

## Introduction to Advanced Error Reduction in Organizations (AERO)

In high-risk industries where errors can have devastating outcomes, the need to minimize the probability of errors and/or mitigate their consequences is critical. That's where AERO technology comes in – to effectively minimize the occurrence and consequences of errors in YOUR business. AERO is an integration of the Advanced Human Performance System created by Fisher Improvement Technologies and utilized in over 25 countries, and the globally known personality tendency management capability of Equilibria. People being aware of and managing their personality tendencies in situations where errors are probable, significantly increases the chance that they will either prevent the error or minimize the consequence. There are seven core elements to the AERO technology that ensure sustainable performance:

1. AERO systems
2. Personality tendencies
3. Application of usable models
4. Science-based definitions
5. Performance Modes
6. Error Traps and Triggers
7. Tools to minimize error and event probability

### The application of AERO technology will help your organization:

- Design systems for maximum safety, quality, effectiveness, efficiency, and reliability
- Use the right tools at the right time to significantly reduce error and event probability
- Understand how to manage personality tendencies and error traps to reduce the probability of undesirable consequences

Leaders of the organization learn new and effective science-based terms, methods, and models that they can start using immediately. As the organization sees and hears these leaders using different language and behaviors, it opens the organization up to the potential and needs for change to get different and better outcomes. Leaders learn to engage in a different way to gain the workforce language and behavior changes needed to create sustainable better outcomes.



Figure 1: AERO Gear Model

## 1. AERO systems

**The task-based system** is how an individual interacts with people, programs, processes, work environments, organizations, and equipment and how these all interact with each other. Individuals *being aware of and managing their personality tendencies* enables a more effective interaction of the individual with this system, reducing errors and events. This system is surrounding tasks at home, work, and play. This system equally impacts safety, quality, effectiveness, efficiency, and productivity. People will use this system because it works for THEM.

Individuals on any task will use the *hierarchy of inputs* to determine what their brain will naturally gravitate to. This tends to mask risk that may come from a systemic driver that the individual does not naturally look for or see first. Individuals at all levels of the organization can be taught to manage these tendencies and to see and manage risk more holistically.

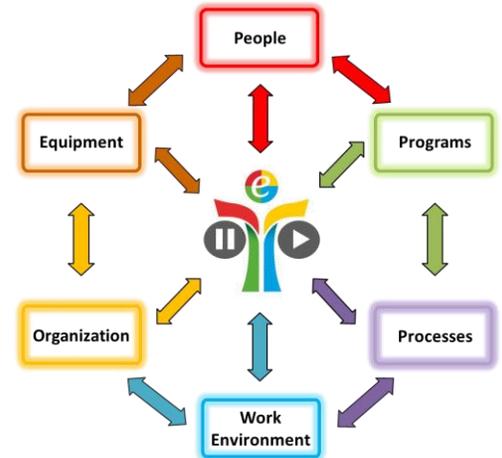


Figure 2: Task Based System

**The Essential Leadership Cycle** depicts how an organization controls and manages the task-based system. It is the best way possible for leaders to understand that the individual's actions and behaviors are driven by elements or changes in the system, that are driven by organizational elements, starting with leadership, that are essential to the task and organizational success. Leaders use the Essential Leadership Cycle to effectively manage the organizational and systematic drivers in the Task-Based System. Failures in the organization to effectively control the Essential Leadership Cycle lead to some of the organizational causes of serious incidents.

