

## Context and use of FAID

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**Note:** This document is best read in conjunction with ‘What you need to know about FAID’ (<http://www.interdynamics.com/wp-content/uploads/2014/01/WhatYouNeedToKnowAboutFAID.pdf>) and other material available from <http://www.interdynamics.com/fatigue-risk-management-solutions/resources-and-media/>

Functionality within this document may in some instances be specific to standalone application versions of FAID. The concepts and risk management methodologies suggested however apply equally to implementations of FAID Technology within third party rostering applications, via the FAID Shared Object Library.

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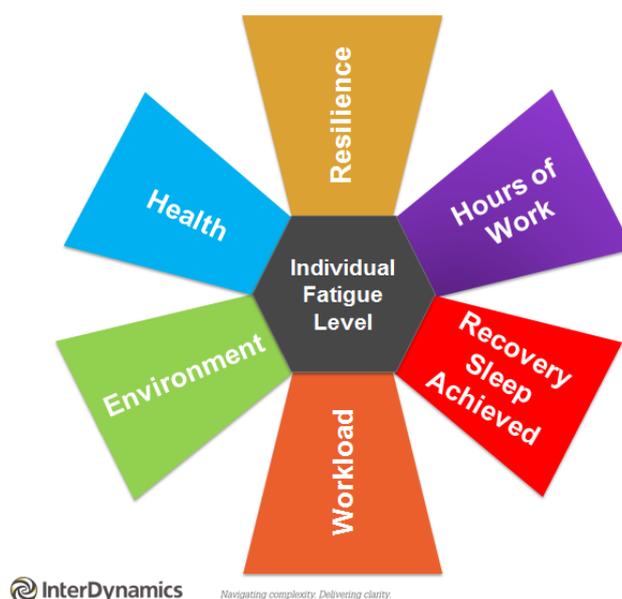
# INTRODUCTION TO FAID AND FATIGUE RISK MANAGEMENT

## What are we trying to deal with when talking about Fatigue Risk Management?

Fatigue levels for individuals can be the result of a number of factors including, recovery sleep (quality and quantity) achieved, hours of work impacts, workload, environment, health issues, and individual susceptibility/resilience to fatigue. Both work and non-work related fatigue factors contribute to safety risks at work, and as a result, require proactive management by individuals and the organisation to ensure the risks associated with fatigue are controlled to a tolerable level.

## Where FAID comes in.

FAID is a powerful analytical tool based on scientific knowledge, which can support the management of hours of work within an organisation's fatigue risk management guidelines. Managing hours of work taking into account fatigue is one of the major elements of a proactive and effective Fatigue Risk Management System (FRMS). Please refer to [InterDynamics' website](#) for information on other key elements of an FRMS and assistance in assessing and managing the various risks posed by fatigue at work.



## What FAID Scores represent & how they are calculated.

No model can predict work-related fatigue completely, however the likelihood of fatigue impairment associated with different work hours can be reviewed using FAID. A FAID Score is provided, indicating different levels of fatigue exposure for different work hours. The higher the FAID Score the higher the fatigue exposure.

Using formulae and factors developed and validated by Dr. Adam Fletcher and Professor Drew Dawson at the Centre for Sleep Research, University of South Australia, FAID was created to provide a representative score of the hours of work related fatigue exposure of a worker, based on the following biological determinants of fatigue:

1. Time of day of work and breaks
2. Duration of work and breaks
3. Work history in the preceding seven days
4. Biological limits on recovery sleep

FAID in its analysis of hours of work, weights more recent work and non-work periods more heavily on an individual's current fatigue exposure than time periods further in the past. FAID in taking into account the rolling 7-day work and non-work history in its analysis, gives consideration to the accumulating impact of fatigue over the most recent 7 days.

A FAID Score can provide an indication of the likelihood of performance impairment associated with fatigue. Validation studies suggest that work-related FAID Scores correlate very highly with sleep-onset latency, neurobehavioural impairment and subjective sleepiness<sup>1</sup>.

## How to apply FAID and get the most out of it.

Hours of work-related fatigue exposure can be limited by allocating work hours within a FAID Score benchmark figure (**Fatigue Tolerance Level / FTL**) and target FTL compliance percentage, for a specific task or role. A lower FTL may be set for a higher risk task or role, and a higher FTL may be set for a lower risk task or role. For a specific task or role, one FTL may be used for planned hours of work, with the option of reviewing actual hours against a higher FTL, acknowledging that variances to the plan may occur on day of operations.

