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Summary

This document contains the experimental plan for the SII experiment in the flight simulator GRACE. It describes the aims and objectives of the experiment, the experimental conditions, and the measurements, indicators and metrics. Furthermore, the simulation environment (GRACE) and the conduct of the experiment (i.e., participants and time schedule) is outlined.

Abbreviation List

ANOVA	Analysis of Variance
APP	Approach
ATC	Air Traffic Control
CAS	Calibrated Air Speed
CDA	Continuous Descend Approach
FAS	Final Approach Speed
FL	Flight Level
FMS	Flight Management System
F/O	First Officer
FPA	Flight Path Angle
GRACE	Generic Research Aircraft Cockpit Environment
HMI	Human-Machine Interface
ICAO	International Civil Aviation Organization
IFS	Intermediate Flap Speed
ILS	Instrument Landing System
ISA	International Standard Atmosphere
KTS	Knots
MLW	Maximum Landing Weight
NAP	Noise Abatement Procedure
PF	Pilot Flying
PNF	Pilot Not Flying
RNAV	Area Navigation
RSME	Rating Scale for Mental Effort
R/T	Radio Telephony
RTS	Real Time Simulation
OEI	One Engine Inoperative
SII	Sourdine II
SA	Situation Awareness
SART	Situation Awareness Rating Technique
TLX	Task Load Index
TMA	Terminal Manoeuvring Area
TOGA	Take-off Go Around
V1	Critical Engine Failure Speed
V2	Take-off Safety Speed

Table of Contents

1. Aims and objectives of the SII RTS for the airborne side

1.1. General Aim

The general aim of the SII Real Time Simulation (RTS) for the airborne side is

- to present pilots with the new noise abatement procedures (NAPs) and the pilot tools,
- to investigate the feasibility ("flyability") and acceptance of the proposed NAPs,
- to investigate the usability and acceptance of the proposed pilot tools, and
- to assess the impact of the proposed NAPs and pilot tools on safety, efficiency, airline costs as well as pilot workload, situational awareness (in particular, "energy awareness") and noise.

1.2. Evaluation Objectives

The general aim of the SII RTS for the airborne side as described above is further detailed in a number of evaluation objectives. These are listed below.

Objective 1: Evaluate the flyability of the proposed NAPs. Within Objective 1, the following questions will be investigated:

1. To which extent is it possible to conform to the proposed NAPs (i.e., vertical and lateral profile, speed constraints)?
2. Is it possible to follow the proposed NAPs even in adverse weather conditions (i.e., unexpected tail wind)?
3. What is the impact of ATC instruction (directs) on the flyability of the proposed NAPs?
4. Does the flyability of the proposed NAPs depend on whether pilot tools (i.e., vertical navigation display and flap deployment cues) are provided?
5. What is the effect of speed constraints on the flyability of the proposed NAPs?

Objective 2: Evaluate whether the proposed Noise Abatement Procedures (NAPs) yield a reduction in the noise level as compared with current procedures. Within Objective 2, the following questions will be investigated:

1. Are there any significant differences in the noise levels between the baseline condition and the NAPs?
2. Are there any significant differences in the noise levels between the proposed NAPs?

Objective 3: Evaluate the impact of the NAPs on airline costs ("flight efficiency"). Within Objective 3, the following questions will be investigated:

1. Are there any differences in the fuel consumption and the flight time (from TMA entry point to landing) between the baseline approach/departure route and the NAPs?
2. Are there any differences in the fuel consumption and the flight time (from TMA entry point to landing) between the various approach/departure NAPs?

Objective 4: Evaluate whether the proposed NAPs and pilot tools change the level of safety as compared with current procedures and tools. Within Objective 4, the following questions will be investigated:

1. Are there any differences in the experienced safety level between the baseline conditions and the conditions in which NAPs and pilot tools are used?
2. Are there any differences in the experienced safety level between the various approach/departure NAPs?

Objective 5: Evaluate acceptance of the NAPs and pilot tools. Within Objective 5, the following questions will be investigated:

1. Are pilots willing to accept the new operational procedures that follow from the use of NAPs?
2. Would pilots be willing to apply these procedures during daily operation?
3. Which advantages/disadvantages in the NAPs do pilots see?
4. To which extent do pilots follow the NAPs (deviation from the prescribed route)?
5. Do pilots see any benefit in the new tools?
6. To which extent do pilots make use of the new tools?

Objective 6: Evaluate the impact of the proposed NAPs and pilot tools on workload. Within Objective 6, the following questions will be investigated:

1. Are there any differences in the subjectively experienced level of workload (RSME, NASA TLX) between the baseline conditions and the various (approach/departure) NAPs?
2. Are there any differences in the task load (total R/T time, number of R/T, number of inputs) between the baseline conditions and the various NAPs?

Objective 7: Evaluate the impact of the NAPs and pilot tools on situational awareness (“energy awareness”). Within Objective 7, the following question will be investigated:

1. Are there any differences in the experienced level of situation awareness (measured with SART) between the baseline conditions and the various (approach/departure) NAPs?

2. Experimental Design

2.1. Experimental factors

The following experimental factors will be considered in the experiment: (1) noise abatement procedures, (2) airborne tools, (3) ATC instructions, and (4) wind.

2.1.1. Noise abatement procedures (Approach and Departure)

The main manipulation in the experiment concerns the different noise abatement procedures. Five different approach procedures (including the baseline approach procedure), and three different departure procedures (including the baseline departure procedure) will be used in the experiment:

- **Approach procedure I (baseline)**
- **Approach procedure II-A (CDA with fixed flight path angle, without speed constraints**
- **Approach procedure II-B (CDA with fixed flight path angle, with speed constraints)**
- **Approach procedure V (CDA with variable path segment)**
- **Departure procedure I (ICAO-A) (baseline)**
- **Departure procedure II (Sourdine optimised close-in)**

These procedures are described in more detail in Chapter 3.

2.1.2. Airborne tools (HMI)

The following tools will be used in the experiment: A flap deployment tool and vertical navigation display. There will be two different levels of the variable "airborne tools":

- Limited HMI, meaning less than optimal for the task to be performed(HMI0)
- Optimal HMI, meaning that support required for the task is provided. (HMI1).

2.1.3. ATC instructions

ATC instructions will be manipulated on two levels: the standard procedure and issuing of directs.

- Standard procedure: Vectoring in APPI, and no ATC instructions in the APPII and APPV (ATC0), and
- Directs issued to the aircraft (short cuts) (ATC1).

The standard procedure is defined differently for the various approach procedures. In APPI, the baseline, the standard procedure consists in vectoring aircraft in the TMA. In the NAPs, in contrast, the standard procedure consists in following a pre-defined lateral path. In the "direct to" condition, ATC gives directs from the TMA entry point SUGOL (direct to NARSI). Directs to the TMA entry point RIVER, in contrast, are not sensible.

2.1.4. Wind

Unexpected tailwind will be a further factor to be investigated in the experiment. There will be two conditions:

- in most scenarios, wind conditions will be normal (W1).
- In some of the scenarios, there will be an unexpected tailwind during the descent (W2).

Tailwind is included as a further experimental variable in order to test the flyability of the proposed NAPs not only under good, but also under adverse weather conditions.

2.2. Measurements, indicators, and metrics

The data collected in the experiment pertain to the following topics: Feasibility, acceptance, noise, airline costs (flight efficiency), safety, situational awareness, and workload.

2.2.1. Feasibility

Feasibility or “Flyability” of the various NAPs should be assessed both by subjective (i.e., pilot feedback) and by objective means (i.e., deviations from the instructed NAP). The following measures are suggested:

- The pilots’ report on the difficulties encountered while flying the NAP, and
- The deviation of the actual approach/departure route from the proposed NAP (vertical, profile, lateral profile, and speed constraints).

2.2.2. Noise

The level of noise pertaining to approach/departure procedure realised during the simulation will be calculated on the basis of a set of parameters logged during the simulations, preferably by using noise load calculation programme (NLCP).

2.2.3. Airline costs/Fuel consumption

Airline costs will be measured on the basis of the following metrics:

- the fuel consumption of the aircraft,
- the flight time from the TMA entry point until touch-down.

Fuel consumption and flight time will be compared between the baseline conditions and the various NAPs.

2.2.4. Safety

The level of safety will be assessed on the basis of the following indicators:

- the experienced safety level for every approach procedure,
- sub-optimal behaviour (“errors”) during the simulation,

The experienced level of safety is a subjective assessment made by the crew on how safe in their opinion the simulated approach or departure was. The experienced level of safety will be measured on the basis of a questionnaire that requires the participants to give ratings on a number of safety dimensions. Furthermore, the crew will be asked to indicate whether they had the impression that they were making inputs that were either sub-optimal or could be even considered “errors”. If so, they will be asked to report them and they will be asked to judge what the consequence of this sub-optimal action was or could have been.

