

EHEST SAFETY MANAGEMENT TOOLKIT

MARIA

(My Assessment of Risks for Incidents and Accidents)
Guidance Manual
2nd Edition, 01 August 2016

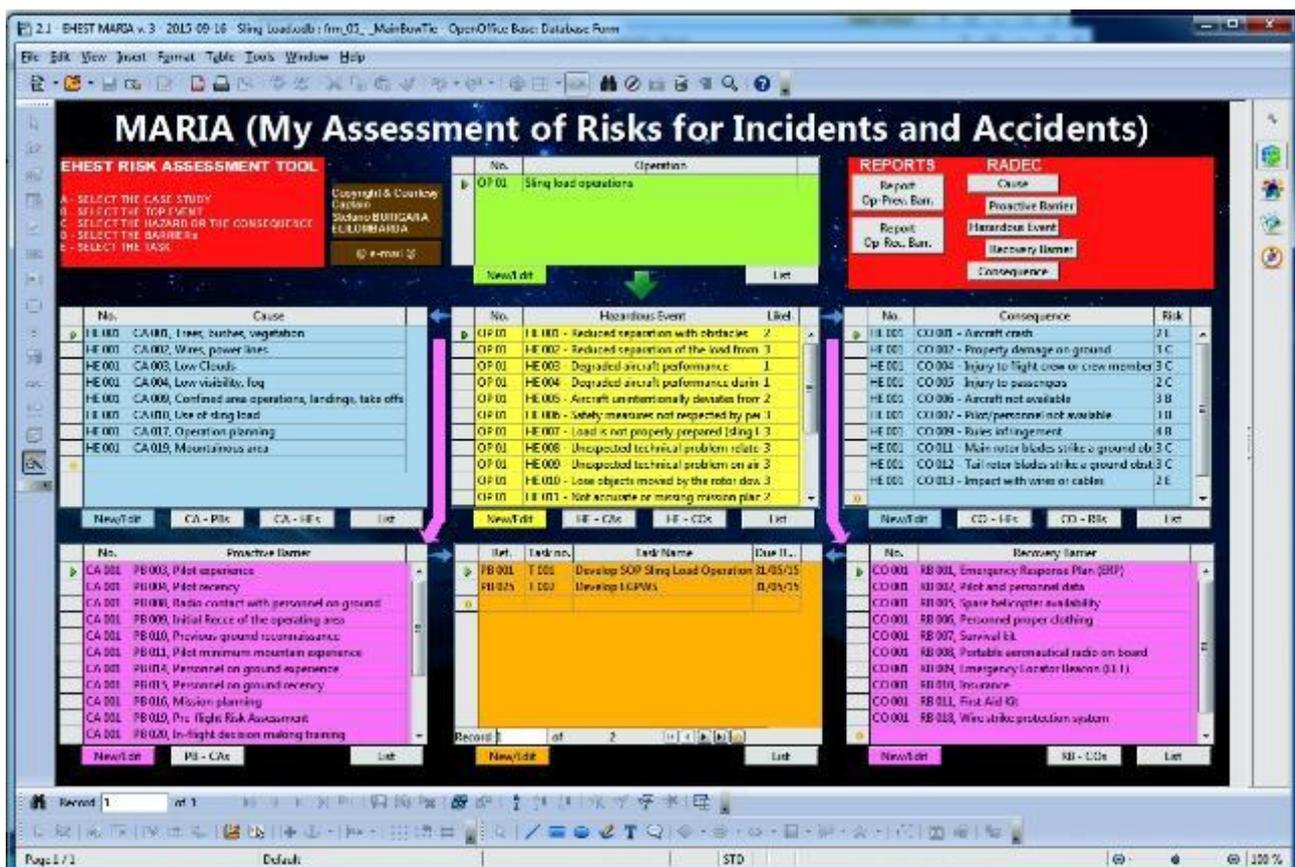


Courtesy: Elicampiglio
Photo: Michele Calovi

European Helicopter Safety Team

MARIA
 (My Assessment of Risks for Incidents and Accidents)

Guidance Manual



Edition 2

01 August 2016

ABOUT THE MANUAL

This manual will walk you through the installation of the OpenOffice suite and the usage of the EHEST "MARIA" tool.

The tool has been developed by Capt. Stefano BURIGANA, Elilombarda Safety Manager and revised by the EHEST Specialist Team Ops. & SMS. The tool has been released by EHEST to assist operators to develop their own Company risk assessments better.

The tool is open source, e.g. it can be used, copied, distributed and changed. The only requirements are that:

- **The tool cannot be sold or used for remuneration.**
- **If the tool is changed, the changes must be made available to the community.**

The information (risk evaluations) contained inside the tool must be considered as examples. Every operator MUST make its own analysis and risk evaluation, since those can significantly differ between different operators or operations.

NOTE: Downloading the MARIA file, the computer could save the file as "read only", preventing the insertion of data and the use of the database.

If necessary, right-click on the file (before opening it), select "Properties" and uncheck the "Read only" box.

Please report your comments and suggestions to:

ehest@easa.europa.eu

In case of "technical" questions about the MARIA tool, please report also to:

sburigana@elilombarda.com

stefano.burigana@gmail.com

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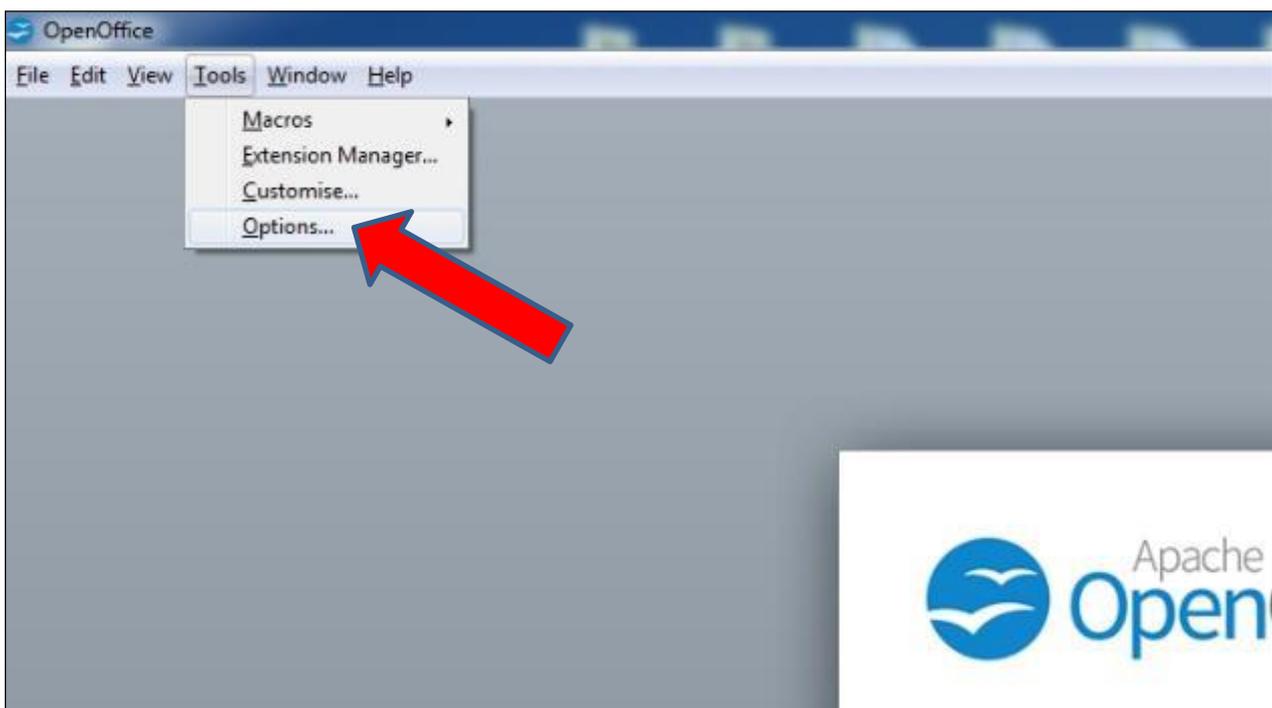
1) HOW TO INSTALL THE EHEST "MARIA"

MARIA is based on OpenOffice, an open source cost-free office suite that can be downloaded and installed by everybody. The idea was to create a tool that could be used with everyday computer programs but, since not every Microsoft Office suite has the Access database in it, EHEST opted for a world-recognized free program such as OpenOffice for the development of MARIA.

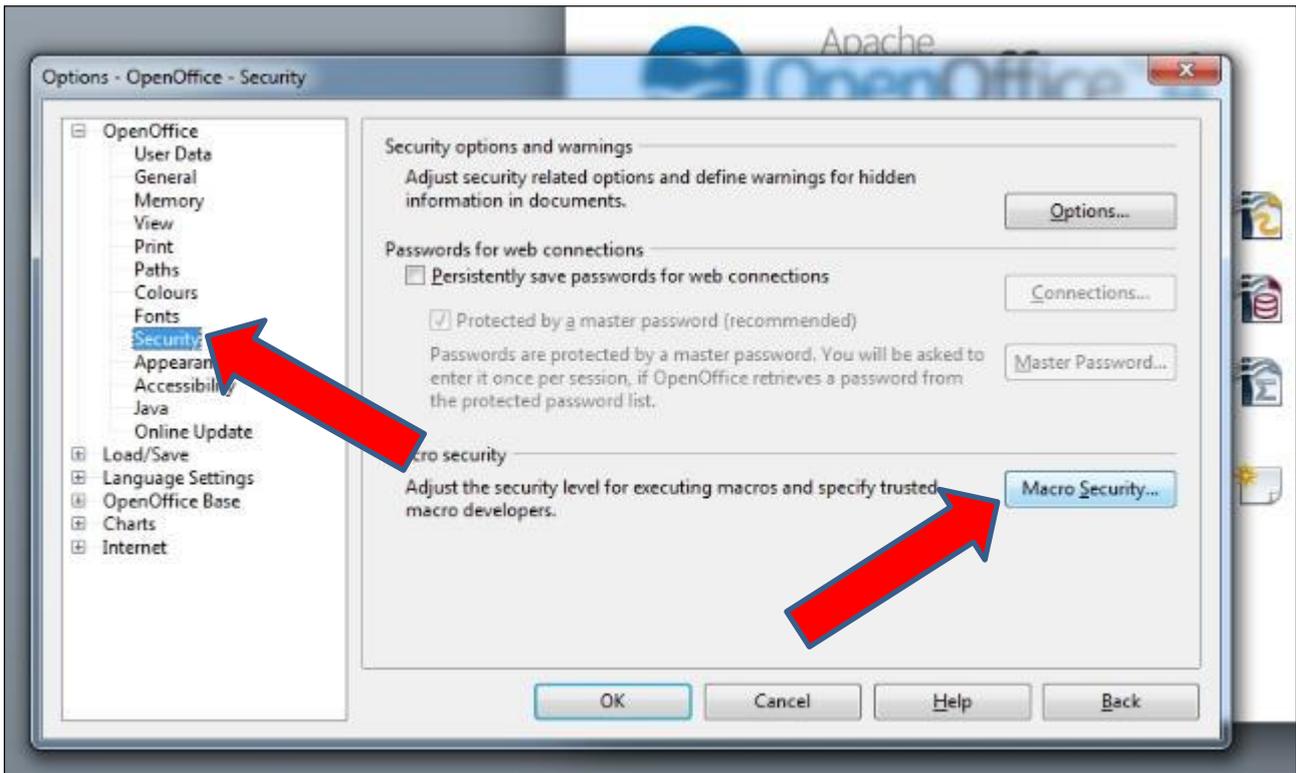
NOTE: There are different free Office suites available, e.g. NeoOffice, LibreOffice, OpenOffice. Be sure to use the Apache OpenOffice.

These are the steps for installing and setting up the OpenOffice suite to be used with MARIA.

