

Canadian Manufacturing Network

Workplace Literacy and Essential Skills Research

Boeing
Incident and Injury Free



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Executive Summary

Boeing: Incident and Injury Free Training

Boeing Winnipeg is one of the largest aerospace composite manufacturers in Canada employing more than 1,600 people. In 2013, Boeing launched a major company-wide safety initiative called “Go for Zero” aimed at reducing injuries and work-related illness. Boeing’s Incident and Injury Free (*IIF*) training program was developed to support the Go for Zero safety program. The company’s goal is to create a workplace where all employees go home, everyday, in as good or better health than they arrived. *IIF* principles maintain that it is possible to eliminate all injuries and incidents through good relationships and a commitment to act and improve behaviours and workplace conditions. A total of 1533 employees participated in groups of 20 in the four-hour training workshop based on Boeing’s safety goal of an Incident and Injury Free (*IIF*) workplace.

Specific goals of the training included:

- Improve relationships to enable employees to communicate with each other and managers on safety concerns
- Raise awareness and mindfulness of risks, choices and more safe practices
- Invite feedback on ways to improve safety and become aware of processes for making such improvements (near miss incident reports)
- Drive personal ownership and responsibility for safety behaviours and attitudes at work and home
- Drive sustainable, continuous improvement of safety behaviours at work and home

The findings suggest that the majority of respondents perceive 'high' value in the training, though they typically rated the training activities and the execution of training as only 'moderately' effective. The majority of respondents reported a high likelihood of behaving safely 'before' training; this likelihood increased appreciably following training.

More than half of respondents report that, since training, they've become more aware of safety issues and are speaking with others about safety issues. Almost half reported an opportunity to improve safety; almost one-third reported an incident or near miss.

To evaluate the impact of the *IIF* training, this study compared the outcomes of injuries and near-miss reports in the six-month period immediately following the training, July 2014 to December 2014, with the same period in 2013. The analysis revealed no appreciable change in the numbers of injuries and work-related illnesses in second half of 2014 when compared with 2013. These findings should not be surprising given the lag time before lower injury statistics would be likely to show up in the safety data.

An examination of the February to December 2014 near-miss reporting data, however, showed a substantial uptick compared to the 2013 data. In the second half of 2013, 76 near-miss reports had been recorded. In the same period in 2014, 96 near-miss reports were received—a 20% increase. This suggests Boeing is ‘on track’ to ultimately achieve the organization’s desired strategic outcome—eliminating injuries and work-related illness (Go for Zero).

“The Incident and Injury Free (*IIF*) engagement program that we delivered at Boeing Canada Winnipeg has been a great first step in generating a new awareness around safety and improving Boeing’s safety culture,” said Marty Lehman, Director Operations Boeing Canada, Winnipeg.

Because of the short timeframe available for this case study it is not possible to predict with a high degree of certainty the success or failure of the *IIF* initiative over the long term. In the short term, however, it seems reasonable to view the substantial increase in post-training, near-miss reporting as an encouraging sign—a leading indicator of ultimate success.

Case Study

Boeing: Incident and Injury Free (IIF)

By Canadian Manufacturing Network with research & report contributed by Lynette Gillis Ph.D. & Allan Bailey, Centre for Learning Impact

Study Background

Overview of Boeing Boeing Winnipeg is one of the largest aerospace composite manufacturers in Canada employing over 1,600 highly skilled people. Boeing is an 8th year recipient of Canada’s Best Diversity Employer Award; silver level LEED site for environmental leadership; and is a 4th year recipient of the Fred Mitchell for Lean. The Winnipeg site is part of Boeing Fabrication within Boeing Commercial Airplanes.

The site helps to sustain Boeing Commercial Airplanes production by being responsible for nearly 1,000 end-item composite parts and assemblies for all current 7-Series jetliners. Major products include wing-body fairings, engine strut forward and aft fairings, and landing gear doors. This Boeing Fabrication business unit is a tier 1 supplier to the 787 Dreamliner, responsible for the engineering design and manufacturing of the wing-to-body fairing and main landing gear doors for this breakthrough airplane.

Training Rationale

Boeing has a major Enterprise-wide safety initiative called “Go for Zero.” This initiative sets the vision for all Boeing facilities to achieve a 100% incident and injury free workplace. In 2014 Boeing Winnipeg implemented an Incident and Injury Free (IIF) training program in support of the Go for Zero safety initiative. The goal of IIF is to create a workplace and culture that enables all employees go home, everyday, in as good or better health than they arrived. IIF principles maintain that it is possible to eliminate all injuries and incidents through engagement, strong relationships and a commitment to act and improve behaviors and workplace conditions that are fundamental to safety.

The Training

A total of 1533 employees participated in groups of 20 in the four-hour Incident and Injury Free (IIF) workplace workshops. The majority of employees attended training between February and July 2014. The sessions included all levels of office employees as well as employees who work in the production areas. All full time, part time, term and summer students attended. The IIF training program was delivered to employees in both Winnipeg facilities – Murray Park and Redwood.