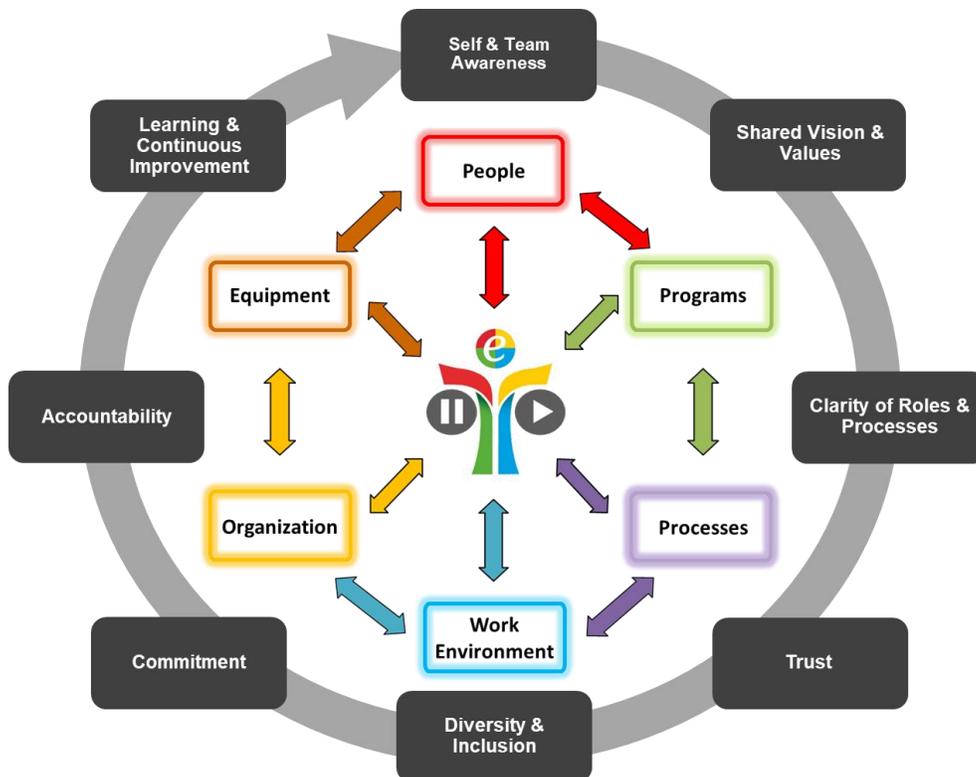
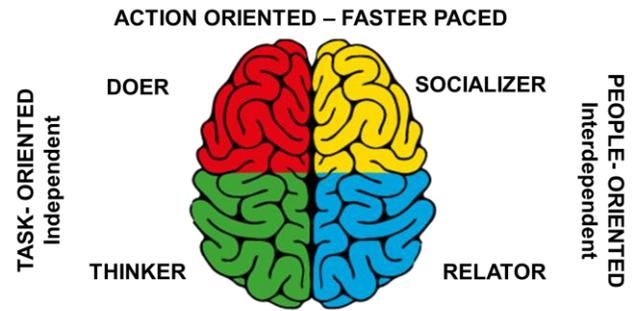


Figure 3: The Essential Leadership Cycle

## 2. Personality tendencies

Different people with different personality tendencies see and manage risk differently. It doesn't matter whether it is a leader making a critical decision, a supervisor trying to evaluate and manage a critical task, or a group of workers trying to perform the task. Understanding our personality tendencies, strengths, and potential limiters make us more effective at managing risk and reducing errors.



INFORMATION ORIENTED – NEEDS TIME TO PROCESS  
Figure 4: The E-Colors Brain Model

