Introduction to Bowties

Quick Start Guide
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Introduction to Bowties

Most people working in risk management are familiar with the fundamentals of risk assessment.

Risk = combination of likelihood of an event occurring with the consequence of the event

Most often we have a single risk scenario / hazard (e.g. person struck by car causing fatal injuries), and we rate likelihood and consequence.

Bowtie analysis breaks down the risk scenario to really get to grips with the different causes of risk within the scenario.

What is the likelihood of the person being struck by the car? What is the likelihood that they will be killed when struck by the car, and not just injured or unharmed?

What caused the person to be struck by the car in the first place?
So we often think of risk like this:

Person struck by car → Person fatally injured by car

And so we brainstorm all the risk controls that might help:

Driver training
High visibility vests
Traffic management plan
First aiders

Bowties encourage you to break down the scenario so that individual risk factors can have adequate controls placed against them.
This is useful because it highlights how your risk controls actually work to reduce risk.

Bowties also encourage you to consider different ways that the event could unfold, so that even more risk factors can be adequately controlled to reduce the risk.
By considering all the factors at work in the risk scenario, you improve your visibility of how your risk controls actually work. With more visibility comes more confidence that what you have in place is adequate for the job.
The scenario diagram then starts to look like this:

And to make analysis easier, it becomes this:
Here’s a breakdown of how the bowtie method works.

**Hazard / Scenario** – The hazard/scenario is the risk situation that we are ultimately concerned with controlling. For example: a person being struck by moving plant or equipment.

**Top Event** – The incident that occurs when the potential risk situation is realised. It is defined as the point of which a loss-of-control occurs. What this means is that it is the trigger point at which the cause of an incident has materialised and you are no longer in control of what happens next. For example: an uncontrolled fall from height.
**Causes**

**Preventative controls**

**Hazard Top Event**

**Mitigative controls**

**Consequences**

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**Cause** – *Something that has the potential to release a hazard and cause the top event to occur. For example: wet road conditions could cause a vehicle rollover.*

A cause is a material factor that can lead to a loss-of-control (i.e. an incident).

Failed controls are not causes. For instance, failing to isolate an electrical panel is not a cause of an electrocution incident. The isolation procedure is a control for reducing the risk of a cause. Failing to isolate the panel would an Escalation Factor, which is a condition that defeats or reduces the effectiveness of a control.

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**Consequence** – *An event (or chain of events) which results from the release of a hazard, and which directly results in loss or damage. For example: crush injuries to workers.*

Different consequences have different kinds of harmful impact. For example, a vehicle rollover could results in physical injuries, damage to the vehicle, and suspension of road operations.

Feel free to add in as many different consequences as you feel are relevant to your bowtie. But be aware that the overall risk calculation will include all of those consequences.
Control – A material factor which can be used to control the causes or consequences of a top event. Controls can reduce the likelihood of the top event occurring, or reduce the severity of the consequences resulting from the top event.

Preventative Controls are controls which reduce the likelihood of a cause leading to the top event. They prevent the loss-of-control from occurring.

Mitigative Controls are controls which reduce the severity of a consequence resulting from the top event. They reduce the impact of the loss-of-control once its too late to prevent it.
The usefulness of a control will depend on its **effectiveness**. This is essentially an indication of how much the control actually reduces likelihood or consequence.

For example, having protective guarding around a cutting tool is fairly effective in reducing the risk of physical injury from flying debris.

When assigning effectiveness ratings to your controls, bear in mind the **hierarchy of controls**:

1. **Elimination**
2. **Substitution**
3. **Engineering controls**
4. **Administrative controls**
5. **Personal protective equipment**

The hierarchy of controls was developed for safety applications, but it applies in all domains of risk management. Elimination of risk factors will always be the most effective control, but is not always possible.

Elimination, substitution and engineering controls are sometimes known as **hard controls**. This is because they are independent of human action, and thus are always reliable to reduce risk.

Administrative controls (sometimes called procedural controls or safe work practices) are sometimes known as **soft controls**. This is because they rely on humans following a procedure in order to reduce risk.
The **bowtie method** is all about mapping the top event, causes, consequences and controls together.

**Follow the process below to build your risk assessment using the bowtie method:**

<table>
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<th>Establish the context</th>
<th>Define the scope of work</th>
<th>Identify risk criteria (inc. risk tolerance)</th>
<th>Determine risk matrix / ratings</th>
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<td>Consult stakeholders to determine risk criteria</td>
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The last two steps are part of the risk management system more broadly, and are not within the scope of bowtie risk assessment.
Make sure you have established the context for your risk assessment. Define the scope, to narrow down your risk assessment to include only the relevant locations, work units, tasks, and risk types.

