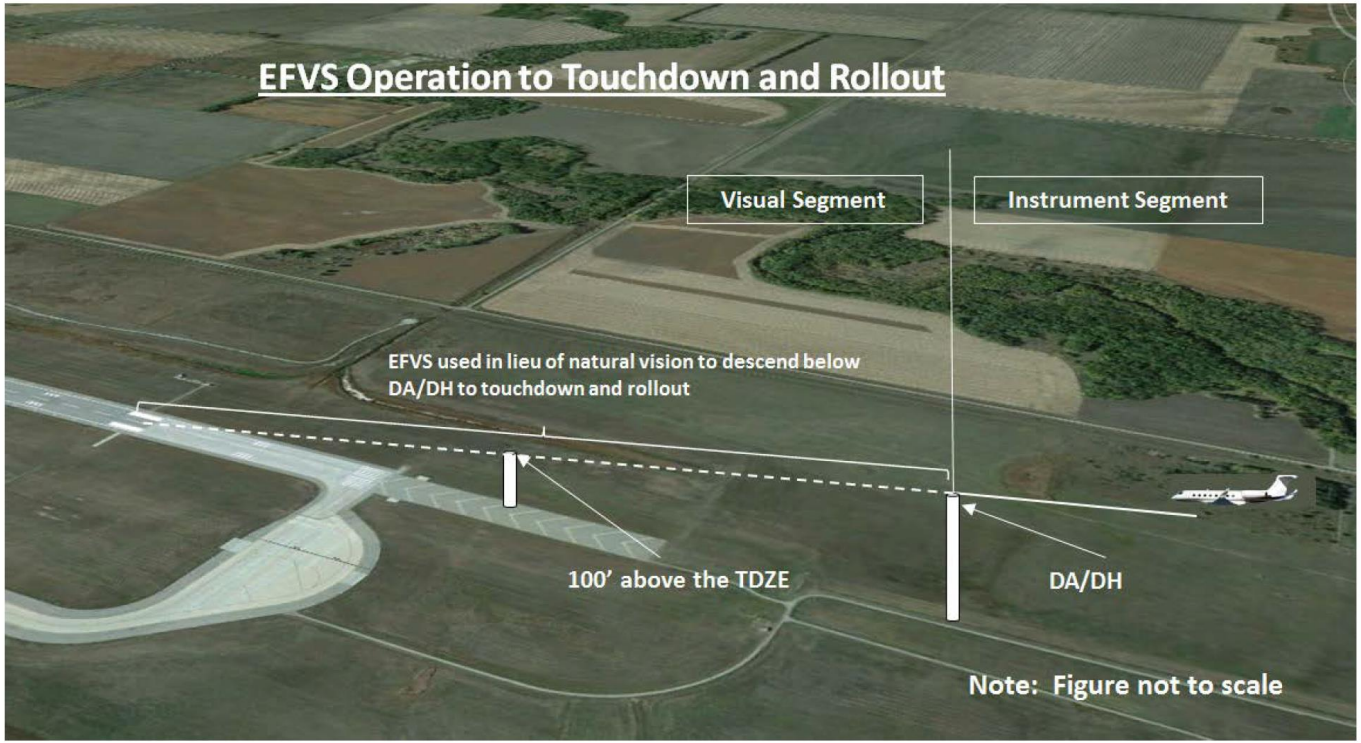
- The concept of operational credits is based on a total system approach:
  - enhance equipment in the aircraft, in conjunction with equal ground infrastructure allows lower minima, or
  - Enhance equipment in the aircraft, in conjunction with a standard minima allows lower ground infrastructure in the airport

EFVS APPROACH concept (100 ft as DH)

Operational Concept for EFVS

At 100' HAT visual references (see AMC1 CAT.OP.MPA.305(e) must be distinctly visible and identifiable (lighting, marking) without reliance on EVS

EFVS – Landing (no DH with 300 m as RVR limitation)



EFVS OPERATIONS

EFVS users receive credit to dispatch/flight release and begin approaches when reported weather is lower than IAP minimums