## Strength, Potential Limiters & How Different Personalities Can Get Hurt...

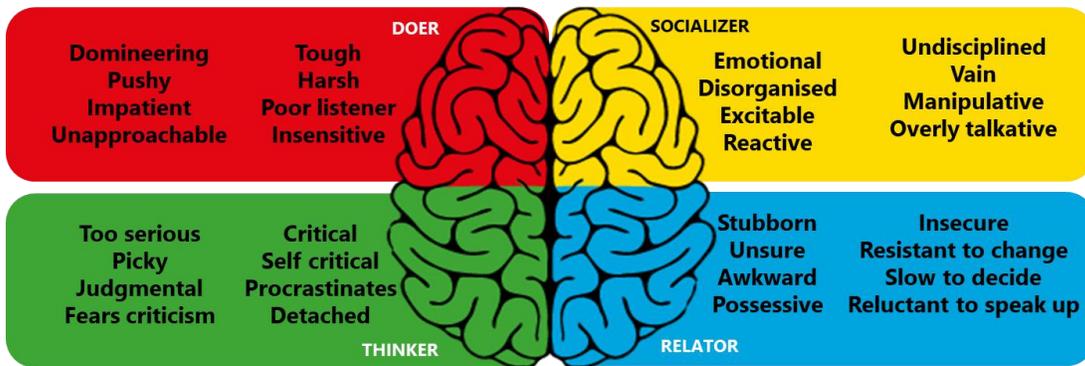


Figure 5: Personality Based Strengths

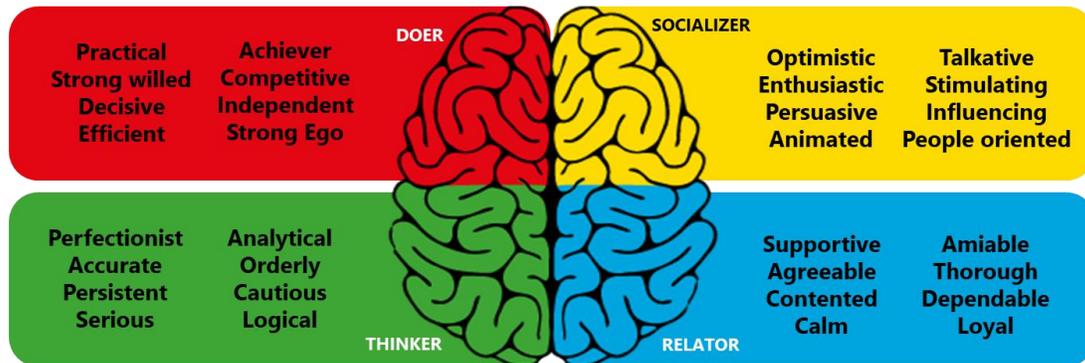


Figure 6: Personality Based Potential Limiters

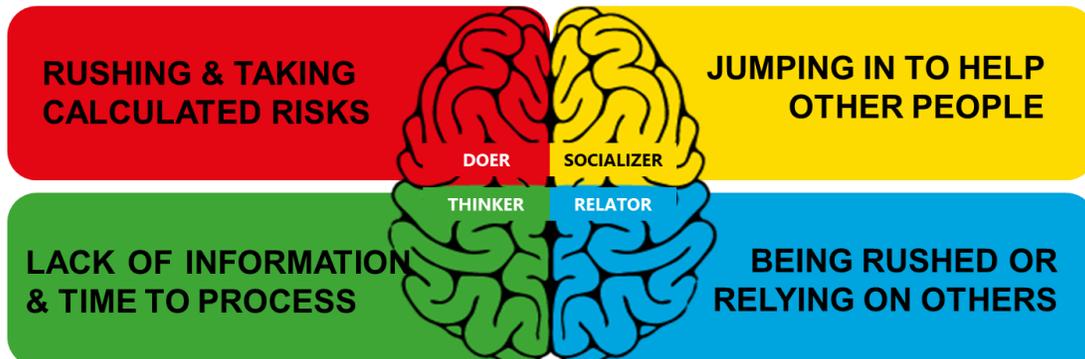


Figure 7: How Could I Get Hurt?

## Personality Based Communication Tendencies

Different personalities need different questions answered first. Understanding this can lead to better overall communications, but also better high-risk task briefings and task preparations.

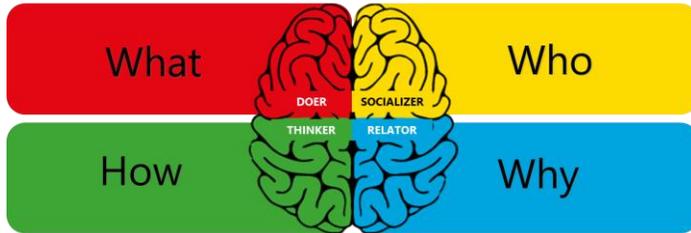


Figure 8: Typical First Question

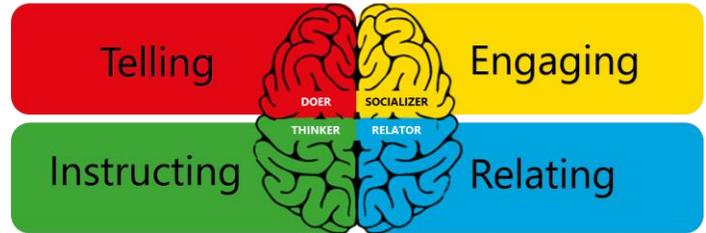


Figure 9: Communication Style

## 3. Application of usable models

Traditional models must take into account that different people with different personality tendencies see and manage risk differently. Application of this basic concept together with the rest of science-based Human & Organizational Performance principles provides a new level of application and effectiveness to existing performance improvement models.

