The SOURDINE Projects : Developing environmentally friendly arrival and departure procedures

Les projets SOURDINE : Développer des procédures de décollage et d'atterrissage respectueuses de l'environnement

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Recent years have shown a rapid increase in air traffic and the associated community noise is today cited as a major problem. This issue has to be solved by the air transport industry, if further growth is to be accomodated without intolerable nuisance levels for the community arising from aircraft movements. Many steps have already been taken both worldwide and within Europe to search for improvements in this area. Most notably, the continued development of more silent engines and airframes will aid in a reduction of the aircraft noise levels. However, this is a relatively slow process, which can only be achieved through a gradual replacement of the existing fleet by these more advanced aircraft and engine types.
An additional solution to the noise problem, which can be applied both to the current fleet as well as to future aircraft, is provided by introducing alternative approach and departure procedures at affected airports. This concerns a more advanced operation of the aircraft, aimed at producing a lower noise output by modifying the way the aircraft approaches or departs from an airport. Various procedures have already been introduced at different airports to provide a local solution, e.g. special take-off procedures and different variants of a continuous descent approach procedure as applied at Heathrow or Schipol airport. There is, however, currently a lack of standardisation with respect to the international harmonisation and operation of such procedures.
The SOURDINE I project provided a step towards a harmonised approach within Europe in this field. In this pilot project, in preparation of a follow-on project, an inventory has been made of current regulations and practices concerning aircarft noise, upcoming technology and their evolution together with a study of operational, safety, capacity and economical constraints that influence the definition of new procedures. Based on these data, a number of promising measures have been selected and assessed for introduction in the short and medium term, as well as requirements have been defined for supporting tools to introduce these measures.
The overall results of the Sourdine I project form a basis for the SOURDINE II follow-up project in which the most promising noise abatement measures and the enabling technologies for ATC and aircraft will be further developed. An essential prerequisite for a world-wide acceptability of an alternative procedure, will be the involvement of all concerned parties in the developement process, such as the aircraft operators, manufacturers, airports authorities and air traffic control. The consortia for both projects have been set up to reflect this requirement, and involve these parties either through active development or by means of a review board.
Ces dernières années ont vu une augmentation rapide du trafic aérien et le bruit qui lui est associé, cité comme un problème majeur. Ce problème doit être résolu par l'industrie aéronautique si elle veut que cette croissance continue sans augmenter, de façon intolérable pour la population, les nuisances provenant des mouvements d'avions.
Plusieurs étapes ont déjà été franchies dans le monde et en Europe pour trouver des améliorations dans ce domaine. On peut noter que la mise au point de moteurs et de fuselages toujours plus silencieux, aide à la réduction du bruit des avions. Toutefois, cette évolution est relativement lente, car elle est tributaire d'un remplacement graduel de la flotte existante par ces avions et ces moteurs plus évolués.
Une autre solution au problème de bruit, qui peut être appliquée autant à la flotte actuelle qu'aux futurs avions peut être d'introduire des procédures alternatives de décollage et d'atterrisage sur chaque aéroport. Il s'agit d'une manœuvre plus précoce de l'avion, visant à produire moins de bruit en modifiant la manière avec laquelle les avions décollent et atterrissent sur un aéroport. Différentes procédures ont déjà été introduites sur plusieurs aéroports afin de fournir des solutions locales comme des procédures de décollage particulières ou différentes adaptations de la procédure d'approche en descente continue comme celle appliquée à Heatrow (Angleterre) ou Schipol (Pays-Bas). Malheureusement, une normalisation manque en vue de l'harmonisation au plan international de telles procédures.
Le projet SOURDINE I a été une étape vers cette approche harmonisée en Europe. Dans ce projet pilote, un inventaire des réglementations actuelles et des pratiques a été fait, concernant le bruit des avions, les technologies futures et leurs évolutions conjointement à une étude des contraintes opérationnelles, de sécurité, de capacité et économiques qui influent sur la définition des nouvelles procédures. A partir de ces données, un nombre de mesures ont été sélectionnées et évaluées afin de les introduire dans les procédures à moyen et court termes. Dans le même temps, des outils supplémentaires ont été exigés pour mettre en place ces mesures.
Les résultats de ce programme forment la base du projet SOURDINE II dans lequel les mesures de réduction du bruit les plus prometteuses et les technologies les plus appropriées pour les ATC et les avions seront davantage développées. Un préalable essentiel à l'acceptation universelle de cette procédure alternative sera la participation à ce processus de développement de toutes les parties concernées telles que les opérateurs d'avions, les constructeurs, les autorités aéroportuaires compétentes et les contrôleurs aériens. Les consortium des deux projets ont été mis en place pour réfléchir à ces exigences et impliquer les différents partenaires soit au travers d'un développement actif soit par le biais d'un comité de suivi.