FAF

100 ft operation

DA, DH, or MDA

100FT above TDZ

EFVS used in lieu of natural vision to descend below DA/DH or MDA

Transition to natural vision required at 100ft to descend below 100' above the TDZE to touchdown

FAF

Touchdown operation

DA or DH

Visual advantage (VA) – actual situation

- AC 20-167A recommends documenting VA performance but provides no guidance on how and every applicant can propose their own means.
- Necessity to have a more standardized process to test and document the EFVS performance

……

- EFVS certification guidance AC 20167B (draft) introduces the VA definition and way to measure and document it in the AFM
  - VA is described in terms of Enhanced Visibility Factor (EVF).
- Updated CS-AWO (NPA 2018-06) will include an AMC for the VA determination and standardized process to document in line with AC 20-167B

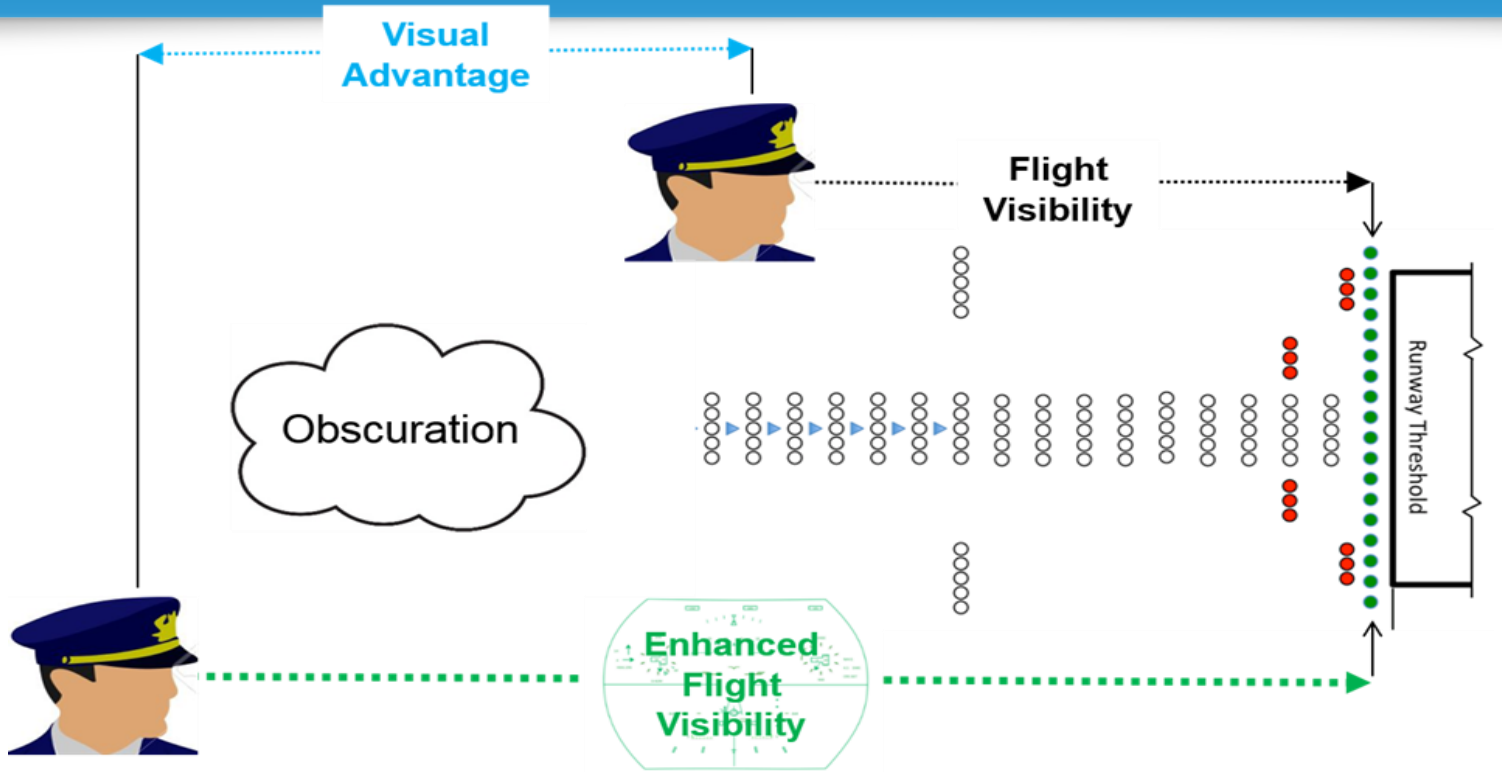
Guidance for EFVS performance demonstration (AC 20-167B)

