COST of SMS

The EUROCONTROL Approach
&
Associated S/W Tool

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What is the challenge beyond the SMS technicality?

• Have you already been requested to financially justify safety initiatives and/or your activities?

• Do you think that the possibility to provide financial figures to your management or to the Board would help the deployment and operation of Safety Management?
Scope & Rationale of the Cost of SMS project

To assess the feasibility of the definition of a cost-model for SMS activities.

Scope
- Development & Introduction
- Day-to-day Operations & Maintenance

Initial Rationale
... to make a “business case” for the initiatives ANSPs/EUROCONTROL want to realize. In this context, every single recruitment and every investment needs to be substantiated by a “return of investment” analysis ....
Regulatory framework

- EUROCONTROL ESARRs
- Commission Regulation 2096/2005
- Directive 2006/23/EC on a Community air traffic controller licence
- Directive 2003/42/EC on occurrence reporting in civil aviation
- Directive 94/56/EC establishing the fundamental principles governing the investigation of civil aviation accidents and incidents
- Commission Regulation 1315/2007 on safety oversight in ATM
- Commission Regulation 482/2008 on software safety assurance in ATM
- Draft EASA Rules ATM001 – ATM004
Best practices for the SMS Model

- EGSMM (EUROCONTROL Generic Safety Management Manual)
- ATM Safety Framework Maturity Survey – Methodology for ANSPs
Aligned with the 2010+ ANSPs ATM Safety Framework

Safety Culture

Element: Development of a positive and proactive Safety Culture

Safety Policy

Element: Organisational and Individual Safety Responsibilities

Safety Achievement

Elements:
- Safety Standards and Procedures
- Competency
- Risk Management
- Safety Interfaces

Safety Assurance

Elements:
- Safety Reporting, Investigation and Improvement
- Safety Performance Monitoring
- Operational Safety Survey and SMS Audits

Safety Promotion

Element:
- Adoption and Sharing of Best Practices
Scope of SMS components/procedures

- Definitions for cost of safety management and cost of safety
- Decomposition of the safety procedures in terms of:
  - Objective
  - Input (e.g. regulatory requirements)
  - Activities (tasks)
  - Type of resources used (e.g. OPS, ENG)
  - Infrastructure & equipment
  - Training needs, and
  - Output (of SMS procedure)
Inventory of SMS cost elements
Eligible SMS costs

- Human effort costs
- Training costs
- Investment costs
  \( (e.g. \text{infrastructure} \& \text{equipment}) \)
- Non-effort costs
  \( (e.g. \text{publications, leaflets, production cost of manuals, etc.}) \)
EUROCONTROL & ICAO charging principles

- ICAO Manual of Air Navigation Services Economics, Doc. 9082 and Doc. 9161
- EUROCONTROL Principles for Establishing the Cost-Base for En-route Charges and the Calculation of the Unit Rates
- EUROCONTROL Guidance on the Rules and Procedures of the En-route Charges System
- EC Regulation 550/2004 on the provision of air navigation services in the single European sky
- EC Regulation 1794/2006 on common charging scheme for air navigation services
Cost model principles

• Standard cost model - SCM
  • The most appropriate to measure costs in order to meet requirements and obligation imposed by regulation

• Activity based
  • Breaking down the SMS components to the level that can be measured

• Quantitative methodology
  • The model is based on a quantitative methodology to measure the resources, which are necessary to be employed by an ANSP to meet SMS requirements. Qualitative

• Management accounting systems
  • Reflecting resources expanded in order to ensure the functioning of an economic entity
Outline model structure

Primary Process

Secondary Process

- Fixed costs
- Variable costs
- En-route costs
- Terminal costs

Cost elements:
- Effort to ensure SMS operation - internal
- Effort to ensure SMS operation - external
- Investments (CAPEX)
- Investment costs - depreciation and interest
- Training for SMS operation
- Non-effort cost elements (materials, external services, others)

- Direct SMS costs
- Hidden SMS costs

- Restructuring costs
- Gap analysis
- Costs related to the enforced SMS

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What you can do with the SMS cost model?