The below represents an example of a combination of hours of work rules that could fit within an organisations FRMS guidelines, utilising FAID as a key component in the development and audit of fatigue risks associated with hours of work:

- An FTL of 'x' (or multiple FTLs for tasks of various risks)
- Monthly, or roster cycle period compliance of all hours to be no less than 'y%' (Target Compliance)
- Individual shifts should not exceed 'z' points above the FTL
- Varying levels of actions/controls to be applied as exposures approach/exceed FTL
- Potential for differing values of x, y, and z above, for planned hours as opposed to actual hours.

## How to determine Fatigue Tolerance Levels (FTLs) and Target Compliance percentages.

FAID Fatigue Tolerance Levels and target compliance percentages are usually determined by an organisation after carrying out a Fatigue Hazard Analysis (FHA) risk assessment for a specific role<sup>2</sup>. That is, a risk assessment which reviews the hazards of a role when fatigue is present. The risk assessment would take into account (among other things) the current hours of work fatigue exposure analysed using FAID, including, importantly, the Apparent FTL/the overall hours of work fatigue exposure currently being tolerated by the organisation.

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<sup>1</sup> Fletcher, A. (1999). *Measurement and management of work-related fatigue: Development and preliminary validations of a predictive model*. Ph.D. Thesis, 1999, The University of South Australia.

<sup>2</sup> InterDynamics' risk assessment methodology founded on Zurich's Hazard Analysis methodology aligned with AS/NZS ISO 31000:2009.

## **What is involved in assessing and managing your organisational risk profile.**

Understanding and managing your organisational risk profile with relation to fatigue is an important process within FRMS that involves looking at multiple areas of exposure. For example, a view of the organisation's fatigue risk profile can be gained by determining the:

- Fatigue risk profile of the workforce through an employee Managing Fatigue Survey;
- Hours of Work risk profile through a FAID Hours of Work Diagnostic of planned and actual hours worked;
- Workplace hazards in the context of fatigue, associated with specific roles and environmental factors through a Fatigue Hazard Analysis risk assessment;
- Drawing it all together with a fatigue risk grading will provide contextual data on the specific, system level fatigue-related risks for your organisation, and how to manage them effectively within a true risk-management framework.

As can be seen, the use of FAID in determining the Hours of Work risk profile is one component of many.

## **Scientific validation of FAID as an Hours of Work related fatigue model.**

The formula and factors used by FAID have been validated within simulated work environments and field-based situations by the Centre for Sleep Research (University of South Australia). The development and validation of FAID is well substantiated and published in numerous international peer-reviewed journals and books.

## **What you need to know about FAID.**

[links to <http://www.interdynamics.com/wp-content/uploads/2014/01/WhatYouNeedToKnowAboutFAID.pdf>]

# SETTING TOLERANCE THRESHOLDS

Hours of work-related fatigue exposure can be limited by allocating work hours within a FAID Score benchmark figure (**Fatigue Tolerance Level/FTL**) and a Target FTL Compliance percentage, for a specific task or role. A lower FTL may be set for a higher risk task or role, and a higher FTL may be set for a lower risk task or role.

## **How to determine Fatigue Tolerance Levels (FTLs) and Target Compliance percentages.**

FAID Fatigue Tolerance Levels (FTLs) and Target Compliance percentages are usually determined by an organisation after carrying out a Fatigue Hazard Analysis (FHA) risk assessment for a specific role<sup>3</sup>. That is, a risk assessment which reviews the hazards of a role when fatigue is present. The risk assessment would also take into account the current hours of work fatigue exposure analysed using FAID, including the Apparent FTL/the overall hours of work fatigue exposure currently being tolerated by the organisation.

Whilst FAID enables multiple FTLs to be set for different task risks associated with the hours of work being analysed, most FAID users initially evaluate all work periods using a single FTL, associated with the highest risk task for the hours worked.

[To set multiple FTLs based on various levels of Task Risk \(advanced feature\) click here.](#)

Risk improvement actions or additional controls should be considered for those work periods with Peak FAID Scores in excess of the Fatigue Tolerance Level set by the organisation.

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<sup>3</sup> InterDynamics' risk assessment methodology founded on Zurich's Hazard Analysis methodology aligned with AS/NZS ISO 31000:2009.

# FATIGUE HAZARD ANALYSIS

When individuals perform tasks in a workplace they are exposed to fatigue hazards.

## The definition of a 'Fatigue Hazard'.

A "Fatigue Hazard" is defined as a known characteristic, inherent property, vulnerability, condition or unintended action that represents a potential threat to people, property, the environment or business profitability that can be triggered by fatigued individuals.