Fifteen in-company facilitators received four full days of train the trainer IIF and train-the trainer training. Also, 106 Managers participated in a four full days of training.

Managers were involved in the selection of staff for each session, and for communicating to their staff what the session was about before they took the training. A Manager was also scheduled to attend and support each training session. Additionally, a member of the leadership team spoke at the beginning to show full support.

Specific goals of the training included:

- Improve relationships to enable employees to communicate with each other and Managers on safety concerns
- Raise awareness and mindfulness of risks, choices and more safe practices
- Invite feedback on ways to improve safety and become aware of processes for making such improvements
- Drive personal ownership and responsibility for safety behaviours and attitudes at work and home
- Drive sustainable, continuous improvement of safety behaviours at work and home

Success measures for *IIF* include: tracking of incidents (accidents, injuries and near misses) as they relate to number, severity, lost time and the number of improvements being made to increase safety.

The training emphasized the importance of recognizing and reporting a broad spectrum of near misses—any potentially hazardous situations which could arise or have led to harm. An increase in near-miss reporting could be viewed as an indication of increased awareness in training participants of potentially hazardous situations. Importantly, near-miss reports serve as red flag alerts. Over time such reports could potentially add an important measure of sustainability to Boeing’s efforts to foster its “Go for Zero” safety culture. They would do so by increasing opportunities for the organization to recognize, analyze, and rectify workplace hazards.

Moreover, an increase in the number of employees taking the trouble to submit such reports could be viewed as a key success measure—as evidence that employees are applying new knowledge and awareness to the workplace. Further, the extent to which near-miss reporting improves could be interpreted as a measure of how successful the training has been in addressing Boeing’s overarching, strategic goal to foster an organization-wide, self-sustaining culture of safety.

Methodology: High Impact Evaluation

The Learning Value Chain™

The Case Study Methodology

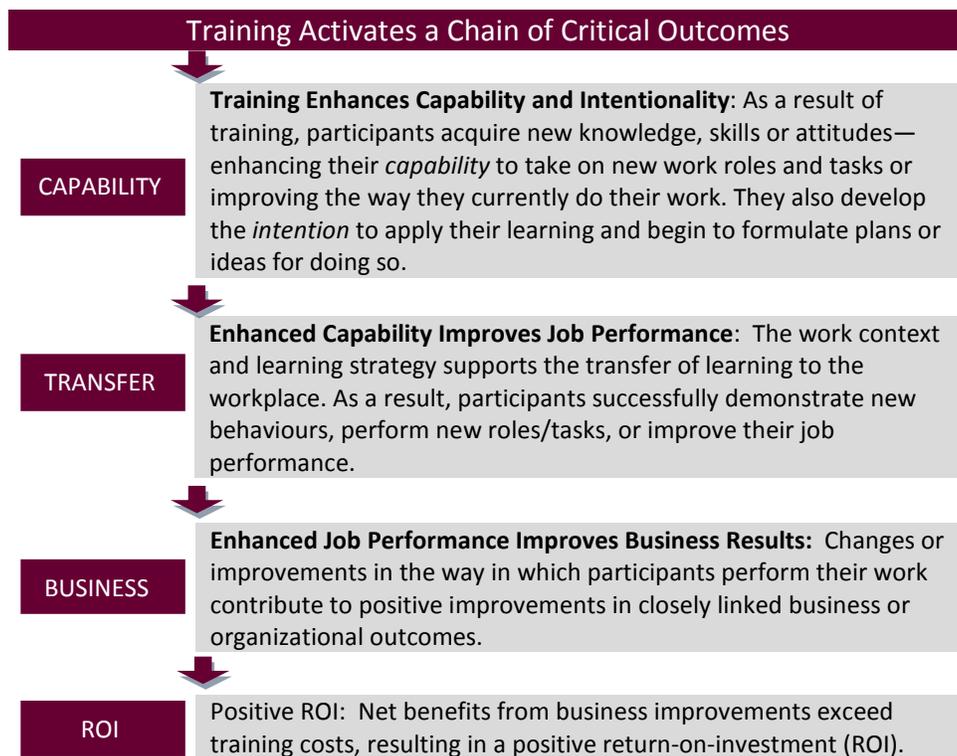
The Boeing case study adopts the Learning Value Chain evaluation approach—the core evaluation framework and instrument-set develop for the Gillis and Bailey High Impact Evaluation model. The Learning Value Chain™ framework offers an uncomplicated, field-tested framework for evaluating the learning effectiveness and the business value of training and human resource investments (Figure 1).