- Identify implementation and operation costs per SMS procedure or for whole SMS;
- What will be the cost of a new procedure;
- Different analyses of human effort distribution;
- Costs of different elements of SMS;
- Optimise costs – do you have the right resources?
- Assess feasibility of new safety targets from perspective of resources available or budget
- Make analysis of the allocation of SMS intrinsic cost regarding the implementation strategy or operation monitoring and identify weaknesses & strengths
What we Achieved

- Hands-on evaluation with several ANSPs for a reliable validation (including 1 Airline and 1 Aerodrome Operator)
  - We need to cover all SMS procedures
- Analysis of the results (on going)
- An update of the model based on the analysis & documentation
- Development of a user friendly tool to be used with the updated model;
- Training and awareness for usage
- Link with Safety Maturity Framework
Further development

- Link with ACE
- Clarifications
- Coordination with PRU/PRC
- ...

ATM Cost-Effectiveness (ACE) 2008 Benchmarking Report

Prepared by the Performance Review Unit (PRU) with the ACE Working Group

June 2010
SMS COST MODEL
In more details
Model input
Model output
Decomposing the problem

- Two cost cards per procedure:
  - Implementation
  - Operation

- Four cost components in each task:
  - Human effort
  - Training
  - Infrastructure and equipment
  - Non-effort elements

- Adaptation to SMS enhancement
  - SMS Baseline cost model
  - Safety Maturity categories/levels
Overview of SMS break down

SAFETY MANAGEMENT SYSTEM

SMS PROCEDURE
DIP, ISO, VRS and etc.

Implementation

Design

Actions

Coordination

...

Approval

...

Initiation

Actions

Execution

Actions

Output approval

...

Completion

Actions
Cost model input/output

- Model Input
  - Global variables
  - Implementation cost card
  - Operation cost card

- Model Output (results)
  - Human effort
  - Training
  - Infrastructure & equipment
  - Non-effort elements
Global variables

• Global variables
  • Daily rates
    • SAF
    • OPS, ENG
  • MAN, ANC, ADM
  • INT & EXT Trainers or support
  • Inflation
  • Weighted average cost of capital
  • Annual effort cost increase
Human effort - implementation

- Procedure Design
- Procedure Coordination
- Procedure Approval
- Procedure Initiation

Human effort - operation

- Procedure Execution
- Procedure Output Approval
- Procedure Completion
Training

- Input data
  - Training courses
  - Training infrastructure and equipment e.g. SOE (Standard office Equipment), venue
  - Training missions
  - Training non-effort elements e.g. training materials

- Output
  - Total training cost
Infrastructure and equipment

- Input data
  - Gross balance value
  - Expected operating life
  - % for SMS purposes

- Output data
  - Cost (depreciation and interest) for the whole operating life
Non-effort elements

- Input data
  - Unit price
  - Quantity
  - Frequency per year

- Output data
  - Total cost
Results of SMS cost modeling

- Implementation costs
- Operation costs
- For individual procedures and overall
- Analysis of human effort distribution
- Overall cost of different SMS elements
**Human Effort for Maintenance and day-to-day Operation of SMS**

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<thead>
<tr>
<th>Procedure Action</th>
<th>Internal SAF [total man-days]</th>
<th>Internal OPS [total man-days]</th>
<th>Internal ENG [total man-days]</th>
<th>Internal MAN [total man-days]</th>
<th>Internal ANC [total man-days]</th>
<th>Internal ADM [total man-days]</th>
<th>External [total man-days]</th>
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<td><strong>Grand Total Human Effort</strong></td>
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<td>R-Average Rate [per day]</td>
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<td>150 €</td>
<td>260 €</td>
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<td><strong>Total Human Effort Costs</strong></td>
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Managing expenses in a financial crisis

• Planning manpower
• Strategic planning
• Estimating cost of individual SMS activities
• Optimizing SMS procedures
• Optimizing resources
• Assess the feasibility to meet the safety targets

Answering questions

• How much costs me each particular activity?
• May I optimise SMS procedure in terms of effort/cost?
• May I plan manpower for my SMS? Would I meet the safety targets?
• Can I make a plan for some years ahead?
Link with Safety Maturity Model - Approach

- Baseline Model
  - SMS model
  - & Cost Model Principles
- Regulatory framework
- EUROCONTROL SMS COST MODEL
- EUROCONTROL & ICAO charging principles
- Mapping SMS Model with Safety Maturity Model
Link with Safety Maturity Model - Scope & Rationale

To start from the cost-model for SMS tasks/activities and assess the feasibility of enhancing practices in safety management based on SMS maturity Study Area

Scope

- Comply with Regulatory Framework
- Adopt Best Practices that are part of the Reg. Framework and taken from other ANSPs/Industries/ECTL
- Be Best Practices owner & Confident Adopter – issuing new standards for the community

Initial Rationale

... to not replace and not assess the safety maturity model. In this context, to link the cost of SMS model with a continuous safety improvement loop....
Safety Maturity categories

All requirements for the previous stage/level must be fully satisfied before proceeding to the next stage of the model. No maturity stages can be missed.