- EFVS performance demonstrated in fog will be used to describe the EFVS visual advantage in all reported weather conditions.
- The data used to quantify the visual advantage should be collected in conditions that result in a reported or measured visibility equal to or less than 1400 feet RVR or ¼ SM of prevailing visibility.
- The data set should include a minimum of 10 approaches from at least 2 different airports.
- Accurate measuring of inflight visibility and enhanced flight visibility will likely require post flight analysis of recorded data.
  - For the measurement of enhanced flight visibility, the applicant should use imagery, as close to what is displayed to the pilot on the HUD as possible.

Visual advantage concept - definitions

- Enhanced Flight Visibility:
  - average forward horizontal distance (slant), from the cockpit of an aircraft in flight, at which prominent topographical objects may be clearly distinguished and identified by day or night by a pilot using an enhanced flight vision system
  - Visual Advantage:
    - difference between the enhanced flight visibility and the flight visibility.
  - Enhanced Visibility Factor (EVF): Visual Advantage (VA) divided by the Enhanced Flight Visibility.

Visual advantage depiction (AC 20-167B credit)



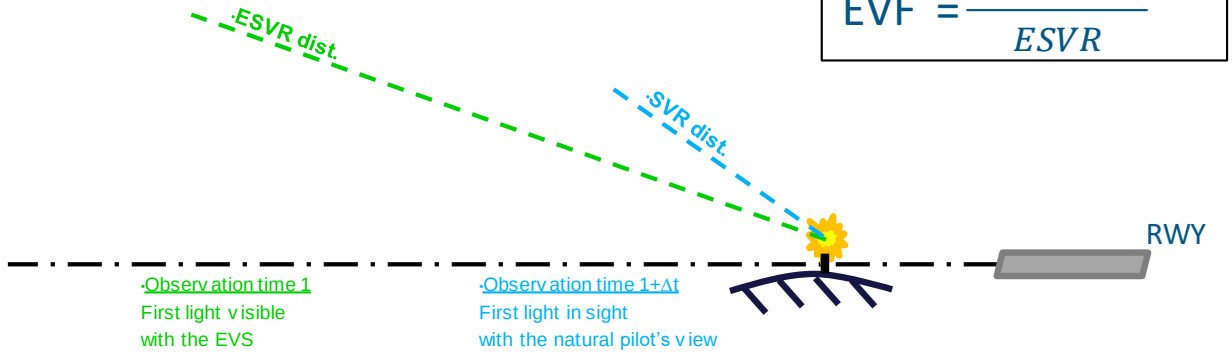
For the purposes of quantifying the visual advantage of the EFVS, enhanced flight visibility is the calculated **slant range** at which the pilot can first detect a visual reference

Visual Advantage assessment

- VISUAL ADVANTAGE (VA) – The calculated difference between the enhanced flight visibility and the flight visibility.

- ENHANCED VISIBILTY FACTOR (EVF) - The Visual Advantage divided by the Enhanced Flight Visibility. The documented Enhanced Visibility Factor should be rounded to the nearest 100th (for example 0.34).