Work-related fatigue and consequent changes in alertness, reaction time, decision-making, communication, and other performance impairments associated with fatigue can increase safety risks, and the likelihood/consequence of an error, accident or incident.

## How to assess fatigue related risks and prioritise treatments.

An organisation can perform a task Fatigue Hazard Analysis risk assessment<sup>4</sup> to identify the fatigue hazards, which are specific to their workplace and their tasks. InterDynamics' Fatigue Hazard Analysis risk assessment process assesses the impact that fatigue-specific triggers have on the likelihood and consequence of hazard scenarios for that role/task. Risk improvement actions, as outcomes of the FHA risk assessment, can therefore target protections against fatigue-triggered events, as well as controls to minimise/treat fatigue.

## What makes InterDynamics' Fatigue Hazard Analysis (FHA) process different from most risk assessments?

Other risk assessment processes which either do not take fatigue into account as a trigger, or only target reducing the likelihood of fatigue, do not result in controls that manage the risks that present when fatigue is at play (i.e. the fatigue context). Additionally, risk assessments that identify contributors to fatigue as the hazard rarely assess the consequence of fatigue. Understanding the level of consequence assists in deciding (and prioritising) what actions are required, as the existence of fatigue itself may not necessarily result in an adverse/intolerable event.

Focusing on controls that reduce fatigue is a positive step towards minimising fatigue-related risks, however this is not enough when wishing to manage fatigue from an overall risk perspective. Practically, fatigue may not always be avoidable, for example during emergencies, staff shortages, times of stress, minor illness/colds, etc., and adequate layering of protections to cover these situations is required.

The fatigue context exists in many work situations and not only within organisations that require shift-work or 24-hour operations. Within this context it is important that risk assessments treat the hazards of the role/task, as well as minimising fatigue itself. InterDynamics' Fatigue Hazard Analysis risk assessment process does this through a consultative process with staff and management, resulting in the quantifying of risks, prioritisation of improvement actions, and targeting risks to levels tolerable to the organisation, all within the context of fatigue.

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<sup>4</sup> InterDynamics' risk assessment methodology founded on Zurich's Hazard Analysis methodology aligned with AS/NZS ISO

## **Why an FHA is the best way to determine hours of work Tolerance Thresholds (including appropriate Fatigue Tolerance Levels and Target Compliance percentages).**

Wherever possible, an FHA is best performed as the uniting piece of the ‘Determine’ stage of the Risk-Based Approach to Fatigue Management. This means that the recommendations and decisions made at an FHA risk assessment workshop are well informed; not only by the task and environmental risk assessment performed in the context of a fatigued workforce, but also from organisational data on absenteeism (which can be an indicator of fatiguing work schedules), occurrences, accidents and incidents, and other work that (ideally) has gone before, in determining how big and how bad the issue of fatigue is within the workforce. These other assessments to determine the fatigue risk profile of the workforce include:

- An employee Managing Fatigue Survey
- A FAID Hours of Work Diagnostic of planned and actual hours worked

A key outcome of a Fatigue Hazard Analysis is the establishment of FAID indicative Fatigue Tolerance Levels (FTLs) and Target FTL Compliance percentages deemed appropriate by the organisation for each task. This process takes into account the current hours of work fatigue exposure analysed using FAID, including the Apparent FTL/overall hours of work fatigue exposure currently being tolerated by the organisation.

## **Outcomes of a Fatigue Hazard Analysis and further information.**

Once set, hours of work-related fatigue exposure can be limited by allocating work hours within a FAID Score benchmark figure (**Fatigue Tolerance Level/FTL**), and Target FTL Compliance percentages, for specific tasks or roles. A lower FTL may be set for a higher risk task or role, and a higher FTL may be set for a lower risk task or role. For a specific task or role, one FTL may be used for planned hours of work, with the option of reviewing actual hours against a higher FTL, acknowledging that variances to the plan may occur on day of operations.

Other outcomes of an FHA include

- Increased employee engagement and contribution in the identification of acceptable fatigue related risk exposure levels, and other necessary controls that can inform the development and continuous improvement of the Fatigue Management Plan; leading to the reduction of overall fatigue-related risk, and greater acceptance and effectiveness of risk improvement actions (including the use of FAID)
- Treatments/controls that are transparent, agreed & specific to each team/group/department
- Acceptable & unacceptable fatigue-related risks identified and made clear to all
- Security of knowing that the Fatigue Risk Management component of the Safety Management System is being based on data from objective analysis & organisational experience
- Documented records of outcomes and the level of rigour applied to determining tolerable levels of fatigue related risk exposure and recommended treatments
- Prioritisation for risk reduction investments
- Benchmark data for future review of fatigue-related exposures and controls
- Fatigue Risk Management controls that are transparent, agreed and understood at all levels, and sit above regulatory compliance-based systems

- Increased employee confidence in the ongoing commitment by the organisation to reducing fatigue-related risk through regular reviews and best practice processes
- Improved knowledge and communication through information about fatigue-related risk & scientific facts of sleep deprivation being available to all
- Consistent, repeatable, fatigue-related risk assessment & documentation processes

Further information on the Fatigue Hazard Analysis risk assessment process can be found [here](#).