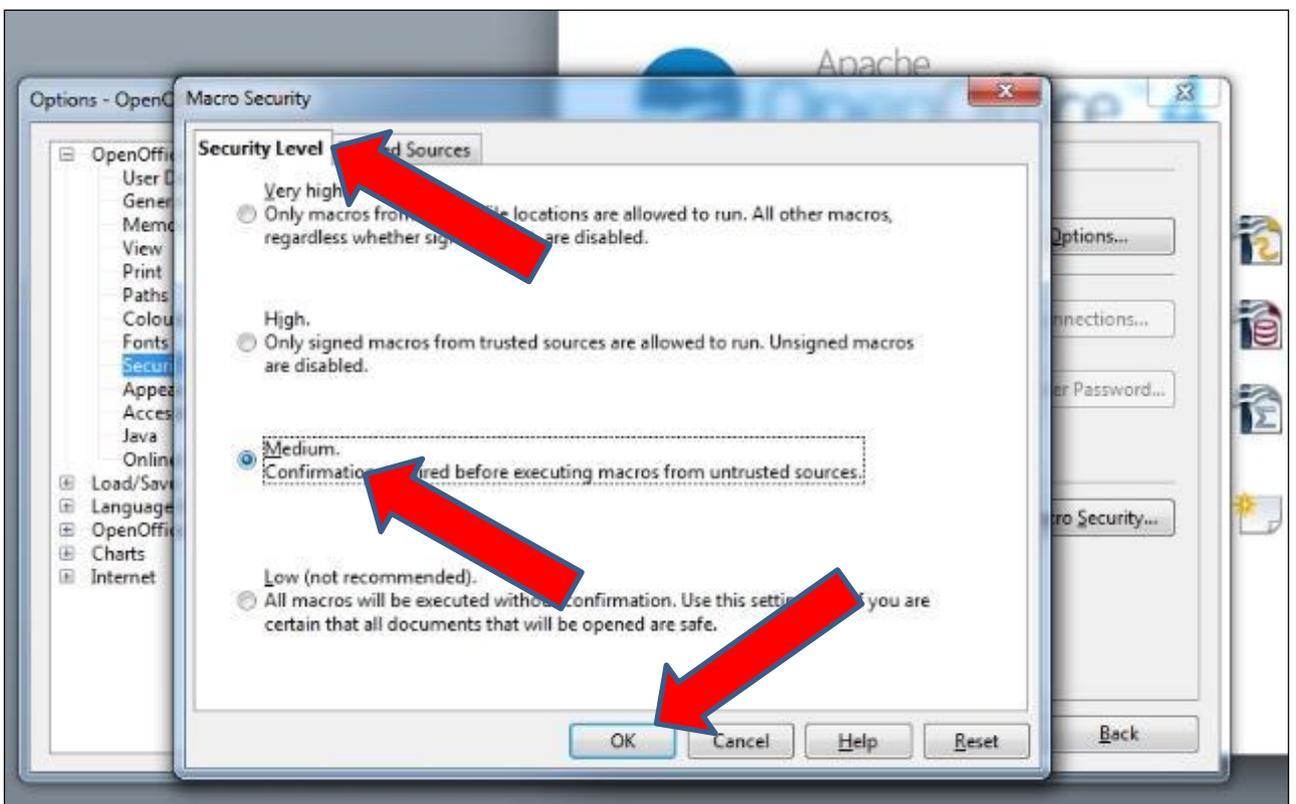
- 1) Download OpenOffice from <http://www.openoffice.org/download/index.html>
- 2) Install the OpenOffice suite
- 3) Enable macros:
 - Select **Tools, Options**



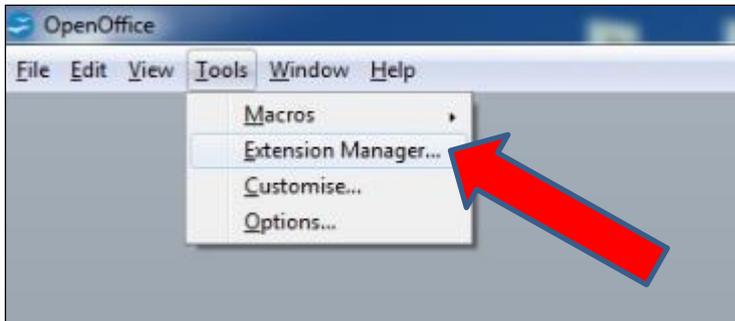
- Select **Security, Macro Security...**



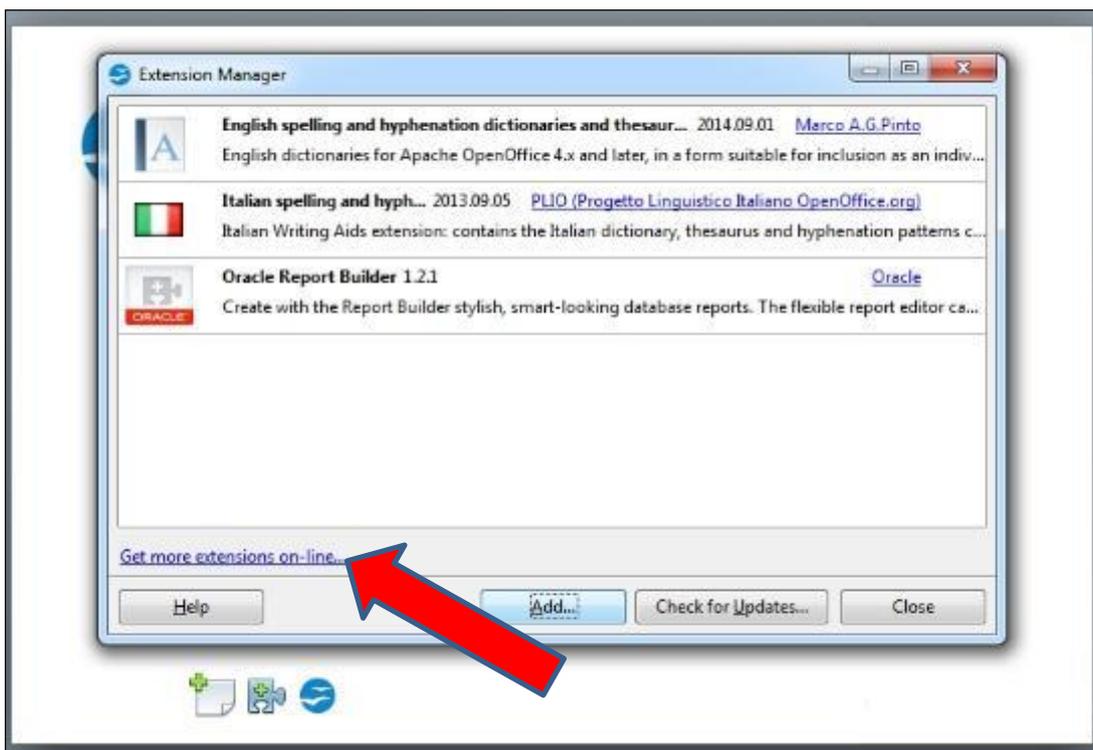
- Select **Security Level** tab, **Medium** (suggested), **OK**.



- 4) Install the Oracle Report Builder. This extension is used to produce the reports:
- Select **Tools, Extension Manager**



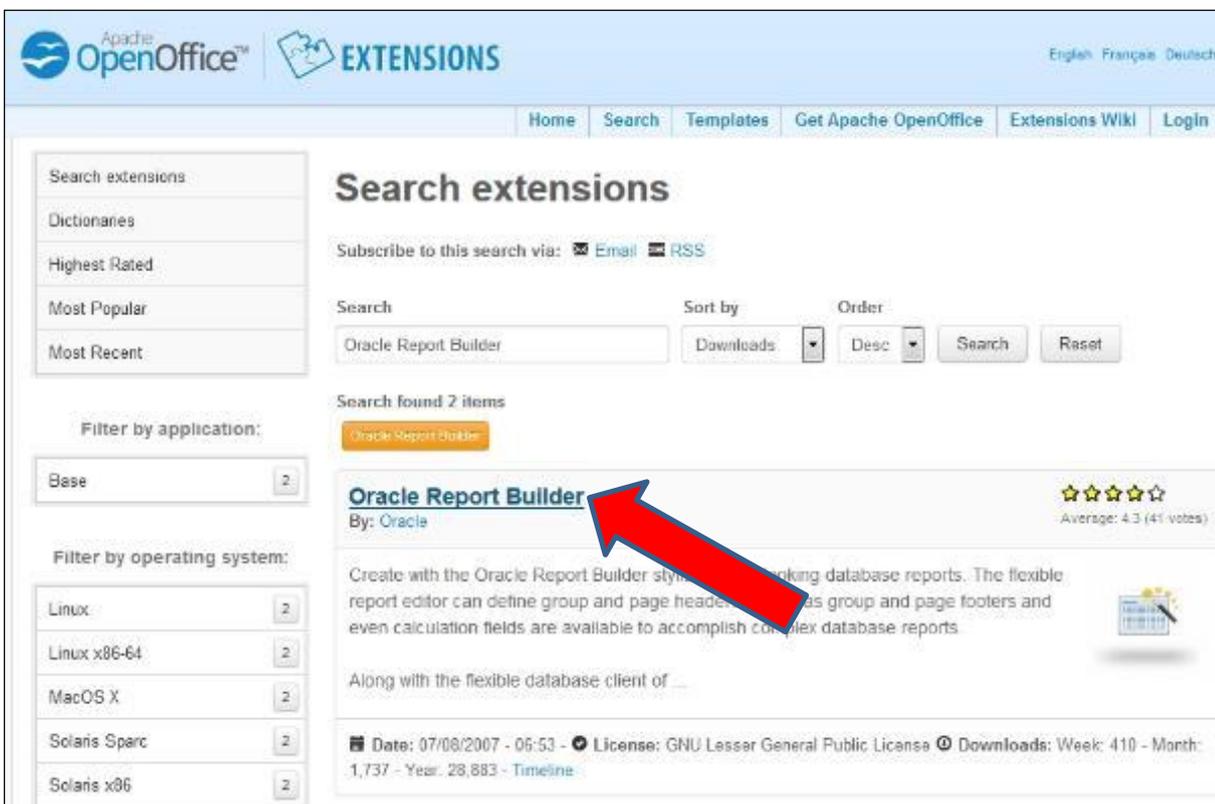
- Select **Get more extensions on-line** (you must have an internet connection)



- Write **"Oracle Report Builder"** in the search window and press **Search**



- Select the extension **Oracle Report Builder**



- Select **Download Extension**

Oracle Report Builder

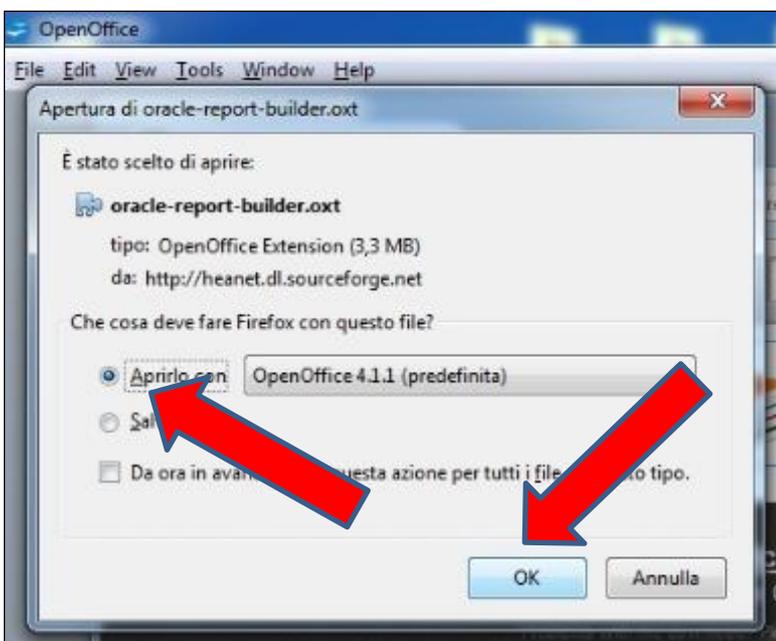
View Releases

Provider:	ORACLE Oracle
Maintainer:	mh
Rating:	★★★★☆ Average: 4.3 (41 votes)
Application:	Base
Tags:	Sun, , reports, , base, , oracle,
Source code:	http://hg.services.openoffice.org/DEV300/file/2ebd15d9e8a6/reportbuilder
Post date:	Tuesday, 7 August, 2007 - 06:53
Statistics	Week: 410 - Month: 1,737 - Year: 26,863 - Timeline



System Independent [Releases](#)
 Compatible with OpenOffice [Releases](#)
 User feedback:
 Compatible with OpenOffice 4.x?
 0%   100%

- Select the extension **Open with** and **OK**



2) ABOUT TERMINOLOGY

MARIA uses a variation of the Bowtie methodology to manage the risk analysis, but efforts have been made in order to maintain consistency with the European Regulation terminology and concepts. This means that some terms were adapted to best represent the concepts or to reduce confusion with other available methodologies.

