



# SESAR 2020 VLD - AAL2 Demonstration Report – Appendix E

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## Appendix E Human Performance Assessment Report (HPAR)

### E.1 EXE-VLD-V4-100 Human Performance Assessment Report

#### E.1.1 OBJ-VLD-V4-011 RNP to GLS Approach Pilot Feasibility Demonstration

##### E.1.2.1 Pilot Questionnaires for RNP to GLS Post-Flight Analysis

##### E.1.2.1.1 Lufthansa Pilot Questionnaires for RNP to GLS

The objective of this questionnaire is to collect your opinion with regards to the AAL2 flight trial you have just performed.

The questionnaire is divided in five sections:

- Operational
- Safety
- Workload
- Working Methods
- Additional remarks

Each section contains a set of statements to be evaluated by assessing their answers and, where possible (and requested), providing the rationale for your selections.

Please read carefully through the list of statements and select the answer that most accurately reflects your thoughts. Your selection can be made by checking either **YES** or **NO**.

If you are unsure of the answer or if you deem the question is not applicable, select **N/A**.

Please consider that the questionnaire statements focus **ONLY** on assessing new concepts introduced by the *AAL2 Large Scale Demonstration project*.

Your company AAL2 point of contact is available for clarifications.

Note: Filled questionnaires will be treated confidentially and used only for statistical purposes.

<b>ROUTE:</b>	<b>Runway:</b>
<b>Date:</b>	<b>Name: (optional)</b>
<b>Flight:</b>	<b>Role (PF/PM):</b>
<b>Wind:</b>	<b>Temperature:</b>



### 1 – OPERATIONAL

During your flight today:		YES	NO	N/A	If NO, please detail
1.1	Did you request to fly the AAL2 procedure from ATC?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.2	Did you get your ATC approval before the clearance limit?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.3	Have you been able to fly the AAL2 procedures with normal and expected system behaviour?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.4	Did you use the Autopilot in LNAV Mode before using the Approach Mode?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.5	Did you arm the Approach Mode shortly before the descent point?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.6	Did you increase or decrease your speed (during any phase of flight) on ATC request?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(If yes)
1.7	Did you notice any change in the amount of ATC communications compared to routine operations?	<input type="checkbox"/> Increase <input type="checkbox"/> Decrease	<input type="checkbox"/> No		
1.8	When flying the fixed radius turns, did you encounter normal bank angles?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.9	Have you been satisfied with the FMS Position Performance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.10	Has the transition from the fixed radius turns to the ILS / GLS been as expected and smooth?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

### 2 - SAFETY

Compared to routine operations:		YES	NO	N/A	If NO, please detail
2.1	Did you perceive that the AAL2 flight trials have not negatively influenced flight safety in any stage of the flight?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.2	Did you perceive that the ATCO's in contact during the flight were fully aware of the operational scenario of the flight trials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.3	Did you deviate from the planned ATS route on ATC request or due to adverse meteorological conditions? <b>(if YES, please detail)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.4	If you answered YES to question 2.3, did you feel that safety was ever compromised due to such deviations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

### 3 – WORKLOAD



**During your flight today, compared to routine operations:**

		YES	NO	N/A	If YES, please detail
3.1	Did you notice any differences in your workload levels?	<input type="checkbox"/> Increase <input type="checkbox"/> Decrease	<input type="checkbox"/>		
3.2	If you answered YES to question 3.1, did this affect your overall performance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3.3	If you answered YES to question 3.1, what type of workload difference did you experience?	<input type="checkbox"/> mental <input type="checkbox"/> physical <input type="checkbox"/> physiological <input type="checkbox"/> other ( <b>please detail below</b> ) <input type="checkbox"/> N/A			
3.4	If you answered YES to question 3.1, did you feel that, due to increased/decreased workload levels, safety was ever compromised?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

#### 4 – WORKING METHODS

**During your flight today:**

		YES	NO	N/A	If NO, please detail
4.1	Were you required to alter your routine working methods in order to fulfill your duties?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.2	If you answered YES to question 4.1, was AAL2 operational information, provided before the flight, exhaustive with regards to roles and responsibilities, working methods and operational requirements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.3	If you answered YES to question 4.1, did you feel that, due to alteration of working methods, safety was ever compromised?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.4	Was the information provided before the flight trial sufficient to safely perform the flight?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.5	Did you perceive any improvement with regards to flight efficiency?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

#### 5 – ADDITIONAL REMARKS



### E.1.2.2.1 Ryanair Pilot Questionnaires for RNP to GLS

The objective of this questionnaire is to collect your opinion with regards to the AAL2 flight trial you have just performed.

The questionnaire is divided in five sections:

- Operational
- Safety
- Workload
- Working Methods
- Additional remarks

Each section contains a set of statements to be evaluated by assessing their answers and, where possible (and requested), providing the rationale for your selections.

Please read carefully through the list of statements and select the answer that most accurately reflects your thoughts. Your selection can be made by checking either **YES** or **NO**.

If you are unsure of the answer or if you deem the question is not applicable, select **N/A**.

Please consider that the questionnaire statements focus **ONLY** on assessing new concepts introduced by the *AAL2 Large Scale Demonstration project*.

Your company AAL2 point of contact (BC AGP) is available for clarifications.

Note: Filled questionnaires will be treated confidentially and used only for statistical purposes.

<b>ROUTE:</b>	<b>Runway:</b>
<b>Date:</b>	<b>Name: (optional)</b>
<b>Flight:</b>	<b>Role (PF/PM):</b>
<b>Wind:</b>	<b>Temperature:</b>

#### 1 – OPERATIONAL

During your flight today:		YES	NO	N/A	If NO, please detail
1.11	Did you request to fly the AAL2 procedure from ATC?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.12	Did you get your ATC approval before the clearance limit?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	





1.13	Have you been able to fly the AAL2 procedures with normal and expected system behaviour?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.14	Did you use the Autopilot in LNAV Mode before using the Approach Mode?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.15	Did you arm the Approach Mode shortly before the descent point?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.16	Did you increase or decrease your speed (during any phase of flight) on ATC request?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(If yes)
1.17	Did you notice any change in the amount of ATC communications compared to routine operations?	<input type="checkbox"/> Increase <input type="checkbox"/> Decrease	<input type="checkbox"/> No		
1.18	When flying the fixed radius turns, did you encounter normal bank angles?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.19	Have you been satisfied with the FMS Position Performance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.20	Has the transition from the fixed radius turns to the ILS / GLS been as expected and smooth?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

## 2 - SAFETY

Compared to routine operations:

YES NO N/A If NO, please detail

2.5	Did you perceive that the AAL2 flight trials have not negatively influenced flight safety in any stage of the flight?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.6	Did you perceive that the ATCO's in contact during the flight were fully aware of the operational scenario of the flight trials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.7	Did you deviate from the planned ATS route on ATC request or due to adverse meteorological conditions? <b>(if YES, please detail)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.8	If you answered YES to question 2.3, did you feel that safety was ever compromised due to such deviations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