# TOLERANCE THRESHOLDS

## Tolerance level and Compliance targets.

**FAID** analysis results can assist organisations and managers in understanding the fatigue exposure of different hours of work. The model can support fatigue risk management decision-making by revealing higher risk times when controls/treatments should be targeted, or limiting the fatigue exposure of work hours for tasks or roles that are more sensitive to fatigue-related impairment and/or have significant consequence in the event of a fatigue-related error.

Hours of work-related fatigue exposure can be limited by allocating work hours within, and auditing/reviewing against, a FAID Score benchmark figure (**Fatigue Tolerance Level/FTL**) and a Target Compliance percentage against the FTL, for a specific task or role. A lower FTL may be set for a higher risk task or role, and a higher FTL may be set for a lower risk task or role. For a specific task or role, one FTL may be used for planned hours of work, with the option of reviewing actual hours against a higher FTL, acknowledging that variances to the plan may occur on day of operations.

## Example of Hours of Work rostering rules/KPIs.

The below represents an example of a combination of hours of work rules that could fit within an organisations FRMS guidelines, utilising FAID as a key component in the development and audit of fatigue risks associated with hours of work:

- A Fatigue Tolerance Level (FTL) of 'x' (or multiple FTLs for tasks of various risks)
- Monthly, or roster cycle period compliance of all hours to be no less than 'y'% (Target Compliance)
- Individual shifts should not exceed 'z' points above the FTL
- Varying levels of actions/controls to be applied as exposures approach/exceed FTL
- Potential for differing values of x, y, and z above, for planned hours as opposed to actual hours.

## How to determine what FTL and Target Compliance % is appropriate?

FAID Fatigue Tolerance Levels and Target Compliance percentages are usually determined by an organisation after carrying out a Fatigue Hazard Analysis (FHA) risk assessment for a specific role<sup>5</sup>. That is, a risk assessment which reviews the hazards of a role when fatigue is present. The risk assessment would take into account the current hours of work fatigue exposure analysed using FAID, (including the Apparent FTL/the overall hours of work fatigue exposure currently being tolerated by the organisation).

This process is so critical to effective fatigue risk management that a whole button is dedicated within FAID Standard to information about the Fatigue Hazard Analysis risk assessment process.

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<sup>5</sup> InterDynamics' risk assessment methodology founded on Zurich's Hazard Analysis methodology aligned with AS/NZS ISO 31000:2009.

## Various Task Risk profiles & Multiple FTLs

Hours of work-related fatigue exposure can be limited by allocating work hours within a FAID Score benchmark figure (**Fatigue Tolerance Level / FTL**) and a target FTL compliance percentage, for specific tasks or roles. A lower FTL may be set for a higher risk task or role, and a higher FTL may be set for a lower risk task or role.

This advanced feature of FAID enables multiple FTLs to be set for different task risks associated with the hours of work being analysed. For example;

If multiple FTL's for varying Task Risks (advanced feature turned on from the Settings screen) were set at Low = 100, Moderate = 80, and High = 65 (keeping in mind that higher risk tasks are more likely to warrant lower FTLs to limit the hours of work related fatigue exposure),

A 'High' risk task work period with a Peak FAID Score of 80, would rate as a FAID Red Condition (as it is above the 'High' risk FTL of 65).

Whereas,

A 'Low' risk task work period with a FAID Score of 80, would rate as a FAID Green Condition (as it is less than 10 points below the 'Low' risk FTL of 100).

FAID Fatigue Tolerance Levels and target compliance percentages are usually determined by an organisation after carrying out a Fatigue Hazard Analysis (FHA) risk assessment for a specific role<sup>6</sup>. That is, a risk assessment which reviews the hazards of a role when fatigue is present. The risk assessment would take into account the current hours of work fatigue exposure analysed using FAID, (including the Apparent FTL/the overall hours of work fatigue exposure currently being tolerated by the organisation).