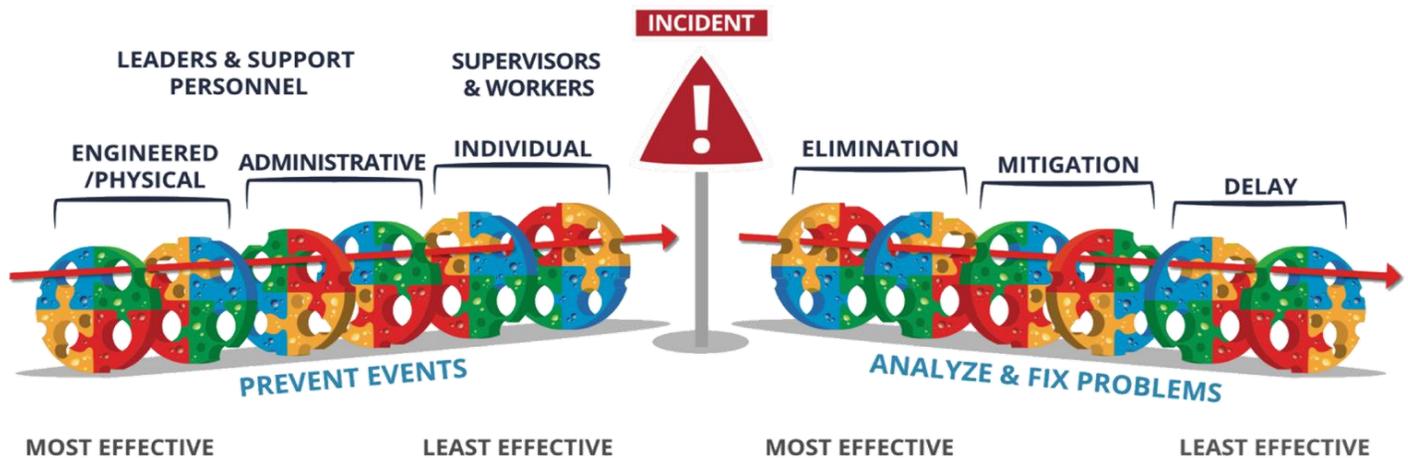


Figure 10: AERO Swiss Cheese Model

## 4. Science-based definitions

### Some basic understandings

- 90% of events are caused by something OTHER THAN JUST the individual\*
- 95% of people react very similarly (physiologically) to the same stimuli
- People do what they do, at the time that they do it, for reasons that make sense to them at the time\*\*
- AERO is NOT common sense

AERO integration requires the use of very specific definitions for things like errors, events, deviations, violations, causes, traps, triggers, and tools. Leaders who commit to using these science-based definitions see faster and more effective integration of the concepts into the day-to-day work. Also, understanding our tendencies (and those of others), along with the definitions helps people in the organization more specifically comply with the definitions, providing almost immediate consistency and move towards sustainability.

<b>Error</b> An action or inaction that <b>unintentionally</b> Results in an undesirable or unwanted condition OR Leads a task or system out of limits OR <b>Deviates</b> from a rule, standard, or expectation	We <b>MUST</b> learn to separate the <b>ERRORS</b> from the <b>EVENT</b>
<b>Event (or incident)</b> The undesirable result of an error, a set of errors or a set of conditions	
<b>Deviation</b> Not strictly complying with a rule, standard or expectation	<b>ERRORS</b> and <b>VIOLATIONS</b> are <b>DIFFERENT THINGS</b>
<b>Violation</b> An action or inaction that intentionally deviates from a rule, standard, or expectation	
<b>Active Error</b> An action or inaction that results in immediate consequence	We <b>MUST</b> pay <b>ATTENTION</b> to <b>ALL TYPES</b> of <b>ERRORS</b>
<b>Latent Error</b> An action or inaction that results in consequences that are delayed or create latent conditions	

**Leaders that do not understand and use the science-based definitions will have trouble getting their workforce to believe they are trying to help them reduce error and incidents.**