## 3 – WORKLOAD

During your flight today, compared to routine operations:

YES NO N/A If YES, please detail

3.4	Did you notice any differences in your workload levels?	<input type="checkbox"/> Increase <input type="checkbox"/> Decrease	<input type="checkbox"/>		
3.5	If you answered YES to question 3.1, did this affect your overall performance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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3.6	If you answered YES to question 3.1, what type of workload difference did you experience?	<input type="checkbox"/> mental <input type="checkbox"/> physical <input type="checkbox"/> physiological <input type="checkbox"/> other (please detail below) <input type="checkbox"/> N/A			
3.4	If you answered YES to question 3.1, did you feel that, due to increased/decreased workload levels, safety was ever compromised?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

#### 4 – WORKING METHODS

During your flight today:		YES	NO	N/A	If NO, please detail
4.3	Were you required to alter your routine working methods in order to fulfill your duties?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.4	If you answered YES to question 4.1, was AAL2 operational information, provided before the flight, exhaustive with regards to roles and responsibilities, working methods and operational requirements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.3	If you answered YES to question 4.1, did you feel that, due to alteration of working methods, safety was ever compromised?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.4	Was the information provided before the flight trial sufficient to safely perform the flight?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.5	Did you perceive any improvement with regards to flight efficiency?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

#### 5 – ADDITIONAL REMARKS

### E.1.2.2 RNP to GLS Results and Conclusions

#### E.1.2.2.2 Lufthansa



The core objective from the human factor's perspective was to collect subjective data on pilot and system performance as well as perception of the RNP to GLS approaches flown with A320 family aircraft using newly designed RNP to GLS approaches with RF legs at Bremen airport onto varying runways.

### *Facility and Contributors*

The approaches were performed by DLH revenue flights using GLS equipped Airbus A319, A320, A321.

All flights were performed with dedicated crews (mainly training Captains or other management pilots) that were briefed with handout and/or CBT.

### *Procedure*

The flight Crews (CPT/SFO/FO) were allocated and briefed (F2F and Handout) by the AAL2 Team together with the respective fleet management. All crew members had the required information package supplied via e-mail and hardcopy in their crew mailboxes. This package contained the Handout and the crew feedback form (see Appendix F). The filled-out forms were returned via Company Mail to the AAL2 team where they have been analyzed and kept for further clarification with the crew that have been necessary. In such cases the Demo team contacted the crews and the F2F Feedback also found its way into the HF POV.



### *Data Collection, Data Analysis and Results*

The questionnaire used was divided into 4 main sections:

- Operational
- Safety
- Workload
- Working Methods

The Lufthansa has flown 12 RNP to GLS Revenue Flights at Bremen airport with Airbus A320 family aircraft, most of them to RWY 27 via point VERED. The RNP Transition is designed with Altitude Constraints (Max and Min altitude windows) which allows aircrafts to fly continuous descent profiles.

Operationally speaking, there were some changes required in cooperation with ATC as the descent was initiated at a pilots desired Top of Descent, but this was not an issue as the traffic volume in this specific sector remains usually quite low. From monitoring the fully managed descent profile, there was some additional workload experienced when flying the transition for the first time, but that decreased as pilots flew the transition multiple times. This had no impact on flight safety as the workload always remained at a very acceptable level. Generally speaking, the transition can be well managed with the knowledge of Constant Descent Operations that has been in place at FRA and MUC for many years now. There is no change in working methods required. Therefore, RNP to GLS approaches were assessed as feasible from pilot point of view.

It must be added that all DLH flight crews experienced low performance of the A320 autoflight system when flying the RNP transition in Bremen. The autoflight system commanded level offs and ineffective speed controls in Managed mode which makes it impossible to fly the optimum descent path. Some of DLH flight crews needed to correct the flight path by using speed brakes or changing the autoflight system from managed to selected mode. However, analysis of Airbus showed that the FMS software which is installed in the Lufthansa A320 Fleet is not designed for Continuous Descent Approach (CDA), which was important parameter of the DFS design of new RNP to GLS procedures to Bremen. More analysis is needed to find out if there could be an improvement by changing the way how the procedures are coded in the Navigation Data Base of the FMS.

#### **E.1.2.2.2 Ryanair**

Ryanair performed 6 RNP to GLS approaches to Bremen with Boeing 737-800 in total. Each crew undertook an e-learning course and each crew were briefed about the approach by RYR GLS coordinator and asked to fill out a questionnaire via EFB email. The questionnaire was divided into 5 sections. Each crew was different, no pilot flew the approach twice and most approaches were via different RNP to GLS approach procedure (EMIV, PIXUR, VERED) to different runway 09/27. Some approaches were affected by ATC constrains.

#### *Operational*

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The RNP approach to BRE was considered very efficient in comparison to other RNP approaches. This efficiency leads directly to fuel and time savings.

#### *Safety*

No adverse safety concerns were noted.

#### *Workload*

No adverse effects on workload were noted, workload was exactly the same as other RNP approaches.

#### *Working Methods*

There were no differences to normal Ryanair standard operating procedures and no change to working methods.

#### *Conclusion*

The RNP to GLS approach to BRE was exactly the same as RNP to ILS approach in BRE from the pilot point of view. Ryanair found the shortened RNP approach efficient and time saving, well-constructed approach and very pilot friendly. All flown RNP to GLS approaches were assessed by pilots as feasible.

## **E.1.2 OBJ-VLD-V4-014 Practice GLS CAT II Pilot Feasibility Demonstration**

### **E.1.3.1 Pilot Questionnaires for practice GLS CAT II Autoland Demo Post-Flight Analysis**

#### **E.1.3.1.1 Lufthansa Pilot Questionnaires for practice GLS CAT II Autoland**

This questionnaire addresses pilot feasibility assessment of practice GLS CAT II approach demonstration objective. The regulatory baseline is GLS CAT I Autoland.

The objective of this questionnaire is to collect your opinion with regards to the AAL2 flight trial you have just performed.

The questionnaire is divided in five sections:

- Operational
- Safety
- Workload
- Working Methods
- Additional remarks

Each section contains a set of statements to be evaluated by assessing their answers and, where possible (and requested), providing the rationale for your selections.



Please read carefully through the list of statements and select the answer that most accurately reflects your thoughts. Your selection can be made by checking either **YES** or **NO**.

If you are unsure of the answer or if you deem the question is not applicable, select **N/A**.

Please consider that the questionnaire statements focus **ONLY** on assessing new concepts introduced by the *AAL2 Large Scale Demonstration project*.

In case of doubts, your company AAL2 point of contact is available for clarifications.

Note: Filled questionnaires will be treated confidentially and used only for statistical purposes.