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<thead>
<tr>
<th>Initiating</th>
<th>Planning/Initial Implementation</th>
<th>Implementing</th>
<th>Managing and Measuring</th>
<th>Optimising</th>
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<tbody>
<tr>
<td>• Awareness exists of the need for SMS. No specific formal implementation actions are in place or planned.</td>
<td>• A gap analysis has been performed.</td>
<td>• The Organisation has achieved the required regulatory standard.</td>
<td>• SMS Implementation has been completed and both safety performance and system performance are measured and controlled using statistical and other quantitative techniques.</td>
<td>• Safety processes/ systems are firmly embedded within the organisation.</td>
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<tr>
<td>• The processes for managing safety are ad-hoc and/or inconsistent with the Organisation's safety obligations.</td>
<td>• The Organisation has an SMS Implementation Plan that is consistent with the organisation's safety goals and obligations.</td>
<td>• The SMS standard processes are in use across the organisation and are producing consistent results. The results are being measured using qualitative techniques.</td>
<td>• Quantitative safety objectives are based on customer, end user and organisational needs.</td>
<td>• The focus is on continuous improvement in operational safety and maximising the effectiveness of SMS processes through innovative improvements.</td>
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<td>• Implementation is underway but not yet completed in some major aspects.</td>
<td>• Implementation is underway but not yet completed in some major aspects.</td>
<td>• Sub-processes are developed that significantly contribute to overall organisation safety performance.</td>
<td>• There are defined processes to set standards and improvement targets.</td>
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<td>• The effectiveness of the SMS and safety improvement actions are measured and evaluated against defined improvements criteria.</td>
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</table>

The SMS components and elements are not documented and have not been implemented. No SMS Implementation Plan has been developed.

An Implementation Plan exists covering all SMS. The plan is not yet fully deployed. SMS components and elements are not yet effective and do not yet meet the required regulatory standard.

The SMS Implementation Plan is mostly implemented. SMS components and elements meet the required regulatory standard.

The SMS Implementation Plan is mostly implemented. SMS components and elements are effective. The Organisation is identifying / adopting Industry best practices beyond the regulatory compliance requirements.

The SMS is fully implemented and its components and elements are effective. The Organisation is setting the Industry SMS best practices.

The SMS processes are continually improved to meet the needs of the organisation and are producing a demonstrable improvement in safety performance. The Organisation is setting the Industry SMS best practices.

The organisation is not measuring and monitoring safety performance.

The organisation has a plan to capture information about safety performance.

The organisation is collecting safety reports under a controlled process, and is responding to safety issues identified as a result of individual incident investigations.

The organisation is measuring safety performance. It has identified its key safety risks and has developed plans for improvement.

The organisation is managing its key safety risks in conjunction with external stakeholders and can demonstrate improved safety performance.
The EUROCONTROL SMS Cost Model

- Planning / Initial Implementation Level 2
- Planning Level 1
- Implementation Level 3
- Regulatory Compliance
- Managing & Measuring Level 4
- SMS Maturity Cost Level 4 & 5
- Continuous Improvement Level 5
- SMS Cost Model Baseline Level 1 to 3
- Regulatory Framework Implementation
- SMS Enhancement

32 March 2011 - Brussels
### SMS Procedures & Safety Framework Maturity Study Areas

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<td>SMS development &amp; implementation plan</td>
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<td>Organisation’s safety policy</td>
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<td>3</td>
<td>Safety targets and safety indicators</td>
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<td>4</td>
<td>SMS organisational structure</td>
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<td>5</td>
<td>Safety responsibilities &amp; accountabilities</td>
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<td>SMS documentation</td>
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<td>Competency assurance</td>
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<td>Safety of external services</td>
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<td>19</td>
<td>Lesson dissemination &amp; safety awareness</td>
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#### Safety Culture
SA1 Development of a positive and proactive safety culture

#### Safety Policy
SA2 Organisational and Individual Safety Responsibilities
SA3 Timely Compliance with International Obligations