Figure 11: AERO Definitions

## How bad things happen

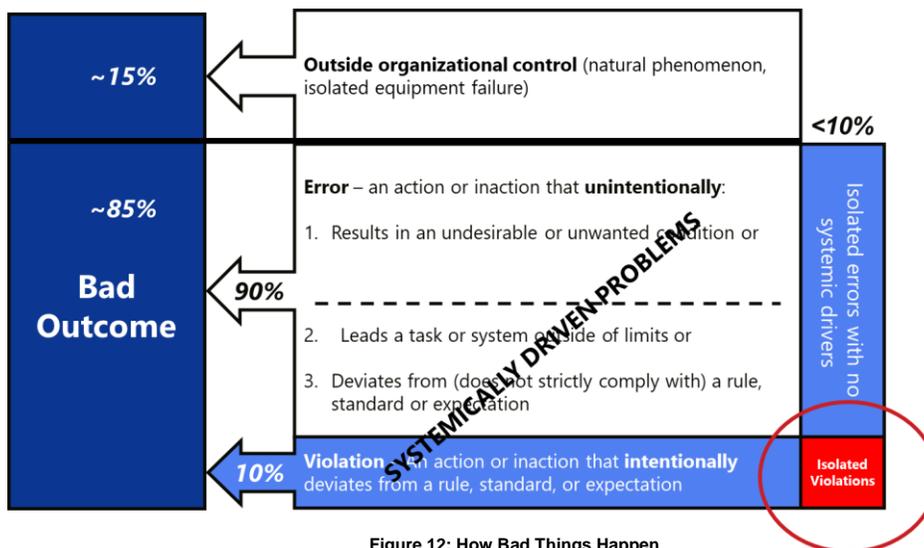


Figure 12: How Bad Things Happen

## 5. Performance Modes

There are three mental models called performance modes that people float in and out of all day. They were determined by research in the 1960s. They are based on *THIS PERSON on THIS TASK at THIS TIME*. It does not matter how many times an organization has done a task, only how many times the person doing it THIS time has done it impacts their mental model. AERO is about improving performance at the TASK and STEP levels.

**Skill-Based** – things we do out of habit, not thinking, using low or no conscious thought. The tasks contain less than 7 discreet steps and must be done >50 times successfully over a short period to allow someone to perform in this mode. There is a relatively low *error rate of 1:1000* in this mode, approximately 3x better than the standard human failure rate.

**Rule-Based** – there is a rule and you know there is a rule (an agreement that an expectation exists). People cannot know all rules, so they have to know a rule exists, so they can go find it. SOPs, JSAs, WIs are all examples of rules, however, all rules are not written. The *error rate for this mode is 1:100* when things are done from memory and there are <7 steps. Tasks >7 steps long and done from memory, increase error rate exponentially. Tasks that use a correct and well-written rule reduces the error rate by a factor of 10 or more.

**Knowledge-Based** – you don't know what you don't know. There are gaps in your information, and your mind knows that the gap exists, but does NOT know the answer. This is exhibited by people scratching their heads, saying phrases like "I think", "I believe", "I am almost sure". Whenever these "triggers" exist, the *error rate is 1:2-1:10 (50%-10%)*.

Performance Mode	Characteristics	Error Rate
<b>Skill Based</b>	Habitual tasks that need low to no conscious thought and you don't have to think... (>50 times and <7 steps)	<b>HABITS</b> <b>1:1000</b>
<b>Rule Based</b>	There is a rule and the person knows the rule exists but does not have to KNOW the rule (we cannot know all the rules)...	<b>PROCESS</b> <b>1:100</b>
<b>Lack of... Knowledge Based</b>	The person does not know what they don't know – they THINK they know but have some doubt... <b>You cannot THINK your way out!</b>	<b>GAPS</b> <b>1:2 - 1:10</b>

Figure 13: Performance Modes Table

Both the Equilibria data and traditional human performance studies have shown that people must *manage their tendencies* to ensure they identify their (and those around them) shifting performance modes, especially when shifting to knowledge-based mode. This enables them to use the right tool the right way to effectively reduce the error rate.

## 6. Error Traps & Triggers

**Error Traps** – Task-related predicaments (characteristics of a specific) task or individual that increases the probability for error during a specific action.