<b>APPROACH:</b>	<b>Runway:</b>
<b>Date:</b>	<b>Name: (optional)</b>
<b>Flight:</b>	<b>Role (PF/PM):</b>
<b>Wind:</b>	<b>Temperature:</b>

### 1 – OPERATIONAL

During your flight today:		YES	NO	N/A	If NO, please detail
1.1	Did you request to fly the practice GLS CAT II procedure from ATC?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.2	Did you get your ATC approval before the clearance limit?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.3	Have you been able to fly the practice GLS CAT II procedures with normal and expected system behaviour?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.4	Did you use the Autopilot in LOC Mode before using the Approach Mode?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.5	Did you arm the Approach Mode shortly before the descent point?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.6	Did you increase or decrease your speed (during any phase of flight within 50NM of Destination Airport) on ATC request?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(If yes)
1.7	Did you notice any change in the amount of ATC communications compared to routine operations?	<input type="checkbox"/> Increase <input type="checkbox"/> Decrease	<input type="checkbox"/> No		
1.8	When flying the practice GLS CAT II Autoland, did you encounter unexpected banks on short final?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.9	When flying the practice GLS CAT II Autoland, did you encounter normal flare on short final?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



1.10	When flying the practice GLS CAT II Autoland, did you encounter normal touch down?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.11	When flying the practice GLS CAT II Autoland, did the aircraft land on centre line?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.12	When flying the practice GLS CAT II Autoland, did the aircraft land in the touchdown zone?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

## 2 - SAFETY

Compared to routine operations: YES NO N/A If NO, please detail

2.1	Did you perceive that the AAL2 flight trials have not negatively influenced flight safety in any stage of the flight?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.2	Did you perceive that the ATCO's in contact during the flight were fully aware of the operational scenario of the flight trials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.3	Did you deviate from the planned ATS route on ATC request or due to adverse meteorological conditions? <b>(if YES, please detail)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.4	If you answered YES to question 2.3, did you feel that safety was ever compromised due to such deviations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

## 3 – WORKLOAD

During your flight today, compared to routine operations: YES NO N/A If YES, please detail

3.1	Did you notice any differences in your workload levels?	<input type="checkbox"/> Increase <input type="checkbox"/> Decrease	<input type="checkbox"/>		
3.2	If you answered YES to question 3.1, did this affect your overall performance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3.3	If you answered YES to question 3.1, what type of workload difference did you experience?	<input type="checkbox"/> mental <input type="checkbox"/> physical <input type="checkbox"/> physiological <input type="checkbox"/> other <b>(please detail below)</b> <input type="checkbox"/> N/A <div style="border: 1px solid black; height: 40px; width: 100%; margin-top: 5px;"></div>			
3.4	If you answered YES to question 3.1, did you feel that, due to increased/decreased	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



workload levels, safety was ever compromised?				
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#### 4 – WORKING METHODS

During your flight today:		YES	NO	N/A	If NO, please detail
4.1	Were you required to alter your routine working methods in order to fulfill your duties?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.2	If you answered YES to question 4.1, was AAL2 operational information, provided before the flight, exhaustive with regards to <ul style="list-style-type: none"> <li>- roles and responsibilities,</li> <li>- working methods and</li> <li>- operational requirements?</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.3	If you answered YES to question 4.1, did you feel that, due to alteration of working methods, safety was ever compromised?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.4	Was the information provided before the flight trial sufficient to safely perform the flight?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.5	Did you perceive any improvement with regards to flight efficiency?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

#### 5 – ADDITIONAL REMARKS

### E.1.3.1.2 Ryanair Pilot Questionnaires for practice GLS CAT II Autoland

The objective of this questionnaire is to collect your opinion with regards to the AAL2 flight trial you have just performed. The regulatory baseline is GLS CAT I Autoland.

The questionnaire is divided in five sections:

- Operational
- Safety
- Workload

Founding Members







- SOP'S
- Additional remarks

Each section contains a set of statements to be evaluated by assessing their answers and, where possible (and requested), providing the rationale for your selections.

Please read carefully through the list of statements and select the answer that most accurately reflects your thoughts. Your selection can be made by checking either **YES** or **NO**.

If you are unsure of the answer or if you deem the question is not applicable, select **N/A**.

Please consider that the questionnaire statements focus **ONLY** on assessing new concepts introduced by the *AAL2 Large Scale Demonstration project*.

In case of doubts, your company AAL2 point of contact is available for clarifications.

Note: Filled questionnaires will be treated confidentially and used only for statistical purposes.

<b>ROUTE:</b>	<b>Runway:</b>
<b>GLS Channel number:</b>	<b>GLS Reference Path Indicator:</b>
<b>Date:</b>	<b>Name: (optional)</b>
<b>Flight:</b>	<b>Role (PF/PM):</b>
<b>Wind:</b>	<b>Temperature:</b>

**1 – OPERATIONAL**

<b>During your flight today:</b>		<b>YES</b>	<b>NO</b>	<b>N/A</b>	<b>If NO, please detail</b>
<b>1.13</b>	Did you request to fly the practice GLS CAT II procedure from ATC?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>1.14</b>	Did you get your ATC approval before the clearance limit?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>1.15</b>	Have you been able to fly the practice GLS CAT II procedures with normal and expected system behaviour?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>1.16</b>	Did you use the Autopilot in LOC Mode before using the Approach Mode?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>1.17</b>	Did you arm the Approach Mode shortly before the descent point?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>1.18</b>	Did you increase or decrease your speed (during any phase of flight) on ATC request?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(If yes)



1.19	Did you notice any change in the amount of ATC communications compared to routine operations?	<input type="checkbox"/> Increase <input type="checkbox"/> Decrease	<input type="checkbox"/> No	
1.20	When flying the practice GLS CAT II Autoland, did you encounter normal bank angels on short final?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.21	When flying the practice GLS CAT II Autoland, did you encounter normal flare on short final?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.22	When flying the practice GLS CAT II Autoland, did you encounter normal touch down?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.23	When flying the practice GLS CAT II Autoland, did the aircraft land on centre line?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.24	When flying the practice GLS CAT II Autoland, did the aircraft land in the touchdown zone?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**2 – SAFETY**

**Compared to routine operations:** YES NO N/A If NO, please detail

2.5	Did you perceive that the AAL2 flight trials have not negatively influenced flight safety in any stage of the flight?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.6	Did you perceive that the ATCO’s in contact during the flight were fully aware of the operational scenario of the flight trials?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.7	Did you deviate from the planned ATS route on ATC request or due to adverse meteorological conditions? <b>(if YES, please detail)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.8	If you answered YES to question 2.3, did you feel that safety was ever compromised due to such deviations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

**3 – WORKLOAD**

**During your flight today, compared to routine operations:** YES NO N/A If YES, please detail

3.4	Did you notice any differences in your workload levels?	<input type="checkbox"/> Increase <input type="checkbox"/> Decrease	<input type="checkbox"/>		
3.5	If you answered YES to question 3.1, did this affect your overall performance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3.6	If you answered YES to question 3.1, what type of workload difference did you experience?			<input type="checkbox"/> mental <input type="checkbox"/> physical	

Founding Members





		<input type="checkbox"/> physiological <input type="checkbox"/> other ( <b>please detail below</b> ) <input type="checkbox"/> N/A			
<b>3.4</b>	If you answered YES to question 3.1, did you feel that, due to increased/decreased workload levels, safety was ever compromised?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