#### Safety Achievement
SA4 Safety standards and procedures
SA5 Competency
SA6 Risk Management
SA7 Safety Interfaces

#### Safety Assurance
SA8 Safety Reporting, Investigation and Improvement
SA9 Safety Performance Monitoring
SA10 Operational Safety Surveys and SMS Audits

#### Safety Promotion
SA11 Adoption and Sharing of Best Practices
Mapping of SMS cost model to SMS maturity model

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<th>No</th>
<th>Elements</th>
<th>SA 1</th>
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<td>4</td>
<td>Compliance with regional/international safety standards</td>
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<td>SA 4</td>
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<td>Emergency response procedures and planning</td>
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<td>6</td>
<td>Provision of feedback to the training organisations</td>
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<td>Management of internal interfaces</td>
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<td>SA 7</td>
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<td>8</td>
<td>Management of external interfaces, except services</td>
<td></td>
<td>SA 8</td>
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<td>9</td>
<td>Safety information disclosure</td>
<td></td>
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</tr>
<tr>
<td>10</td>
<td>External safety surveys &amp; SMS audits</td>
<td></td>
<td>SA 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>11</td>
<td>Systematic gathering of safety and SMS best practices</td>
<td></td>
<td>SA 11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Three Options for the Safety Maturity Cost

Mapping SMS Baseline Model with Safety Maturity Model

Safety Maturity Tasks Unique
Simplified

Safety Maturity Tasks

EUROCONTROL SMS MATURITY COST MODEL
SMS COST MODEL Demonstration
The EUROCONTROL ABC Tool

Administrative Burden Cost estimation Tool (ABC Tool) establishes the costs associated with the development and implementation, day-to-day operation and maintenance of different systems by Air Navigation Providers in Europe.

ABC Tool
Version: 1.0

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# Demo – Global variables

## Daily Rates

<table>
<thead>
<tr>
<th>Role</th>
<th>Rate</th>
<th>Overhead Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAF - daily rate</td>
<td>220.00 €</td>
<td>20.00%</td>
</tr>
<tr>
<td>OPS - daily rate</td>
<td>200.00 €</td>
<td>20.00%</td>
</tr>
<tr>
<td>ENG - daily rate</td>
<td>150.00 €</td>
<td>20.00%</td>
</tr>
<tr>
<td>MAN - daily rate</td>
<td>260.00 €</td>
<td>20.00%</td>
</tr>
<tr>
<td>ANC - daily rate</td>
<td>110.00 €</td>
<td>20.00%</td>
</tr>
<tr>
<td>ADM - daily rate</td>
<td>90.00 €</td>
<td>20.00%</td>
</tr>
<tr>
<td>Internal Trainer - daily rate</td>
<td>220.00 €</td>
<td>20.00%</td>
</tr>
<tr>
<td>External Trainer - daily rate</td>
<td>500.00 €</td>
<td>N/A</td>
</tr>
<tr>
<td>External Human Effort - daily rate</td>
<td>300.00 €</td>
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</tr>
</tbody>
</table>

## SMS cost model - Human effort assignment matrix

<table>
<thead>
<tr>
<th>SAF</th>
<th>OPS</th>
<th>ENG</th>
<th>MAN</th>
<th>ANC</th>
<th>ADM</th>
</tr>
</thead>
<tbody>
<tr>
<td>[safety]</td>
<td>[operations]</td>
<td>[engineering]</td>
<td>[management]</td>
<td>[ancillary]</td>
<td>[administration]</td>
</tr>
<tr>
<td>Expert</td>
<td>Expert CNS</td>
<td>Top management (incl. directors)</td>
<td>MET</td>
<td>Procurement</td>
<td></td>
</tr>
<tr>
<td>Specialist</td>
<td>ATCO in OPS</td>
<td>COM</td>
<td>Line management</td>
<td>AIS</td>
<td>Accounting</td>
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<td></td>
<td>ATFM/ASM</td>
<td>NAV</td>
<td>SAR</td>
<td>HR</td>
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<tr>
<td>Assistant</td>
<td>SUR</td>
<td>Instructor</td>
<td></td>
<td></td>
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<tr>
<td>OPS support (non-ATCOs)</td>
<td>IT</td>
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<tr>
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<td>Electro</td>
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<td>Instructor</td>
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## Global Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
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<tbody>
<tr>
<td>Annual effort cost increase</td>
<td>3.50%</td>
</tr>
<tr>
<td>Inflation</td>
<td>3.00%</td>
</tr>
<tr>
<td>WACC - weighted average cost of capital</td>
<td>5.00%</td>
</tr>
</tbody>
</table>
Questions & Answers Part 1

• What is the operation profile in some years?