**Triggers**- are clues or cues (using the 5 physical senses and intuition) that a trap exists. Observable actions or reactions, a recognized thought or individual perception, or a “gut-feeling” that something isn’t right.

AERO development has revealed that, based on our tendencies, we set different traps in different ways for different personality styles. In return, those different personality styles set traps differently for us. When individuals are aware of and manage their tendencies, the ability to see the triggers and deal with the traps is significantly increased over the traditional generalized science of human performance.

- Stress
  - Multi-tasking/High work load
  - Time pressure
- 
- Poor communications
  - Vague/poor written guidance
  - Overconfidence
  - Infrequent or first time task
- 
- Distractions
  - First working day following time off > 4 days
  - The end of work shift or extended hours

Figure 14: Top 10 Error Traps

## 7. Tools to minimize error and event probability

AERO offers a variety of choices of tools for the person on the task to pull from to reduce their probability of error. Adding the tool of Personal Intervention as the gateway, significantly increase the probability that this person on this task at this time will use the right tool the right way to reduce the probability of an error that could result in an event. Each time the right tool is used the right way, the error rate on that task is reduced by at least a factor of 10.

Tendencies & Personal Intervention




**Verbalize, Point & Touch**  
**Step-by-Step**  
**Stop & Seek-out Help**

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**3-Part Communication**  
**Pre-Procedure Brief**

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**Show & Tell**  
**Values & Method based observations**

}

**Individual**

}

**Group**

}

**Leader**

Figure 15: AERO Tools

## Conclusion

As leaders and the organization proceed through the critical elements of deployment (Education, Integration & Sustainability) they can use the Essential Leadership Cycle to improve the probability that the deployment achieves the desired outcomes. By focusing on the driving elements and understanding the resultant conditions, the organization can stay focused on the important attributes of improvement.

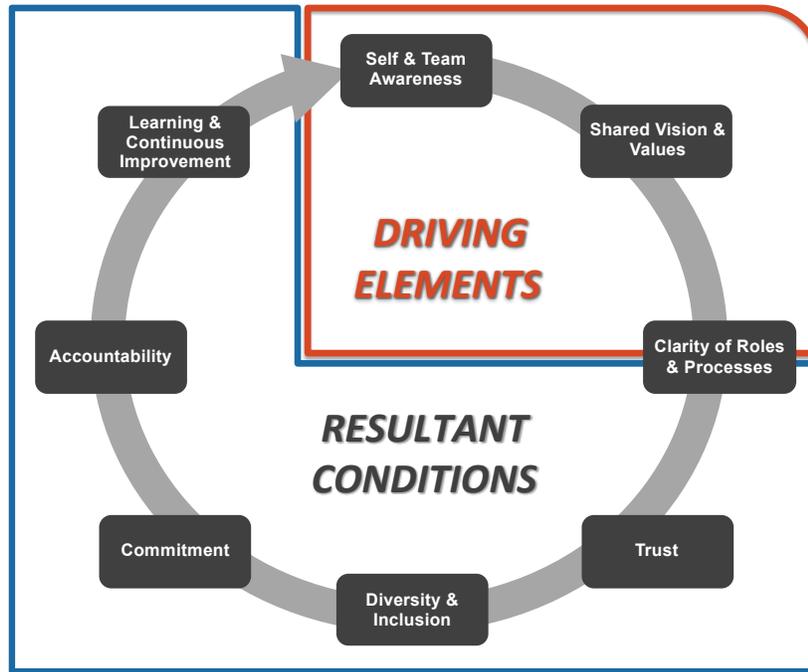


Figure 16: Essential Leadership Cycle – Driving Elements & Resultant Conditions

The integration of the knowledge and use of personality tendencies significantly improves the probability that traditional human performance elements will be used the right way to reduce errors and events, especially on tasks that contain fatality or serious injury potential or relate to process-safety.