#### 4 – SOP

During your flight today:		YES	NO	N/A	If NO, please detail
<b>4.3</b>	Were existing Ryanair SOP’s sufficient to allow you complete your approach?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>4.4</b>	If you answered NO to 4.1, was safety compromised?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>4.3</b>	Was the operational information provided prior to the flight sufficient for the approach?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>4.4</b>	Was the information provided prior the flight trial sufficient to safely perform the flight?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>4.5</b>	Did you perceive any improvement with regards to flight efficiency?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

#### 5 – ADDITIONAL REMARKS

### E.1.3.3 Practice GLS CAT II Results and Conclusions

#### E.1.3.3.1 Lufthansa

The core objective from the human factors perspective was to collect subjective data on pilot and system performance as well as perception of the practice GLS CAT II Autoland approaches in support of evaluation of pilot feasibility with different kind of aircraft (long and short haul) and at different airports onto varying runways. Pilot operating method is described in 3.4.2.1.1.





### *Facility and Contributors*

The approaches were performed by DLH revenue flights using following GLS equipped aircraft:

- Airbus A319
- Airbus A320
- Airbus A321
- Boeing 747-8

All flights were performed with dedicated crews (mainly training Captains or other management pilots) that were briefed with handout and/or CBT either. Approaches with A320 family were flown to both Frankfurt (EDDF) and Bremen (EDDW) airport, approaches with B747-8 were flown to Frankfurt (EDDF).

### *Procedure*

The flight Crews (CPT/SFO/FO) were allocated and briefed (F2F and Handout) by the AAL2 Team together with the respective fleet management (B748 and A320). All crew members had the required information package supplied via e-mail and hardcopy in their crew mailboxes. This package contained the Handout and the crew feedback form (see Appendix F). The filled-out forms were returned via Company Mail to the AAL2 team where they have been analysed and kept for further clarification with the crew that have been necessary. In such cases the Demo team contacted the crews and the F2F Feedback also found its way into the HF POV.

### *Data Collection, Data Analysis and Results*

The questionnaire used was divided into 4 main sections:

- Operational
- Safety
- Workload
- Working Methods

In total 43 (A320 Family) and 14 (B748) flights with practice GLS CAT II Autoland have been performed and evaluated by Lufthansa.

To fly the practice GLS CAT II approach in Autoland Mode, a DH of 100ft was inserted into the FMS. All flights were cleared for a GLS CAT I Approach by ATC and weather conditions were better than for CAT I conditions (according to Operational Risk Evaluation).

All Boeing 747-8 flight Crews reported a smooth and good performance of the Autoflight function during the Autoland Approach. There were no anomalies reported and no difference to an ILS based Autoland was experienced. All A320 flight Crews reported safe landings in Autoland mode but made some observations which is under investigation by Lufthansa and Airbus. First analysis showed that the performance of the Autoflight system is the same that flight crews experienced when flying an ILS Autoland. The crew workload when flying the GLS CAT I Autoland remained low as the procedure was almost identical to the conventional ILS CAT II/III Autoland procedure at DLH. The only visible difference for pilots on A320 family was the Mode designator in the FMA (Autoland vs. CAT III Dual). System behaviour did not change and when flying the approach several times, the workload remained at this level. Autoland approaches were within the required limits and out of 57 practice GLS CAT II Autoland approaches, only once pilot felt that approach may be too long and landed manually. Therefore, it can be concluded that practice GLS CAT II approaches were perceived feasible by pilots



during more than 95% of successful approaches required by criterion set up for OBJ-VLD-V4-014 demonstration objective.

### E.1.3.3.2 Ryanair

Ryanair pilots flown 1 practice GLS CAT II Autoland approach using Ryanair practice CAT II procedures in the USA at Grant county international Airport (KMWH) during aircraft acceptance flight, i.e. non-revenue flight on B737-800 aircraft that was not yet registered on Ryanair. Therefore, flight data were not recorded for AAL2 and are not included in flight accuracy demonstration objective evaluation as not done on a Ryanair registered aircraft at Grant county international Airport (KMWH). However, based on feedback from flight crew, no non-standard behaviour with respect to flying technique, safety or pilot workload was experienced and the approach was the same as ILS CAT II/III Autoland flown today.

## E.2 EXE-VLD-V4-200 Human Performance Assessment Report

### E.2.1 Introduction

Human factor questionnaires have been defined to address the main points to be assessed during demos. They contain seven sections collecting contextual information and feedback about:

- Execution of AAL2 flight demos
- Determination of Runway suitability for EFVS operation
- Affordability/ complexity of EFVS operation

With respect to the flights, the crews involved in the demo, the ATC/ATS and the air operator were exposed to the questionnaires.

With respect to the Determination of the suitability of the runway, the two options of the NPA 2018-06 were assessed as part of AAL2 objectives.

- Operator representatives were questioned about the process they were asked to follow. This corresponds to the case where the aerodrome has not been promulgated as suitable for EFVS by the state of the aerodrome.
- The leaders who conducted the experimental approval process for aerodrome were queried about that process (corresponding to the case of promulgation of aerodrome by the state).

With respect to the affordability of the EFVS operation, the opinion of the aerodrome operator and/or ANSP has been collected.

Personal information and information that are not directly linked to AAL2 project objectives (e.g. remarks related to the system tested...) have been retrieved from the questionnaires.

Note: Flight debrief, test records and results of meetings/ phone calls and internal documentations were also used in addition to questionnaires for establishing conclusions of AAL2 that are described in appendix B.



## E.2.2 Method

Questionnaires were established with the support of Dassault human factor experts in charge of EFVS and applying similar methods as those used for certification.

Each Stakeholder reviewed the part of the questionnaire relevant to his activity (ATC, air operator, pilot, aerodrome operator...).

Questionnaires were filled in by the stakeholders alone and a debriefing session was organized.

Different sections of the questionnaires and results are presented here below.

## E.2.3 Background information

The two first sections of the questionnaires capture basic information about the pilots who performed the demos and the air operator who were involved in the process of declaration of runway suitability for EFVS.

### 1. Pilot information

Two end user pilots participated to the flight demos:

- A pilot of an ATR 42-600 flying for regional aviation
- A pilot of a Falcon 8X flying for a business jet operator

Those pilots had civilian background, are experimented pilots and are qualified to low vis operations. One pilot has former experience in HUD and is EFVS qualified but had never flown real EFVS approach with OPS credit. He is familiar with the Antwerp airport where he has been based for many years. The other pilot has neither HUD nor EFVS experience.

One Dassault and One ATR EFVS test pilots were also part of the crew. Related information is also communicated in the following section.



