L.O.S.A.N.G.E.

Line Operations Safety Analysis using Naturalistically Gathered Expertise

Report n°3

direction générale
de l'Aviation civile

direction des affaires
stratégiques et
techniques

sous-direction
de la sécurité et de
l'espace aérien

bureau des aéronefs et de l'exploitation de la sous-direction de la sécurité et de l'espace aérien

16 novembre 2005

Société Française d'Études et Réalisations d'Équipements Aéronautiques
3, Carrefour de Weiden
92441 Issy-les-Moulineaux Cedex ; France
http://www.sofreavia.com

Report 3

Airlines data collection and Normal Operations Monitoring

Reference : Contract N°C1565		Version : 1.0
Drafted by :		Date :
Verified by :		Date :
Authorised by :		Date : 16/11/05
Addressees :	Copies :	

DOCUMENT REVIEW

Version	Date	Description of evolution	Modifications
R3_V1.0	22/02/05	Version finale	
	15/10/05	Final Version	
V2.0	21/11/05	Revised Final Version	SDE

Table of Contents

GLOSSARY

ALPA	AirLine Pilots Association
ASR	Air Safety Report
BEA	French Investigation Board
CC	Cabin Crew
CFIT	Controlled Flight Into Terrain
CRM	Crew Resource Management
FSO	Flight Safety Officer
FSM	Flight Safety Manager
HF	Human Factors
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IFALPA	International Federation of Airline Pilots Associations
LOSA	Line Operations Safety Audit
LOSANGE	Line Oriented Safety Analysis using Naturalistically Gathered Expertise
NOM	Normal Operations Monitoring
NOTECHS	NOn TECHnical Skills assessment
PPE	Professional Practice Evaluation
STAFH	Suivi Terrain des Acquis Facteurs Humains => Field Follow-up of Human Factors Knowledge (Air Traffic Control)
SMS	Safety Management System
TEM	Threat and Error Management
UT	University of Texas

1. INTRODUCTION

1.1. Context of the LOSANGE study

1.1.1. Summary of the LOSANGE study

In view of the success across the Atlantic of the LOSA methodology, and in front of the great advertising performed for this methodology at ICAO and airlines, the French DGAC has launched the LOSANGE study aimed at drawing up features of the methodology, in order:

- To provide airlines with a realistic view of the LOSA contributions and implementation conditions (R1 report),
- To identify or suggest some alternative methods for systematic observations of normal operations during normal flight (R2 report).
- To suggest LOSA adaptations according to the existing situation in the airlines associated to the study, taking into account the airlines real needs (R3 report),

This study should therefore allow airlines to explain their choice for LOSA adaptation internally (according to the hierarchy, professional and pilots' associations organisations) and externally (international organisations supporting LOSA).

1.1.2. Objectives of this report (R3)

This document is the third LOSANGE report. It aims to:

- Check the status on the potential implementation of the methodology by airlines.
- Make a list of the different approaches and their links between them (connected actors)
- Characterise the data collected
- Assess the needs and their types
- Propose options concerning the adaptation of the existing concepts of LOSA

1.2. Working Method

The working method in this report relies on:

- The elaboration and dissemination of the questionnaire (attached as annex 1) aiming to check the status of the current approaches in terms of safety with the partner airlines (objectives, actors, results, strengths and weaknesses…).
- The survey of different actors who have answered through individual interviews. A total of 12 persons have been interviewed (6 in each partner airlines) with the following profile:
    - Flight Safety Managers
    - Type Rating Instructor (TRI)
    - Quality Manager

- Training Manager
- CRM instructor
- Flight Safety Officer

- The verification of the documents related to the safety data collection or the dissemination used in the airlines.

2. FIELD DATA COLLECTION MEANS PERFORMED BY PARTNERS AIRLINES

2.1. Characterisation of the data collection in partner airlines

2.1.1. Data related to technical investigations of civil aviation accidents

This category of data is a bit peculiar because it appears afterwards. This is the main source of information on the practice of the pilots (iceberg metaphor) even if important efforts have been made recently in order to complete this with additional data in relation with "precursors" of accidents (notion used by Air France Flight Safety Manager to deal with flight safety).

2.1.2. Data related to the notion of «precursor»

This study shows that most data related to the flight safety are generally transmitted inside a company either in the form of performance tables presenting outcome as a function of some specific in-flight parameters (specifically the data concerning compliance to norms and procedures in predefined risks families) or as anecdotes.

The quantitative data seem to be favoured by decision-makers and represent an easy and manageable format when communicating with other airlines, i.e. in the frame of internal and external communication of the airline.

The anecdotes seem to be a frequent way used among pilots and personnel of safety management unit, mainly due to its operational nature. Indeed, they describe operational facts in a usable way which allows each professional to understand easily the nature of the issue. The notion of precursors is more significant for front-line professionals compared to a process like LOSA which uses a categorisation of the errors to attempt to build-up information.

The quantitative data and anecdotes are the basis used to describe the precursors of the incidents or accidents.

The notion of precursor has been defined by several manners while questioning the airlines' safety personnel: incidents and accidents genesis, failure mode of a defence, risk practice (procedural deviation), dangerous practice (errors or latent conditions), risk situation (critical context in terms of safety). The data related to this notion can then take several forms.