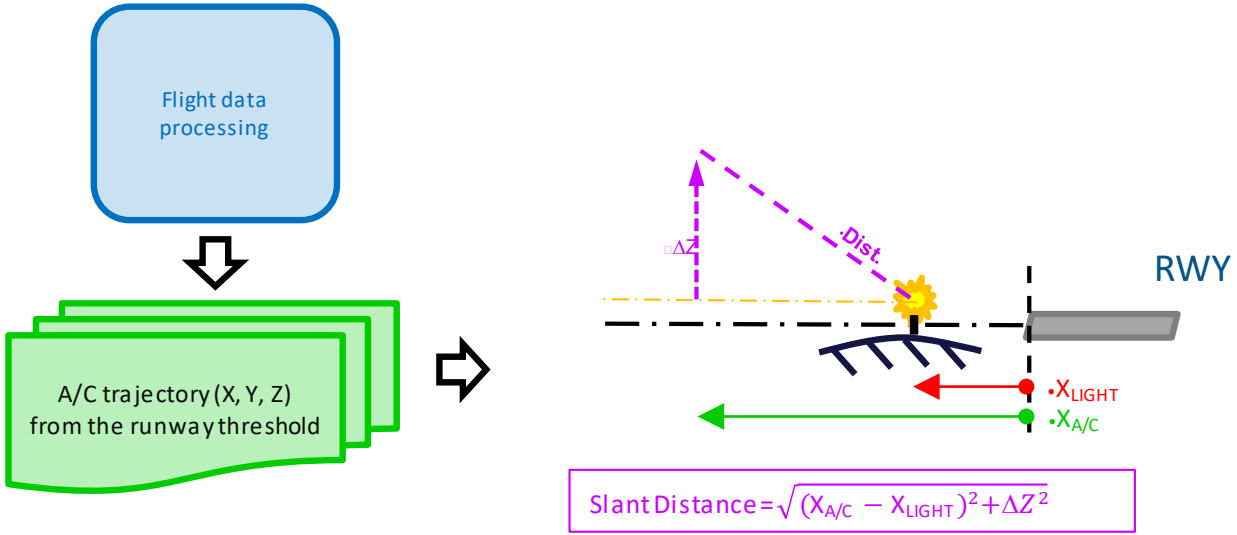
$$EVF = \frac{ESVR - SVR}{ESVR}$$



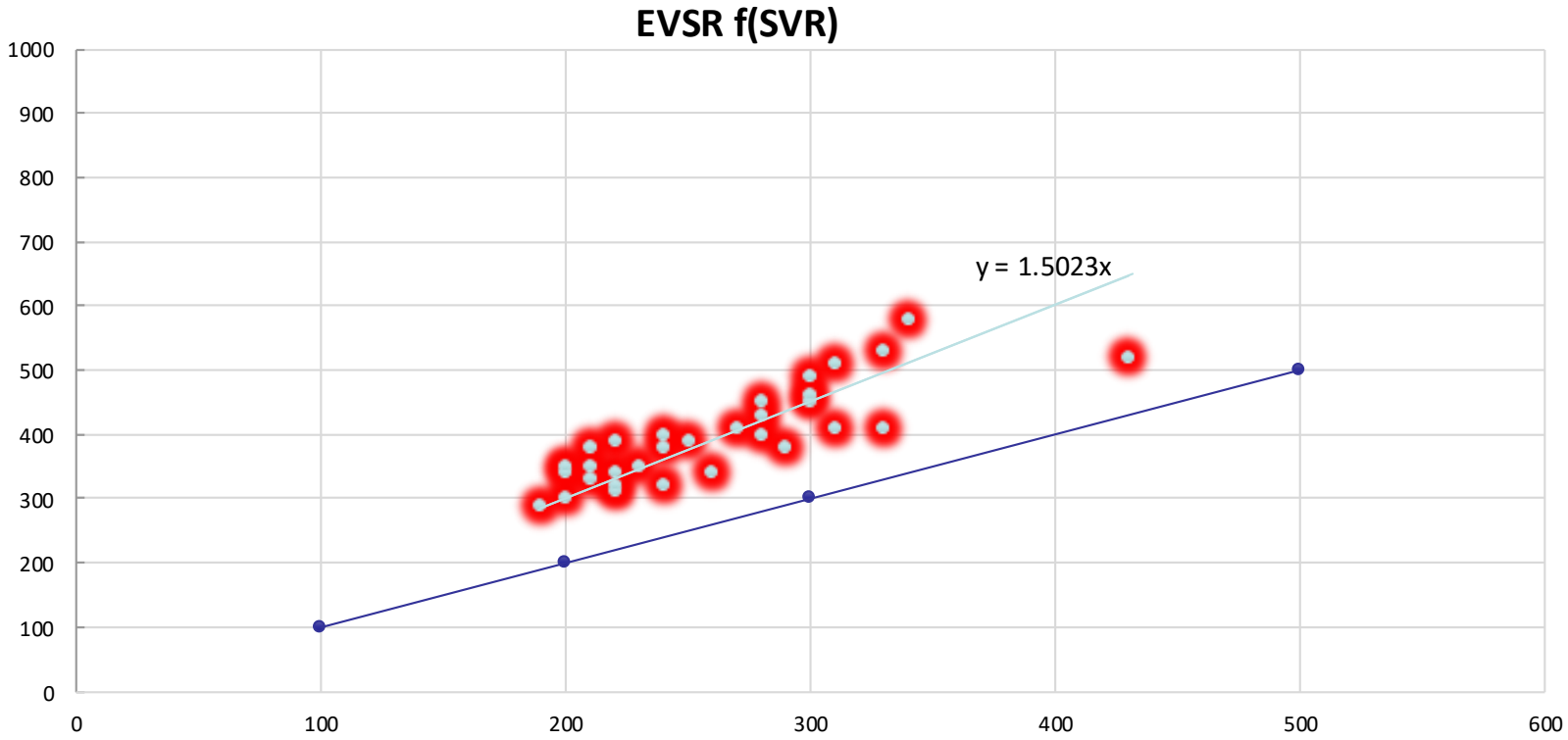
Both lights seen through the EVS and the natural vision need to be the same (???) – still to be defined