### 1. PILOT EVALUATOR INFORMATION

<b>Name</b>	[REDACTED]
<b>Background</b> (circle all that apply)	<input type="checkbox"/> Civilian <input type="checkbox"/> Military
<b>Aircraft type ratings</b>	Falcon 7X/8X
<b>Low Vis qualification</b>	LVTO 125m / EVS Ops credit Approved on Falcon 7X
<b>EFVS qualification and currency</b>	yes
<b>EFVS operation real experience</b>	Did you already fly actual EFVS operation with Ops credit ? This was the first time
<b>Flight hours</b>	7000
<b>HUD flight hours</b>	200
<b>EFVS flight hours</b>	50
<b>Familiarity of the pilot with airport used</b>	<input type="checkbox"/> Regular <input type="checkbox"/> Irregular <input type="checkbox"/> New EBAW used for this specific training

### 1. PILOT EVALUATOR INFORMATION

<b>Name</b>	[REDACTED]
<b>Background</b> (circle all that apply)	<input checked="" type="checkbox"/> Civilian <input type="checkbox"/> Military
<b>Aircraft type ratings</b>	ATR 42/72
<b>Low Vis qualification</b>	LVO > LVTO 125 m / CAT II
<b>EVS qualification and currency</b>	
<b>Flight hours</b>	Approx 6500 FLH
<b>HUD flight hours</b>	0
<b>EVS flight hours</b>	0
<b>Familiarity of the pilot with airport used</b>	<input type="checkbox"/> Regular <input type="checkbox"/> Irregular <input checked="" type="checkbox"/> New



## 1. PILOT EVALUATOR INFORMATION

Name	[Redacted]
Background (circle all that apply)	<input type="checkbox"/> Civilian <input type="checkbox"/> Military
Aircraft type ratings	Falcon 7/8X, 2000EASy, 900EASy
Low Vis qualification	yes
EFVS qualification and currency	no
EFVS operation real experience	Did you already fly actual EFVS operation with Ops credit ? Yes, during development and certification tests (> 50 approaches)
Flight hours	6000
HUD flight hours	2000
EFVS flight hours	100
Familiarity of the pilot with airport used	<input type="checkbox"/> Regular <input type="checkbox"/> Irregular <input type="checkbox"/> New  A familiarization flight has been performed at the aerodrome before demos.

## 2. Air operator information

Two air operators were involved in the project.

- a major regional scheduled air traffic operator
- a business jet air operator (non-scheduled air traffic)

Business jet operator was represented by the pilot who performed the demos.

## 2. Operator EVALUATOR INFORMATION

Name	[Redacted] Aircraft Ltd
Low Vis operations approvals	<input type="checkbox"/> CATII/III <input checked="" type="checkbox"/> LVTO <input checked="" type="checkbox"/> EFVS
Real Practice of EFVS operations 100ft	<input checked="" type="checkbox"/> Regular <input type="checkbox"/> Irregular <input type="checkbox"/> New  [Redacted] recommends practice of the procedures and it is of course part of the SIM sessions, but also evaluated during the line check.





## 2. Operator EVALUATOR INFORMATION

<b>Name</b>	[REDACTED]
<b>Low Vis operations approvals</b>	<input checked="" type="checkbox"/> CATII <input checked="" type="checkbox"/> LVTO <input type="checkbox"/> EFVS
<b>Real Practice of EFVS operations 100ft</b>	<input type="checkbox"/> Regular <input type="checkbox"/> Irregular <input type="checkbox"/> New  N/A

## 2. Operator EVALUATOR INFORMATION

<b>Name</b>	[REDACTED]
<b>Low Vis operations approvals</b>	<input checked="" type="checkbox"/> CATII/III <input checked="" type="checkbox"/> LVTO <input checked="" type="checkbox"/> EFVS (TESTING)
<b>Real Practice of EFVS operations 100ft</b>	<input checked="" type="checkbox"/> Regular <input type="checkbox"/> Irregular <input type="checkbox"/> New

### E.2.4 Pilots demos conditions and feedback

Conditions of flight demos (Approach type, lighting available...) were collected through the section 3 of the questionnaire.

Related pilot feedback was collected in section 4 of the questionnaire.

Conclusions are detailed in Appendix B.3.2

# 1. Conditions

## 3. Tests conditions (for each approach at each aerodrome)

<b>Runway/ Approach type flown for that aerodrome</b>	Approach type/ Runway (ex ILS29): EBAW // ILS29			
<b>Phases of flight where EFVS is used &amp; Role of Pilot (check all that apply)</b>	X Approach X as PF X as PM	X Landing & rollout X as PF X as PM	<input type="checkbox"/> Go-Around <input type="checkbox"/> as PF <input type="checkbox"/> as PM	<input type="checkbox"/> Touch and Go <input type="checkbox"/> as PF <input type="checkbox"/> as PM
<b>Conditions when using EFVS (check all that apply or/and complete)</b>	<input type="checkbox"/> Dawn <input type="checkbox"/> Day <input type="checkbox"/> Sunset <input checked="" type="checkbox"/> Night <input type="checkbox"/> Snow <input checked="" type="checkbox"/> FOG <input type="checkbox"/> MIST  RVR communicated by ATC during EFVS approaches: from <u>  400  </u> meters to <u>  550  </u> meters			
<b>Approach lighting systems (check the closest configuration)</b>  Second Option				
<b>Runway lights</b>				
<b>Comments</b>	RVR conditions were variable but proved the validity and necessity of the Ops credit.  While we were doing the tests other aircraft had to divert.			



### 3. Tests conditions

<b>Phases where EFVS is used</b> (check all that apply)	<input checked="" type="checkbox"/> Approach <input checked="" type="checkbox"/> PF <input type="checkbox"/> PM	<input checked="" type="checkbox"/> Landing & rollout <input checked="" type="checkbox"/> PF <input type="checkbox"/> PM	<input checked="" type="checkbox"/> Go-Around <input checked="" type="checkbox"/> PF <input type="checkbox"/> PM	<input type="checkbox"/> Touch and Go <input type="checkbox"/> PF <input type="checkbox"/> PM
<b>Aerodrome/ Runway/ Approach type(s)</b>	Aerodrome: EBAW / LFBX Runway: EBAW 11/29 & LFBX 29 Approach Type: LPV/ILS/LNAV/VNAV			
<b>Conditions when using EFVS</b> (check all that apply or/and complete)	<input type="checkbox"/> Dawn <input checked="" type="checkbox"/> Day <input type="checkbox"/> Sunset <input type="checkbox"/> Night <input type="checkbox"/> Snow <input type="checkbox"/> FOG <input type="checkbox"/> MIST RVR communicated by ATC: N/A meters			
<b>Approach lighting systems</b> (check the closest configuration)				
<b>Runway lights</b>				
<b>Comments</b>	No low visibility conditions during the test. Low visibility conditions simulated using an obscurant panel on pilot windshield.			



## 2. Pilot feedback

This section contains the questionnaires of the pilots who were involved in the demos.