The analysis of the data collected by the airlines explains the notion of precursor. **A precursor can be considered as an event that involves a professional practice in a specific context that results in a failure mode of the defence**:

- **A practice** is an action performed by the crew or someone external (maintenance agent, air traffic controller). It can be characterised as a moment or a mean to achieve an action, an error, a procedure deviation or a latency condition (that is to say the practice of an external user to the cockpit or a organisational feature)
- **The context** includes several elements from the situation: the environment but also the actors' situation (working load, phase of flight, stress situation…).

- **The failure-mode of a defence**: the multiple occurrence of a practice in a given context will reveal a particular failure mode of a defence (this notion is defined in the paragraph 2.3)

The identification of the incident or accident precursors is the main objective of the processes conducted by the partner airlines. They created a variety of complementary tools (approaches) that aims at characterising and defining the information related to the existence of precursor in the operationnal context, that is to say during normal flight operation.

2.2. Check-list of steps allowing the field data collection related to the precursors

2.2.1. Data collection with formal tools

Whatever the size of the airlines, French and European ones must follow the regulations about the safety management. Concerning the regulatory processes, different approaches include the management of technical and non-technical skills (training, evaluation), the flight data collection and their analysis (ASR, safety report) and the incident or accident investigation.

Here below is presented a list of the main tools and initiatives performed by AIR FRANCE and AIR HORIZONS related to the flight safety management and dealing directly or indirectly with the pilots practices (the shared tools of Air France and Air Horizon are underlined). These approaches can be divided in two separated categories; the sensors and the information transmitters.

The sensors, aiming at the data collection are:

- The incident and accident investigation: investigation from the French BEA (for mandatory procedures) or from airline internal services (for specific interesting incidents).
- The flight data analysis: systematic analysis of recorded parameters for almost all flight (roughly 200 recorded parameters depending on the type of aircraft).
- The ASR: voluntary and anonymous safety report filled in by the crew and kept in a database (BASIS type)
- The Safety report: Confidential Safety Report (mostly HF)
- The SIE (Safety Information Exchange): Sharing of the ASR with other airlines and industries
- The survey: ad-hoc process initiated by the flight safety office
- The quality assurance: Use of indicators, audits and classified incidents
- Skills and proficiency checks: checks performed by an examiner in a simulator or in-flight
- ASR training meeting: Periodical meeting with all the Flight Crew staff in charge of the professional and training level of each fleet. This meeting aims to understand the difficulties of implementing a given training.
- The operational log book of the OC (Operational Centre)

It should be pointed out that the above mentioned sensors are very different by nature. Some are used permanently (flight data analysis, safety reports), others more punctually (survey, SIE). We will see that these elements can be used to collect information of very different kinds.

The results of these processes are disseminated either internally to the different groups of airline staff («flight safety and flight data analysis» division staff, line pilots, union staff representatives…) or externally (mainly the French DGAC, but also other airlines).

The information transmitters aiming to disseminating the data and their analysis are:

- The training: Transition, recurrent or type rating training, command training, etc.
- Class based training
- Internal Journal (e.g. Flight Safety Bulletin) containing case studies based on ASR
- Introduction meeting for newly hired pilots: presentation of the Flight Safety policy and tools
- The CRM Training

Those modalities (means, quality, quantity) contribute to widespread dissemination of a certain vision of the safety aspects and airline risks (risks identification, risk assessment). This vision will also depend on the level of confidence granted to each process.

All these approaches listed above contribute to the building of a Safety Management System (SMS) with different complementary perspectives. The field data collection of pilot professional practices is always present in most of these approaches, under different aspects and perspectives.

2.2.2. Informal data collection

It should be pointed out that the information collected informally by our partner airlines is relatively important. This form of collecting information allows the different front line actors to identify problems that were invisible to more formal tools.
More carefully collected and analysed, this informal information feedback might be retained for allowing cross-checking and quantifications. This would correlate with results from more formal method. But, at the time being, they are rarely disseminated or used by formal channels (not included in official information transmitters) and are only beneficial to some individuals rather than collectively shared.
The informal means to collect information are:

- The informal discussion with an instructor or a CRM facilitator (inside or outside a training period): The CRM facilitator can be viewed by some as a preferred contact. This is the reason why it is essential that this function is held by different categories of personnel (Captain, First Officer or Operational Staff). This might encouraged this kind of experience feedback.
- The simulator or in-flight checks: informal discussion with an examiner during a debrief session.
- The discussions during stop-overs between different pilots (even when one of them holds a management position in the airline such as flight safety officer staff for example).
- The observation on Jump Seat by Flight Ops Inspector.

2.2.3. The complementarities of sensors

Precursors are being identified thanks to all the sensors mentioned in paragraph 2.1. Each sensor can describe all or part of the components of the precursors.

The use of permanent sensors with on demand sensors (e.g. survey) is a means to increase the understanding of a precursor. A cross use of several sensors can precisely describe:

- All the elements constituting of a precursor (the professional practice, the context and the failure-mode of a defence),
- The occurrence frequency,
- The gravity of the potential risk
- The family of the risk (CFIT, flight collision, ground collision …)

For example, the check process (line checks but also simulator checks), the systematic flight data analysis, the analysis of incident or accidents, the ASR, ad-hoc surveys and the quality process, mainly gather data related to adherence to procedure and compliance with practices (thanks mainly to the use of all the performance criteria).