All metrics pertaining to safety will be compared between the baseline condition and the proposed NAPs and tools. Quantitative measures will be analysed statistically (t-test, ANOVA); qualitative measurements will be analysed on the basis of content analysis.

2.2.5. Acceptance

Acceptance will be measured on the basis of pilots' feedback with respect to the following issues:

- The degree to which pilots are willing to accept the proposed NAPs,
- The degree to which pilots would have carried out the NAPs in daily operation,
- The degree to which pilots are willing to accept the SII airborne tools,
- Advantages/disadvantages of the SII procedures,
- Advantages/disadvantages of the SII tools, and
- The reported use of the new SII airborne tools.

The subjective measurements will be obtained on the basis of interviews and de-briefings. The data will not be quantitative, but qualitative, and therefore will be analysed with the method of content analysis rather than statistically.

2.2.6. Situational Awareness

Situational Awareness (SA) refers to the "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future" (cf. Endsley, [1, 2]). For the present purposes, the concept of situation awareness seems too broad. For the pilot, awareness can – among others - refer to the following aspects of the situation:

- The navigation of the aircraft (i.e., route to be flown, distance to threshold), and
- The aircraft's energy state (i.e., a combination of speed and altitude)

Different aspects of the pilot's situational awareness will be measured on the basis of items in the post-run questionnaire.

2.2.7. Workload in relation with performance

Workload will be measured on the basis of subjective (i.e., self-assessment) measurements which will be analysed in relation with the achieved flight performance. With respect to the performance measurements, the following metrics will be used:

- Deviation in altitude to the planned route
- Deviation in speed to the planned route
- Localizer en glide slope intercept points
- Number of communications between PF and PNF

All of these metrics will be recorded in the flight simulator. With respect to subjective measurements, the following metrics will be used:

- Rating Scale for Mental Effort (RSME), and
- NASA Task Load Index (TLX).

Both RSME and NASA TLX will be handed out once after each simulation run.

Objective and subjective measurements of taskload and workload will be compared for the baseline condition and the SII procedures. They will be analysed using descriptive (median or mean and standard deviation) an inferential statistics (t-tests, ANOVAs).

2.3. Combinations of experimental factors

The experimental design specified above is based on the following considerations:

- A complete experimental design combining the 5 approach/departure routes with the 2 levels of the variable “pilot tools”, the 2 levels of the variable “speed constraints”, 2 levels of the variable “ATC instructions” and 2 level of the variable “wind” would yield a total of 80 runs. This number of runs is by far too large to be carried out in 2 days.
- For the departure routes, the variables “ATC instruction”, “wind”, and “tools” are not relevant. For this reason, they do not have to be manipulated. Departure Procedures I and II will be done without speed constraints, without ATC instruction, without tools, and in normal wind. They will not be tested with any further manipulations, leading to two runs in the experiment.
- The baseline procedure (Approach Procedure I) should follow as closely as possible the current procedures. This means that aircraft are vectored in the TMA to intercept the ILS, pilots do a step-wise approach, and there are no additional support tools. For this reason, speed constraints, and tools do not have to be manipulated. Since Approach Procedure I includes level segments which eliminates the wind effect, wind will not be manipulated. In contrast, the ATC instruction “direct to” will be manipulated since it requires an FMS action from the crew which is seen as less desirable at low altitudes (i.e. FL100 or below).
- For the Approach Procedure V, which is an innovative, long-term procedure, it is assumed that the HMI 0 condition (without further support tools) will be not applicable any more when the implementation of the procedure becomes relevant.
- For the ATC condition, it is assumed that it can be separated from the actual arrival procedure. The reason is that it takes place before the descent from 7000ft is initiated, which is taken as the starting condition of the noise abatement approach. Therefore, the ATC condition is not included as a full experimental variable but can be limited to certain runs. The effects of ATC issued directs (i.e., ATC1) will be investigated in Approach Procedures I, II-B and V, but it will only be tested with normal wind and HMI1.

The factor “pilot role” (i.e., assignment of participants to roles) will not be crossed with the above conditions. However, it will be ensured that each participant will act as PF in half of the runs, and as PNF in the other half. Furthermore, it will be taken care that there is no systematic confounding between participants and their roles in the run one the one hand, and experimental conditions on the other.

The following experimental conditions will be realised (condition numbers as used in the experiment included in brackets for later reference):

	HMI 0 (limited)				**HMI1 (optimised)**			
	W1 (normal)		**W2 (tail wind)**		**W1 (normal)**		**W2 (tailwind**	
Procedure	**ATC 0**	**ATC1**	**ATC0**	**ATC1**	**ATC0**	**ATC1**	**ATC0**	**ATC1**
Approach Procedure I					X (1)	X (2)		
Approach Procedure II-A	X (3)		X (4)		X (5)		X (6)	
Approach Procedure II-B	X (7)		X (8)		X (9)	X (11)	X (10)	
Approach Procedure V					X (12)	X (14)	X (13)	
Departure Procedure I	X (15)							
Departure Procedure II	X (16)							

The focus of the experiment is to compare Approach Procedure I (the reference procedure) with Approach Procedure II (an experimental procedure with CDA) under varying conditions. Procedure V, a further experimental procedure with CDA, will be evaluated less extensively because it is a more long-term, far into the future, procedure.

According to the current planning, each crew will conduct 16 approaches/departures. In order to control for training effects, care should be taken that the order of conducting the flight missions vary between crews. Complete randomisation will not be applied, the runs will be executed in clusters using the same procedures. A detailed description of the rotation plan used for conducting the different runs is provided in Chapter 5.

3. Airspace, procedures, and tools used in the experiment

3.1. Airspace, SIDs and STARs

There will be two runways used in the simulations:

- Runway 18R (approach procedures): The landing will be done on 18R.
- Runway 36L (departure procedure): Departure will be done from RWY36L.

Figure 1 shows the Approach routes used in the baseline condition (i.e., Approach Procedure I), Figure 2 shows the Approach Routes used in the Sourdine experimental procedures (i.e., approach Procedures II and IV).

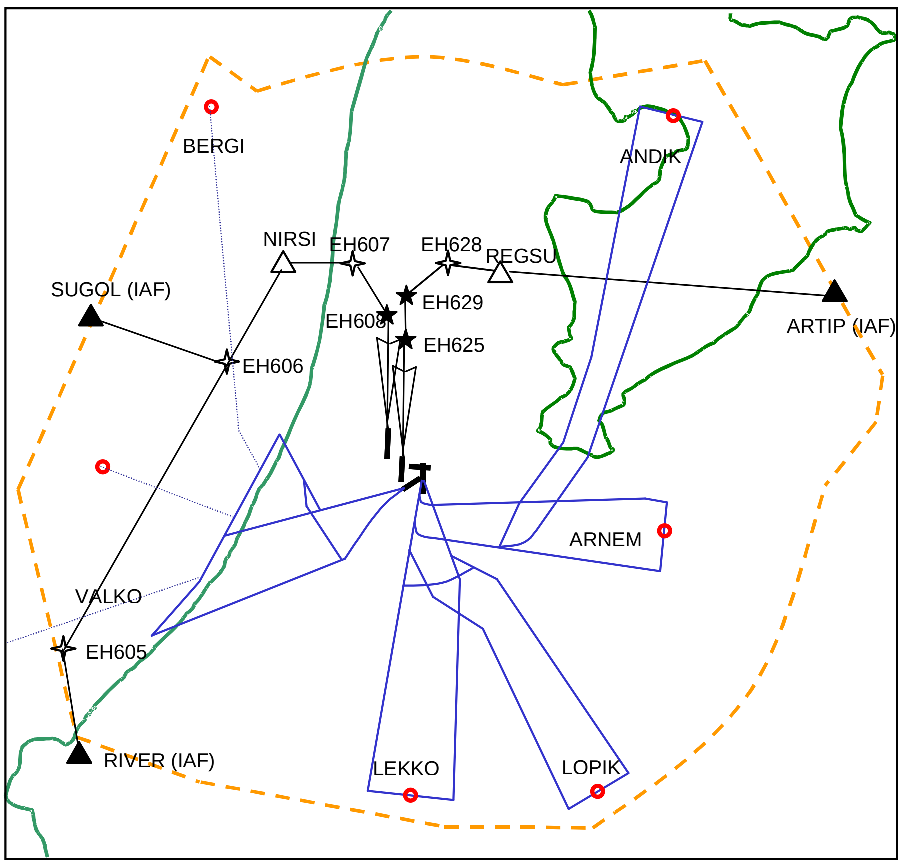


Figure 1: Approach routes used in the baseline condition

In the approach routes used for the Sourdine procedures, the merging point EH606 is slightly displaced and now called MICOL. This was necessary because traffic from RIVER starts their CDA at FL80 instead of FL70. Therefore traffic between SUGOL and RIVER is always vertically separated at the merging point. Traffic will start their descend along the CDA vertical path after this merging point. Points NIRSI, EH607 and EH608 are also slightly displaced and now called NARSI, EH707 and

EH708 respectively. This was necessary to comply with the PANS-OPS requirements for parallel approaches.