The SOURDINE projects

The way how you fly the aircraft, can also influence the noise. So thereby, in 1998, the European Commission initiated the SOURDINE projects. Its main objective was to develop European harmonised environmental friendly approach and departure procedures (e.g. speed, thrust, altitude, configuration, routing).

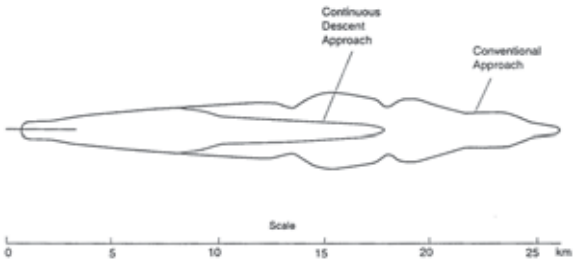

Fig. 1 : Continuous descent approach (LAmax=65 dB(A))

SOURDINE I	SOURDINE II
4th Frameworh	5th Framework
Period : 1998-2000	Period : sept 2001-sept 2004
Consortium : AENA, Aerospatiale, Air France, Air Support, DERA, INECO, NLR, RLD, SerdB, SICTA	Consortium : AENA, EADS, ISDEFE, INECOR, Eurocontrol, SICTA, NLR

SOURDINE I is first, a reasonable short project making a survey of what is actually possible and what kind of procedures are feasible and SOURDINE II will go on with this results to finally make a validated plan.

The ideas generated through the SOURDINE projects were :

- Make a survey of all procedures feasible to be performed,
- Look around what kinds of noise legislation is active at the moment concerning noise,
- Look at what kind of models are actually available to calculate how much noise is produced by each procedures.

The highlights of the SOURDINE I project

They are some flight procedures for existing aircraft, using existing air traffic control infrastructure, without need for new avionics or air traffic control (ATC) tools which have some benefits for the noise, for example :

- the use of lower landing flap settings,
- the increased ILS glide slope intercept altitude,
- the optimised noise abatment take-off procedures,
- the continuous descent approach.

These procedures can be flown at the moment with existing equipment, but if you want to have really benefits, you need additional equipment aboard the aircraft, or on the grounds. The procedures that may require additonal certification modifications to existing avionics and/or ATC equipment or development of new tools/equipment are :

- a further development of continuous descent approach (ACDA).
- the use of precision-RNAV in the terminal area
- the increased glide slope angles

For the ACDA, we performed a simulation for Boeing 747-300.
There is a significant reduction in noise footprint of the Continous descent approach versus the footprint of the conventinal approach (fig. 1).

At the moment, for example, we are already flying Continuous descent approaches at Schipol Airport, but only during the night time. The reason is that being able to perform a continuous descent approach is very difficult for air traffic control (ATC).

The main objective of the SOURDINE II project

If you want to have noise abatement procedures, which still allow the full use of airport capacity, you probably need to invest in equipment either on the ground, or in airborn. So if you want to have a solution, you are only going to have it locally.
The main objective of SOURDINE II, is that we want to produce an implementation plan for the transition from current day procedures to European harmonised advanced noise abatement procedures in 2015 and validate it, not only in terms of safety, efficiency and capacity, but also in terms of operational feasibility for the air traffic controller, and in terms of cost/benefit analysis, organisation…

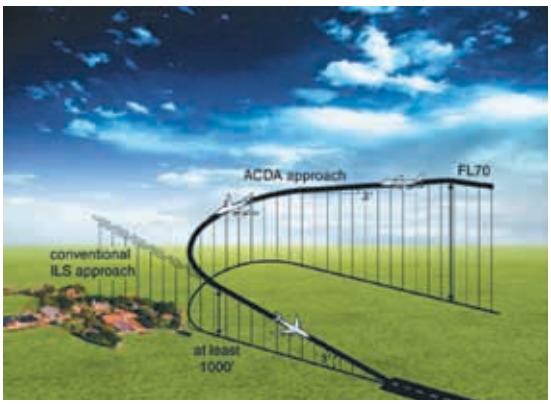

Fig. 2 : The advanced approach concepts

The advanced approach concepts will integrate the following procedures :

We use a **curved approach** with a continuous lateral and vertical path guidance, we will constantly **decelerate** with speed controlled via an energy management algorithm (within FMS), we have a **4-D RNAV** that means prediction and control of aircraft track in position and time, and to perform this, we might need **some additional equipment** in the aircraft for example, some sort of energy cues, where we help the pilot to perform optimal Continuous