AVINOR

				PROCEDURE
Title:	**RISK ANALYSES: CHANGE ANALYSIS USING THE HUL-METHOD**		Ref. No.:	H-P-S411
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			Drafted by:	CAJEL
			Approved by:	

1. OBJECT

To ensure that all changes which have a bearing on air safety are assessed in a comprehensive and structured manner to take account of any impact on safety levels.

2. TARGET GROUP

Knowledge of method:

- Employees with special responsibility for, and duties in, safety assessment and risk analysis.

Information:

- Line managers at all levels and in all units.
- All employees involved in change planning and implementation.

3. DESCRIPTION

General

In a number of situations it will not be necessary to assess the absolute level of risk for an activity or individual event. The problem will often be comparing the safety qualities or safety level of one system, action, activity or operation with those of another. A comparative risk assessment of this kind is called a change analysis.

A change analysis can be carried out in several ways. The present Procedure describes a method of analysis called the *HUL method*. Change analyses by means of the HUL method are used to assess the impact of a change on air safety[1]. The situations where the change will or may have an impact are identified, and for each situation the risk is assessed before and after the change as higher-risk (H), unchanged (U) or lower-risk.

Application of the method

The impact of the change on situations of significance for air safety can be categorised using the following codes:

- Change generates **H**igher risk: H
- Change generates **U**nchanged risk: U
- Change generates **L**ower risk: L

[1] It is a general method and can of course also be used to assess the impact of change on other areas of results. Such applications are, however, not described in this Procedure.

To take into account the fact that the contribution of the assessed risk situations to the overall level of risk may not be the same, a simple quantitative system has been designed in order to weight the individual contributions. The methodology is as follows:

Weighting	Description
3	Significant impact on air safety
2	Impact on air safety
1	Slight impact on air safety

Thus code "3H", for example, means that a function or fault on a component of the new system has a significant negative impact on air safety in comparison with the existing system, whereas code "1L" indicates that the new system has a somewhat positive impact on air safety. Situations which are assessed as unchanged ("U") do not carry a weighting. The advantage of such a weighting system is that the overall perceived risk can be summed up and assessed by comparing the total number of Hs with the total number of Ls.

By means of this system, the acceptance criteria for the HUL method are based on the guidelines set out in Procedure H-P-S420.

- **Category 2: Unacceptable[2] level of risk**
  Most situations are adversely affected by the change (predominance of Hs).
  Measures to reduce the risk must be proposed and prioritised.
- **Category 1: Tolerable level of risk**
  There is at least one situation which is adversely affected by the change, but most situations are beneficially affected.
  Measures are proposed and prioritised on the basis of cost-effectiveness considerations (see Annex 1 to Procedure xx).
- **Category 0: Negligible level of risk**
  No situations are adversely affected by the change.
  Measures are not necessary.

A precondition for use of these acceptance criteria is that the HUL analysis must be carried out in conjunction with the present Procedure.

Step-by-step application of the method

The procedure applied in a HUL analysis is outlined below. It involves five stages. Each stage must be worked through and completed before the next stage can be commenced.

1) The starting point for the change analysis is identification of all possible risk situations which might lead to or cause a *critical occurrence* (see categories of accidents and occurrences pursuant to ESARR 2). The first step is therefore risk identification, the purpose of which is to identify all current risk situations or conditions. A natural starting point for risk identification is to go through the risk situations which are documented in existing safety documentation (risk analyses, safety assessments, regulations, safety

[2] For some changes, it may in certain cases be appropriate to accept an increase in risk. This would, however, need to be specifically justified.

plans, safety procedures, etc.). In addition and/or if the existing overview of possible risks is incomplete, possible new risk situations must be surveyed.

2) This process can be carried out by brainstorming, for example analysing possible faults/defects in the two systems which can be compared. Key questions which will enable hazard situations to be identified are:

   What can go wrong?
   - Faults or defects in a new system or situation?
   - Faults or defects in an existing system or situation?
   - What consequence or effect will the faults or defects have?

   Established methods of hazard identification can be used as an alternative.

3) The next step is to describe the hazard situation or condition and specify the relevant event category (in a risk analysis often referred to as the "top event"). Event categories should be defined in accordance with ESARR 2. The template in Annex 1 can be used for hazard identification purposes.