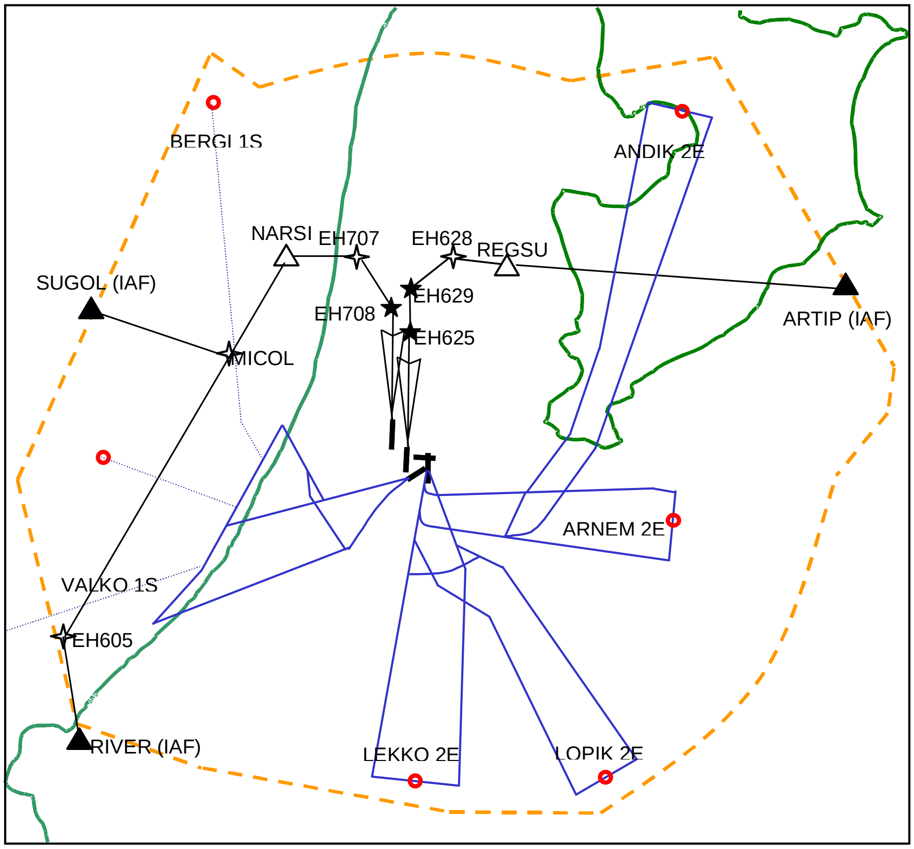


Figure 2: Approach routes used in the experimental conditions

The following RNAV transitions and approaches are available:

- RIVER 1B TRANSITION (TO RWY 18R)
- SUGOL 1B TRANSITION (TO RWY 18R)

The following SIDs are available:

- PAMPUS 1V (RWY 36L)

3.2. Noise Abatement Procedures

Overall assumptions:

- Aircraft at 90% MLW when starting approach (standard MLW per aircraft)
- Standard ISA atmospheric conditions
- Airport/runway elevation: Sea Level

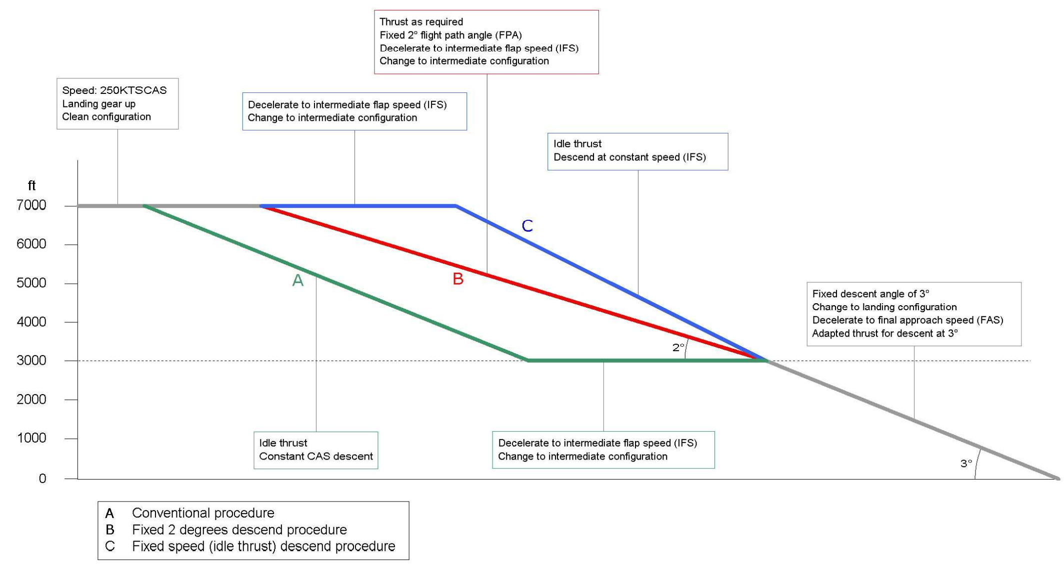


Figure 3: approach procedures flown in Sourdine II flight simulation experiment

3.2.1. Approach procedure I

Approach procedure I (Reference, green line in Figure 3): Reference with level deceleration at 3000ft

Condition	Parameter values
7000 ft (Fixed height)	– Speed 250 KTS CAS – Level flight – Clean configuration – Landing Gear up
	– Idle thrust – Constant CAS descent
3000 ft (Fixed height)	– Level flight – Decelerate and change to intermediate configuration – Decelerate to intermediate flap speed (IFS)
	– Fixed descent angle of 3° – Landing gear down – Decelerate (+) and change to landing configuration (++) – Decelerate to final approach speed (FAS)
Landing configuration and speed reached (Resulting height, minimum 1000ft)	– Adapted Thrust for descent at 3° – Constant speed (FAS) descent to 50ft

3.2.2. Approach Procedure II

Approach procedure II (red line in Figure 3): Continuous Descent Approach with 2° initial Flight Path Angle

Condition	Parameter values
7000 ft (Fixed height)	– Speed 250 KTS CAS – Level flight – Clean configuration – Landing Gear up
	– Idle thrust – Fixed 2° Flight Path Angle (FPA) – Decelerate and change to intermediate configuration – Decelerate to intermediate flap speed (IFS)
3000 ft (Fixed height)	– Fixed descent angle of 3°. – Landing gear down – Decelerate and change to landing configuration (++) – Decelerate to final approach speed (FAS)
Landing configuration and speed reached (Resulting height, minimum 1000ft)	– Adapted thrust for descent at 3° – Constant speed (FAS) descent to 50ft

(+) To maximum allowable speed to select landing configuration

(++) Minimum allow

3.2.3. Approach Procedure V

Approach procedure V (blue line in Figure 3): Continuous Descent Approach with constant speed, variable Flight Path Angle segment at intermediate configuration

Condition	Parameter values
7000 ft (Fixed height)	– Speed 250 KTS CAS – Level flight – Clean configuration – Landing Gear up
	– Idle thrust – Decelerate and change to intermediate configuration – Decelerate to intermediate flap speed (IFS)
Intermediate configuration reached (Resulting FPA)	– Descend at constant speed (IFS) to 3000ft – Idle thrust
3000 ft (Fixed height)	– Fixed descent angle of 3°. – Landing gear down – Decelerate and change to landing configuration (++) – Decelerate to final approach speed (FAS)
Landing configuration and speed reached (Resulting height, minimum 1000ft)	– Adapted thrust for descent at 3° – Constant speed (FAS) descent to 50ft