### 4. Pilot Feedback on Operations (resulting from all approaches)

#### ❖ Approach using EFVS compared to non EFVS standard operation

<b>Situational Awareness</b>	<b>Approach</b>	Degraded <input type="checkbox"/>	Equivalent <input type="checkbox"/>	Improved <input checked="" type="checkbox"/>
	<b>Landing</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<b>Rollout</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<b>Taxi</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Comment				
<b>Workload perceived</b>	<b>Approach</b>	Decreased <input type="checkbox"/>	Equivalent <input checked="" type="checkbox"/>	Increased <input type="checkbox"/>
	<b>Landing</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<b>Rollout</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<b>Taxi</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comment				
<b>Perceived Accuracy</b>	<b>Landing/ Touchdown</b>	Degraded <input type="checkbox"/>	Equivalent <input checked="" type="checkbox"/>	Improved <input type="checkbox"/>
	<b>Rollout</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comment	Actual touchdown seemed slightly left of CL but typical for HUD landings.			
<b>Crew coordination</b>	<b>Easy</b> <input type="checkbox"/>		Equivalent <input checked="" type="checkbox"/>	Requires significant effort <input type="checkbox"/>
Comment				
<b>Decision making</b>	<b>Easy</b> <input type="checkbox"/>		Equivalent <input checked="" type="checkbox"/>	Requires significant effort <input type="checkbox"/>
Comment	Might have required slightly higher workload, however, if used more often this should decrease.			
<b>Ease of operation</b>	<b>Approach EFVS segment</b>	Degraded <input type="checkbox"/>	Equivalent <input checked="" type="checkbox"/>	Improved <input type="checkbox"/>
	<b>Landing (flare)</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<b>Rollout</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<b>Taxi</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comment	Actual landing/flare, was more complex due to the short time between visual and actual touchdown, on this short runway. Quite some difference between SIM and aircraft (much easier in the SIM).			



### 4. Pilot Feedback on Operations

#### ❖ Approach using EFVS compared to standard CAT 1 operation

		Degraded <input type="checkbox"/>	Equivalent <input type="checkbox"/>	Improved <input type="checkbox"/>
<b>Ease of operation</b>	<b>Approach EFVS segment</b>	<input type="checkbox"/>	<input type="checkbox"/>	X
	<b>Landing</b>	<input type="checkbox"/>	<input type="checkbox"/>	X
	<b>Rollout</b>	<input type="checkbox"/>	x	<input type="checkbox"/>
	<b>Taxi</b>	<input type="checkbox"/>	x	<input type="checkbox"/>
<b>Comment</b>	No feedback for Rollout and taxi in degraded met conditions -but no difficulties using it			
<b>Perceived Accuracy</b>	<b>Landing</b>	<input type="checkbox"/>	<input type="checkbox"/>	x
	<b>rollout</b>	<input type="checkbox"/>	x	<input type="checkbox"/>
<b>Comment</b>	Same comment as up for Rollout			
<b>Situational Awareness</b>	<b>Approach</b>	<input type="checkbox"/>	x	<input type="checkbox"/>
	<b>Landing</b>	<input type="checkbox"/>	x	<input type="checkbox"/>
	<b>Rollout</b>	<input type="checkbox"/>	x	<input type="checkbox"/>
	<b>Taxi</b>	<input type="checkbox"/>	x	<input type="checkbox"/>
<b>Comment</b>	Same comment as up for Rollout and taxi			
<b>Workload perceived</b>	<b>Approach</b>	Decreased <input type="checkbox"/>	Equivalent x	Increased <input type="checkbox"/>
	<b>Landing</b>	<input type="checkbox"/>	x	<input type="checkbox"/>
	<b>Rollout</b>	<input type="checkbox"/>	x	<input type="checkbox"/>
	<b>taxi</b>	<input type="checkbox"/>	<input type="checkbox"/>	x
<b>Comment</b>				
<b>Crew coordination</b>				
<b>Decision making</b>	If the subject is aborted approach or go around decision, no change.			



#### 4. Pilot Feedback on Operations (resulting from all approaches)



##### ❖ Approach using EFVS compared to non EFVS standard operation

<b>Situational Awareness</b>	<b>Approach</b>	Degraded <input type="checkbox"/>	Equivalent <input type="checkbox"/>	Improved <input checked="" type="checkbox"/>
	<b>Landing</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<b>Rollout</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<b>Taxi</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Comment				
<b>Workload perceived</b>	<b>Approach</b>	Decreased <input type="checkbox"/>	Equivalent <input checked="" type="checkbox"/>	Increased <input type="checkbox"/>
	<b>Landing</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<b>Rollout</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<b>Taxi</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comment	See comment on decision making			
<b>Perceived Accuracy</b>	<b>Landing/ Touchdown</b>	Degraded <input type="checkbox"/>	Equivalent <input checked="" type="checkbox"/>	Improved <input type="checkbox"/>
	<b>Rollout</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comment				
<b>Crew coordination</b>	Easy <input type="checkbox"/>		Equivalent <input checked="" type="checkbox"/>	Requires significant effort <input type="checkbox"/>
Comment	New EVS calls out, request to be trained			
<b>Decision making</b>	Easy <input type="checkbox"/>		Equivalent <input type="checkbox"/>	Requires significant effort <input checked="" type="checkbox"/>
Comment	One additional "decision window" and a specific cognitive load must be available to detect failures. Training and Experience should decrease the workload.			
<b>Ease of operation</b>	<b>Approach EFVS segment</b>	Degraded <input type="checkbox"/>	Equivalent <input type="checkbox"/>	Improved <input checked="" type="checkbox"/>
	<b>Landing (flare)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<b>Rollout</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<b>Taxi</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Comment	In bad weather conditions (and even more by night), EFVS obviously improves all those phases			



#### 4. Pilot Feedback on Operations (resulting from all approaches)

##### ❖ Approach using EFVS compared to non EFVS standard operation

<b>Situational Awareness</b>	<b>Approach</b>	Degraded <input type="checkbox"/>	Equivalent <input type="checkbox"/>	Improved <input checked="" type="checkbox"/>
	Landing	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Rollout	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Taxi	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comment				
<b>Workload perceived</b>	<b>Approach</b>	Decreased <input type="checkbox"/>	Equivalent <input type="checkbox"/>	Increased <input checked="" type="checkbox"/>
	Landing	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Rollout	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Taxi	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comment	Approach workload increased as new operation (testing purpose)			
<b>Perceived Accuracy</b>	<b>Landing/ Touchdown</b>	Degraded <input type="checkbox"/>	Equivalent <input checked="" type="checkbox"/>	Improved <input type="checkbox"/>
	Rollout	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comment				
<b>Crew coordination</b>	Easy <input type="checkbox"/>	Equivalent <input type="checkbox"/>	Requires significant effort <input checked="" type="checkbox"/>	
Comment	Because procedures are new, and crew not well trained (testing purpose)			
<b>Decision making</b>	Easy <input type="checkbox"/>	Equivalent <input checked="" type="checkbox"/>	Requires significant effort <input type="checkbox"/>	
Comment				
<b>Ease of operation</b>	<b>Approach EFVS segment</b>	Degraded <input type="checkbox"/>	Equivalent <input type="checkbox"/>	Improved <input checked="" type="checkbox"/>
	Landing (flare)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Rollout	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Taxi	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comment				

### E.2.5 ATC feedback

ATC feedback has been collected in section 6 of the questionnaire. Questionnaire has been filled in by Antwerp ATC and Perigueux ATS (AFIS) where demo have been performed.