MARIA is not a BowTie method, but it takes some of the BowTie concepts.

Please refer to the UK CAA website for an explanation of BowTie



(<http://www.caa.co.uk/default.aspx?catid=2786&pagetype=90>).

With reference to the BowTie diagram above, these are the main differences:

Hazard is perhaps the most used word in aeronautical safety, but several different concepts are used with this word:

BOWTIE METHODOLOGY – Hazard is a situation, operation, event that is part of the normal life, but that has the potential of harming the safety. For example, weather is something we are used to living with: clouds, wind, rain, temperature are normal elements we cope with every day. These are all HAZARDS, but they can be harmful in case of low clouds, strong or gusty winds, heavy rain or icing conditions. In the latter case the hazards became THREATS and could be contributing factors for an unwanted situation (top event)

EUROPEAN REGULATION – The Regulation does not make such differentiation, but consider the HAZARD as a general event or situation that already is outside normal situation or that is already a contributing factor to a possible incident or accident. Cf. "ORO.GEN.200 - Management system – (a) (3)":

the identification of aviation safety hazards entailed by the activities of the operator, their evaluation and the management of associated risks, including taking actions to mitigate the risk and verify their effectiveness;

In MARIA tool, both HAZARDS and THREATS (as for Bowtie meaning) are called CAUSES, and for simplicity they can be listed together.

The more general meaning of HAZARD used by the EU Regulation, in the Bowtie methodology is the central part of the graphic and is called TOP EVENT. As said before, these are situations or events that can be seen as an unwanted state, i.e. something happened that is already outside

the normal situation and, if not treated accordingly, can develop into an incident or accident. An example can be the inadvertent entry into IMC, altitude infringement or wrong radio frequency selection.

In MARIA tool, these are called HAZARDOUS EVENTS as they are close to the concept used by Bowtie methodology, but they can be easily understood as HAZARDS as for EU Regulation.

Consequences, Proactive and Recovery Barriers maintain the same meaning as for Bowtie terminology.

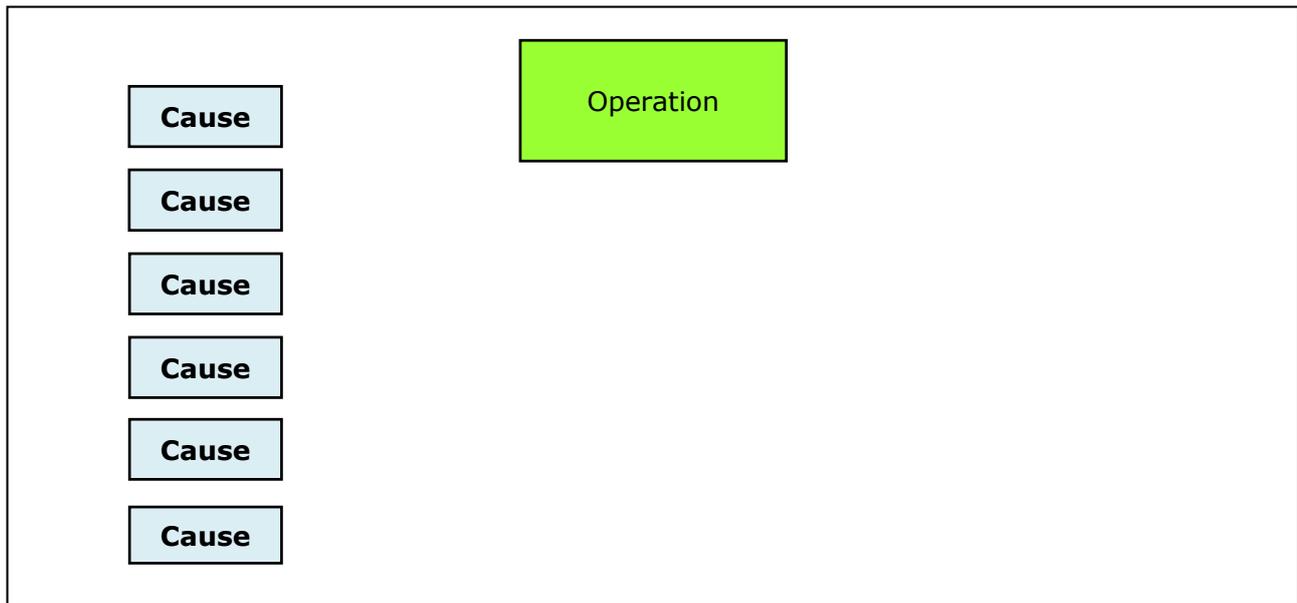
3) "MARIA" RISK ASSESSMENT METHODOLOGY

Following is a description of the MARIA risk assessment methodology.

First an **Operation** is created. An Operation is the risk assessment, the safety occurrence, the management of change, and so on, that we want to analyse in order to split it in more simple/basic contributing factors/causes.



The situation, or operation, we are studying is "inserted" or it "lives" inside a specific environment made of "Causes" which can either be Hazards or Threats.



Hazards are not necessarily “bad things”: they are situations, environments, operations that we normally do or live with, but that can lead to an unwanted situation. As an example meteorological situations, or even a thunderstorm, is a Hazard: it exists and we live with it. It does not necessarily give any danger, yet... unless I fly under or within the thunderstorm, that is something I do not want to do (= Hazardous Event). If I end up under or within a thunderstorm, I can have damage to the aircraft, lightning strikes, even loss of control and crash on ground. These are all “Consequences” (see ahead) that are potentially catastrophic results from a non-regular situation (Hazardous Event).

Threats describe events that may cause an unsafe state if not managed with preventive controls. They are generally called “Contributing Factors”, and are not unwanted situations (Hazardous Events) yet, but they can turn (alone or in combination) into a Hazardous Event if a barrier will not stop the sequence of events.

Consider the Hazardous Event and ask the question ‘why’ or ‘how’ could this occur?

In the thunderstorm example we can have:

HAZARDS (they are all normal elements we work with):

- Thunderstorm
- Night operations
- Marginal VFR

THREATS (contributing factors)

- The pilot heads toward the thunderstorm
- The aircraft was released with the weather radar not operative and under MEL
- Thunderstorms were not forecast

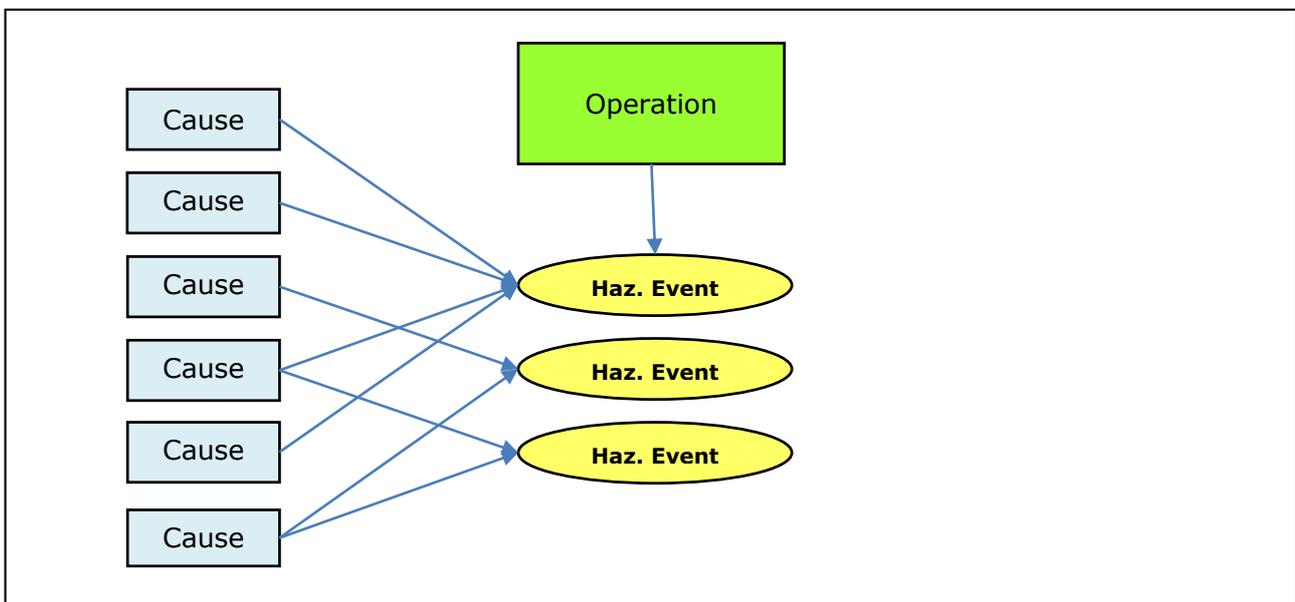
All the above are considered as “CAUSES”.

“Causes” could end up in some unwanted events called **Hazardous Events**. These are events/occurrences/situation that are outside the normal management of a flight or maintenance: something happened which is not wanted, it puts the personnel or the aircraft in an unwanted situation, and it can be a precursor to a much worse incident or accident.

A single Cause can end up in more than a Hazardous Event. For example, flying close to a CB I can possibly end up with:

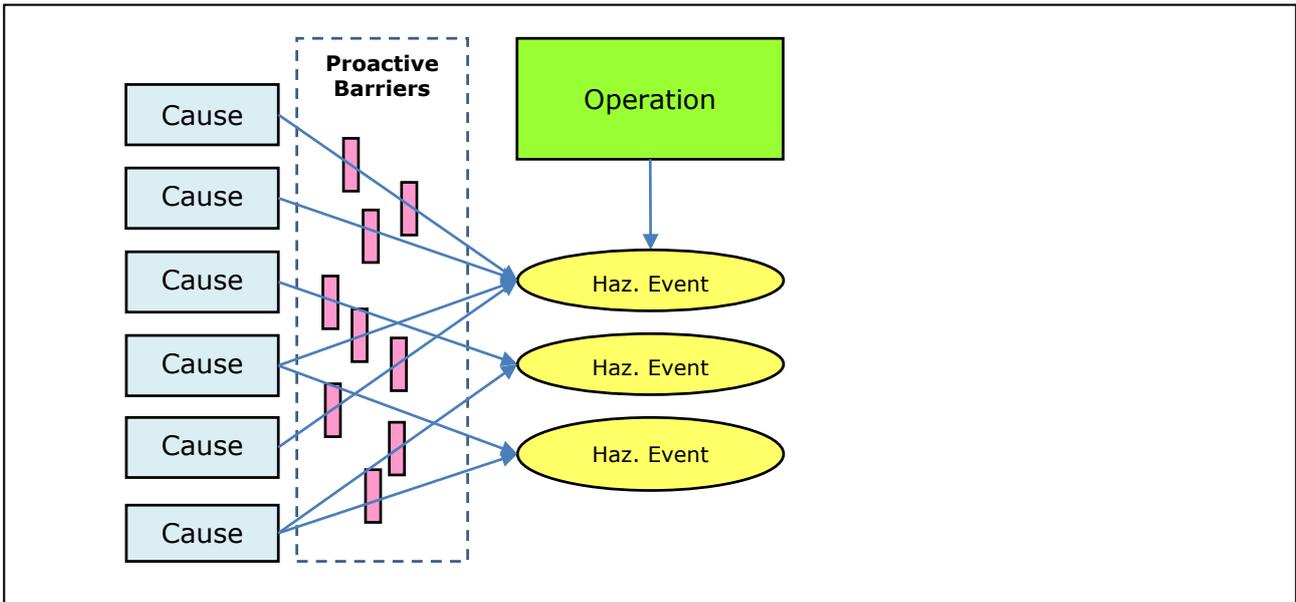
- flying in severe turbulence; or
- inadvertent IMC; or
- icing conditions; and so on.

These situations are outside the normal flight conditions I want to maintain, but they are not detrimental, yet. I am in an unwanted state or situation, but I can still recover from the situation provided I apply some recovery actions or “Barriers”.