FAID enables assessment and control of hours of work fatigue exposure taking into account the risk profile of the task/job type/role, associated with the hours worked. ]

Whilst FAID enables multiple FTLs to be set for different task risks associated with the hours of work being analysed, most FAID users initially evaluate all work periods using a single FTL, associated with the highest risk task for the hours worked.

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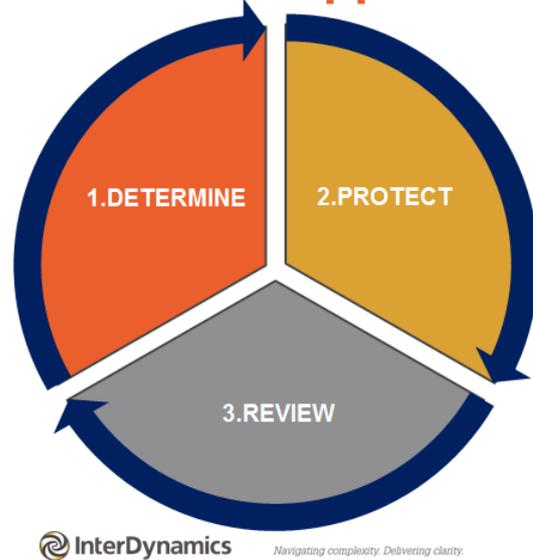
<sup>6</sup> InterDynamics' risk assessment methodology founded on Zurich's Hazard Analysis methodology aligned with AS/NZS ISO 31000:2009.

## How FAID can be used within a Risk-Based Approach, to support a framework for continuous improvement.

FAID can be used within a Risk-Based Approach, to support a framework for continuous improvement by:

1. Determine:
  - Assess the organisation's current hours of work fatigue exposure (including the Apparent FTL / the overall hours of work fatigue exposure currently being tolerated by the organisation).
  - Decide on FAID Score benchmark figure (Fatigue Tolerance Level / FTL) and FTL compliance, for a specific task or role, after carrying out a Fatigue Hazard Analysis risk assessment for each role.
2. Protect:
  - Limit hours of work fatigue exposure by planning rosters to within agreed Fatigue Tolerance Level(s) and FTL compliance.
  - Limit hours of work fatigue exposure by taking into account agreed Fatigue Tolerance Level(s) and target FTL compliance in the process of overtime allocation, shift swaps, roster changes, etc.
3. Review:
  - Audit actual hours of work to ensure compliance within agreed Fatigue Tolerance Level(s) and target FTL compliance, and consider business process improvements for non-compliant hours.
  - Monitor and evaluate changes in hours of work fatigue exposure trends over time.

### Risk-Based Approach



### FAID: One component of many within a Risk-Based Approach.

Understanding and managing your organisational risk profile with relation to fatigue is an important process within FRMS that involves looking at multiple areas of exposure. For example, a view of the organisation's fatigue risk profile can be gained by determining the:

- Fatigue risk profile of the workforce through an employee Managing Fatigue Survey;
- Hours of Work risk profile through a FAID Hours of Work Diagnostic of planned and actual hours worked;
- Workplace hazards in the context of fatigue, associated with specific roles and environmental factors through a Fatigue Hazard Analysis risk assessment;
- Drawing it all together with a fatigue risk grading will provide contextual data on the specific system level fatigue-related risks for your organisation, and how to manage them effectively within a true risk-management framework.

As can be seen, the use of FAID in determining the Hours of Work risk profile is one component of many.

# FAID CONDITIONS

Increasing, relative hours of work fatigue exposure against a Fatigue Tolerance Level (FTL) is indicated within standalone FAID products by three FAID Conditions Green, Yellow, and Red.

FAID nominally categorises FAID Conditions using the following scale:

- \* Red ( FAID Score points above the FTL )
- \* Yellow ( within 10 FAID Score points of the FTL )
- \* Green ( less than 10 FAID Score points below the FTL )

(Image used on right to demonstrate the different conditions still to be shown).

## How FAID uses FAID Conditions in its reporting.

FAID not only provides the number of minutes worked in the various FAID Conditions for each shift, but also the percentage of time analysed overall at each FAID Condition. The percentage of time in the FAID Red Condition representing the percentage of Non-Compliance to the FTL.

FAID also reports 'Compliance', which represents the total percentage of time worked below the Tolerance Level (that is in the Green and Yellow Conditions).

FAID Condition colouring of shifts within the 'Gantt Chart' and 'FAID Score Plot' output screens represent the peak FAID Condition achieved within each shift, and should not be read as indicating that the entire shift was in this FAID Condition.