Conclusions are detailed in Appendix B.3.2



## 1. Antwerp

### 6. ATC Feedback on Operations

#### ❖ Approach using EFVS compared to non EFVS operation

Use of Field 18 of Flight plan	Useful X	Useless <input type="checkbox"/>	
Impact on traffic management	No impact <input type="checkbox"/>	Acceptable X	Not acceptable <input type="checkbox"/>
Traffic Awareness during approach	Degraded <input type="checkbox"/>	Equivalent X	
Need for specific phraseology for EFVS operation	No X	Yes <input type="checkbox"/>	
Management of "LVP"	Easy and fast <input type="checkbox"/>	Acceptable X	Too complex <input type="checkbox"/>
Comment			
Workload perceived	Increased <input type="checkbox"/>	Equivalent X	Decreased <input type="checkbox"/>
Ease of operation	Equivalent <input type="checkbox"/>	Acceptable X	Degraded <input type="checkbox"/>
Comments/ recommendations	<p>Use of Field 18 of FPL recommended, such that ATC can always lookup EFVS capability.</p> <p>No need for specific phraseology to/from pilots, as this already exists. When weather conditions are below the "standard" minima, ATC will ask for pilot intentions. If the pilot is EFVS equipped, the pilot can mention it at this point in time.</p> <p>ATC always considers a possible missed approach/go-around, for any arrival, so – in fact – it is of less relevance whether the aircraft is equipped with EFVS (or not). It is the pilot's responsibility to check its minima for the procedure he is flying.</p>		





## 2. Perigueux

### 6. ATC Feedback on Operations

#### ❖ Approach using EFVS compared to non EFVS operation

	Degraded <input type="checkbox"/>	Equivalent <input type="checkbox"/>	
Ease of operation	<input type="checkbox"/>	X	
Traffic Awareness in approach	<input type="checkbox"/>	X	
Impact on traffic management	No impact X	Acceptable <input type="checkbox"/>	Not acceptable <input type="checkbox"/>
Workload perceived	Increased <input type="checkbox"/>	Equivalent X	Decreased <input type="checkbox"/>
Adequacy of phraseology used for demo	Suitable X	Not suitable <input type="checkbox"/>	
Use of Field 18 of Flight plan	Useful <input type="checkbox"/>	Useless X	
Comments/ recommendations	<p>DOF: 10 APRIL 2019</p> <p>MTO: QFU29 – WIND CALM – CAVOK – QNH1012 –T8°</p> <p>AIRCRAFT: ATR42-600</p> <p>NO EFVS ON FIELD 18 OF FLIGHT PLAN SO FIREMEN AND AFIS PROCEEDED AS SEEN WITH THE CREW (EVP PROCEDURE IN FORCE)</p>		



## E.2.6 Aerodrome operator feedback

Aerodrome operator provided feedback about two points:

- The comment field of the Section 7 of the questionnaire presents feedback about the execution of demos.
- First part of the section 7 of the questionnaire relates the opinion of the aerodrome operator with respect to his interest for the EFVS operation.

See B.2 for conclusions.

### 1. Antwerp



### 7. Aerodrome operator Feedback on Operation

❖ **Affordability/ interest of EFVS operation compared to non EFVS operations**

<b>Name of aerodrome operator</b>	EBAW – Antwerp International Airport		
<b>Min RVR allowed for EFVS demo</b>	500 ≤ RVR ≤ 550 m		
<b>Interest for operation</b>	Strong <input checked="" type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
<b>Is the operation affordable (cost)</b>	<del>Affordable</del> , No significant additional cost <input checked="" type="checkbox"/>	Affordable with acceptable investment <input type="checkbox"/>	Not affordable (Too costly) <input type="checkbox"/>
<b>Is the operation accessible (complexity)</b>	Easily accessible (low complexity degree to deal with) <input checked="" type="checkbox"/>	Accessible (reasonable complexity degree to deal with) <input type="checkbox"/>	Not accessible (Too complex) <input type="checkbox"/>
<b>Do you intent to apply for EFVS operation approval</b>	YES		
<b>Comments/ recommendations</b>	<p>EFVS demo flights were performed in LVP conditions.</p> <p>EBAW LVP were in place.</p> <p>No special comments nor recommendations.</p>		



## 2. Perigueux

### 7. Aerodrome operator Feedback on Operation

❖ **Affordability/ interest of EFVS operation compared to non EFVS operations**

<b>Name of aerodrome operator</b>	LFBX		
<b>Min RVR allowed for EFVS demo</b>			
<b>Interest of operation</b>	Strong <input checked="" type="checkbox"/>	Medium <input type="checkbox"/>	Low <input type="checkbox"/>
<b>Is the operation affordable (cost)</b>	<del>Affordable</del> No significant additional cost <input checked="" type="checkbox"/>	Affordable with acceptable investment <input type="checkbox"/>	Not affordable (Too costly) <input type="checkbox"/>
<b>Is the operation accessible (complexity)</b>	Easily accessible (low complexity degree to dealt with) <input checked="" type="checkbox"/>	Accessible (reasonable complexity degree to deal with) <input type="checkbox"/>	Not accessible (Too complex) <input type="checkbox"/>
<b>Comments/ recommendations</b>	MORE AND MORE EFVS FLIGHTS!		



## E.2.7 Determination of Runway suitability for EFVS

### 1. Air operators

#### a. regional scheduled traffic air operator

#### 5. Air Operator Feedback on Operations

##### ❖ Preparation of EFVS operation

	Easy and fast (There is a Quick way to determine)	Acceptable	Too complex explain ☞
Determination of eligibility of IAP (approach type, slope, offset...)	x	<input type="checkbox"/>	<input type="checkbox"/>
<b>Suitability check of runway</b>			
Determination of adequacy of obstacle surface clearance (OFZ/ VSS)	x	<input type="checkbox"/>	<input type="checkbox"/>
Determination of availability of second power supply with adequate switch power time	x	<input type="checkbox"/>	<input type="checkbox"/>
Existence of adequate LVC procedures	x	<input type="checkbox"/>	<input type="checkbox"/>
Determination of the presence of RVR sensor	x	<input type="checkbox"/>	<input type="checkbox"/>
Determination of adequate balked landing procedure	x	<input type="checkbox"/>	<input type="checkbox"/>
Comments	We will apply directives from AIP and charts. No problem for our company.		

##### ❖ Affordability of EFVS operation preparation

	Affordable without significant effort	Affordable with reasonable effort	Not affordable. Too complex and time consuming
Global affordability of EFVS operation (complexity)	x	<input type="checkbox"/>	<input type="checkbox"/>
Comments/ recommendations	No complexity.		