*e.g. the risk assessment is to include working at heights by the shutdown maintenance team at site A only, examining safety risks.*

Identify key risk criteria for your risk assessment. At a minimum, determine what the level of risk tolerance is.

*e.g. the risk assessment is to assess consequence in terms of physical injury, and a risk rating of significant or higher must be reduced through appropriate risk controls.*

Determine the system of risk ratings (i.e. the risk matrix) that you will use. Most organisations will have a particular risk matrix.

*Make sure that the risk matrix and associated descriptions is set up through configuration. Also determine what system of effectiveness ratings will be used to assign control effectiveness.*
Identify the hazard(s) that are present in the scope of your risk assessment. Hazards could include:

- Vehicles/mobile plant collisions with pedestrians or other vehicles
- Fall from height or to depth
- Fire or explosion

*e.g. the risk assessment is to include working at heights by the shutdown maintenance team at site A only, examining safety risks.*

Identify the top event(s) that are associated with each hazard. Hone in on the loss-of-control that is present in each instance. Top events could include:

- Unavoidable collision with vehicle/mobile plant
- Uncontrolled fall from height
- Uncontrolled combustion
Identify the causes that could lead to the top event for each scenario. The causes of a vehicle/mobile plant collision could include:

- Driver error
- Impaired driver (e.g. alcohol, fatigue)
- Distracted drivers/pedestrians
- Conflicting vehicle and pedestrian movement paths
- Equipment failure (e.g. defective brakes)
- Significant ambient noise
- Obstructed driver visibility
- Excess speed
- Dangerous road conditions
Identify the consequences that could result from the top event for each scenario. The consequences of a vehicle/mobile plant collision could include:

- Fatal crush injuries to pedestrian
- Driver entanglement in wrecked vehicle
- Damaged or written off vehicles
- Damaged assets or equipment
- Disruption to operations
Assign a likelihood and consequence rating to each node. Remember:

- For causes, you are selecting the likelihood of the cause leading to the top event in the absence of any controls whatsoever.

- For consequences, you are selecting the consequence that represents the most credible worst case scenario (the highest severity that would be realistically expected). Select the most appropriate category of consequence and then the most appropriate level of severity.

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Risk Analysis

Identify causes
Identify consequences
Assess likelihood & consequence

Assign a likelihood and consequence rating to each node. Remember:

- For causes, you are selecting the likelihood of the cause leading to the top event in the absence of any controls whatsoever.

- For consequences, you are selecting the consequence that represents the most credible worst case scenario (the highest severity that would be realistically expected). Select the most appropriate category of consequence and then the most appropriate level of severity.

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Impaired driver
C Lth: 3 Possible

Equipment failure
C Lth: 4 Likely

Obstructed driver visibility
C Lth: 4 Likely

Vehicle/mobile plant accident
Unavoidable collision by vehicle/mobile plant

Fatal crush injury [pedestrian]
C Ctg: Health and Safety
C Sev: F First Aid Case

Driver entanglement
C Ctg: Health and Safety
C Sev: D Major injury or Occupational Illness, Permanent Partial Disability or Lost Work Case > 4 days