At different levels, these approaches bring information on the conditions that conduct a crew to deviate from the rule and on the frequency of these deviations (systematic data analysis of flights, surveys).
The informal discussion can provide details on occasions about the operational context correlated with the deviations, but supply very few elements on their frequency or their level of generalisation.
The annual reviews and other synthesis (quality and safety) provided by the airlines in the framework of this project demonstrates well the usage and the dissemination modes of this category of data. The communication around these questions represents the majority of the exchange between the front line personnel (the pilots) and the different services of the airlines. For some, these elements are essential and even unique for managing safety at their level.
The following table sums up the main types of data collected by the sensors and stresses also their complementarity:

	Qualitative data on a precursor					Quantitative data on a precursor
	The errors	The deviations	The latent conditions	The elements of the Context	The failure of a defence	The number of observed cases
Flight data analysis		☑		✓	☑	☑
ASR	✓	✓	✓	✓	✓	
SIE					☑	☑
Survey				☑	☑	☑
ASR	☑	☑	☑	☑		
Quality assurance		☑				☑
Line (or simulator) checks	✓	☑		☑		
Informal discussions	✓	✓	✓	✓	✓	
ASR Training Meeting		✓	✓	✓		

Table: Type of data collected depending on the method used.

☑ the sensor collects almost entirely this type of data
✓ the data collection is more erratic or less complete.

2.3. Definition of the Model: the approach of the partner airlines and LOSA

This model attempts to sum-up the approach of the airlines about the indexation and treatment of the data related to accident prevention. Therefore, we can represent all the potential collected elements and the different sensors mentioned in paragraph 2.2.

In this model, the incidents and accidents are undesirable events which are studied very carefully (investigated) resulting in the identification of the failure of several defence mechanisms. But they are also preventively treated thanks to the installation of a certain number of defence mechanisms. The term defence defines all the measures taken to prevent or to recover from risky situations (training, procedures, check-list, rules…).

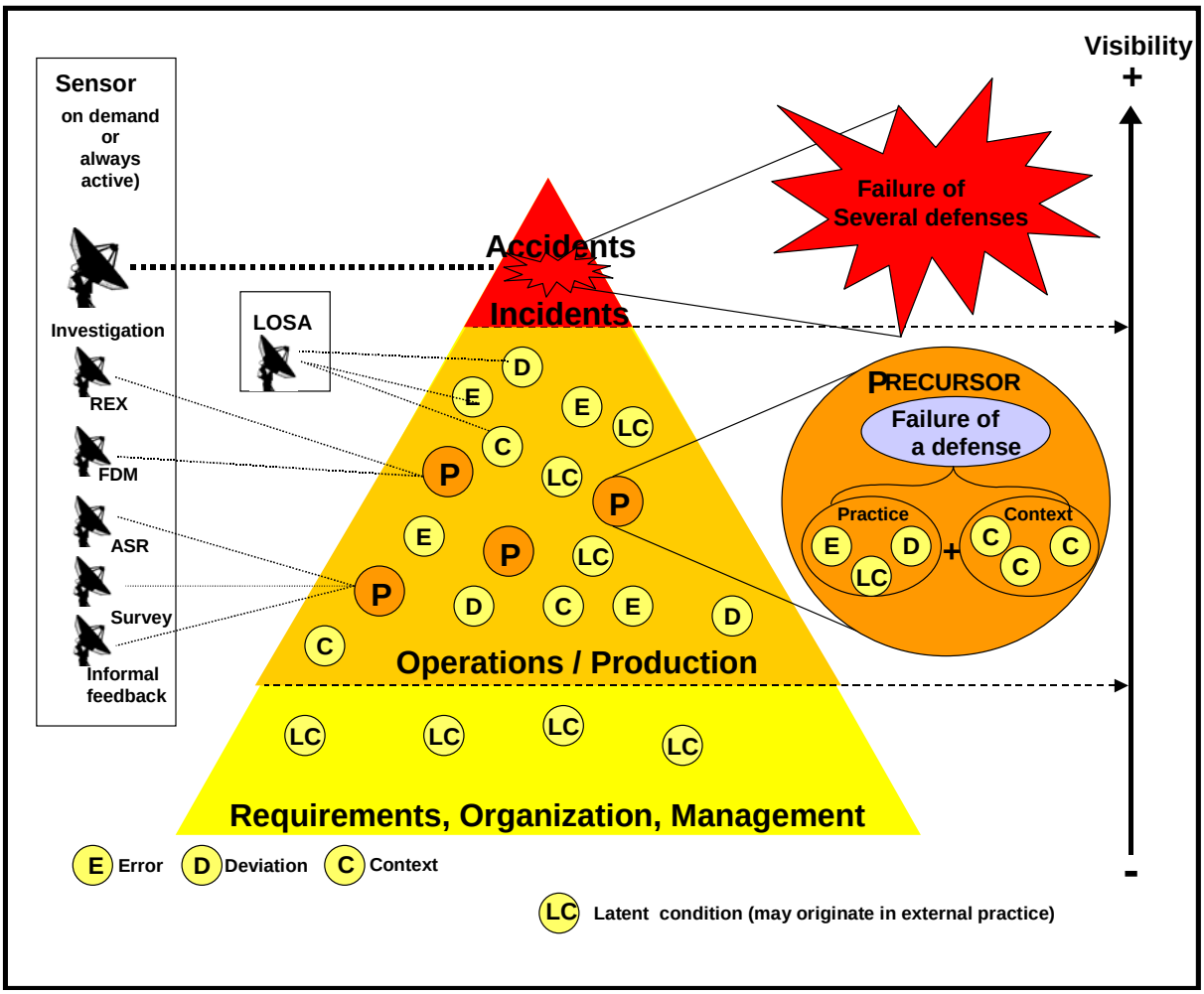

Figure: Complementary ways of capturing the constitutive elements of a precursor leading to incidents/accidents

Caution: The visibility scale on the right only refers to errors, deviations, latent conditions, contextual elements and precursors. The scale does not refer to the capacities of the sensors on the left that represent the different ways to make those elements more visible.