• What is the total man effort per annum? How is this effort distributed?

• What are direct/hidden costs?
Operation profile - Example

Operation profile for 15 years

<table>
<thead>
<tr>
<th>Year</th>
<th>0 €</th>
<th>20 000 €</th>
<th>40 000 €</th>
<th>60 000 €</th>
<th>80 000 €</th>
<th>100 000 €</th>
<th>120 000 €</th>
<th>140 000 €</th>
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</tbody>
</table>
# Human Effort for Development and Implementation of SMS

<table>
<thead>
<tr>
<th>Procedure Action</th>
<th>SAF</th>
<th>OPS</th>
<th>ENG</th>
<th>MAN</th>
<th>ANC</th>
<th>ADM</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[total mandays]</td>
<td>[total mandays]</td>
<td>[total mandays]</td>
<td>[total mandays]</td>
<td>[total mandays]</td>
<td>[total mandays]</td>
<td>[total amount]</td>
</tr>
<tr>
<td>1-Design</td>
<td>41</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2-Coordination</td>
<td>12</td>
<td>20</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3-Approval</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1.25</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>4-Initiation</td>
<td>39</td>
<td>20</td>
<td>20</td>
<td>12</td>
<td>10</td>
<td>5</td>
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</table>

**Grand Total Human Effort**

<table>
<thead>
<tr>
<th>SAF</th>
<th>OPS</th>
<th>ENG</th>
<th>MAN</th>
<th>ANC</th>
<th>ADM</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>94</td>
<td>40</td>
<td>40</td>
<td>13.25</td>
<td>10</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

- **Average Rate [per day]**
  - SAF: 220 €
  - OPS: 200 €
  - ENG: 150 €
  - MAN: 260 €
  - ANC: 110 €
  - ADM: 90 €

- **OH-Overhead [%]**
  - SAF: 20.00%
  - OPS: 20.00%
  - ENG: 20.00%
  - MAN: 20.00%
  - ANC: 20.00%
  - ADM: 20.00%

- **Rate for estimations**
  - SAF: 264.00 €
  - OPS: 240.00 €
  - ENG: 180.00 €
  - MAN: 312.00 €
  - ANC: 152.00 €
  - ADM: 108.00 €

**Total Human Effort Costs**

<table>
<thead>
<tr>
<th>SAF</th>
<th>OPS</th>
<th>ENG</th>
<th>MAN</th>
<th>ANC</th>
<th>ADM</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 816 €</td>
<td>9 600 €</td>
<td>7 200 €</td>
<td>4 134 €</td>
<td>1 320 €</td>
<td>540 €</td>
<td>1 800 €</td>
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</table>
## Man effort for day-to-day operation

### Human Effort for Maintenance and day-to-day Operation of SMS

<table>
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<tr>
<th>Procedure Action</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SAF</td>
<td>OPS</td>
</tr>
<tr>
<td>5-Execution</td>
<td>0.625</td>
<td>0.5</td>
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<tr>
<td>6-Output approval</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7-Completion</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td><strong>Grand Total Human Effort</strong></td>
<td><strong>121.25</strong></td>
<td><strong>25.00</strong></td>
</tr>
<tr>
<td><strong>R-Average Rate [per day]</strong></td>
<td><strong>220 €</strong></td>
<td><strong>200 €</strong></td>
</tr>
<tr>
<td><strong>OH-Overhead [%]</strong></td>
<td><strong>20.00%</strong></td>
<td><strong>20.00%</strong></td>
</tr>
<tr>
<td><strong>Rate for estimations</strong></td>
<td><strong>264.00 €</strong></td>
<td><strong>240.00 €</strong></td>
</tr>
<tr>
<td><strong>Total Human Effort Costs</strong></td>
<td><strong>32 010 €</strong></td>
<td><strong>6 000 €</strong></td>
</tr>
</tbody>
</table>
Human effort distribution - Example

Implementación - Costos de Esfuerzo Humano [%]

- SAF: 51%
- OPS: 20%
- ENG: 13%
- MAN: 9%
- ANC: 3%
- ADM: 3%
- External: 3%
Equipment profile - Example

Infrastructure and Equipment for 15 years

Year
Questions & Answers – Part II

• How much does cost the development of my SMS?