Written off vehicle
C Ctg: Financial
C Sev: F < A$1M
```
Evaluate whether the scenario is at an unacceptably high level of risk. The calculation of likelihood and consequence will yield a risk rating, which should be compared against the risk tolerance benchmark that was set earlier.

Use this comparison to identify unacceptable risk scenarios and rank the risk scenarios in order of priority for treatment.
Select risk controls to reduce the likelihood and consequence of the risk scenario.

Preventative risk controls should be added to the causal pathways on the left to bring down likelihood.

Mitigative risk controls should be added to the consequence pathways on the right to bring down consequence.

Assign an effectiveness rating to each control to determine what risk treatments are required. Add in a combination of different controls to bring the risk down to an acceptable level.

For many operators, the standard is As Low As Reasonably Practicable, also known as ALARP (i.e. the risk has been reduced to the lowest level possible without implementing controls that are cost-prohibitive, physically impossible or otherwise impracticable).
Welcome to RiskView. This quick start guide will give you the basics you need to get started on your own.

If you need training in using RiskView, we offer a range of training sessions. Contact us [here](#) to discuss our training options.

If you need technical support with your product, please visit the support site [here](#).
Step 1: Log in

Navigate to the trial site login that you have been provided. It should look something like this:

https://yourcompanynamemeercat-riskview.com/

Make sure that you are using a supported browser: Microsoft Edge, Google Chrome, Internet Explorer 10, Safari or Firefox.

We recommend using Google Chrome, because it supports the latest functionality in browser-based programs like RiskView. If you encounter problems with other browsers, try switching to Google Chrome.

Use the login details you have been provided to log in.

Step 2: Your dashboard

When you log in for the first time, you’ll be taken to the RiskView dashboard. You can navigate to any module in RiskView from the dashboard using the sidebar menu.
Quick links

Use the find button to search for bowties, risk studies, or other items in RiskView.

Use the **Home** button to navigate back to the dashboard.

Use the browse button to access different modules in RiskView.

Use the in-tray to access your messages [not available on trial sites].

Use the **Active Views** button to pick from any bowties, risk studies, or other items you have opened.

Use the my profile button to configure settings and preferences [not available on trial sites].

Use the support button to request technical support from our support team.

Use the new button to create a new bowtie, risk study, or other item in RiskView.

Use the **Back** button to go back to the previous tab.

Use the **Properties** button at the top right of the screen to see information about a selected item.

Use the **Create New** button on any screen to add a new item.

Use the **Perspectives** button on any screen to change the display and layout of the content.
Bowties

Bowties can be accessed using the Risk Studies tab. Select Browse >> Risk Studies >> Draft Risk Scenarios.

To see more information about an existing bowtie, double-click on the bowtie entry. You can also select the Properties button at the top right of the screen.

To view an existing bowtie diagram, select the bowtie entry and click View Bowtie.

To go back to the list of bowties, click the Back button or select the list from the Active Views button.

Hazard Studies (HAZID, HAZOP, Risk Register)

Hazard Studies can be accessed using the Risk Studies tab. Select Browse >> Risk Studies >> Hazard Studies.

To see more information about an existing hazard study, double-click on the hazard study entry. You can also select the Properties button at the top right of the screen.

To view an existing hazard study worksheet, select the hazard study entry and click Study Worksheet.

To go back to the list of hazard studies, click the Back button or select the list from the Active Views button.
Action tracking can be accessed using the **Actions** tab. Select **Browse >> Actions >> All Actions**.

To see more information about an existing tracked action, double-click on the action entry. You can also select the **Properties** button at the top right of the screen.

The Verification Wizard (our auditing and control assurance tool) can be accessed using the **Assurance** tab. Select **Browse >> Assurance >> Open Verification Activities**.

To see more information about an existing verification activity, double-click on the activity entry. You can also select the **Properties** button at the top right of the screen.

To view an existing verification activity in Verification Wizard mode, select the verification activity and click **Verification Activity Wizard**.
Bowties Quick Start Guide

Now that you have the basics of the bowtie method, it’s time to use RiskView to start building bowties.

This section will give you a brief introduction to how RiskView can be used to build bowties.

For more detailed assistance, contact us to discuss our training packages.
Bowties – Creation

To create a new bowtie, navigate to Draft Risk Scenarios and click Create New. A pop-up window will open to create the new bowtie.

The Scenario box is the name of the risk scenario that your bowtie is about. This is the default name that will be used for the bowtie. The Top Event box is for the loss-of-control event that your risk scenario relates to. You can leave this blank. Click OK to create the new bowtie.

When the pop-up window closes, select the new bowtie and click View Bowtie.

Bowties – Options

Any additional information you add to the bowtie (now or later) will change the risk analysis outcomes.

If you set the Status to Active, your bowtie is treated as a completed bowtie and moves to the Risk Scenarios tab. If you set the Status to Draft, your bowtie is treated as a work-in-progress and stays in the Draft Risk Scenarios tab.

Scenario Options (Risk Integrator or higher)
The Risk Analysis Type determines how RiskView analyses risk. This will significantly change the way that the bowtie automatically calculates based on your inputs. Qualitative Risk Analysis calculates risk based on the product of likelihood and consequence. Risk is rated in descriptive terms based on a risk matrix. Semi-Quantitative Risk Analysis calculates risk based on the product of cause probability and consequence severity. Risk is calculated mathematically but rated according to a risk matrix.
Bowties – Causes

Bowties start with the central node, which is the risk scenario (or the top event at which the loss-of-control occurs).