Visual Advantage assessment

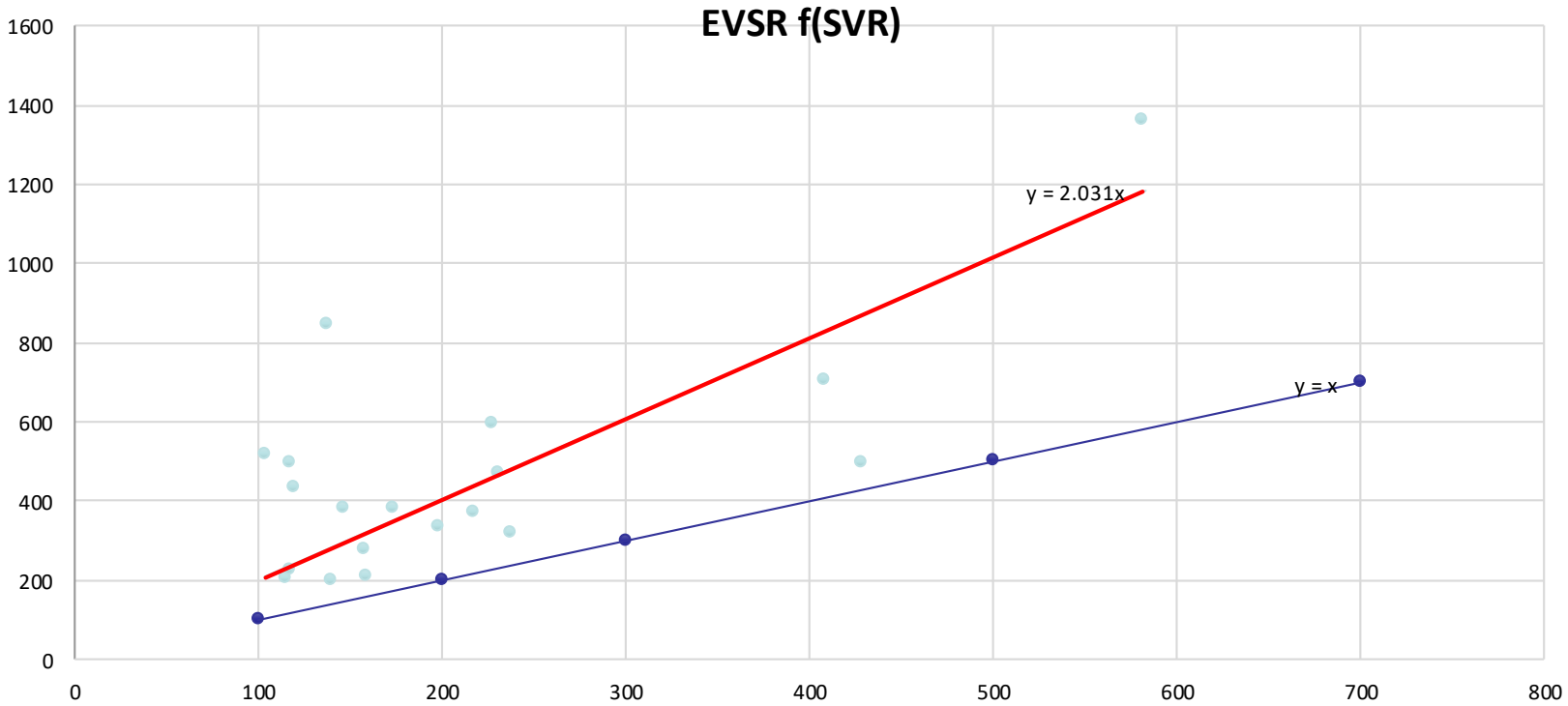
METHOD of A/C TRAJECTOGRAPHY



EVSR as function of SVR - EVF= 0.33 (example)



EVSR as function of SVR (EVF=0.5) - example



AFM proposal

- In the AFM, the demonstrated visual advantage will be in terms of the system's eligibility to reduce the IAP visibility requirement by no more than 25%, 33%, or 50%.
- AC 20-167B (draft)
  - Systems with a demonstrated EVF of 0.33 to 0.49 are eligible for a 33% reduction in visibility requirements offered by the operator's authorization.
  - Systems with a demonstrated EVF of 0.50 or greater are eligible for a 50% reduction in visibility requirements offered by the operator's authorization.

AFM entry to cater for the Visual Advantage

- For EFVS Approach (100 ft ops credit):