(+) To maximum allowable speed to select landing configuration

(++) Minimum allowable flap deployment

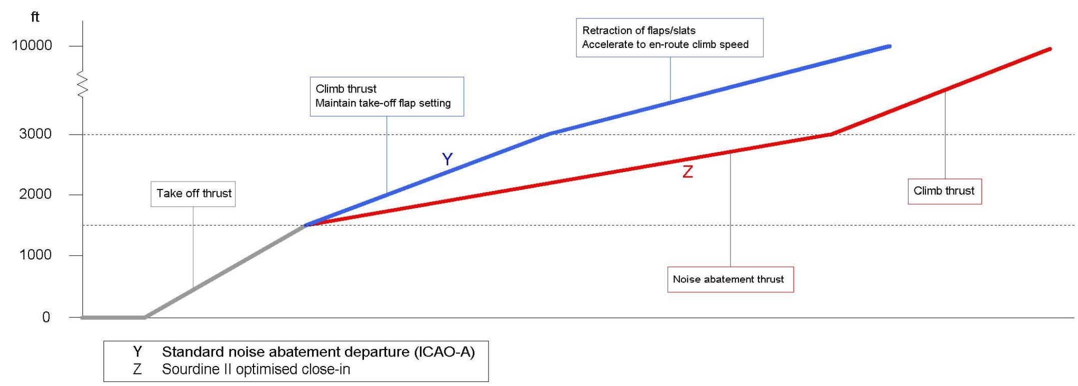


Figure 4: departure procedures flown in Sourdine II flight simulation experiment

3.2.4. Departure procedure I

Departure procedure I (Reference, blue line in Figure 4): Standard noise abatement departure (ICAO A)

Condition	Parameter values
0 ft	– TOGA (Take-off Go Around) thrust – Brake release and acceleration to rotation speed (*) – Rotation and lift-off
	– Retraction of undercarriage – Climb out at a speed of V2 + 10-20 KTS IAS (**)
1500 ft	– Reduce to climb thrust – Maintain V2 + 10-20 KTS IAS
3000 ft	– Accelerate and retract flaps/slats on schedule to clean configuration – Continue acceleration to 250KTS – Climb to 15000ft

3.2.5. Departure procedure II

Departure procedure II (red line in Figure 4): SII Optimised Close-in

Condition	Parameter values
0 ft	– TOGA (Take-off Go Around) thrust – Brake release and acceleration to rotation speed (*) – Rotation and lift-off
	– Retraction of undercarriage – Climb out at a speed of V2 + 10-20 KTS IAS (**)
At an altitude not lower than 800ft [1]	– Reduce thrust to OEI climb gradient (***) or max climb, whichever is lowest – Maintain V2 + 10-20 KTS IAS
3000 ft	– If OEI climb gradient thrust was selected: gradually change thrust to climb thrust – Maintain V2 + 10-20 KTS IAS
5000 ft	– Accelerate and retract flaps/slats on schedule to clean configuration – Continue acceleration to 250KTS – Climb to 15000ft

(*) cleanest possible takeoff configuration

(**) V2+10 where possible

(***) 1.7% for 4 engines jet, 1.2% for twinjet

[1] Strictly dependant on local airport

3.3. Flight Deck displays

In support of the Sourdine procedures the following items are added on the flight deck:

- Vertical navigation display
- Flap deployment cues

Further modifications are assumed not to be required. The relevant procedure is assumed to be available in the navigation database. Which is for the experiment the case.

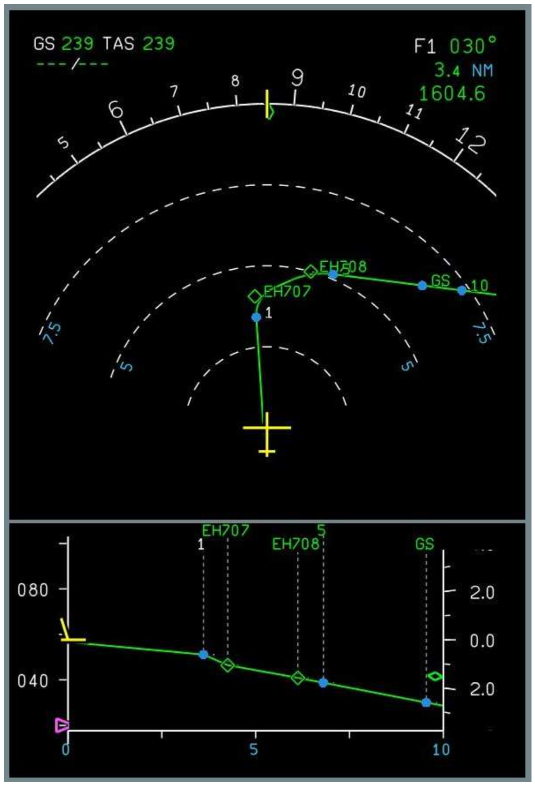


Figure 5: Navigation display with Sourdine specific elements

4. Experimental environment

4.1. GRACE

The GRACE, Generic Research Aircraft Cockpit Environment, has a number of standard configurations. One of those is the Airbus A330 layout. As figure 4 shows, the A330 configuration includes the displays and flight controls for both pilots. Behind the two pilots a seat for an observer is available. During the experiment an observer will be present for handling the questionnaires to both pilots after each run, the observer will notify the crew what the conditions (procedure and flight deck tools) of the next run will be. During the runs the observer will make notes of observations without interrupting the activities of the crew during a run.

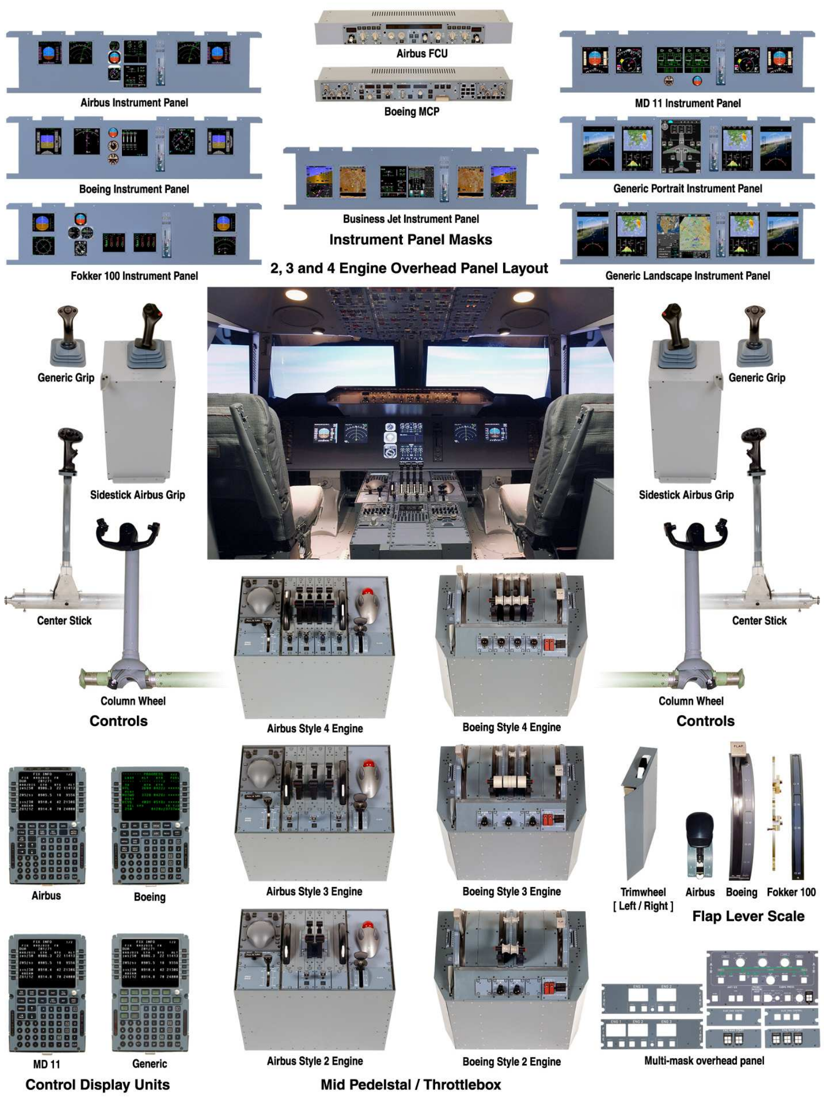


Figure 6: GRACE various layouts

4.2. Pilot Roles

There will be two pilot tasks in the simulation: the Pilot Flying (PF) and the Pilot Not Flying (PNF). The tasks to be carried out by PF and PNF are conform normal operations and will be varied (conform the experimental matrix) between captain and first officer. The pilot flying will operate the autopilot, monitor the flight progress and optionally the FMS. The PNF will perform the communication with ATC, read the checklist on request of the PF and optionally perform FMS tasks.

4.3. Experimental scenarios

In the simulation, the following runway configuration will be used: inbound runway 18R, outbound runway 36L. For more information on the airspace used and the Approach/Departure routes see Chapter 3.