• How much does it cost me per year to run the SMS?

• What are the costs of the different SMS components?
SMS Implementation Costs

- Human effort: 35.20%
- Training: 0.74%
- Infrastructure & equipment: 64.06%
SMS Operation Costs

- Human effort: 78.87%
- Training: 20.67%
- Infrastructure & equipment: 0.46%
Questions & Answers – Part III

• What is the effort spent by the different entities (units) for developing/operating SMS?

• How much will it cost me to develop, implement and run a new procedure?

• How much will it cost me to reach the new safety target/adopt best practices/apply my own approach to enhance safety
What is the effort spent by the different entities for developing the SMS?

<table>
<thead>
<tr>
<th>SAF</th>
<th>OPS</th>
<th>ENG</th>
<th>MAN</th>
<th>ANC</th>
<th>ADM</th>
<th>Ext</th>
</tr>
</thead>
<tbody>
<tr>
<td>47%</td>
<td>17%</td>
<td>17%</td>
<td>7%</td>
<td>5%</td>
<td>3%</td>
<td>5%</td>
</tr>
</tbody>
</table>
What are the efforts spent by the different entities for operating of SMS?

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>SAF</td>
<td>43%</td>
</tr>
<tr>
<td>OPS</td>
<td>18%</td>
</tr>
<tr>
<td>ENG</td>
<td>18%</td>
</tr>
<tr>
<td>MAN</td>
<td>13%</td>
</tr>
<tr>
<td>ANC</td>
<td>5%</td>
</tr>
<tr>
<td>ADM</td>
<td>1%</td>
</tr>
<tr>
<td>Ext</td>
<td>1%</td>
</tr>
</tbody>
</table>
### Implementation Procedure:

**Investigation of Safety Occurrences**

#### Human effort man-days: (EXT - 6)

<table>
<thead>
<tr>
<th>SAF</th>
<th>OPS</th>
<th>ENG</th>
<th>MAN</th>
<th>ANC</th>
<th>ADM</th>
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</thead>
<tbody>
<tr>
<td>95</td>
<td>26</td>
<td>25</td>
<td>3.5</td>
<td>2.3</td>
<td>0.1</td>
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</table>

#### Training man-days:

<table>
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<tr>
<th>SAF</th>
<th>OPS</th>
<th>ENG</th>
<th>MAN</th>
<th>ANC</th>
<th>ADM</th>
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<td>132</td>
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</tr>
</tbody>
</table>

#### Infrastructure & equipment:

**Standard Office Equipment – 45 000 EUR**
Implementation overall costs

- SMS organisational structure – 11 %
- SMS Documentation – 10 %
- Competency assurance – 10 %
- Mandatory reporting system – 10 %
- Investigation of safety occurrences – 17 %

Five procedures make up 58 %.
Operation costs

Operational costs [%]

- SMS Development and Implementation Plan
- Organisation's Safety Policy
- Safety Targets and Safety Indicators
- SMS Organisational Structure
- Safety Responsibilities and Accountabilities
- SMS Documentation
- Competency Assurance
- Safety of External Services
- Mandatory Reporting System
- Voluntary Reporting System
- Investigation of Safety Occurrences
- Management of Safety Related Changes
- Risk Assessment and Mitigation
- Software Safety Assurance System
- Safety Surveys
- Safety Monitoring
- Safety Records
- Safety Improvement
- Lesson Dissemination and Safety Awareness
Operation overall costs

- Mandatory reporting system – 13 %
- Management of safety related changes – 14 %
- Risk assessment & mitigation – 13 %
- Software assurance plan – 11 %
- Lesson dissemination & safety awareness – 10 %

Five procedures make up 61 %.
Benchmarking Implementation vs. Operation

- Implementation
- Operation

- Benchmarking Implementation vs. Operation
- Implementation
- Operation

- Benchmarking Implementation vs. Operation
- Implementation
- Operation

- Benchmarking Implementation vs. Operation
- Implementation
- Operation

- Benchmarking Implementation vs. Operation
- Implementation
- Operation

- Benchmarking Implementation vs. Operation
- Implementation
- Operation

- Benchmarking Implementation vs. Operation
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- Benchmarking Implementation vs. Operation
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- Operation

- Benchmarking Implementation vs. Operation
- Implementation
- Operation

- Benchmarking Implementation vs. Operation
- Implementation
- Operation

- Benchmarking Implementation vs. Operation
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Any Questions