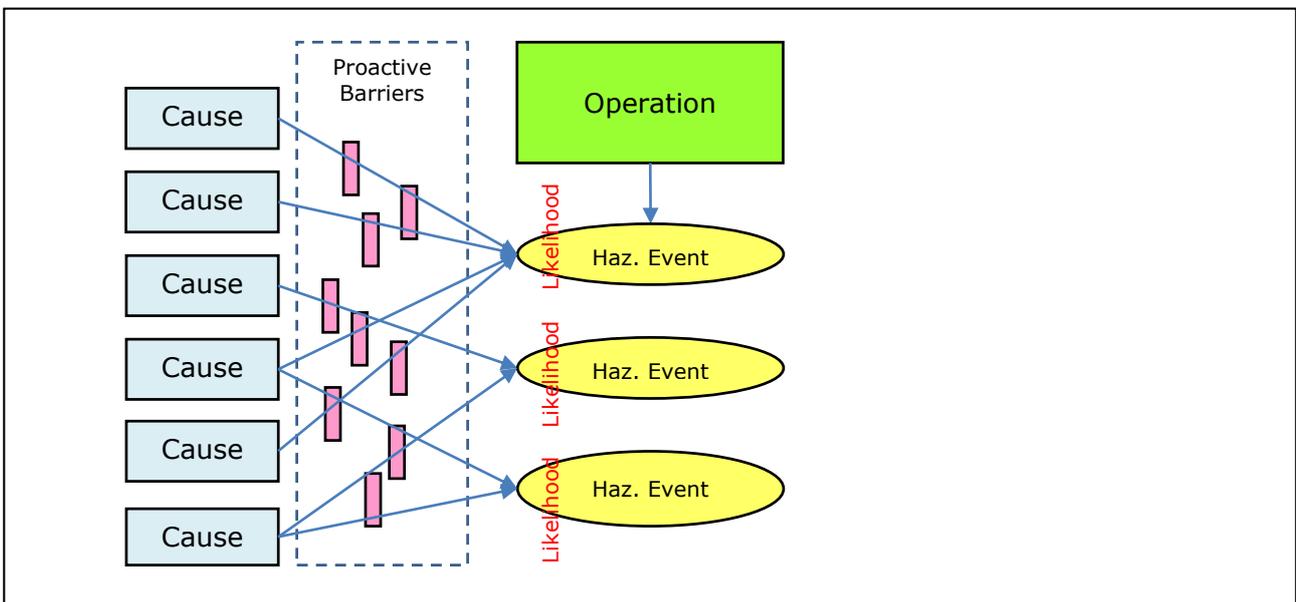


We generally have, or will strive to have, several methods for avoiding, intercepting, blocking events before they change from a normal and wanted situation to a dangerous, abnormal or unwanted situation (Hazardous Event). To do that, we use procedures, back-up systems, double controls, technology, and so on. All these are called **Proactive Barriers**.

Every Cause has its own list of related safety controls, called “Proactive Controls”, that are put there to try to avoid, or put a “barrier”, to a normal situation that can turn into an undesirable situation (Hazardous Event).



We can list all the things that will help us to maintain the control of the situation (Barriers). After that, we can evaluate the **Likelihood** (probability) that a particular Hazardous Event would happen and an unwanted state or situation would arise.



Together with the development and improvement of safety Barriers, the evaluation of the Likelihood of a Hazardous Event and the evaluation of the Risk level of a Consequence are the most important part of a safety analysis.

The Risk is assessed by the use of a **Risk Matrix**.

A Risk Matrix is an evaluation table, or graphic, where we choose in one side the possibility (Likelihood) that the “bad thing” (Hazardous Event or Consequence) would happen and in the other side the gravity (Severity) of the Consequences of the “bad thing” if it finally happens.

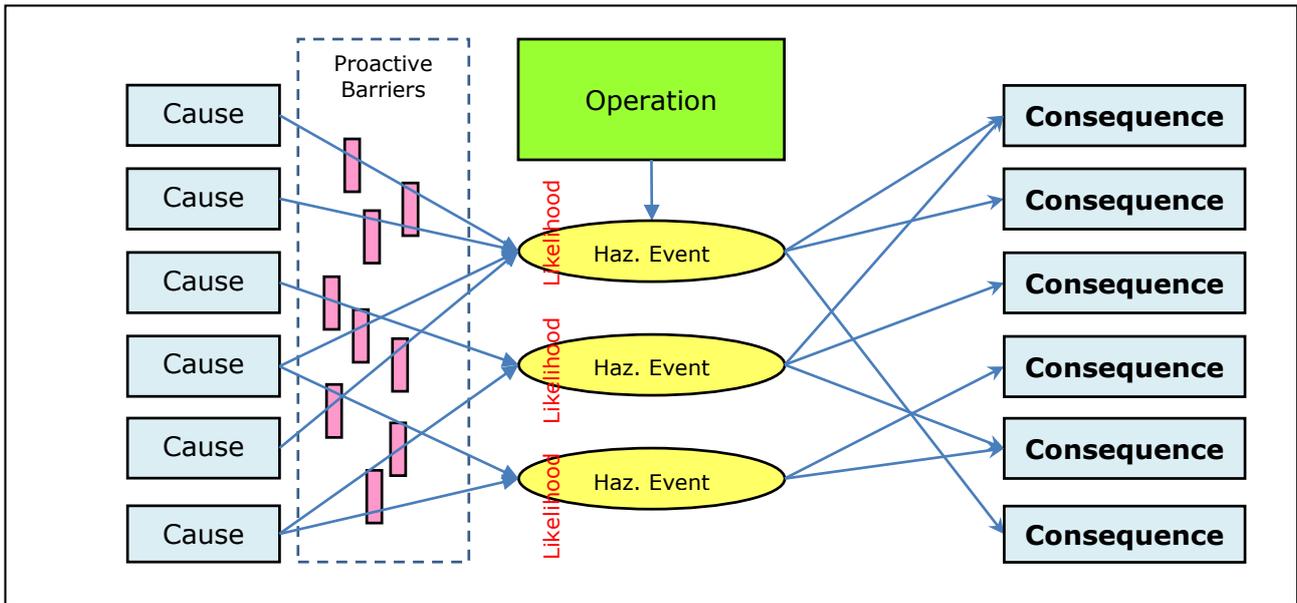
RISK MATRIX							
	Risk Likelihood	Risk Severity					
		Negligible (A)	Minor (B)	Major (C)	Hazardous (D)	Catastrophic (E)	
Likely to occur many times. Has already occurred in the Company (> 3 times/year - indicative). Has occurred frequently in the history of the aviation industry.	Frequent (5)	5 A	5 B	5 C	5 D	5 E	
Likely to occur sometimes. Has already occurred in the Company (< 3 times/year - indicative). Has occurred infrequently in the history of the aviation industry.	Occasional (4)	4 A	4 B	4 C	4 D	4 E	
Unlikely to occur, but possible. Has already occurred in the Company at least once. Has seldom occurred in the history of the aviation industry.	Remote (3)	3 A	3 B	3 C	3 D	3 E	
Very unlikely to occur. Not known to have occurred in the Company but already occurred at least once in the history of the aviation industry.	Improbable (2)	2 A	2 B	2 C	2 D	2 E	
Almost inconceivable that the event will occur. It has never occurred in the history of the aviation industry.	Extremely Improbable (1)	1 A	1 B	1 C	1 D	1 E	
Unacceptable Risk Level	Unacceptable under the existing circumstances	Personnel	Superficial or no injuries	Light injuries	Serious injuries	Fatality	Multiple fatalities
Tolerable Risk Level	Acceptable based on risk mitigation. It may require management decision	Environment	Negligible or no effects	Little impact	Noteworthy local effects	Effects difficult to repair	Massive effects (pollution, destruction, etc.)
Acceptable Risk Level	Acceptable	Material values & assets	Negligible impact	Financial loss with little impact. Damage < 50K€	Substantial financial loss. Damage < 250K€	Severe financial loss, long term eff. Damage < 1 M€	Catastrophic financial loss. Damage > 1 M€
		Reputation	Light or no impact	Limited impact	Considerable impact	National impact	International impact

Risk Matrix should be of “quantitative” type, that means a matrix were the likelihood is a real statistic of similar events happened per amount of time/flight hours/cycles. In real life, this is not realistic for small or even medium size operators who would never fly the minimum statistic basic flight hours (10.000 or even 100.000) during the whole Company lifetime.

For this reason, we work with “qualitative” reference when it comes to evaluate the likelihood part of the risk matrix. Just sit down and think if a similar event has ever happened in the Company, in similar Companies, or in the aeronautical world (as far as you know). In the worst situation (no information at all) just think how often could that event happen in your company and make an evaluation based on your judgment. This could not be a scientific approach, but it is surely better than having no likelihood ideas at all. After all: who better than you knows your job? You will probably make a good estimation of likelihood based on your knowledge and experience of similar situations.

Hazardous Events are assessed only for the Likelihood that this event could happen, while Consequences are assessed also by the possible severity of the consequences. This is because in the Hazardous Event nothing detrimental happened yet, but we only have an unwanted situation that we want to recover from.

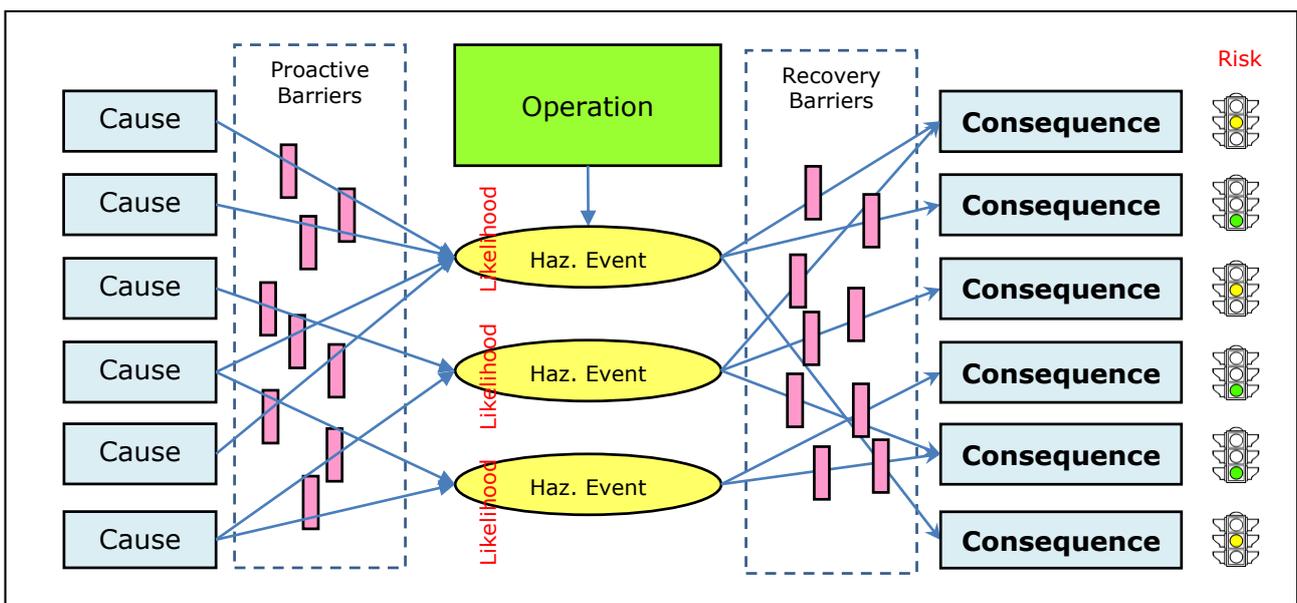
As said before, the Hazardous Event is only an occurrence or situation that could lead to an accident. Therefore, the next step is to identify and link all the **Consequences** that could be triggered by the Hazardous Events. This is the right side of the tool.



Consequences describe the possible incidents or accidents that may potentially result from the Hazardous Event if the event is not managed with recovery controls.