5. Conduct of the experiment

5.1. Participants

It is assumed that 5 crews consisting of two airline pilots each will participate in the experiment.

5.2. Duration of the experiment

According to the above planning, each crew will carry out 16 runs (see Chapter 2.3). Together with an initial briefing and some training flights in the simulator, these 16 runs can be conducted within 2 days. This means that 5 crews will participate for 2 days each, yielding a total of 10 experimental days.

5.3. Rotation of experimental conditions over participants

As was highlighted in section 2.3, the order in which the experimental conditions are completed is varied between crews to avoid training effects. The in that section described 16 experimental conditions are executed in five clusters containing runs with similar procedures. These five clusters are allocated to the five crews according to a Latin Square arrangement. The composition of the different clusters and the distribution of these blocks over the different crews is presented below. Within the separate clusters of conditions, different combinations of the three or four conditions were possible, and are chosen in such a way that each crew receives a different sequence. In this way, each crew executes both the clusters as well as the conditions within the clusters in a different order. The complete rotation plan of the experiment is included in Annex B.

Block	Procedure	Conditions
A	Reference approach (I) / departure (I / II)	1, 2, 15, 16
B	Approach II-A	3, 4, 5
C	Approach II-A/b	6, 7, 8
D	Approach II-B	9, 10, 11
E	Approach V	12, 13, 14

		Presentation order				
		1	2	3	4	5
Crew	1	A	D	C	B	E
	2	C	A	E	D	B
	3	D	B	A	E	C
	4	E	C	B	A	D
	5	B	E	D	C	A

5.4. Pre-experimental information and training

A briefing guide will be sent out to all participants a couple of weeks before the start of the experiment. Furthermore, a considerable part of the first experiment day will be used for training purposes. The briefing guide and the training will cover the following topics:

- A short presentation of the Sourdine concept and the proposed approach and departure procedures,
- A description of the flight simulator,
- A description of the function and usage of the pilot tools.

In addition, training runs will be conducted in order for the participants to familiarise themselves with the simulator. These training runs will cover the en-route phase as well and will last longer than the experimental runs. Longer training runs should be better suited for familiarisation with the simulator than short, frequently interrupted flight sections.

Each of the two participants will have the same amount of training time as PF and as PNF.

5.5. Time schedule for the simulation

Every simulation run will last around 15 minutes (from TMA entry point until touch-down). Starting up the simulator for the next exercise will take around 5-10 minutes. During this time, participants will be requested to fill in post-run questionnaires (see Annex A) for the measurement of Situation Awareness and Workload. The proposed time schedule for the 2 simulation days is as follows:

First day

9:00 Briefing on the concept, the procedures, and the pilot tools

10:30 Coffee Break

10:45 Training flights in the simulator

12:15 Lunch

13:15 Continued training in the flight simulator

14:15 Run 1 - 4 (including questionnaires)

15:45 Coffee Break

16:00 Run 5 – 6 (including questionnaires

16:45 De-briefing

17:00 End

Second day

8:45 Arrival at Simulator

9:00 Run 7 - 10 (including questionnaires)

11:30 Coffee Break

11:45 Run 11 - 12 (including questionnaires)

12:30 Lunch Break

13:30 Run 13 - 16 (including questionnaires)

15:00 Coffee Break

15:15 Final De-briefing

17:00 End

Annex A: Questionnaires

NASA TLX

NASA-TLX Rating scale definitions

INSTRUCTIONS:

Please read the descriptions below.

After that, make your selection for the pair-wise comparison of factors listed at the bottom of this page.

Scale	Description
Mental demand (MD)	How much mental activity and perceptual activity was required (e.g., thinking, deciding, calculating, remembering, searching, etc.)? Was the task easy or demanding, simple or complex, exacting or forgiving?
Physical demand (PD)	How much physical activity was required (e.g., pushing, pulling, turning, controlling, activating, etc.)? Was the task easy or demanding, slow or brisk, slack or strenuous, restful or laborious?
Temporal demand (TD)	How much time pressure did you feel due to the rate or pace at which the tasks or task elements occurred? Was the pace slow and leisurely or rapid and frantic?
Performance (OP)	How successful do you think you were in accomplishing the goals of the task set by the experimenter (or yourself)? How satisfied were you with your performance in accomplishing these goals?
Effort (EF)	How hard did you have to work (mentally and physically) to accomplish you level of performance?
Frustration level (FL)	How insecure, discouraged, irritated, stressed and annoyed versus secure, gratified, content, relaxed and complacent did you feel during the task?

Pair-wise comparison of factors

Select the member of each pair that provided the most significant source or workload variation in the task(s) you performed (circle the most significant factor).

Physical demand / Mental demand

Temporal demand / Mental demand

Performance / Mental demand

Effort / Mental demand

Frustration level / Mental demand

Temporal demand / Physical demand

Performance / Physical demand

Effort / Physical demand

Frustration level / Physical demand

Performance / Temporal demand

Effort / Temporal demand

Frustration level / Temporal demand

Effort / Performance

Frustration level / Performance

Frustration level / Effort

NASA TLX RATING SHEET

INSTRUCTIONS:

On each scale, place a mark that represents the magnitude of that factor in the task(s) you just performed.

LOW **HIGH**

MENTAL DEMAND

LOW **HIGH**

PHYSICAL DEMAND

LOW **HIGH**

TEMPORAL DEMAND

EXCELLENT **POOR**

PERFORMANCE

LOW **HIGH**

EFFORT

LOW **HIGH**

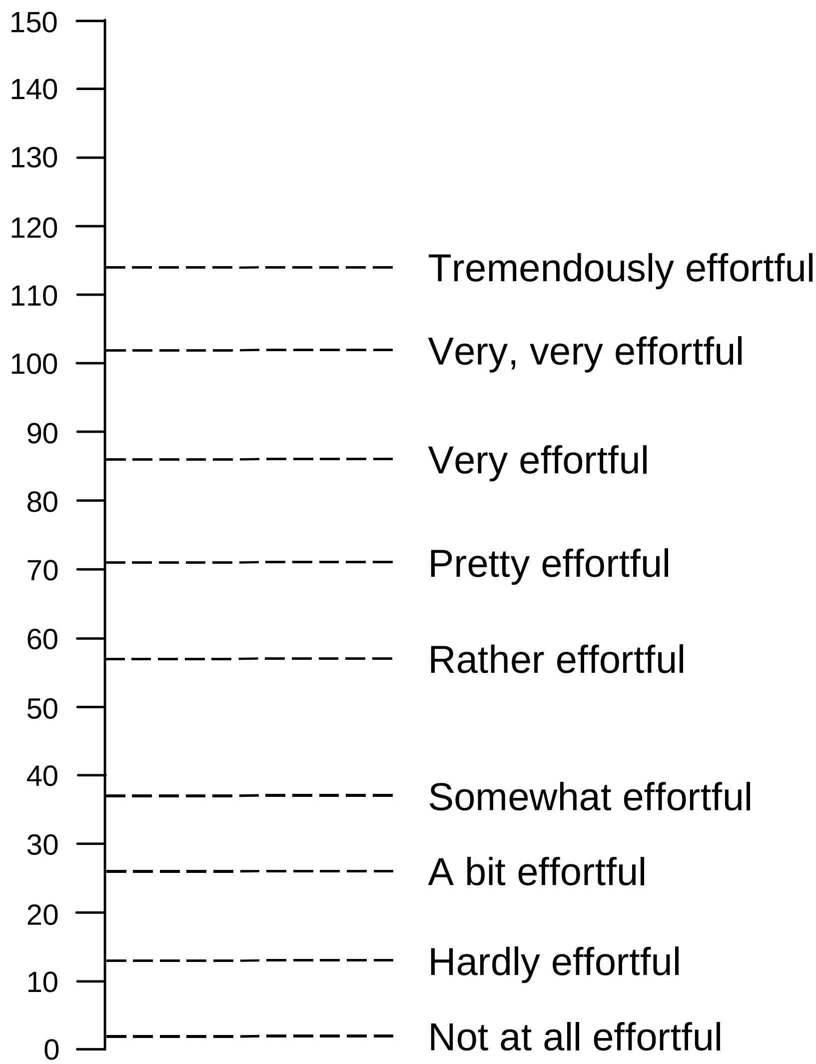
FRUSTRATION

Nationaal Lucht- en Ruimtevaartlaboratorium
National Aerospace Laboratory (NLR)

crew	position	run	date

Rating Scale Mental Effort (RSME)

Please indicate, by placing a mark on the vertical line below, how much effort you had to invest in order to execute the task (that you have just been working on).



Post-run questionnaire

Listed below are some detailed questions related to the past run.