The «Operations / Production» level and up includes the initiating sequences for incidents and accidents under the precursor form. A precursor involves the unique combination of three different elements. These events combine the use of a practice (see definition) in a given context which results in the failure-mode of a defence.

As suggested by the model, the visibility of the precursor is difficult. The simultaneous use of several types of sensors or of the information they provide is the only way to describe precisely the characteristics of the elements constituting of a precursor (frequency, criticality…).

This model offers an explanation about the visibility of notions such as errors, deviations (of procedures) and latent conditions (as defined by J. Reason).

As is illustrated in the figure, LOSA is potentially capable of catching errors, violations and external context conditions but only in isolation, that is capturing each of those items independently from other meaningful information.

LOSA is not capable of describing the precursors defined above (or only by chance if one observer describes the failure of a defence during a specific flight, but is it still normal operations?). Defining a corrective measure is possible only when the three aspects of the precursors are known. Because LOSA offers only a partial and disjointed vision of individual elements (error nature, external context), it is then very difficult to interpret the results and define adequate corrective measures.

As for latent conditions, no sensor is able to identify them at the decision making level, that of requirements definition or organisational structure. Those latent conditions only become visible through the precursors, the incidents and the accidents.

2.4. Application of the model on an example

In 1994, a captain of a 737 Boeing informally discussed with the « flight safety unit » an aborted take-off because of an error in flaps configuration.

Analysis *Use of a type of sensor: informal conversation.*
Defence: Check-list
Practice: Lowering of the flaps while taxiing
Context: taxiing (1st element)

After contacting and interviewing of the crew, it appears that the probability of this kind of error (omission of flaps setting) could be important.

Analysis *Use of a second kind of sensors: The interview of the crew in the framework of the flight safety analysis*

As there was no indication on the frequency of this kind of precursor, the management was unable to decide on the measure to adopt. From their point of view, this event was isolated and unlikely. The “fight safety” unit decided to conduct a survey among line crews to try to get at the probability of this type of precursor.

Analysis *Use of a third type of sensors: the survey.*

Three simple questions were asked:

1. During your career, have you ever forgotten to flaps setting before take off?
2. If yes, could you tell us the circumstances of this error?
3. If no, do you think it could happen to you?

The «flight safety» unit received almost 300 answers. 79 “YES” to the first question. The error was mainly detected in most cases by reading the check list or by checking the take-off parameters while taxiing. In 4 cases, the detection was made thanks to the « take-off configuration » alarm activation. There is only one NO answer to the third question.

Analysis *Identification of the practice frequency: high*
Adjustment of the criticality: high

Based on a 4000 mailed questionnaire, a total of 300 returns may appear as a low. However, the returned questionnaires demonstrated the reality of the risk (it was not an isolated case) and allowed a better understanding of the circumstances (context) so as to take the appropriate corrective measures. Effectively, in most cases, the omission of the flaps setting occurred because when taxiing the crew is likely to get absorbed by other preoccupation or interrupted in their task. It was decided that this action (flaps setting) had to be performed after the start of the engine and not anymore when taxiing.

Analysis *Enriched context: taxiing with a high workload and/or high probability to be interrupted*
Identification of the corrective measure: change of the moment of the action in the procedure (change of the practice)

3. AIRLINES NEEDS

This chapter sum-up the needs expressed by the surveyed staff of Air France and Air Horizons to guaranty the use of the "sensors" and to take the benefits from their complementarities.

3.1. Needs and risk perceptions

Depending on his position in the company and on the types of information he knows, a single actor builds his own representation of the level of safety and of the elements that constitutes risk.

Therefore, different needs can appear depending on the job position considered:

- The objectives to be reached (to improves one's own visibility and that of others)
- The confidence given to the data sources
- The refinement of the airline's level of safety knowledge: conditions and frequencies of precursors.

3.2. Needs on data collection

The airline safety managers or those having responsibilities in safety management are commissioned to collect data. We have seen that this data collection can be achieved thanks to several types of sensors: some permanent and other more ad-hoc or on demand and that their different nature can improve the comprehension of a precursor.
In order to optimise these processes of identification and knowledge improvement, the following can be envisaged:

- Continuously updating identification of precursors: a permanent watch is the only method to guaranty that all the precursors are correctly identified. This permanent watch is possible only if the individuals at all level of the airline structure participating in this process retain their motivation. The implication of the pilots is a necessary condition, but is not sufficient because the organisational response is also essential.
- Developing the connection between the sensors (meshing of the targeted operations) so as to optimise the amplification network (good definition of each element of the precursors and improved visibility): this development is possible through an augmentation of the synergy between the different users of the above mentioned sensors.
- Controlling the delay between the time of precursor appearance and its identification: the longer the precursor exists in the system (in the airline), the more likely its involvement in a sequence leading to incident or accident because of the operational hazards variety and complexity.