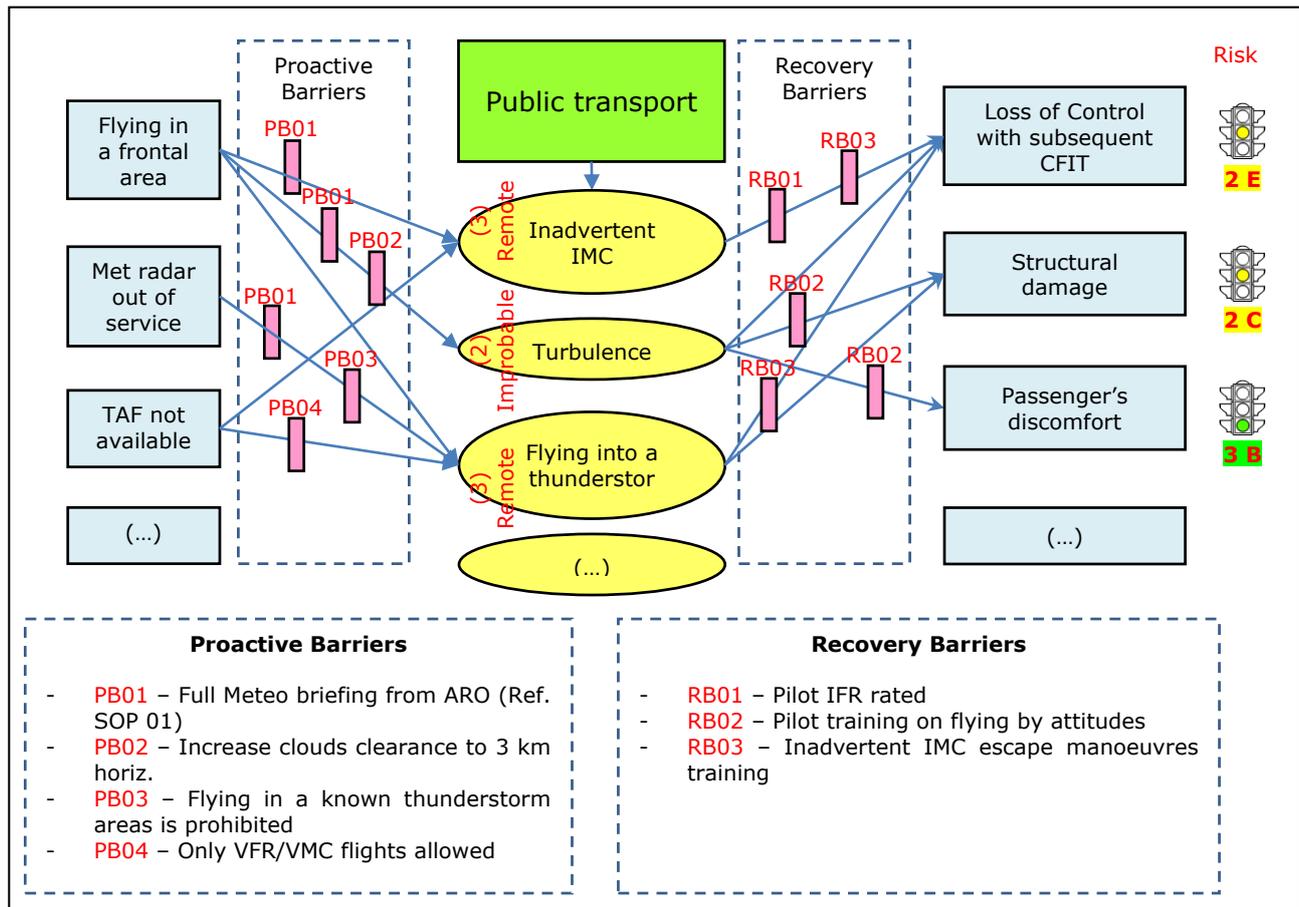
In our flying close to a CB example, the inadvertent IMC Hazardous Event could lead to a loss of control with possible CFIT if the pilot do not do something to recover from the inadvertent IMC (Recovery Barriers).

As well as the Proactive Barriers, we can have several measures in place to reduce the possibility that a Hazardous Event turns into a Consequence. These are called **Recovery Barriers**.



In the practical world, mitigations could be either the measures that block the chain of events from an abnormal situation (Hazardous Event) to the possible Consequence (reducing the Risk Likelihood), or the measures in place to reduce the deleterious outcome of an accident (reducing the Risk Severity).

The following example is how the thunderstorm could be analysed and rated.



4) WHY AN EHEST RISK ASSESSMENT TOOL?

Handling a complete methodology to make an in depth risk assessment and analysis could become very complicated, because there are many connections between the elements (in a technical database terminology: several “many-to-many relations”) that makes the use of a classical “tabular list” very unhandy. Just to clarify:

- An operator will have several Operations (i.e. risk assessments on its operations, changes, occurrences, etc.).
- Each Operation has several Hazardous Events. Each Hazardous Event can be linked to more than one Operation. **(many-to-many relations)**
- Each Hazardous Event could be triggered by several Causes. Each Cause can be the starting point of several Hazardous Events. **(many-to-many relations)**

- Each Hazardous Event can be prevented by several Proactive Barriers. Those Barriers are used to limit the Likelihood that a Hazardous Events happens. **(many-to-many relations)**
- Hazardous Events can lead to some Consequences. More than one Consequence could be the result of several Hazardous Events. **(many-to-many relations)**
- I could stop the event chain from a Hazardous Event to Consequences or reduce the magnitude of the Consequence through the implementation of some Recovery Barriers. Those Recovery Barriers can be used to reduce the potential negative effects of many Hazardous Events. **(many-to-many relations)**

Now, try to keep in mind all these connections when developing your own 'Bowtie' on plain paper!... Impossible even for easy studies.

To help the safety analysts (e.g. Post Holders, Managers, Safety Managers) to take into consideration all the dangerous situations and the controlling elements related to their operations, EHEST developed the MARIA tool.

5) HOW TO USE THE EHEST "MARIA" TOOL

NOTE:

The OpenOffice Base program, as many other programs, could crash erasing important data or a whole day's work.

I strongly suggest to periodically save your work, i.e. every ten minutes of work or after an important entry.

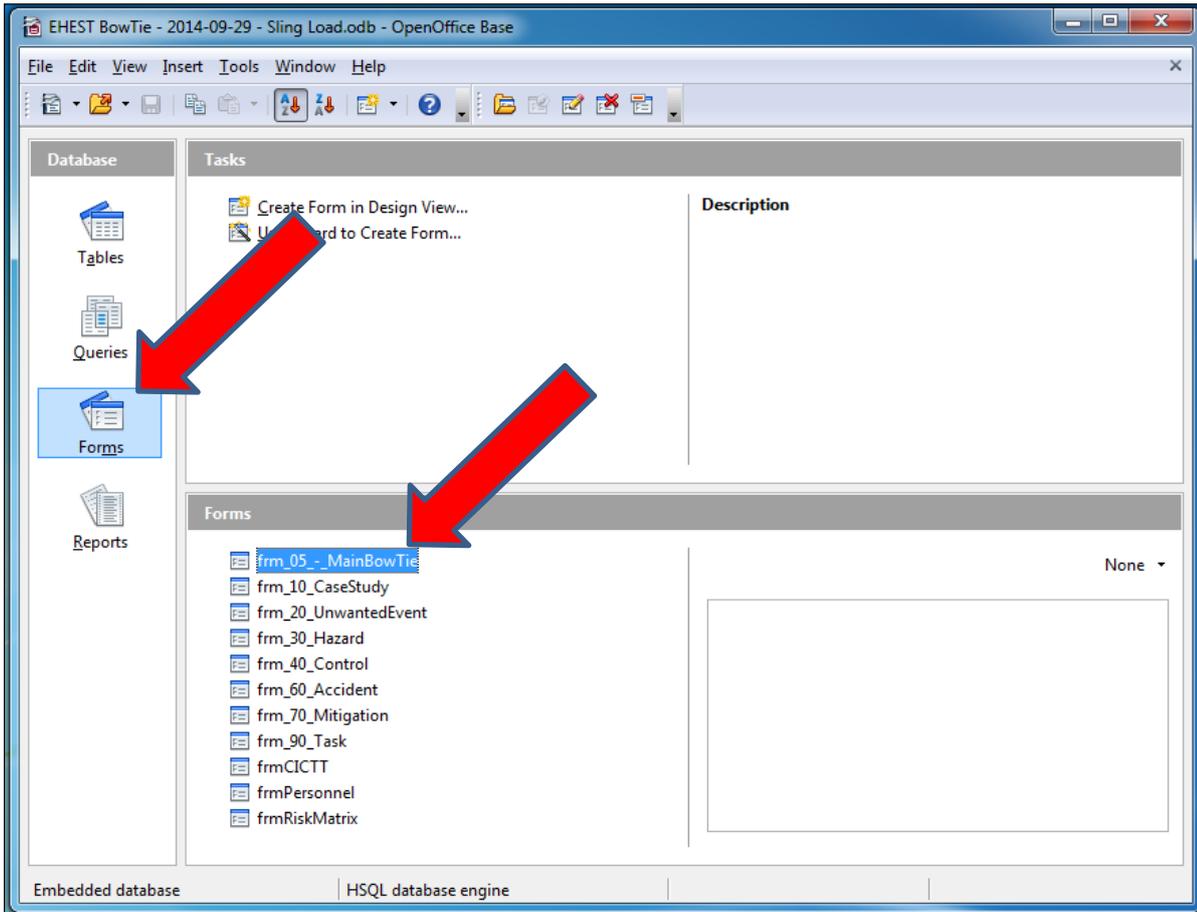
Moreover, because it happened that after a crash the file could not be opened anymore or behaved strangely, I strongly suggest to back up your working file periodically or after important entries.

Open the database double-clicking on the MARIA file.

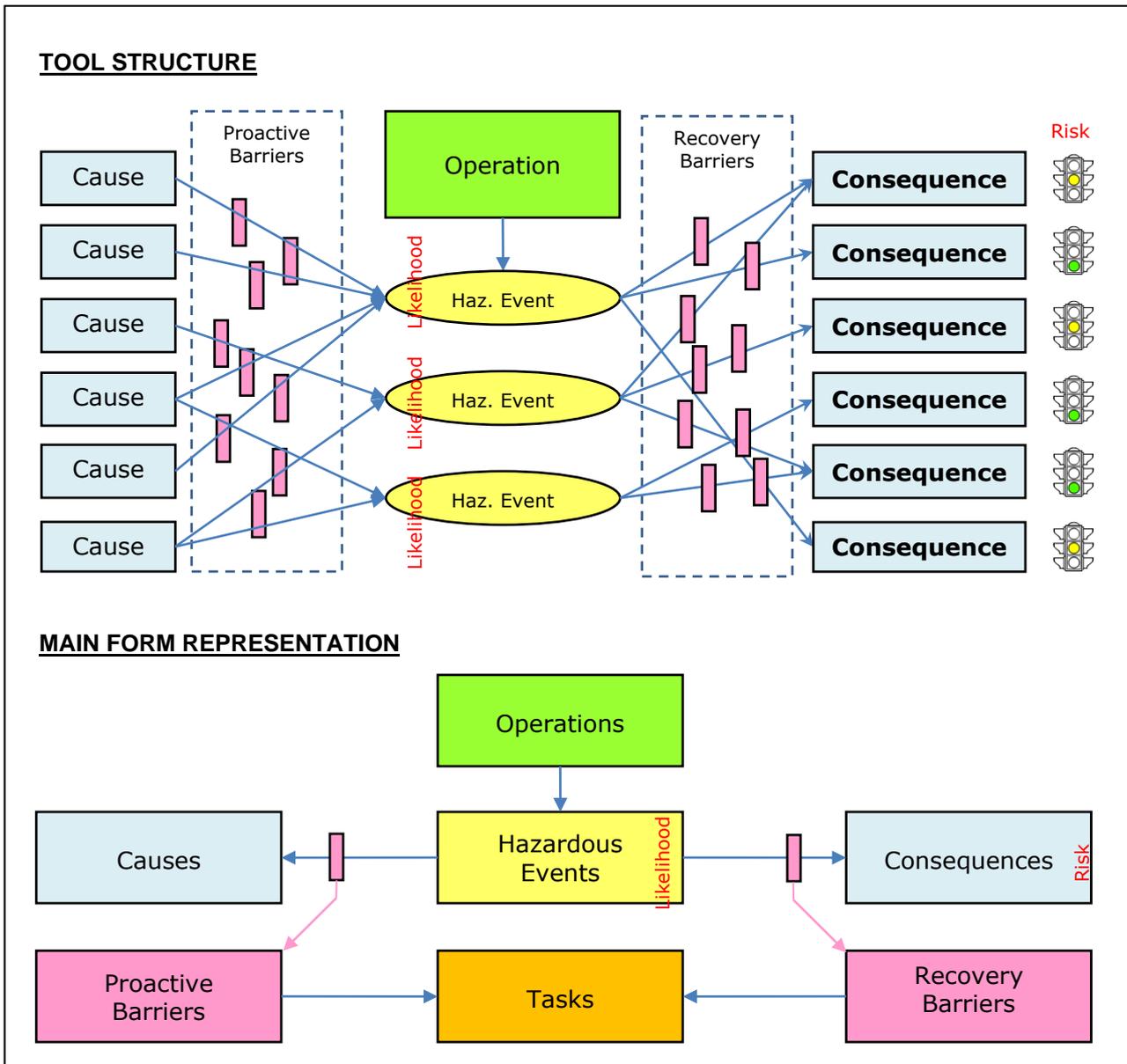
Wait until the main page opens. It could take a while (up to 1 minute).