Causes are added to the left of the central node. To add a new cause, right click on the bowtie and select New Cause. You can also hover the cursor over the central node, click the Create New button and select Cause.

More information needs to be added to the new cause. Double-click on the cause to open the summary input view. Enter a name for the cause and select a Likelihood. (You can also select the cause and click the Properties button to add information to a cause.)

RiskView will begin to automatically calculate the risk of the scenario based on the Likelihood values you input. The risk rating at the central node will dynamically update as you add or change inputs.

Bowties – Consequences

Consequences are added to the right of the central node. To add a new consequence, right click on the bowtie and select New Consequence. You can also hover the cursor over the central node, click the Create New button and select Cause.

More information needs to be added to the new consequence. Double-click on the cause to open the summary input view. Enter a name for the cause and select a Consequence Category and Severity. (You can also select the consequence and click the Properties button to add information to a consequence.)

RiskView will begin to automatically calculate the risk of the scenario based on the Consequence Severity values you input. The risk rating at the central node will dynamically update as you add or change inputs.
Controls are added between causes or consequences and the central node. To add a new control, right click on the cause or consequence you want to add the control to and select **New Control**.

More information needs to be added to the new control. Double-click on the cause to open the summary input view. Enter a name for the control in the **Context/Usage** box. (You can also select the cause and click the **Properties** button to add information to a control.) Changing the **Status** of the control will affect whether the control has any effect on reducing risk. Changing the **Control Effectiveness** will affect how much the control reduces risk.

RiskView will dynamically update the risk in the scenario as you add or change controls. The thickness of the line from a cause or consequence to the central node indicates the strength of causality. A thick line indicates that the cause or consequence makes a significant contribution to the overall risk rating.

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RiskView supports a range of customizable perspectives, which change how your bowties look.

Click the **Perspectives** button to select one of the default perspectives. You can also use this menu to create a new perspective or edit an existing perspective.
Navigating around your bowties is simple. To add detail to any node, you can double click on it. For more options and fields, select a node and click the Properties Panel button at the top right of the screen. You can also click the Item Properties button.

If your bowtie isn’t quite fitting on the screen anymore, click the Zoom to Fit button. This will re-centre your bowtie and zoom to show the whole diagram.

To rearrange the order of causes or consequences, simply drag and drop the cause or consequence to the desired location. Click the Layout button and RiskView will adjust the bowtie to fit the new order.

To join cause or consequence pathways together, click and drag the tab at the top of the desired control node. An arrow will appear. Join the arrow to the node you want to connect. The target node will be highlighted to show where it will connect.

Bowties can be exported from RiskView as diagrams or in report format. To export a bowtie, click the Print Bowtie button. This gives you the option to print a hard copy or save as a pdf. Check the Bowtie Printing Options box, and make sure the size, zoom and page orientation are correct. The print preview pane shows you what the bowtie will look like. Click print, and then select your printer or Print to PDF.

To create a bowtie report, click the Show Reports button. A drop-down box will show you the list of pre-configured reports available to you.

The Risk Scenarios Report converts your bowtie into a summary spreadsheet, with each cause and consequence separated out with their controls.

The Tabular Bowtie Report converts your bowtie into a table format, with all causes, consequences, preventative controls and mitigative controls listed together.

Other reports will have specific uses, and we recommend trying different reports to determine which are the most useful for your organisation.

When you have clicked on the type of report you want, a new tab will open. Click the View Report button at the top right to generate the report. Some reports will run over several pages, so use the Page Navigation buttons if necessary. To export a report, click the Export button and select your desired file format.
RiskView is highly customisable to suit your needs. Most labels, terminology and ratings can be customised.

To edit your settings, select **My Profile >> Configuration**. After the new tab opens, select **Current Configuration >> Load** to begin editing.

Terminology (the names and labels used in RiskView) can be edited by selecting the **Terminology** tab. Simply find the term you need to change, and type the desired name into the **Value** column.

To edit your risk matrix, select the **Risk Matrix** tab. Here you can change the names and scores assigned to cause likelihood, consequence categories and consequence severities. Simply type the desired values into each cell. To add or remove a rating, click the tick-box next to the rating item.

If you have made changes to the likelihood and consequence values, make sure that you check that the risk matrix is still correct. Select **Risk Matrix Intersection Cells** in the **Risk Matrix** tab to view and edit the risk matrix.

You can also change the control effectiveness ratings by select **Control Adequacy Settings** in the **Lookups** tab.

To save your changes, click on the **Review Changes** button at the top right of the screen. You will then be shown a summary of the changes you have made. Select **Apply Changes** if you are happy with the summary.

You have the option of saving a local copy of the new configuration. To save the changes to your current configuration, click on Apply Configuration. If you are not working with other team members in RiskView, you can select the option to save your changes and force server restart.

If other people might be working in RiskView, select the option to apply the changes at the next server restart to prevent others from losing their work.

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**Need more help?**

Visit our support page [here](#) to log a ticket for technical support.

If you would like to arrange a training session, please contact us [here](#).