Please rate them by checking one box only.

1. In your opinion, this run was **efficient**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

2. In your opinion, this run was **safe**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

3. In your opinion, this run was **noise-friendly**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

4. Your **awareness** of the aircraft's **energy state** in this run was:						
	Very low	**Low**	*Rather low*	*Rather high*	*High*	*Very high*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

5. Your **awareness** of the **relevant surrounding traffic** in this run was:						
	Very low	*Low*	*Rather low*	*Rather high*	*High*	*Very high*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

6. Your **navigational awareness** (e.g., route to be flown) in this run was:						
	Very low	*Low*	*Rather low*	*Rather high*	*High*	*Very high*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

7. Did you have problems with the **Approach/Departure procedure** in this run?		
	YES	*NO*
(Please check one box only)	❑	❑
*If **yes**, please explain:*		

8. In your opinion, the **flap / gear deployment indications** (next to the route on the Navigation Display) used in this run provided you with helpful information:

	Not applicable		*Completely disagree*	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑		❑	❑	❑	❑	❑	❑

If not agreed or slightly agree, please explain:

9. Did you have problems with the **flap / gear deployment indications** (next to the route on the Navigation Display) in this run?

	Not applicable		*YES*	*NO*
(Please check one box only)	❑		❑	❑

*If **yes**, please explain:*

10. How do you rate the design of the **flap / gear deployment indications** (next to the route on the Navigation Display)?

	Not applicable		*Poor*	*Fair*	*Good*
(Please check one box only)	❑		❑	❑	❑

*If **yes**, please explain:*

11. In your opinion, the **vertical navigation display** used in this run provided you with helpful information:

	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑

If not agreed or slightly agree, please explain:

12. Did you have problems with the **vertical navigation display** in this run?

	YES	*NO*
(Please check one box only)	❑	❑

*If **yes**, please explain:*

13. How do you rate the design of the **vertical navigation display**?

	Not applicable		*Poor*	*Fair*	*Good*
(Please check one box only)	❑		❑	❑	❑

*If **yes**, please explain:*

14. Do you think you need additional or improved tools / information / etc. to perform the current run (flying the current procedure) in a more successful way?		
	YES	*NO*
(Please check one box only)	❑	❑
*If **yes**, please explain:*		

15. The run you performed was overall acceptable *A system, tool or procedure is **acceptable** if you would accept it in your real working conditions.*						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑

If rated less than agree, please state reason(s) (more ticks allowed):

- ❑ Workload
- ❑ Safety
- ❑ Flight efficiency (flight time, fuelburn, etc.)
- ❑ Other:

Debriefing questionnaire

Participant:	Date:	Time:

Listed below are some questions related to the approach / departure procedures that you have flown during the experiment. The questions are applicable to the procedures in general, not to any specific condition you have flown. Furthermore, you will find some questions regarding the Sourdine II tools that were introduced.

Please rate the questions by checking one box only.

Approach procedure A:

Reference with level deceleration at 3000ft (green line in Figure 7)

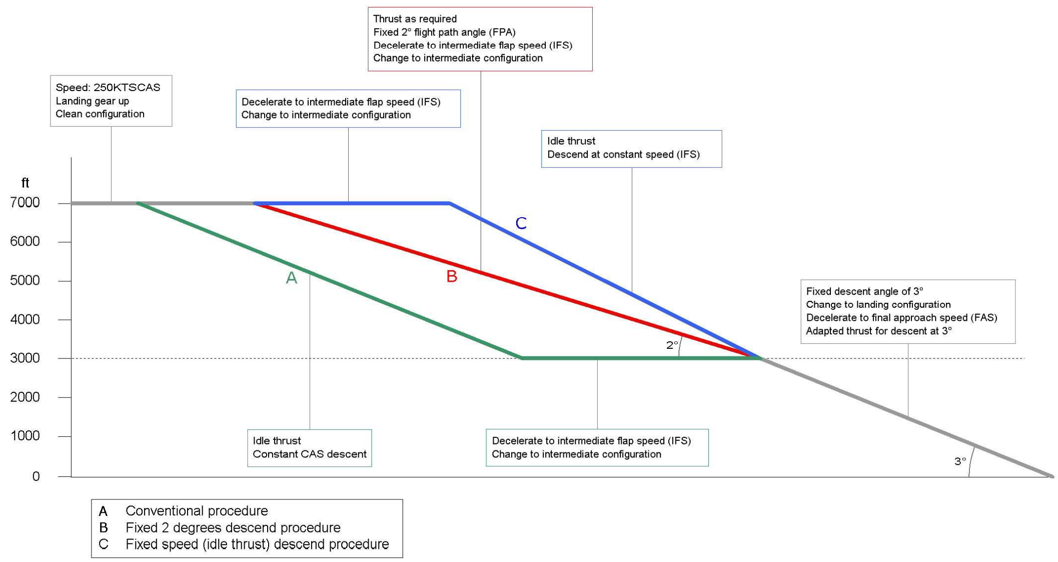


Figure 7: Approach procedures

16. What do you consider to be the **advantages** of approach procedure A?
Please explain:

17. What do you consider to be the **disadvantages** of approach procedure A?
Please explain:

18. In your opinion, approach procedure A is overall **safe**						
	Complet ely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Complet ely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

19. In your opinion, approach procedure A is overall **efficient**						
	Complet ely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Complet ely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

20. In your opinion, approach procedure A is overall **noise friendly**						
	Complet ely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Complet ely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

21. In your opinion, approach procedure A is overall **acceptable** *A system, tool or procedure is **acceptable** if you would accept it in your real working conditions.*						
	Complet ely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Complet ely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

Approach procedure B:

Continuous Descent Approach with 2°initial Flight Path Angle (red line in Figure 8)

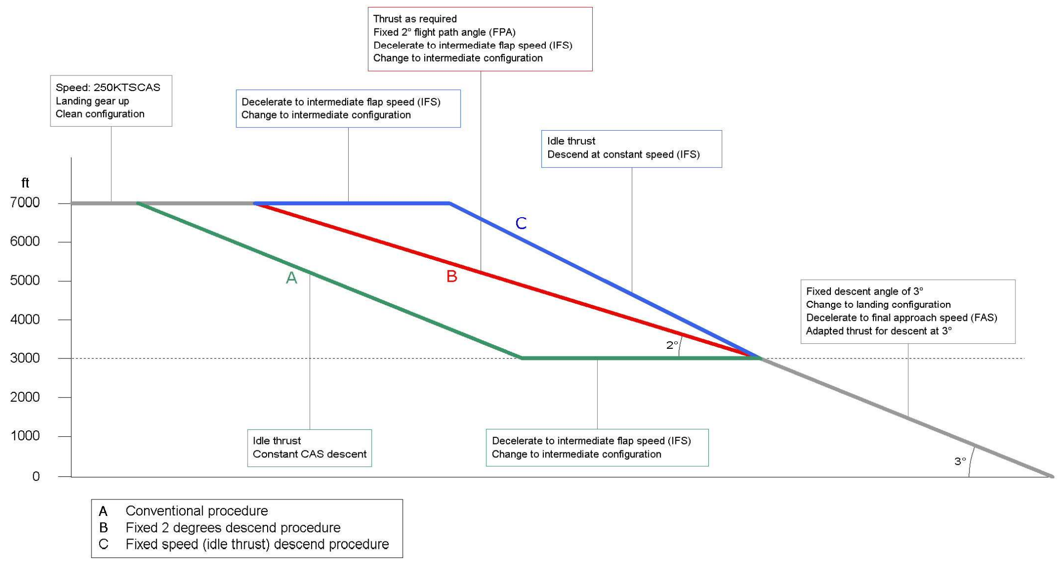


Figure 8: Approach procedures

22. What do you consider to be the **advantages** of approach procedure B?
Please explain:

23. What do you consider to be the **disadvantages** of approach procedure B?
Please explain:

24. In your opinion, approach procedure B is overall **safe**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

25. In your opinion, approach procedure B is overall **efficient**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

26. In your opinion, approach procedure B is overall **noise friendly**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

27. In your opinion, approach procedure B is overall **acceptable** *A system, tool or procedure is **acceptable** if you would accept it in your real working conditions.*						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

Approach procedure C:

Continuous Descent Approach with constant speed, variable Flight Path Angle segment at intermediate configuration (blue line in Figure 9)