If the main page does not open automatically, select “Forms” from the left-side column and then double-click on “frm_05_-_MainBowTie” on the bottom-right window.

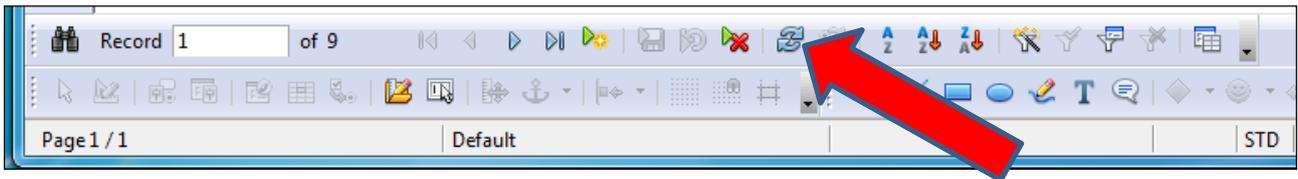


Here you can find the tool structure, as explained before, and how it is showed on the main form:



You can enter information (Operation, Hazardous Event, Cause, Proactive Barrier, Consequence, Recovery Barrier, Task) in the order you want. The important thing is then to link every piece of information together.

NOTE: in order to be able to see the variations to the database after an entry, use the "Refresh" button on the lower part of the database window, or close and re-open the form.



OPERATION

You start a safety study, or Operation (risk assessment, management of change, occurrence analysis, etc.), by defining the Operation number and its definition. Press "New/Edit" to enter the Operation window.

No.	Operation
▶ OP 01	Sling load operations

New/Edit List

OPERATION

No.	Operation	Note	Initial Date	Revision Date
▶ OP 01	Sling load operations			

INSERT, DELETE OR UPDATE OPERATIONS

The table at the top briefly lists all the Operations already inserted. You can enter or edit the Operations in the table below.

To close the window just click on the "X" on the upper-right of the window.

HAZARDOUS EVENT

In this window you find all the Hazardous Events linked to the selected Operation. If you select a different Operation you will see its related Hazardous Event list.

To write a new Hazardous Event or to edit the existing ones, press "New/Edit" button and the following window will show up

No.	Hazardous Event	Likel.
OP 01	HE 001 - Reduced separation with obstacles	2
OP 01	HE 002 - Reduced separation of the load from	3
OP 01	HE 003 - Degraded aircraft performance	1
OP 01	HE 004 - Degraded aircraft performance durin	1
OP 01	HE 005 - Aircraft unintentionally deviates from	2
OP 01	HE 006 - Safety measures not respected by per	3
OP 01	HE 007 - Load is not properly prepared (sling l	3
OP 01	HE 008 - Unexpected technical problem relate	3
OP 01	HE 009 - Unexpected technical problem on air	3
OP 01	HE 010 - Lose objects moved by the rotor dow	3
OP 01	HE 011 - Not accurate or missing mission plan	2

Buttons: New/Edit, HE - CAs, HE - COs, List

HAZARDOUS EVENT

Has. Event n.: HE 001

Description: Reduced separation with obstacles

Note: The aircraft does not maintain the required safety separation from ground obstacles

Date Inserted: 13/03/15

Likelihood: 2 - Improbable - Very unlikely to occur

References:

Operation

No.	Operation
OP 01	Sling load operations

Hazardous Events related to the Operation

Operation	Related Hazardous Events
OP 01	HE 001, Reduced separation with obstacles
OP 01	HE 002, Reduced separation of the load from obstacles (sling load)
OP 01	HE 003, Degraded aircraft performance
OP 01	HE 004, Degraded aircraft performance during sling load operations
OP 01	HE 005, Aircraft unintentionally deviates from normal in-flight parameters
OP 01	HE 006, Safety measures not respected by personnel on ground during sling load operations
OP 01	HE 007, Load is not properly prepared (sling load operations)
OP 01	HE 008, Unexpected technical problem related to sling load operations
OP 01	HE 009, Unexpected technical problem on aircraft

Hazardous Event List

ID Har. Event	Description	Likelihood
HE 001	Reduced separation with obstacles	2
HE 002	Reduced separation of the load from obstacles (sling load)	3
HE 003	Degraded aircraft performance	1
HE 004	Degraded aircraft performance during sling load operations	1
HE 005	Aircraft unintentionally deviates from normal in-flight parameters	2
HE 006	Safety measures not respected by personnel on ground during sling load operations	3
HE 007	Load is not properly prepared (sling load operations)	3
HE 008	Unexpected technical problem related to sling load operations	3
HE 009	Unexpected technical problem on aircraft	3
HE 010	Lose objects moved by the rotor dow	3

A - ADD, DELETE OR EDIT HAZARDOUS EVENT LIST

B - LINK EACH OPERATION WITH RELATED HAZ. EVENTS

1 - Select the Operation element
 2 - Add, delete or edit related Hazardous Events

This window is split in two sections:

a complete list of all the inserted Hazardous Events...

... and a place where to link the Operation with the related Hazardous Events.



HAZARDOUS EVENT

Haz. Event n. HF 001
 Description: Reduced separation with obstacles
 Note: The aircraft does not maintain the required safety separation from ground obstacles.
 Date Inserted: 13/03/15
 Likelihood: 2 - Improbable - Very unlikely to occur

Operation

No.	Operation
OP 01	Sling load operations

B - LINK EACH OPERATION WITH RELATED HAZ. EVENTS

1 - Select the Operation element
 2 - Add, delete or edit related Hazardous Events

Hazardous Events related to the Operation

Operation	Related Hazardous Events
OP 01	HE 001, Reduced separation with obstacles
OP 01	HE 002, Reduced separation of the load from obstacles (sling load)
OP 01	HE 003, Degraded aircraft performance
OP 01	HE 004, Degraded aircraft performance during sling load operations
OP 01	HE 005, Aircraft unintentionally deviates from normal in-flight parameters
OP 01	HE 006, Safety measures not respected by personnel on ground during sling load operations
OP 01	HE 007, Load is not properly prepared (sling load operations)
OP 01	HE 008, Unexpected technical problem related to sling load operations
OP 01	HE 009, Unexpected technical problem on aircraft

A - ADD, DELETE OR EDIT HAZARDOUS EVENT LIST

Hazardous Event List

ID Haz. Event	Description	Likelihood
HE 001	Reduced separation with obstacles	2
HE 002	Reduced separation of the load from obstacles (sling load)	3
HE 003	Degraded aircraft performance	1
HE 004	Degraded aircraft performance during sling load operations	1
HE 005	Aircraft unintentionally deviates from normal in-flight parameters	2
HE 006	Safety measures not respected by personnel on ground during sling load operations	3
HE 007	Load is not properly prepared (sling load operations)	3
HE 008	Unexpected technical problem related to sling load operations	3
HE 009	Unexpected technical problem on aircraft	3
HE 010	Lose objects moved by the rotor downwash	3

You can insert a new Hazardous Event clicking on the "new record" symbol just under the Hazardous Event list.

A - ADD, DELETE OR EDIT HAZARDOUS EVENT LIST

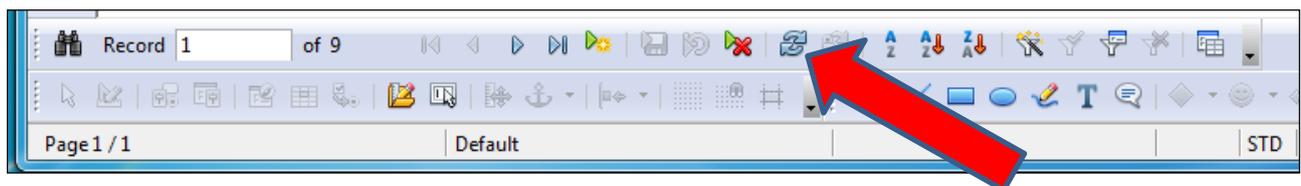
Hazardous Event List

ID Haz. Event	Description	Likelihood
HE 001	Reduced separation with obstacles	2
HE 002	Reduced separation of the load from obstacles (sling load)	3
HE 003	Degraded aircraft performance	1
HE 004	Degraded aircraft performance during sling load operations	1
HE 005	Aircraft unintentionally deviates from normal in-flight parameters	2
HE 006	Safety measures not respected by personnel on ground during sling load operations	3
HE 007	Load is not properly prepared (sling load operations)	3
HE 008	Unexpected technical problem related to sling load operations	3
HE 009	Unexpected technical problem on aircraft	3
HE 010	Lose objects moved by the rotor downwash	3

Then just fill up the left-hand, yellow-coloured section.

HAZARDOUS EVENT		
Haz. Event n.	HE 001	← Hazardous Event reference Number (must be unique)
Description	Reduced separation with obstacles	← Give a name to the Hazardous Event
Note	The aircraft does not maintain the required safety separation from ground obstacles	← Explain the Hazardous Event.
Date Inserted	13/03/15	← Insertion and revision dates
Likelihood	2 - Improbable - Very unlikely to occur	← Rate the Likelihood
Risk Matrix		← Show up the Risk Matrix for reference
References		← List the references

NOTE: in order to be able to see the variations to the database use the "Refresh" button on the lower part of the database window, or close and re-open the form.



To link the Hazardous Events to the related Operation:

B - LINK EACH OPERATION WITH RELATED HAZ. EVENTS

1 - Select the Operation element
 2 - Add, delete or edit related Hazardous Events

Select the Operation you are working on

Scroll to the end of the available Hazardous Event list and select the empty record

Click on the drop down menu

Select the new Hazardous Event to link it to the active Operation.

NOTE: you cannot choose the same Hazardous Event twice

Operation	Related Hazardous Events
OP 01	HE 001, Reduced separation with obstacles
OP 01	HE 002, Reduced separation of the load from obstacles (sling load)
OP 01	HE 003, Degraded aircraft performance
OP 01	HE 004, Degraded aircraft performance during sling load operations
OP 01	HE 005, Aircraft unintentionally deviates from normal in-flight parameters
OP 01	HE 006, Safety measures not respected by personnel on ground during sling load operations
OP 01	HE 007, Load is not properly prepared (sling load operations)
OP 01	HE 008, Unexpected technical problem related to sling load operations
OP 01	HE 009, Unexpected technical problem on aircraft
OP 01	HE 001, Reduced separation with obstacles
OP 01	HE 002, Reduced separation of the load from obstacles (sling load)
OP 01	HE 003, Degraded aircraft performance
OP 01	HE 004, Degraded aircraft performance during sling load operations
OP 01	HE 005, Aircraft unintentionally deviates from normal in-flight parameters
OP 01	HE 006, Safety measures not respected by personnel on ground during sling load operations
OP 01	HE 007, Load is not properly prepared (sling load operations)
OP 01	HE 008, Unexpected technical problem related to sling load operations
OP 01	HE 009, Unexpected technical problem on aircraft
OP 01	HE 010, Lose objects moved by the rotor downwash
OP 01	HE 011, Not accurate or missing mission planning and preparation (sling load)
OP 01	HE 012, Flight close to, or into, adverse meteorological conditions
OP 01	HE 013, Unwanted movement of cargo in flight (sling load)
OP 01	HE 014, Repetitive flight patterns/manoeuvres
OP 01	HE 015, External pressure
OP 01	HE 008, Unexpected technical problem related to sling load operations 3
OP 01	HE 009, Unexpected technical problem on aircraft 3
OP 01	HE 010, Lose objects moved by the rotor downwash 3

ID Haz. Event	Description	Count
HE 001	HE 001, Reduced separation with obstacles	
HE 002	HE 002, Reduced separation of the load from obstacles (sling load)	
HE 003	HE 003, Degraded aircraft performance	
HE 004	HE 004, Degraded aircraft performance during sling load operations	
HE 005	HE 005, Aircraft unintentionally deviates from normal in-flight parameters	
HE 006	HE 006, Safety measures not respected by personnel on ground during sling load operations	
HE 007	HE 007, Load is not properly prepared (sling load operations)	
HE 008	HE 008, Unexpected technical problem related to sling load operations	3
HE 009	HE 009, Unexpected technical problem on aircraft	3
HE 010	HE 010, Lose objects moved by the rotor downwash	3
HE 011	HE 011, Not accurate or missing mission planning and preparation (sling load)	
HE 012	HE 012, Flight close to, or into, adverse meteorological conditions	
HE 013	HE 013, Unwanted movement of cargo in flight (sling load)	
HE 014	HE 014, Repetitive flight patterns/manoeuvres	
HE 015	HE 015, External pressure	

NOTE: Each Hazardous Event must have at least one linked Cause and one linked Consequence entry in order to have a correct list output. Likewise, each Cause and each Consequence entry must have at least one linked barrier.