3.3. Needs on data dissemination

The Flight Safety Manager and individuals involved in safety management have to face two types of audiences: the pilots (front line operator) and the management staff.
The type of data to present to each audience is different. Each audience needs information on how to improve his own job performance. As a consequence, pilots will

prefer qualitative and specific information (given by the safety reports, informal conversations or facilitated CRM training). The Management staff will require quantitative and general data (annual report).

Even though the adaptation of the information distribution process is taken into account by the airlines, the communication towards pilots is difficult (they are saturated with information) and towards the management staff (they can be naïve concerning safety precursors).

3.4. Needs on "organisational watch"

Our meaning of the needs for an «organisational watch » is the need to change the approaches concerning the use of the Human Factor in terms of safety. The need for an "organisational watch" has been mentioned by several airline professionals during their individual interviews, and represent also for some people a sufficient reason to carry a LOSA audit, or even make it mandatory.

As demonstrated in the first phase of this project (DGAC report Losange n°1 - 2005), LOSA can be discussed from a strict scientific point of view. The viewpoints presented here below are developed from the work performed during the second phase (DGAC report Losange n°1 - 2005) as well as during the third phase reported herewith:

- As developed in the second report of this project: « the alternative techniques to LOSA for collecting normal operations data », each methodology has its own limit. As a matter of fact, the most important drawback of the LOSA methodology may be to ignore its own biases (notably during the observation and interpreting phases) leading the way to potentially incomplete or inadequate conclusions and recommendations.
- From a more organisational view point, some airline personnel portrayed LOSA as a stimulus for safety monitoring, or as an initiation to the human factor aspect of safety. It might allow individuals at every level of the organisation to take part in a common approach and would help those still "naïve" on these subjects. It should be pointed out that this is one of the objectives mentioned for LOSA.
- Without any regulatory incentive or recognition, initiatives with human factors as a key issue have little chance to be seriously considered by any management and they will not provide the necessary means to set them up.

In order to create a real organisational watch, LOSA will require some adjustment in order to guaranty the validity of the results.
The organisation watch on the Human Factor aspect in the safety domain doesn't exclude other approaches defined to this effect.

4. THE POSSIBLE ADJUSTMENT TRADEOFFS

The possible adjustment tradeoffs proposed in this paragraph result not only from needs identified in the above paragraph but also from the LOSA limitations identified in the first and second report of this study.

4.1. Adjustment of the existing sensors

The figure presented in section 2.2.3 summarizes the capacity of each sensor to collect certain type of data. The features of these sensors combined with the airline needs suggest that the following adjustments for these sensors are feasible:

- Widening the sensors' reach: either by increasing the visibility of the data already present in the spectrum of a particular sensor (sensibility), or by broadening this sensor's capacities to identify other data that were within its range (scope range).
- Supporting the interconnection so as to improve the identification of the precursors (integration).

4.1.1. Adjustment of line checks

The line checks participate in the identification of individual practice of flight management. Indeed, this approach remains an individual evaluation of the performance, with a visible part (synthesis sheet including the observed deviations) and an invisible part for the organisation (individual debriefing including sometimes human factor aspect related to the safety such as the error management and the behaviour).

The problem in this situation is that any check airman observation would be interpreted and analysed considering a given pilot. It will not be possible for the time being to draw conclusions on the human factor aspects that are observed during the inspections so as to identify the generic and recurrent issues that could be caused by more organisational elements (training, life condition, specificity of a flight sector…).

The improved role of the check airmen in order to give access to some data (such as those related to the error management) can be two folds:

- A capitalisation tool of these informal debriefings could allow to better benefit from this amount of information. This tool could be a database that would be filled in systematically by the examiners while retaining the anonymity of the pilots and enabling to consider global actions rather than individual ones.
- The broadening of the mission (double function): the check airman would then be in charge of the debriefing of the human factor aspect during a check. A training of these examiners on observation and debriefing methods for human factor aspects could allow them to accurately fulfil this part of their mission.

The use of a new tool or the broadening of the mission of the examiners could favour a wide dissemination of the human factor culture.

4.1.2. Adjustment of the FSO mission

The FSO are the main information links between the pilots and the flight safety analysis service. An important part of the informal information is exchanged through FSOs. However, the data often remain invisible to the organisation (front line pilots or flight safety manager) because the information is only exchanged among limited groups of

people. It is then necessary to adjust the sensors (informal information through the FSO) in order to make these data visible.
Several actions are possible, by modifying the existing sensors:

- To increase the number of FSO,
- To promote the «peer confident » role of the FSO among the pilots,
- To standardize the training of the FSO as regards to the ability to listen but also to handle the collected data (capture, interpretation),
- To specify and implement a tool to capture and treat the data collected by the FSO.

Some tremendous advantage could be found in this adjustment. The information managed by the FSO are, as previously stated, operationally oriented anecdotes (context description) and easily understood (there is no use of a complex interpretation process). This information is sufficient in itself to the identification of a precursor.

This adjustment is going down the road towards a more systematic watch on precursors with the ultimate goal to reduce the delay between their identification and management.

4.1.3. Generalisation of ad hoc surveys

The systematic survey on specific aspects of flight safety could improve the visibility on pilot practices. These campaigns could be very specific (on a defined theme or for a given fleet) and would answer the need to identify the frequency of a risky identified practice (quantification).
The efficiency of this kind of process has to ensure, once again, the anonymity of the surveyed personnel.