## 5. Air Operator Feedback on Operations

### ❖ Preparation of EFVS operation

	Easy and fast <i>(There is a Quick way to determine)</i>	Acceptable	Too complex <i>(Please explain)</i>
Determination of eligibility of IAP (approach type, slope, offset...)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Suitability check of runway</b>			
Determination of adequacy of obstacle surface clearance (OFZ/ VSS)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Determination of availability of second power supply with adequate switch power time	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Existence of adequate LVP for EFVS operation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Determination of the presence of RVR sensor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Determination of presence of LED on ALS and Runway	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Determination of adequate balked landing procedure	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comments	<p>The <del>data</del> data needed for the preparation of EFVS approaches are not well described and are not highlighted in the approach. As second power supply, dedicated LVP for EFVS operation, RVR sensor, LED on ALS,...</p> <p>It would be useful to have these in the charts, it would reduce pilot error in such operation.</p>		

### ❖ Affordability of EFVS operation preparation

	Affordable without significant effort	Affordable with reasonable effort	Not affordable. Too complex and time consuming
Global affordability of EFVS operation (complexity)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comments/ recommendations	<p>The improvement of approach charts could reduce the complexity of preparation of EFVS operation.</p>		



**b. Business aviation operator**

**5. Air Operator Feedback on Operations**

❖ **Preparation of EFVS operation**

	Easy and fast <i>(There is a Quick way to determine)</i>	Acceptable	Too complex <i>(Please explain)</i>
Determination of eligibility of IAP (approach type, slope, offset...)	<input type="checkbox"/>	<input type="checkbox"/>	X
<b>Suitability check of runway</b>			
Determination of adequacy of obstacle surface clearance (OFZ/ VSS)	<input type="checkbox"/>	<input type="checkbox"/>	x
Determination of availability of second power supply with adequate switch power time	<input type="checkbox"/>	x	<input type="checkbox"/>
Existence of adequate LVP for EFVS operation	<input type="checkbox"/>	X	<input type="checkbox"/>
Determination of the presence of RVR sensor	x	<input type="checkbox"/>	<input type="checkbox"/>
Determination of presence of LED on ALS and Runway	<input type="checkbox"/>	<input type="checkbox"/>	x
Determination of adequate balked landing procedure	<input type="checkbox"/>	<input type="checkbox"/>	x
Comments	<p>We use  plates for daily use.</p> <p>The above are all quite complex (not always too complex). The guidance provided in the  helps but is not made for dispatchers and does not allow for a quick assessment.</p> <p>A possible solution would be to add on the  plates, which type of EVS operations could be allowed. This would partly relieve the crew/operator of the decision and would allow for the controller to know whether or not the aircraft can handle this kind of operations.</p> <p>Today the FPL has no indication of whether or not the flight is approved for this kind of operation. This can result in discussion whether or not the approach can be flown.</p>		

❖ **Affordability of EFVS operation preparation**

	Affordable without significant effort	Affordable with reasonable effort	Not affordable. Too complex and time consuming
Global affordability of EFVS operation (complexity)	<input type="checkbox"/>	X	<input type="checkbox"/>
Comments/ recommendations	<p>The most difficult part today is convincing the authorities of the validity of the procedures.</p>		



## 5. Air Operator Feedback on Operations

### ❖ Preparation of EFVS operation

	Easy and fast <i>(There is a Quick way to determine)</i>	Acceptable	Too complex <i>(Please explain)</i>
Determination of eligibility of IAP (approach type, slope, offset...)	<input type="checkbox"/>	<input type="checkbox"/>	X
<b>Suitability check of runway</b>			
Determination of adequacy of obstacle surface clearance (OFZ/ VSS)	<input type="checkbox"/>	<input type="checkbox"/>	X
Determination of availability of second power supply with adequate switch power time	<input type="checkbox"/>	X	<input type="checkbox"/>
Existence of adequate LVP for EFVS operation	<input type="checkbox"/>	<input type="checkbox"/>	X
Determination of the presence of RVR sensor	X	<input type="checkbox"/>	<input type="checkbox"/>
Determination of presence of LED on ALS and Runway	<input type="checkbox"/>	<input type="checkbox"/>	X
Determination of adequate balked landing procedure	<input type="checkbox"/>	<input type="checkbox"/>	X
Comments	There is a lack of elements given by [redacted] charts.. Not always easy to prepare a flight quickly.		

### ❖ Affordability of EFVS operation preparation

	Affordable without significant effort	Affordable with reasonable effort	Not affordable. Too complex and time consuming
Global affordability of EFVS operation (complexity)	<input type="checkbox"/>	X	<input type="checkbox"/>
Comments/ recommendations	- the standard publication [redacted] shall present all the specific needs for operators (as seen above) - EFVS approaches shall be integrated as a recognized type of approach   - TRAINING is fundamental and all the process has to be "played" even in "non ops credit" conditions as often as possible		



## 2. ANSPs

### 5. Air Operator Feedback on Operations



#### ❖ Preparation of EFVS operation

	Easy and fast <i>(There is a Quick way to determine)</i>	Acceptable	Too complex <i>(Please explain)</i>
Determination of eligibility of IAP (approach type, slope, offset...)	X	<input type="checkbox"/>	<input type="checkbox"/>
<b>Suitability check of runway</b>			
Determination of adequacy of obstacle surface clearance (OFZ/ VSS)	<input type="checkbox"/>	X	<input type="checkbox"/>
Determination of availability of second power supply with adequate switch power time	X	<input type="checkbox"/>	<input type="checkbox"/>
Existence of adequate LVP for EFVS operation	X	<input type="checkbox"/>	<input type="checkbox"/>
Determination of the presence of RVR sensor	X	<input type="checkbox"/>	<input type="checkbox"/>
Determination of presence of LED on ALS and Runway	X	<input type="checkbox"/>	<input type="checkbox"/>
Determination of adequate balked landing procedure	<input type="checkbox"/>	X	<input type="checkbox"/>
Comments	Most information available in AIP (public) or OPS Manual (restricted). For some parts (OFZ/VSS), additional PANS-OPS studies needed to be performed. Moreover an additional LVP procedure had to be developed, to accommodate arrivals in LVO.		

#### ❖ Affordability of EFVS operation preparation

Global affordability of EFVS operation (complexity)	Affordable without significant effort	Affordable with reasonable effort	Not affordable. Too complex and time consuming
	<input type="checkbox"/>	X	<input type="checkbox"/>
Comments/ recommendations	<p>The runway suitability check was comprehensive, and some items required additional studies. Majority of items were included in AIP or OPS manual. For EBAW, an additional LVP procedure had to be developed to accommodate arrivals in LVO.</p> <p>Conclusion: there are clear benefits of EFVS, i.e. to increase the airport's accessibility in LVO. However a substantial effort needs to be done to check the suitability of airport/runways. Compared to installing airport equipment (e.g. ILS CAT II/III) however, this suitability check is fast and affordable. Therefore EFVS with OPS credits is a good solution for regional airports.</p>		