It is suggested to create a Cause, Consequence and Barriers entry, like "00 – No Entry" to be used in case of no operative entry.

CAUSE

In this window you find all the Causes linked to the selected Hazardous Event. If you select a different Hazardous Event you will see its related Cause list.

To write a new Cause or to edit the existing ones, press "New/Edit" button and it will show the following window.

No.	Cause
HE 001	CA 001, Trees, bushes, vegetation
HE 001	CA 002, Wires, power lines
HE 001	CA 003, Low Clouds
HE 001	CA 004, Low visibility, fog
HE 001	CA 009, Confined area operations, landings, take offs
HE 001	CA 010, Use of sling load
HE 001	CA 017, Operation planning
HE 001	CA 019, Mountainous area

New/Edit **CA - PBs** **CA - HEs** **List**

CAUSE

B - LINK EACH HAZ. EVENT WITH RELATED CAUSES
 1 - Select the Haz. Event element
 2 - Add, delete or edit related Cause

Causes related to Hazardous Event

Haz. Event	Related Causes
HE 001	CA 001, Trees, bushes, vegetation
HE 001	CA 002, Wires, power lines
HE 001	CA 003, Low Clouds
HE 001	CA 004, Low visibility, fog
HE 001	CA 009, Confined area operations, landings, take offs
HE 001	CA 010, Use of sling load
HE 001	CA 017, Operation planning
HE 001	CA 019, Mountainous area

Hazardous Event

HE ID	Hazardous Event
HE 001	Reduced separation with obstacles
HE 002	Reduced separation of the load from obstacles
HE 003	Degraded aircraft performance
HE 004	Degraded aircraft performance during sling load
HE 005	Aircraft unintentionally deviates from normal flight
HE 006	Safety measures not respected by personnel on ground
HE 007	Load is not properly prepared (sling load operation)
HE 008	Unexpected technical problem related to sling load
HE 009	Unexpected technical problem on aircraft
HE 010	Loose objects moved by the rotor downwash
HE 011	Not accurate or missing mission planning and execution
HE 012	Flight close to, or into, adverse meteorological conditions
HE 013	Unwanted movement of cargo in flight (sling load)
HE 014	Repetitive flight patterns/manoeuvres

Cause n. CA 001

Cause Name Trees, bushes, vegetation

Description Trees, bushes and vegetation could be dangerous while operating the helicopter near the ground

Date Inserted 18/03/15 **Revision** 1

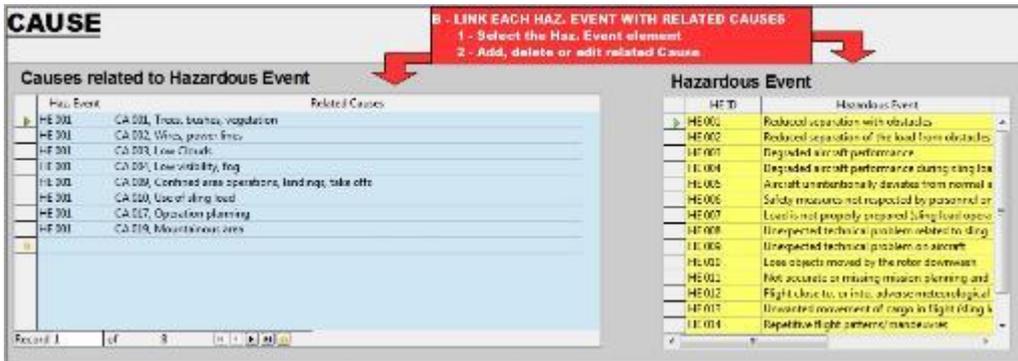
References

Cause List

Cause	Cause Name
CA 001	Trees, bushes, vegetation
CA 002	Wires, power lines
CA 003	Low Clouds
CA 004	Low visibility, fog
CA 005	Vertical development clouds
CA 006	Wind
CA 007	Personnel on ground
CA 008	Properties on ground
CA 009	Confined area operations, landings, take offs
CA 010	Use of sling load
CA 011	Loose objects on the ground
CA 012	Sand, dust, light soil
CA 013	Excess load size and weight

A - ADD, DELETE OR EDIT CAUSE LIST

Once again, this window is split into two sections: the list of Causes linked to the selected Hazardous Event, and the list of all the inserted Causes. In this section you can edit the Causes or create new one.



Linked Causes to Hazardous Events

List of Causes



The procedure is similar to that explained in the HAZARDOUS EVENT paragraph just above.

CONSEQUENCES – PROACTIVE/RECOVERY BARRIER – TASK

The other parts of the tool work in a similar way to the Hazardous Event and Cause sections explained before.

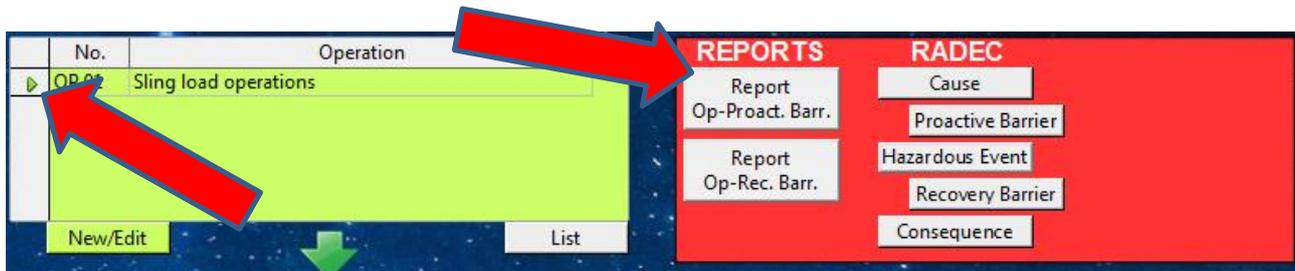
Tasks are not automatically linked to the Proactive or Recovery Barriers, but you must manually insert the reference number in the Task. Ref. cell.

Nr.	Task Name	Task Ref.	Description
T 001	Develop SOP Sling Load	PB 001	
T 002	Develop EGPWS	PB 025	



REPORTS

You can create general reports based on the selected Operation. The reports will give you all the Hazardous Events, and the linked Causes, Proactive Barriers, Consequences and Recovery Barriers in a tabular form.



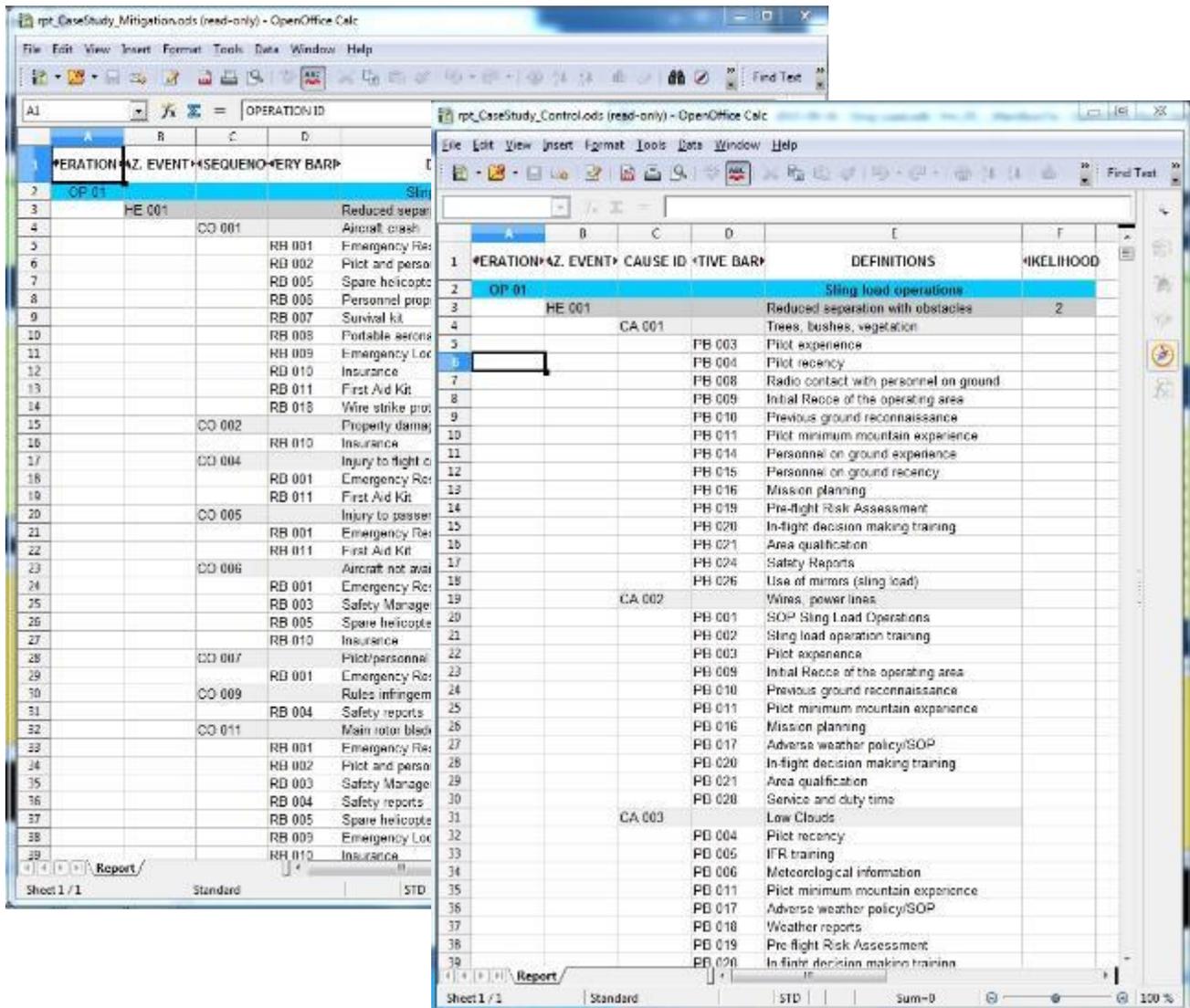
Just click the related button to open a new spreadsheet window with all the elements in a cascade.