4.2. Adjustment of LOSA

The LOSA method remains for some people a valid sensor, especially for its role in mobilizing all airline actors (pilots and operational staff). It seems important to foster the necessary adjustments to give this process more reliability and more efficiency. The “stimulus” effect on organisation will only work if the risks of potential drifts are clearly identified (first report of this study) and managed. Therefore, the objectives can be clarified so as to avoid any disappointment.

All the principles dealing with the preparation of launching a LOSA audit are carefully adapted to the social and airline organisational constraints and are necessary. The main limitation of the LOSA methodology concerns the data collection modalities and the difficulty to use the collected data in order to identify areas of change for flight safety (data interpretation). In this paragraph, we will propose some directions for change so as to overcome these limitations.

4.2.1. Adjustment of the data collection in LOSA

LOSA advocates the opened observation by observers trained in normal condition flight operations.

4.2.1.1. The observation

The input theme (observable theme, collected data classifiacation) of LOSA relies on Human Factor concepts, mainly oriented towards the human error.

The observer angle would be more practical if the input theme were more operational (observation of each phase of flight or verification of the practice conformity compared to the rules including a precise consideration of the context).

The LOSA approach would be more efficient by conducting systematic observation (by contrast with the opened observation). The opportunities to observe the practices related to the threat management, that is to say a degraded situation, are scarce while the focalisation on certain phase of the flight would provide a better visibility on the implementation difficulties.

The systematic or thematic observations are the:

- Verification of the peculiar procedure application
- Preliminary identification of the risks of certain types of flight plan (according to the destination for example): the observation form could include a list of recommended practices and a list of known risky practices (with an unknown frequency).

Another advantage of the systematic observation relies on the observation process itself. The observation standardisation is made easier whatever the profile of the observer.

4.2.1.2. The observer

In the framework of this study, the interrogated actors expressed their opinions on the "ideal" profile of a LOSA observer. The possible candidates for this kind of missions are retired pilots, FSO, controllers, CRM animators. But each time, the question of the used referential can be raised The ideal observer doesn't exist; all profiles are subject to a peculiar bias.

The installation of video recorder in the cockpit can allow confronting real data to several types of observers and then maybe extracts the best.

This technological solution could only be in operation if the regulatory context is as strict as the LOSA method which guaranty the use of data and the agreement of all the concerned actors.

4.2.2. The data interpretation

The difficulty to translate the data into operational terminology is a risk to conduct inappropriate or badly targeted actions.

The nature of the data collected by LOSA needs an interpretation or a translation in operational terms. This interpretation, performed afterwards, is often considered cautiously or impossible to assess compared to the information collected in situation.
In order to avoid this difficulty, the organisation of survey campaigns with more operational or more targeted theme could be a solution. This can take the shape of systematic observations describe in the preceding chapter.

Another means would be to consult one or several independent Human Factor specialist(s) in order to perform this analysis.

ANNEX I: QUESTIONNAIRE USED IN THE FRAMEWORK OF THE LOSANGE PROJECT

This questionnaire is 2-part composed: The main part presented here below and a form to fill in by type of described method. This form is presented at the very end of this annex.

Questionnaire – Main Part:

Project **LOSANGE** **Questionnaire**

http://www.sofreavia.com

First Name & Surname:	**Tel. :** **E-mail :**
Service/ division : **Role in the service :**	**Description of the service task:**
Number of year(s) in the company: **Number of year in the domain of flight safety:**	

The objective of this questionnaire is to know better about your activities so as to appraise better the eventual contribution of LOSA. It will make an inventory of the means used to manage the safety of flight in your company. We thank you by advance to answer these questions as sincerely and objectively as possible.
We reminds you that all the data collected in this questionnaire will stay confidential and will only be exploited in the framework of this project.

The flight safety at Air France

How is the activity of your service concerned with the safety of flight (at the flight crew level)?

_____

Is the work on this subject coordinated with other services?

Yes	

If yes, precise? With what kind of objectives ?

_____

Dans votre service quel est la charge moyenne de travail consacrée à cette activité?

_____ %

Globalement, quels sont, pour vous, les points forts *(apports, …)* **et les faiblesses** *(manques, contraintes, …)* **des démarches de sécurité en vol mises en place chez AF au niveau PNT ?**

Strength	*Weakness*
- - - - - - - - -	- - - - - - - - -

Quels sont, pour vous, les éléments pour la sécurité en vol qui ne sont pas pris en compte dans les démarches de votre compagnie ?

_____

Quelles sont les initiatives, moyens, démarches, méthodes ou outils actuellement mis en œuvre chez AF pour évaluer, diffuser, former à la sécurité en vol (concernant les PNT) ?

Nommez les différentes démarches, outils, méthodes … que vous connaissez chez AF.		
Nom de la démarche	Méthodes / Outils	Service en charge de sa gestion

Détails des Méthodes utilisées

Dans la liste précédente, quelle(s) est/sont la/les méthode(s)/démarche(s) dans laquelle/lesquelles vous êtes impliqué ?
Décrivez cette ou ces méthode(s) à l'aide des fiches jointes.
Merci de remplir une fiche par méthode[1]

The LOSA Method

Did you hear before about the LOSA method?

Yes	**No**

If YES, how?

Is there an internal documentation about LOSA?

Quels sont, pour vous, les intérêts de cette méthode ?

Quelles, sont pour, vous les précautions à prendre dans la mise en œuvre d'une telle méthode ?