***AERO is the next generation error reduction process that results in increased safety, quality, effectiveness, efficiency, and production.***

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## AERO Sample Integration Strategy

The goal of deploying AERO is to not only educate the organization in the technology, science, and use of AERO but to enable the organization to integrate the concepts into the day-to-day workflow of the organization. The developers of AERO discovered long ago that the creation of a new program or process is not necessary, appropriate or desired for most organizations. For this reason, there are three distinct phases of AERO; Education, Integration, and Sustainability:

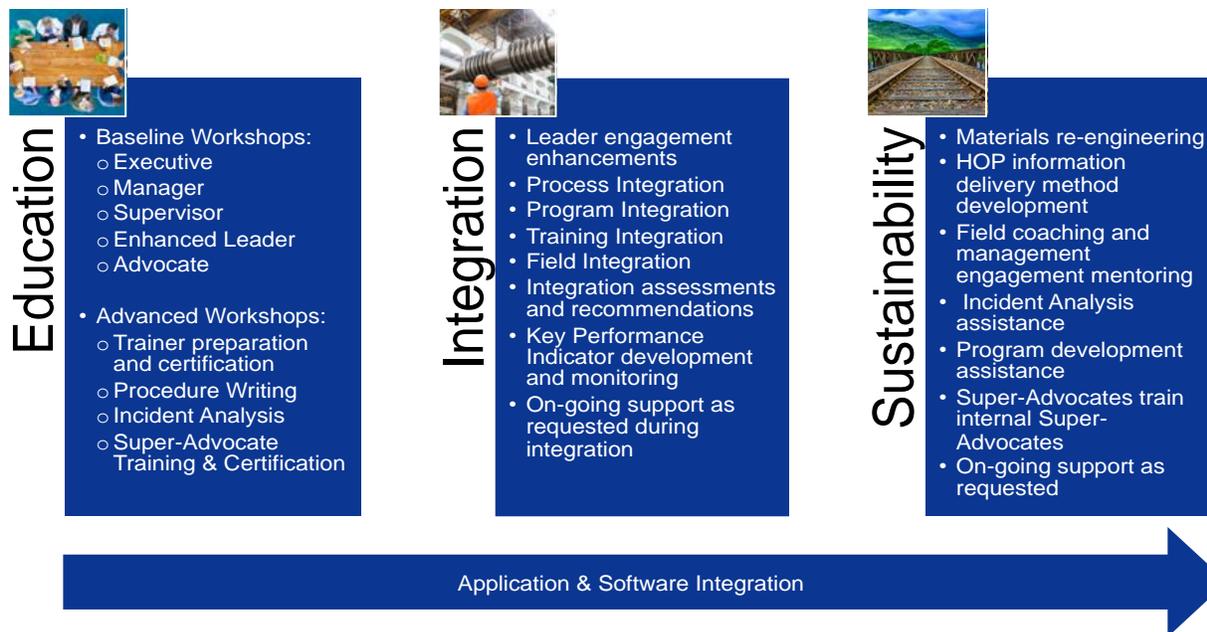


Figure 17: AERO Integration Overview

**1. Education** – Full integration will require each person in the organization to be aware of and manage their personality tendencies related to people, programs, processes, work environments, organizations, and equipment (the AERO System). To do this training will need to be provided. The typical deployment model is as follows:

- Senior Leader workshop - Initial education of Senior Leaders (including union leadership if applicable), with a soak time element to enable them to start using the technology before there is pressure from the organization to do it well.
- Managers workshop – teaching the management level both the science of AERO and the integration strategy they will be using.
- Selection of AERO Advocates/Advocate training – Advocates are the eyes, ears, and internal consultants regarding AERO technology. Advocates reduce the need for external support by being internal subject matter experts that know the systems, people, processes, and equipment of an organization. They will ensure that the concepts are integrated into the workflow in the right way for the right processes. Advocates attend a 4-day workshop to develop their competency.
- Selection of Internal AERO Trainers/Certification – approximately 10-12 of the selected Advocates representing a diagonal slice of the organization should be requested to become internal trainers. These internal trainers will become the delivery mechanism for the 8-hour Employee Awareness workshop.
- Supervisor workshop – Supervisors attend a 2-day workshop consisting of both the theories/science of AERO and how to USE it in the field with their workers.

- f. Employee Awareness workshop – when the organization is ready to start integration, the workforce will be trained by the certified internal trainers.