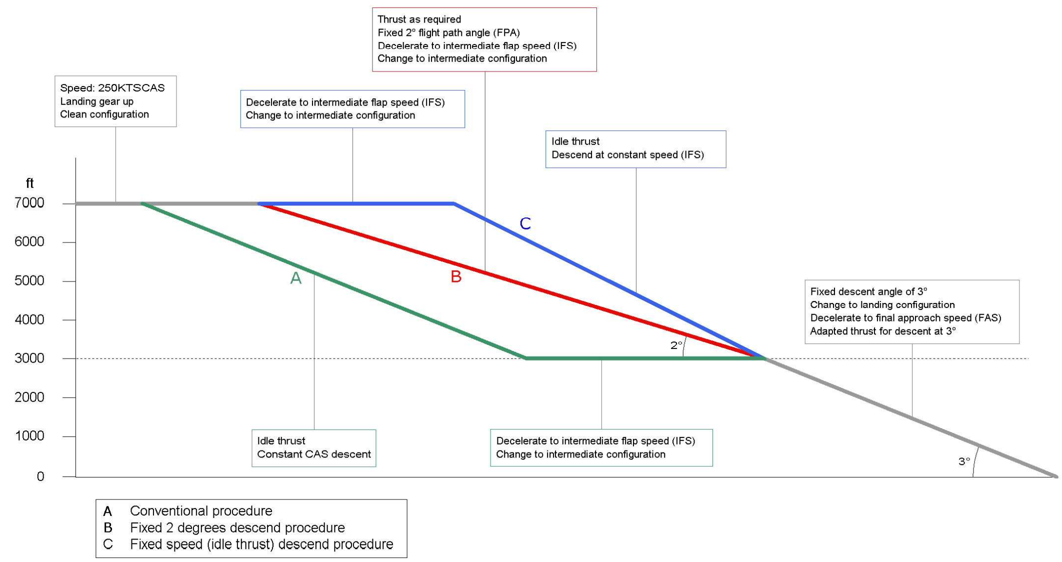


Figure 9: Approach procedures

28. What do you consider to be the **advantages** of approach procedure C?
Please explain:

29. What do you consider to be the **disadvantages** of approach procedure C?
Please explain:

30. In your opinion, approach procedure C is overall **safe**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

31. In your opinion, approach procedure C is overall **efficient**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

32. In your opinion, approach procedure C is overall **noise friendly**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

33. In your opinion, approach procedure C is overall **acceptable** *A system, tool or procedure is* ***acceptable*** *if you would accept it in your real working conditions.*						
	Complet ely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Complet ely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

Departure procedure Y:

Standard noise abatement departure (ICAO-A, blue line in Figure 10)

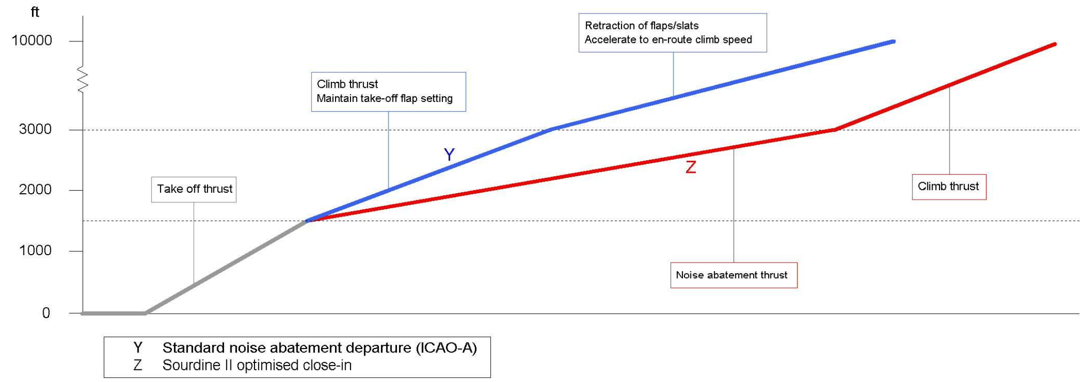


Figure 10: Departure procedures

34. What do you consider to be the **advantages** of departure procedure Y?
Please explain:

35. What do you consider to be the **disadvantages** of departure procedure Y?
Please explain:

36. In your opinion, departure procedure Y is overall **safe**						
	Complet ely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Complet ely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

37. In your opinion, departure procedure Y is overall **efficient**						
	Complet ely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Complet ely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

38. In your opinion, departure procedure Y is overall **noise friendly**						
	Complet ely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Complet ely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

39. In your opinion, departure procedure Y is overall **acceptable** *A system, tool or procedure is **acceptable** if you would accept it in your real working conditions.*						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

Departure procedure Z:

Sourdine II optimised close-in (red line in Figure 11)

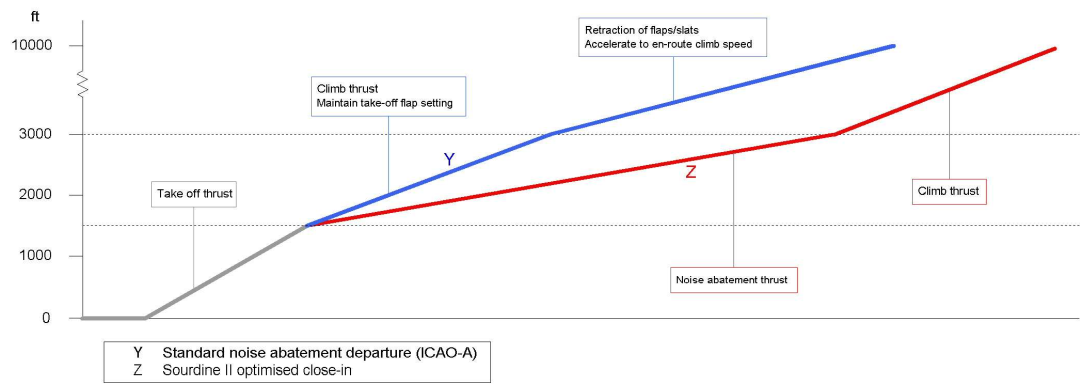


Figure 11: Departure procedures

40. What do you consider to be the **advantages** of departure procedure Z?
Please explain:

41. What do you consider to be the **disadvantages** of departure procedure Z?
Please explain:

42. In your opinion, departure procedure Z is **safe**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

43. In your opinion, departure procedure Z is overall **efficient**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

44. In your opinion, departure procedure Z is overall **noise friendly**						
	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑
If not agreed or slightly agree, please explain:						

45. In your opinion, departure procedure Z is overall **acceptable**

*A system, tool or procedure is **acceptable** if you would accept it in your real working conditions.*

	Complet ely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Complet ely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑

If not agreed or slightly agree, please explain:

General questions about Sourdine II tools

46. In your opinion, making **flap / gear selections** based on system advisory (the flap / gear deployment indications) instead of based on current operating procedures is **acceptable**.

*A system, tool or procedure is **acceptable** if you would accept it in your real working conditions.*

	Completely disagree	*Mostly disagree*	*Slightly disagree*	*Slightly agree*	*Mostly agree*	*Completely agree*
(Please check one box only)	❑	❑	❑	❑	❑	❑

If not agreed or slightly agree, please explain:

47. Do you have suggestions for improvement of the **flap / gear deployment indications**?

	YES	*NO*
(Please check one box only)	❑	❑

*If **yes**, please explain:*

48. Do you have suggestions for improvement of the **vertical navigation display**?

	YES	*NO*
(Please check one box only)	❑	❑

*If **yes**, please explain:*

49. Do you have any other suggestions for improvement of the human machine interface?		
	YES	*NO*
(Please check one box only)	❑	❑
*If **yes**, please explain:*		

50. Do you have any other comments on the experiment in general?		
	YES	*NO*
(Please check one box only)	❑	❑
*If **yes**, please explain:*		

Annex B: Rotation plan experimental conditions

Crew 1

RUN	BLOCK	CONDITION	DEPARTURE / APPROACH	PROCEDURE		HMI	WIND	ATC	PF	ROUTE	SPEED CONSTRAINTS
1	A	1	approach	I	A	HMI 1	W1	ATC 0	F/O	River	Current constraints part of procedure
2	A	2	approach	I	A	HMI 1	W1	ATC 1	Captain	Sugol	Current constraints part of procedure
3	A	16	departure	II	Z	HMI 0	W1		Captain		
4	A	15	departure	I	Y	HMI 0	W1		F/O		
5	D	9	approach	II-B	B	HMI 1	W1	ATC 0	Captain	Sugol	C1 part of procedure
6	D	11	approach	II-B	B	HMI 1	W1	ATC 1	F/O	Sugol	C1 part of procedure
7	D	10	approach	II-B	B	HMI 1	W2	ATC 0	F/O	River	C1 part of procedure
8	C	7	approach	II-B	B	HMI 0	W1	ATC 0	F/O	Sugol	C1 part of procedure
9	C	6	approach	II-A	B	HMI 1	W2	ATC 0	Captain	Sugol	C0 part of procedure
10	C	8	approach	II-B	B	HMI 0	W2	ATC 0	Captain	River	C1 part of procedure
11	B	3	approach	II-A	B	HMI 0	W1	ATC 0	Captain	River	C0 part of procedure
12	B	5	approach	II-A	B	HMI 1	W1	ATC 0	F/O	River	C0 part of procedure
13	B	4	approach	II-A	B	HMI 0	W2	ATC 0	F/O	Sugol	C0 part of procedure
14	E	13	approach	V	C	HMI 1	W2	ATC 0	F/O	Sugol	C0 part of procedure
15	E	14	approach	V	C	HMI 1	W1	ATC 1	Captain	Sugol	C0 part of procedure
16	E	12	approach	V	C	HMI 1	W1	ATC 0	Captain	River	C0 part of procedure