4) For each hazard situation identified, differences in the technical and operational solutions (measures) must be described for the two systems which are being compared. The description can be brief. Reference can be made to other documentation which describes the solutions in more detail.

5) Next, an assessment is made as to which system generates a higher/unchanged/lower risk with a view to air safety for each of the hazard situations identified. This may be done by comparing technical and/or operational solutions (measures) for the new system as seen in relation to the existing system. At the same time, the significance of the changes is weighted, i.e. the contribution of each is specified (1H, 2H or 3H, and likewise for the Ls). The HUL and weighting assessments must be substantiated.

A summary of points 1 to 4 can be presented as shown in the template in Table 1 below.

Table 1: Change analysis template

Ref. no.	Event category	Risk situation or condition	Description of change with view to technical/operational solution for new and existing situation	Risk assessment H/U/L	Justification

6) Lastly, the final risk score must be worked out. For this purpose, the individual contributions are entered in the table and the significance of each change is specified. The risk score gives an overall assessment of all safety-related situations. On the basis of the risk score, a conclusion can be drawn on whether the risk is increased or reduced. Finally, recommendations are given which must either be implemented in order to ensure that the acceptance criteria are met or entail measures which will further reduce the risk.

The risk score might advantageously be set out for each critical occurrence as indicated in the table below, in order to obtain an overview.

Table 2: Results of change analysis

Event category	Total number of risk situations or conditions	New system represents a higher risk (H)	New system represents an unchanged risk (U)	New system represents a lower risk (L)
		Number	Number	Number
TOTAL				

4. SPECIAL REQUIREMENTS FOR EQUIPMENT AND STAFF

HUL analyses are best carried out as a group exercise. The members of the analysis group must always have the following expertise:

- Thorough knowledge of the actual change proposed.
- Expertise in relation to the existing system which is to be replaced or changed.
- Education and training (if applicable).
- Risk analyses/safety work (in general and HUL method in particular).
- Supervisor/meeting facilitator.

The method is relatively simple to apply, but the person managing the process should be an organiser/supervisor in order to ensure that it is targeted and structured.
A group of four to seven people is an ideal size for the analysis group.

5. DOCUMENT REFERENCES

6.1 IN-HOUSE DOCUMENTS
6.2 OVERRIDING DOCUMENTS

6. RECORDS

7. ANNEXES

Annex 1: Risk identification template
Annex 2: Change analysis template
Annex 3: Proposed table of contents for major analysis reports

ANNEX 1

Table 1: Template for identification of risk situations

Ref.[1]	What can go wrong?[2] • Faults or defects in a new system or situation? • Faults or defects in an existing system or situation?	What consequence or effect will the faults or defects have?[3]	Description of risk situation or condition[4]	Critical occurrence

[1] Ref. - serial numbering of risks.
[2] What can go wrong? - Where a change is to be analysed it will almost always be advantageous to break it down into smaller parts. The starting point might be faults in a component incorporated in the system which is to be changed or the existing system. If the analysis concerns activities, possible problems in the implementation of the activity should be described here.
[3] What effect - An indication should given here of the local effect or consequence faults or defects might have.
[4] Description of risk situation.

ANNEX 2

Table 1: Change analysis template

Ref. no.[1]	Critical occurrence	Risk situations or conditions	**Description of change with view to technical/operational solution for existing and new situation**	Risk assessment H/U/L[3]	Justification[4]	Proposed risk-reducing measures

[1] Ref. no., Critical occurrence, System and Risk situation can be taken from Annex 1.
[3] The risk assessment must also include a weighting of the significance of the change for the perceived risk. This might be H, 2H, 3H, L, 2L or 3L.
[4] The risk assessment must be briefly substantiated.

ANNEX 3

Proposed table of contents for major analysis reports

1. Summary and conclusions
2. Introduction
   - 2.1. Background
   - 2.2. Object
   - 2.3. Limitations/conditions
3. System description - description of the object to be analysed
4. Analysis methodology
   - 4.1. Description of method and implementation
   - 4.2. Acceptance criteria
5. Results
   - 5.1. Risk identification
   - 5.2. Risk assessments
   - 5.3. Uncertainty in the analysis
6. Conclusions and recommendations
   - 6.1. Conclusions
   - 6.2. Recommendations - risk-reducing measures
   - 6.3. Prioritisation of measures - cost-effectiveness assessments
7. References

Annexes