*Once license transfer has occurred and internal trainers are certified, the organization can use the internal trainers to deploy the Employee Awareness workshops at any rate desired.*

**Note:** There is also an option to take a delayed deployment approach to the workforce. In this model, first-line supervisors should all be trained as advocates because there will be a delay in taking the information to the workers. This model will also benefit from having full-time dedicated internal coaches who will help accelerate building AERO culture.

**2. Integration** – AERO tools and methods supplement the processes and tools that an organization already has in place, without placing the additional burden on the organization. To do that we:

- Provide sets of proven tools for prevention, detection, and correction of events and incidents that can be integrated into existing processes/tools.
- Provide AERO Advocate training to ensure that the understanding and capabilities are transferred into your organization BEFORE we attempt to evaluate and/or change current processes, standards, or tools. These Advocates will serve to identify the best places to integrate the AERO concepts into your workflow.
- After training for managers and advocates progresses, AERO experts spend about a week with a group of your advocates (Integration Visit) reviewing your internal processes and tools and suggesting places to integrate without jeopardizing the science. Here are some examples...
  - i. Your organization currently does pre-job briefings. The integration week would address improvements to your current process for consideration.
  - ii. You currently do investigations of incidents. The integration week would ensure those investigations assess human performance by strategy.

**3. Sustainability** – Using licensing and education of the FIT and AERO technologies, organizations effectively integrate the concepts into the day-to-day processes and workflow to make it the way they do business. This reduces knowledge transfer challenges and improves sustainability for the long haul.

AERO coaches and facilitators are available throughout the education, integration, and sustainability phases to assist as requested by the organization, however, the goal of AERO integration is to enable an internal organizational ability to create sustainable processes for reducing errors and the significant events that result from these errors.

## Results our clients have shared after integrating AERO

- Generation plants saw the human error-related startup trip-rate go from an average of 17 / year to <1 per year
- Large truck factory saw a noticeable takt-time reduction in the paint line with far fewer quality returns. This reduction resulted in higher factory output with fewer quality upsets. [estimated \$2m in annualized cost avoidance]
- Large constant-process manufacturing site identified in excess of \$1.2M/yr. in documented savings for ONE process area accompanied by a 46% increase in employee engagement measures
- Quality and production managers identified an \$8M/yr. annualized savings impact on recovery at one facility
- Significant reductions in fatalities (one company that averaged 7/year went over 800 days without one) and serious injuries (including the lowering of severity).
- >60% reductions in recordable injuries and lost workdays (DAFW) are commonplace.
- 60 documents containing vague work guidance were identified and corrected (1:2 error rate to a 1:100 error rate)
- Step by step process & technical training created to reduce the error rate in customer issues from 1:2 to 1:100
- Integration of Stop Criteria and standardized work has been completed to date taking error rate from 1:2 to 1:100

## Some quotes

**Operations Manager:** “After over 38 years in the industry I have never witnessed an operating philosophy like FIT HP be embraced and accepted so quickly by both the Operations and Maintenance staff to avoid costly errors. The training we received and presented is an invaluable investment we’ve made for our employees and plant. Thanks!”

**Quality Manager:** “We see that integrating the HP concepts THIS way will significantly reduce our quality upsets (we have already seen several examples of >\$100k savings and we haven’t done worker training yet!) resulting in our facility, and the company being the world leaders in this area. Our managers seek every day to incorporate and integrate the concepts we have learned until we can get the information to our 5,000+ workers to take the next step.”

**Human Resources Manager:** “At the two sites where we have started deploying HP so far, we have seen an over 75% reduction in the number of grievances filed against the company. The union leaders, members, and site leadership are working together and engaging as we have never seen before. They are using each other to come to some very important conclusions and long-term fixes...”

## AERO integration expected outcomes

- Increased reporting of error traps BEFORE the error that produces the event
- Increased reporting of work document issues that could have led to events
- Increased quantity and quality of pre-job briefings
- Increased quantity and quality of manager observations resulting in identifying and fixing latent conditions
- Substantial improvements in trust and communication between all levels of the organization
- Human performance concepts are routinely discussed as a preventative measure
- Problem-solving reflects ensures more analyses reach and fix systemic causes – reducing repeat events
- Reduced number of quality issues that make it through barriers
- Reduced recordable incidents, lost workday injuries and off-site lost-workday
- Improved customer relationships