  - The installed EFVS system demonstrated visual advantage sufficient to meet the criteria of AMC No 6 AIR-OS Part SPA.LVO.100 low visibility operations for EFVS operation to 100 ft above TDZE.".
- For EFVS – L
  - The above sentence can be updated by reflecting the new rule:
    - e.g. likewise the AC-20167B: “The installed ABC EFVS Landing System demonstrated visual advantage sufficient to reduce the IAP visibility requirements by no more than <25%, 33% or 50%>.”.

Thanks for your attention. Questions?

Questions?

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Part II

- Flight standards -

EFVS in operations

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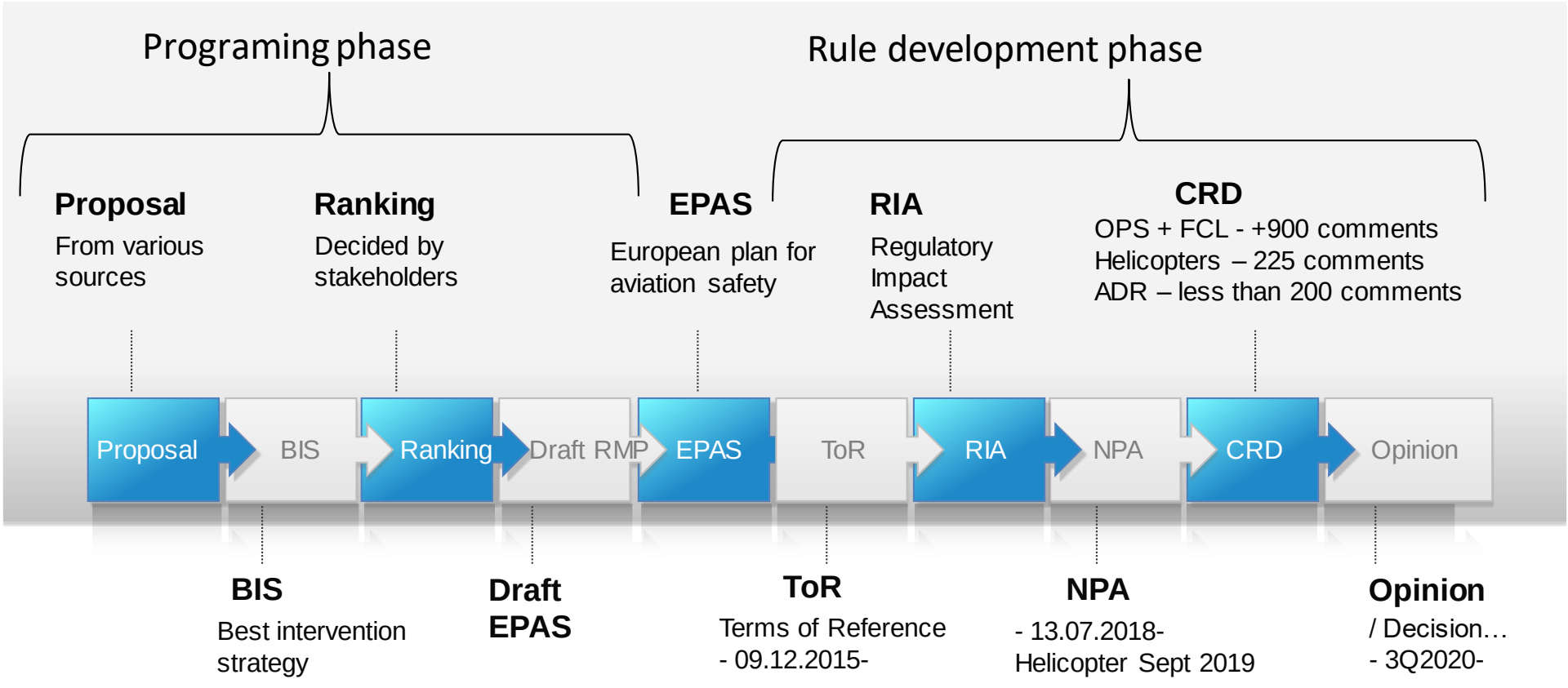
Overview of the Rulemaking activities