Crew 2

RUN	BLOCK	CONDITION	DEPARTURE / APPROACH	PROCEDURE		HMI	WIND	ATC	PF	ROUTE	SPEED CONSTRAINTS
1	C	6	approach	II-A	B	HMI 1	W2	ATC 0	Captain	Sugol	C0 part of procedure
2	C	8	approach	II-B	B	HMI 0	W2	ATC 0	Captain	River	C1 part of procedure
3	C	7	approach	II-B	B	HMI 0	W1	ATC 0	F/O	Sugol	C1 part of procedure
4	A	2	approach	I	A	HMI 1	W1	ATC 1	Captain	Sugol	Current constraints part of procedure
5	A	1	approach	I	A	HMI 1	W1	ATC 0	F/O	River	Current constraints part of procedure
6	A	15	departure	I	Y	HMI 0	W1		F/O		
7	A	16	departure	II	Z	HMI 0	W1		Captain		
8	E	12	approach	V	C	HMI 1	W1	ATC 0	Captain	River	C0 part of procedure
9	E	14	approach	V	C	HMI 1	W1	ATC 1	Captain	Sugol	C0 part of procedure
10	E	13	approach	V	C	HMI 1	W2	ATC 0	F/O	Sugol	C0 part of procedure
11	D	10	approach	II-B	B	HMI 1	W2	ATC 0	F/O	River	C1 part of procedure
12	D	9	approach	II-B	B	HMI 1	W1	ATC 0	Captain	Sugol	C1 part of procedure
13	D	11	approach	II-B	B	HMI 1	W1	ATC 1	F/O	Sugol	C1 part of procedure
14	B	4	approach	II-A	B	HMI 0	W2	ATC 0	F/O	Sugol	C0 part of procedure
15	B	3	approach	II-A	B	HMI 0	W1	ATC 0	Captain	River	C0 part of procedure
16	B	5	approach	II-A	B	HMI 1	W1	ATC 0	F/O	River	C0 part of procedure

Crew 3

RUN	BLOCK	CONDITION	DEPARTURE / APPROACH	PROCEDURE		HMI	WIND	ATC	PF	ROUTE	SPEED CONSTRAINTS
1	D	11	approach	II-B	B	HMI 1	W1	ATC 1	F/O	Sugol	C1 part of procedure
2	D	10	approach	II-B	B	HMI 1	W2	ATC 0	F/O	River	C1 part of procedure
3	D	9	approach	II-B	B	HMI 1	W1	ATC 0	Captain	Sugol	C1 part of procedure
4	B	4	approach	II-A	B	HMI 0	W2	ATC 0	F/O	Sugol	C0 part of procedure
5	B	5	approach	II-A	B	HMI 1	W1	ATC 0	F/O	River	C0 part of procedure
6	B	3	approach	II-A	B	HMI 0	W1	ATC 0	Captain	River	C0 part of procedure
7	A	16	departure	II	Z	HMI 0	W1		Captain		
8	A	15	departure	I	Y	HMI 0	W1		F/O		
9	A	1	approach	I	A	HMI 1	W1	ATC 0	F/O	River	Current constraints part of procedure
10	A	2	approach	I	A	HMI 1	W1	ATC 1	Captain	Sugol	Current constraints part of procedure
11	E	14	approach	V	C	HMI 1	W1	ATC 1	Captain	Sugol	C0 part of procedure
12	E	13	approach	V	C	HMI 1	W2	ATC 0	F/O	Sugol	C0 part of procedure
13	E	12	approach	V	C	HMI 1	W1	ATC 0	Captain	River	C0 part of procedure
14	C	7	approach	II-B	B	HMI 0	W1	ATC 0	F/O	Sugol	C1 part of procedure
15	C	8	approach	II-B	B	HMI 0	W2	ATC 0	Captain	River	C1 part of procedure
16	C	6	approach	II-A	B	HMI 1	W2	ATC 0	Captain	Sugol	C0 part of procedure

Crew 4

RUN	BLOCK	CONDITION	DEPARTURE / APPROACH	PROCEDURE		HMI	WIND	ATC	PF	ROUTE	SPEED CONSTRAINTS
1	E	14	approach	V	C	HMI 1	W1	ATC 1	Captain	Sugol	C0 part of procedure
2	E	12	approach	V	C	HMI 1	W1	ATC 0	Captain	River	C0 part of procedure
3	E	13	approach	V	C	HMI 1	W2	ATC 0	F/O	Sugol	C0 part of procedure
4	C	8	approach	II-B	B	HMI 0	W2	ATC 0	Captain	River	C1 part of procedure
5	C	6	approach	II-A	B	HMI 1	W2	ATC 0	Captain	Sugol	C0 part of procedure
6	C	7	approach	II-B	B	HMI 0	W1	ATC 0	F/O	Sugol	C1 part of procedure
7	B	5	approach	II-A	B	HMI 1	W1	ATC 0	F/O	River	C0 part of procedure
8	B	3	approach	II-A	B	HMI 0	W1	ATC 0	Captain	River	C0 part of procedure
9	B	4	approach	II-A	B	HMI 0	W2	ATC 0	F/O	Sugol	C0 part of procedure
10	A	15	departure	I	Y	HMI 0	W1		F/O		
11	A	2	approach	I	A	HMI 1	W1	ATC 1	Captain	Sugol	Current constraints part of procedure
12	A	16	departure	II	Z	HMI 0	W1		Captain		
13	A	1	approach	I	A	HMI 1	W1	ATC 0	F/O	River	Current constraints part of procedure
14	D	10	approach	II-B	B	HMI 1	W2	ATC 0	F/O	River	C1 part of procedure
15	D	11	approach	II-B	B	HMI 1	W1	ATC 1	F/O	Sugol	C1 part of procedure
16	D	9	approach	II-B	B	HMI 1	W1	ATC 0	Captain	Sugol	C1 part of procedure

Crew 5

RUN	BLOCK	CONDITION	DEPARTURE / APPROACH	PROCEDURE		HMI	WIND	ATC	PF	ROUTE	SPEED CONSTRAINTS
1	B	5	approach	II-A	B	HMI 1	W1	ATC 0	F/O	River	C0 part of procedure
2	B	4	approach	II-A	B	HMI 0	W2	ATC 0	F/O	Sugol	C0 part of procedure
3	B	3	approach	II-A	B	HMI 0	W1	ATC 0	Captain	River	C0 part of procedure
4	E	13	approach	V	C	HMI 1	W2	ATC 0	F/O	Sugol	C0 part of procedure
5	E	12	approach	V	C	HMI 1	W1	ATC 0	Captain	River	C0 part of procedure
6	E	14	approach	V	C	HMI 1	W1	ATC 1	Captain	Sugol	C0 part of procedure
7	D	11	approach	II-B	B	HMI 1	W1	ATC 1	F/O	Sugol	C1 part of procedure
8	D	9	approach	II-B	B	HMI 1	W1	ATC 0	Captain	Sugol	C1 part of procedure
9	D	10	approach	II-B	B	HMI 1	W2	ATC 0	F/O	River	C1 part of procedure
10	C	6	approach	II-A	B	HMI 1	W2	ATC 0	Captain	Sugol	C0 part of procedure
11	C	7	approach	II-B	B	HMI 0	W1	ATC 0	F/O	Sugol	C1 part of procedure
12	C	8	approach	II-B	B	HMI 0	W2	ATC 0	Captain	River	C1 part of procedure
13	A	1	approach	I	A	HMI 1	W1	ATC 0	F/O	River	Current constraints part of procedure
14	A	16	departure	II	Z	HMI 0	W1		Captain		
15	A	2	approach	I	A	HMI 1	W1	ATC 1	Captain	Sugol	Current constraints part of procedure
16	A	15	departure	I	Y	HMI 0	W1		F/O		