Identifiez vous des domaines dans lesquels LOSA risquerait d'impacter, d'être redondant, voire même d'être contradictoire avec la démarche que vous utilisez actuellement ?

[1] *Cette fiche est présentée ici à la fin de cette annexe*

Questionnaire - Method Form:

Description of the Method	
Name of the method	**What is your role in this method?**
Is this method part of a more general (global) approach? Yes/ No If YES, precise:	
What is the objective of this method?	**What are the actors and sectors concerned by this method?**
Faut-il avoir un profil particulier pour pouvoir utiliser cette méthode ? Lequel ? *(Notamment, l'individu ou le groupe doit-il avoir les compétences du public ciblé par la méthode. Par example être pilote)?*	
Avez-vous reçu une formation spécifique à l'utilisation de cette méthode ? Oui / Non Si OUI, pouvez-vous décrire quels en sont les thèmes ? **Quelle était la durée de cette formation ?**	
Cette méthode a-t-elle des conditions préalables pour sa mise en œuvre ? Oui / Non If YES, precise:	
Existe t-il une documentation traitant de l'utilisation de cette méthode ? Oui / Non If YES, precise:	

LE RECUEIL DES DONNEES

Selon quel principe les données sont-elles recueillies? *Recueil continu*	**À quel moment les données sont-elles recueillies?** (En temps réel pendant le vol, de manière différée, …..)

Recueil périodique *Recueil ponctuel mais à un moment choisi* *Recueil ponctuel aléatoire* *Autres :*	**Ce recueil concerne :** *Toute la population étudiée* *Un échantillon représentatif de la pop. étudiée* *Un échantillon aléatoire* *Autre :*
Avec quel(s) support(s)/outil(s) ? *(Ex : formulaire de rapport d'incident, outil de recueil automatique des paramètres de vol….)*	
Ce recueil d'information se base t-il sur le volontariat ou est-il obligatoire ?	**Qui recueille ces données ?** **Quel est son profil ?** *(Observateur impliqué, expert, a été formé spécifiquement…)*
Quel est le nombre de personnes chargées de recueillir ces données dans la compagnie?	
Quelles sont les limites / les contraintes rencontrées lors de l'utilisation de cette méthode ?	

LE STOCKAGE DES DONNEES

Comment sont stockées les données recueillies? *(où, par qui, sous quel format)* **Comment est assurée la confidentialité des données recueillies ?**
Existe-t-il une étape de préparation des données brutes recueillies avant le stockage et l'analyse ?

Si oui, par qui et comment cette préparation est-elle effectuée ?
Quelles sont les limites / les contraintes rencontrées lors des phases de préparation ou de stockage des données ?

L'ANALYSE DES DONNEES

De quelle nature sont les données sécurité recueillies ?	**Les données recueillies sont-elles anonymes ? Oui / Non** Si OUI, comment l'anonymat est-il assuré ?
Comment sont analysées les données recueillies ? *(où, par qui, avec quelles méthodes,…)*	
Qui effectue l'analyse des données ? Quel est (sont) leur(s) profil(s) ? *(Si c'est un groupe, précisez sa composition)*	
Quelles sont les limites / les contraintes rencontrées lors de l'analyse des données ?	

THE RESULTS

À quel type de résultat aboutit cette méthode ?
Comment sont exploités les résultats obtenus ?

Lorsque les résultats sont diffusés, à qui dans la compagnie, comment *(publication interne, restitution directe…)***et sous quelles formes** *(résultats généraux ou détaillés…)***, le sont-ils ?**

A Qui

Comment

Formes

-

-

Quelles sont les limites / les contraintes rencontrées lors de cette phase d'exploitation et de diffusion des résultats ?

AUTRES

Selon vous, comment la population concernée perçoit cette méthode et les résultats obtenus ?

Cette méthode (ou les résultats de la méthode) est-elle exploitée conjointement à une autre méthode (aux résultats d'une autre méthode) ? _____

If YES, precise:

ANNEXE II : EXTRAIT DES QUESTIONNAIRES A PROPOS DES POINTS FORTS ET FAIBLES PERCUS PAR LES ACTEURS

Cette annexe résume pour chaque compagnie les aspects les démarches existantes jugées comme des points forts ou faibles par les acteurs interrogés.

Point Forts d'après les personnes interrogées chez Air Horizons

- Le contact étroit du RSV avec les animateurs CRM (décision des thèmes annuels de formation en commun accord, en fonction de l'actualité de la compagnie)
- Le contact étroit du RSV avec les responsables de la formation (réunion de travail à propos des points importants ou des problèmes identifiés en stage de formation).
- Les retours d'expérience volontaires et anonymes.

Il est à noter que d'après le RSV, les initiatives passées ont fonctionné : les indicateurs utilisés dans le bilan annuel d'analyse sont tous à la baisse. Cependant, toujours d'après ces commentaires, ce type de démarche doit bénéficier d'une attention permanente pour maintenir de bons résultats. Le retour d'expérience est l'outil le plus sensible aux aléas sociaux de la compagnie : en cas de crise, le nombre de retour chute.

Points forts d'après les personnes interrogées chez Air France

- Les Retours d'expérience volontaires et anonymes.
- Le Retour d'expérience formation.
- La synergie entre différents acteurs de la compagnie (Prévention des vols, Qualité, Standard Opérationnel).
- Groupe de travail « Prévention et sécurité ».
- Commission « analyse des vols ».