RMT.0379 - EFVS – Regulatory overview.

- Regulation (EU) 965/2012. Two regulatory concepts:
  - SPA approval.
  - EFVS 200feet. – New concept with NO Specific approval.
- Certification Specifications – Aerodromes (CS-ADR)
  - “EFVS ready airport”

- Certification Specifications AWO – Initial airworthiness
  - EFVS – L and EFVS – A.

CS-ADR regulatory update – RMT.0379

- → ADR must publish the ILS classification and performance data.
  - → Airport information publication.
- → ADR should "declare"(AIP) if they are "EFVS ready."
  - → *"parts of the aerodrome lighting system which are converted to LED"* and
  - → approach light switch over time – one second
- → Electronic terrain and obstacle data should be provided as default option for Precision approaches below 200 ft.
  - → Alternatively precision approach terrain chart iaw ICAO Annex 15.

EFVS – OPS + FCL – Regulatory update

- FCL – NO FCL requirements + NO Licence endorsement.
- Operations – Reg. (EU) 965/2012
  - Annex V – Specific Approval – SPA.LVO.
    - Performance based – IR valid for EFVS-A + EFVS-L.
    - Full use of the Visual advantage at certification – Removal of the fix quantify of 1/3
    - EFVS – Approach operations – AMCs proposed in the NPA.
    - EFVS – Landing operations – NO AMC proposed in the NPA.
      - Possible AMC Currently under discussion.
  - EFVS 200' concept – NO approval
    - Part NCC and Part CAT.

EFVS 200 feet. Detailed explanation.

- Applicability:
  - Part - CAT (Commercial air transport)
  - Part - NCC (Non – commercial complex motor power)
  - Under discussion - SPO (Specialised operations)
    - NCO is EXCLUDED.
- Background
  - Federal aviation administration - Part 91
  - ICAO latest proposed amendment to Attachment H of Annex 6.
    - Operational credits.
- Use – CAT I approaches with higher minima (e.g. Alicante, Biarritz…)
  - Non-precision approach

EFVS 200 feet. Detailed explanation.

Pre-approval NOT required.
Straight in approach only (+- 3degrees).
Normal change to OPS manual + Training of the pilots.

App ban:
Check if RVR above 550m

G/A

No natural vision with the Runway: G/A

MDH/DA (Minima): Visual with Runway through EFVS

At 200ft Natural vision

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Thank you for your attention

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