“Report CS-Proact. Barr.” button creates a list of all related elements of the selected Operation:

Operation
 Hazardous Event
 Cause
 Proactive Barrier

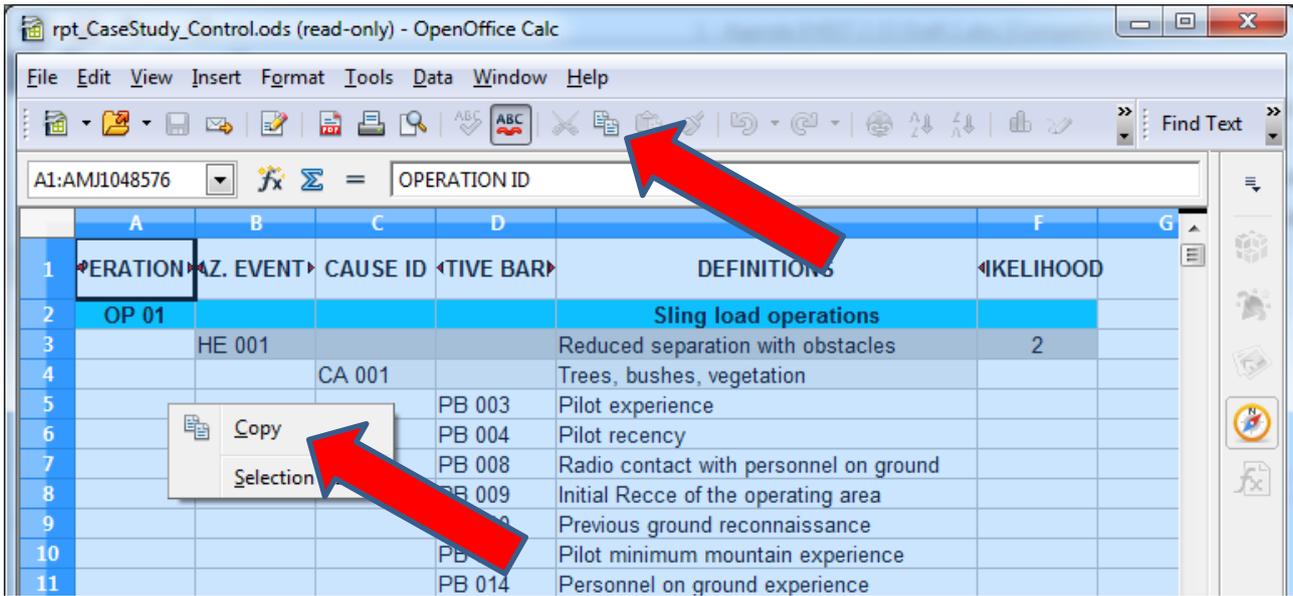
“Report CS-Rec. Barr.” button creates a list of all related elements of the selected Operation:

Operation
 Hazardous Event
 Consequence
 Recovery Barrier

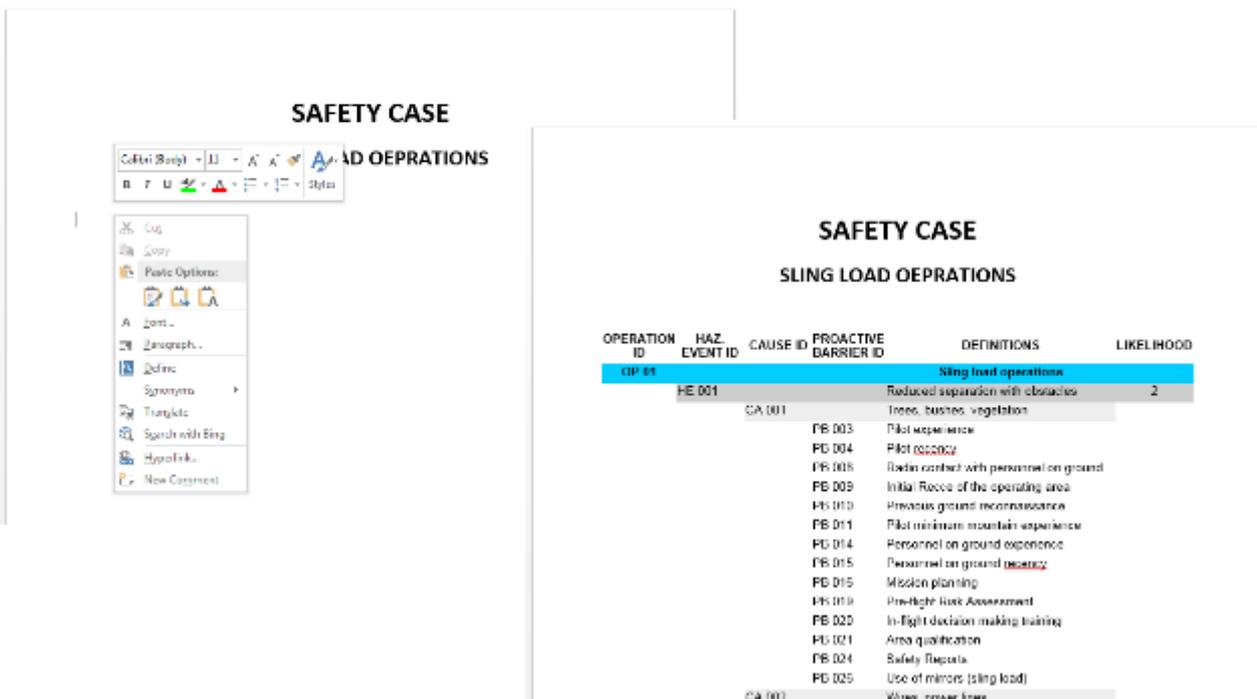


NOTE: Due to the various “many-to-many” links inside the database, the reports could take quite a long time to show up (1 minute or even more).

The lists are an OpenOffice spreadsheet document that can be copied-pasted to any OpenOffice document or other commercial word processors and spreadsheets (e.g. Microsoft Word or Excel). Select all the required cells and then select “Copy” (icon, or right click on the selection, or Ctrl-C key combination).

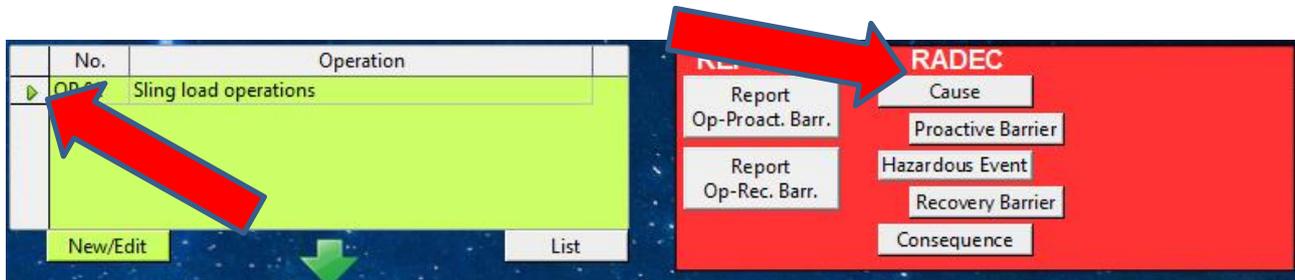


Open your new word processor or spreadsheet document, point the position you want to insert the table and select "Paste" (icon, or right click on the selection, or Ctrl-V key combination).



EHEST RADEC FORM

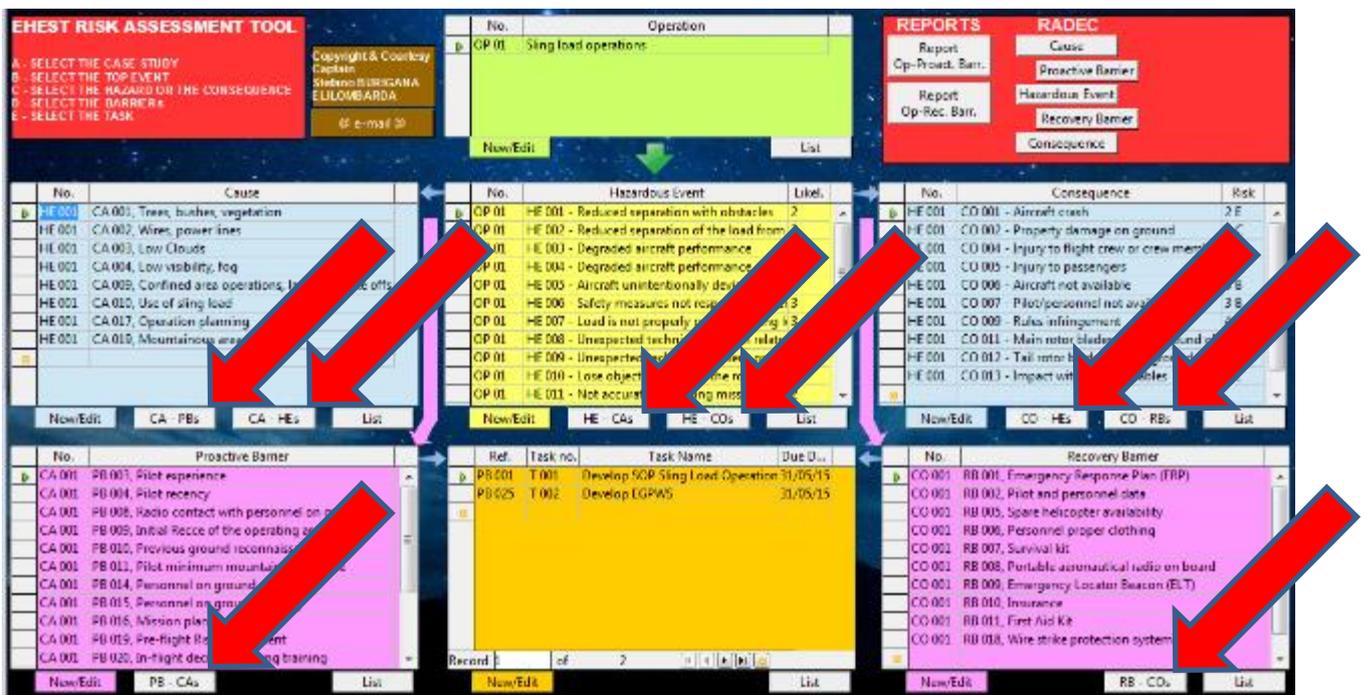
It is possible to select all the elements related to the selected Operation by clicking on the RADEC buttons.



These buttons provide a list of the Cause, Hazardous Events, Proactive Barriers, Consequences and Recovery Barriers you can use on your own documents or in the EHEST RADEC form (ref. EHEST SMS Manual non-complex operators). Just select the items and copy-paste on your documents.

SPECIFIC REPORTS

There are several reports available related to specific relations between the risk assessment elements.



- HE – CAs** Reports all the **Causes** related to the selected **Hazardous Event**
- HE – COs** Reports all the **Consequences** related to the selected **Hazardous Event**
- CA – HEs** Reports all the **Hazardous Events** related to the selected **Cause**
- CA – PBs** Reports all the **Proactive Barriers** related to the selected **Cause**
- PB – CAs** Reports all the **Causes** related to the selected **Proactive Barrier**
- CO – HEs** Reports all the **Hazardous Events** related to the selected **Consequence**
- CO – RBs** Reports all the **Recovery Barriers** related to the selected **Consequence**
- RB – COs** Reports all the **Consequences** related to the selected **Recovery Barrier**

LISTS

To have a list of all the inserted Operations, Hazardous Events, Causes, etc., select the "List" button underneath every table.

The screenshot displays the EHEST Risk Assessment Tool interface. It features several data tables and a reports menu. Red arrows highlight the 'List' buttons located at the bottom of the following tables:

- Operation Table:** Shows 'OP 01 - Sling load operations'.
- Cause Table:** Lists causes such as 'CA 001 - Trees, bushes, vegetation'.
- Hazardous Event Table:** Lists events like 'HE 001 - Reduced separation with obstacles'.
- Consequence Table:** Lists consequences such as 'CO 001 - Aircraft crash'.
- Proactive Barrier Table:** Lists barriers like 'PB 001 - Pilot experience'.
- Recovery Barrier Table:** Lists recovery barriers like 'RB 001 - Emergency Response Plan (ERP)'.

The 'REPORTS' menu in the top right corner includes options for 'Cause', 'Proactive Barrier', 'Hazardous Event', 'Recovery Barrier', and 'Consequence'.

Use the reports output to copy-paste to your safety documents.

The image shows a spreadsheet on top and a RADEC form below. The spreadsheet lists hazards for 'OP 01 Sling load operations' with columns for Hazard ID, Event, and Likelihood. A context menu with 'Copy' and 'Select' options is open over the spreadsheet. A large red arrow points from the 'Copy' button to the 'Hazardous Event' table in the RADEC form below. The RADEC form includes fields for RA No., Definition, Ref., and Operation Description, followed by a table of hazardous events.

Hazardous Event ID	Hazardous Event	Likelihood
HE 001	Reduced separation with obstacles	2
HE 002	Reduced separation of the load from obstacles (sling load)	3
HE 003	Degraded aircraft performance	1
HE 004	Degraded aircraft performance during sling load operations	1
HE 005	Aircraft unintentionally deviates from normal in-flight parameters	2
HE 006	Safety measures not respected by personnel on ground during sling load operations	3
HE 007	Load is not properly prepared (sling load operations)	3
HE 008	Unexpected technical problem related to sling load operations	3
HE 009	Unexpected technical problem on aircraft	3
HE 010	Lose objects moved by the rotor downwash	3
HE 011	Not accurate or missing mission planning and preparation (sling load)	2
HE 012	Flight close to, or into, adverse meteorological conditions	2
HE 013	Unwanted movement of cargo in flight (sling load)	2
HE 014	Repetitive flight patterns/manoeuvres	4
HE 015	External pressure	3

6) SUPPORT EHEST

The EHEST Specialist Team Ops & SMS is making a big effort in order to develop and promote useful safety tools to the aeronautical world. Based on the practical final user experience, these tools can be improved.

Please support EHEST job by reporting your feedbacks and your suggestions to:

ehest@easa.europa.eu