L'élaboration des programmes généraux d'instruction (PGI) est un bon exemple de la production de l'ensemble de ces points forts. Les PGI seraient en effet conçus sur la base de plusieurs sources : expertise du groupe FH d'Air France, le service de la sûreté, de la réglementation, mais aussi des recommandations émanant des retours d'expérience, le l'analyse des vols, des ASR et de la qualité.

Points faibles d'après les personnes interrogées chez Air Horizons

- La difficulté à motiver l'engagement du management aux démarches existantes
- La lassitude des équipages due au manque de visibilité des effets de leurs retours d'expérience
- La difficulté à maintenir la motivation des équipages à fournir des REX dans un contexte social tendu.
- Le RSV a trop souvent l'impression de découvrir des problèmes par hasard
- Une meilleure systématisation de la récolte et de la diffusion des données ainsi que le partage d'une représentation du risque commune par tous les acteurs sont au cœur de ces difficultés.

Points faibles d'après les personnes interrogées chez Air France

- La coordination et coopération insuffisante avec les chefs de division (en cours d'amélioration)
- La saturation des équipages : beaucoup de formations, de documentations (REX, BSV…).
- L'absence de formalisation des retours individuels dispensés lors des contrôles en vol
- Le manque de formation spécifique pour les OSV
- Lenteur des mesures correctives, par nécessité de coordonner avec toutes les flottes et les services

Cette liste, non exhaustive, révèle un souci des acteurs de la compagnie d'améliorer les capteurs et diffuseurs existants.

APPENDIX 3: ABOUT THE AUTHORS AND THE REPORT

The authors of this document at Sofréavia are presented below:

The project manager, **Mr. Ludovic Moulin** is a Human Factors expert (ergonomist – psychologist, with a Master's degree in Ergonomics) with 8 years of experience in different domains like aeronautics and nuclear, in various activities such as air traffic control, avionics maintenance, piloting, cabin safety, nuclear maintenance, nuclear maintenance conduct. The interventions carried out consisting in production of study reports, training report and support (CRM, TRM, and other trainings on Human Factors and safety aspects) and development of methodologies of non-technical skills observation. The techniques used to perform these works, in addition to classical methods such as work analysis and individual interviews, experiments, have often consisted in interdisciplinary work group animation.
Mrs. Stéphanie Joseph is a Human Factors specialist (ergonomist with a Master's degree in Ergonomics) with a 3 years experience in aeronautics. She was involved in two large-scale studies on emergency evacuations from commercial aircraft cabins, including experimental protocol definition, the carrying out of the study and the experimental follow up. Thanks to professional and personal activities, she acquired a good knowledge in the piloting domain. Her participation in several training projects enabled her to develop skills dealing notably with training programs, needs analysis and interviews.
Mr. Laurent Claquin is a Human Factors specialist (ergonomist – psychologist with a Master's degree in Ergonomics) with a 6 years experience in different domains like industry, services, aeronautics and nuclear, with always the aim of safety and/or health improvement. Thanks to his different missions of consulting and studies, he developed skills in methodology design, Human Factors assessment tools, and training. His participation to cockpit simulation and projects dealing with NOTAMs enabled him to acquire experience about on-board activities.

The reviewers from the F-DGAC/DAST who approved this document are presented hereafter:

Mr. Stéphane Deharvengt is the Head of the Human Factors Programme for the F-DGAC/DAST (French – Direction Générale de l'Aviation Civile – Directorate for Strategic and Technical Affairs). He is an Aviation Engineer with a Master's degree in Ergonomics. He is presently studying for a Ph.D. in Ergonomics. On the international side, he represents F-DGAC on the JAA-HFStG (in this context, he has recently been nominated Chairman of this JAA - Human Factors Steering Group) and at ICAO (in the ICAO Flight Safety and Human Factors Study Group). He was also a European Commission evaluator and technical advisor for several aviation research studies. Moreover he has skills in Cockpit design and certification (he is Human Factors assistant specialist in the A380 certification and helped developed the new EASA proposed regulation for cockpit Human Factors certification), in CRM, in Experience Feedback - Flight Data Monitoring, and in Cabin Safety. He has an experience in training as he taught Aviation Human Factors regulation, experience Feedback and Cabin Safety courses to Aviation Engineers and Ergonomists. He has an 11 years private pilot license.

Mr. Claude Valot is a Senior Research Psychologist, employed in the Cognitive Science department of the Aerospace Medical Research Institute (IMASSA) where he has been since 1980. He received his PhD in ergonomics from Toulouse University. He has been involved in numerous Human Factors fields of military and civilian aeronautics: maintenance, Human Factor courses, human errors, violation, designing. He is a consultant for CRM programs in the French Air Force, in Navy and Army aviation. He is also involved in Human Factors certification team and he is a consultant for French Civil Aviation Authority. His current research interests include: cockpit automation, reasoning, decision making and temporal constraints, metacognition.

*** End of the document ***

direction générale
de l'Aviation civile

direction des affaires
stratégiques et
techniques

sous-direction
de la sécurité et de
l'espace aérien

bureau des aéronefs et
de l'exploitation de la
sous-direction de la
sécurité et de l'espace
aérien

50, rue Henry Farman
75720 Paris cedex 15

téléphone : 01 58 09 46 87
télécopie : 01 58 09 45 13
mél : stephane.deharvengt
@aviation-civile.gouv.fr

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

ministère
des Transports
de l'Équipement
du Tourisme
et de la Mer