In the Learning Value Chain™, the training program triggers a chain of critical outcomes. Monitoring this chain of outcomes adds an innovative and critically important predictive value to the evaluation process. As desired outcomes are achieved at each link along the chain, greater value is added and the likelihood increases that training will result in positive business outcomes and return on investment. Conversely, if training fails to meet outcomes at any link, value is diminished and the prospect of positive business results and return on investment is at risk.

Using the Learning Value Chain™ framework, the training program is evaluated at each of four links (Capability, Transfer, Business Results and ROI). At each link, data is gathered to assess the extent to which the training has achieved key outcomes, added value and enabled the next critical event in the chain to occur.

The Learning Value Chain™ model also incorporates a diagnostic strategy to investigate training practices and strategies that may strengthen or weaken outcomes at each link and subsequently influence business impact and return on investment.

Figure 1
The Learning Value Chain™



Capability Results

Evaluation Questions: Did training participants develop new capability: acquire new knowledge and skills, adopt new attitudes, improve existing skills, or discover new and more productive ways of doing work? Did participants also develop the intention to apply their learning or improve their job performance?

To assess Capability—the first link in the Learning Value Chain™— Incident and Injury Free (IIF) workshop participants were asked to complete a combined Capability and Transfer Questionnaire four to nine months after training. 407 participants completed the Questionnaire, representing a response rate of 26%. Appendix A describes the demographics of respondents.

The findings suggest that the majority of respondents perceive 'high' value in the training, though they typically rated the training activities and the execution of training as only 'moderately' effective. The majority of respondents reported a high likelihood of behaving safely 'before' training; this likelihood increased appreciably following training.

Key questionnaire results are described below:

- **Safety Behaviours:** Before training, 73% of training participants rate their likelihood of acting safely as "high", 15% rate it as "moderate," and 12% as "low." After training, 88% rate their likelihood of acting safely as "high", a gain of 15%.
- The greatest gain appears in the area of "acknowledging others for safe behaviours when I see them." There was a gain of 25% in the number of participant stating they would likely do this from 48% before training to 72% after training. Similarly, 19% increase in those that indicate they are more likely to "report a risk or opportunity to improve safety," from 73% before training to 92% after training.
- **Perceived Value:** The largest proportion of participants (69%) perceive the program's value as "high" (i.e., credible, practical, relevant, and essential). "Moderate" value was ascribed by 25% of participants.

Effective Practices The following practice was identified by participants as having contributed very favourably to the learning:

- Video that chronicles an oil worker's suffering following a workplace accident.

The following design and implementation practices were rated as "moderately effective":

- Leadership story
- Leadership opening
- Commitments to specific actions

The instructional practices were rated as "moderately effective":

- Clearly communicating the learning and performance objectives
- Engaging and sustaining learner's interest
- Presenting key concepts clearly and logically
- Providing a realistic and work-related and practice activity
- Providing useful feedback during the activity
- Providing opportunity for collaboration, discussion and learning from others
- Providing useful response to questions, guidance or clarification

Transfer Results

Evaluation Questions: Did the work environment and learning strategy support the transfer of learning to the job? Did training participants apply their learning to their jobs, and did the application of learning impact their work or job performance?

To assess Transfer—the second link in the Learning Value Chain™—the combined Capability and Transfer Questionnaire asked training participants several questions related to performance improvement resulting from the *IIF* training.

More than half of respondents report that, since training, they've become aware of safety issues and are speaking with others about them. Almost half reported an opportunity to improve safety; almost one-third reported an incident or near miss.

Key questionnaire results are described below:

- **Performance Improvement:** 66% have "become aware of safety issues" since training. 62% report that they "spoke with peers or others about a safety issue" (26% report having no opportunity yet). 55% "spoke with managers and leaders about a safety issue," (27% had no opportunity).
- 46% of respondents "reported an opportunity to improve safety" and 29% "reported an incident or near miss."
- **Workplace Readiness:** 46% of respondents report that it was possible to effectively apply their learning in their specific workplace setting to a "moderate" degree (i.e., have the time, manager's support, resources or appropriate opportunities). An additional 33% report that this was possible to a "high" degree.
- The remaining 21% report little success in application. Their most significant issues were that Managers need to respond more effectively to employee concerns (19 mentions) and that the culture is focused on production rather than safety as a first consideration (9 mentions). **Perceived Business Impact:** Participants were asked to what extent they agreed or disagreed that the training had contributed to increased safety at Boeing. A majority (64%) perceived that the training had contributed to increased safety at the company, while 24% were neutral and 6% disagreed that the training had contributed to increased safety.

Effective Practices The following strategies and practices were identified most frequently by participants as enabling the transfer of learning:

- Enabling Transfer**
- Support from manager or supervisor (13%)
 - Sufficient level of knowledge and skill (13%)
 - Support from colleagues or peers (13%)
 - Clear performance expectations (11%)

Significant Barriers to Learning Transfer The following practices were identified most frequently by participants as inhibiting transfer of learning:

- Lack of support of management (11%)
- Lack relevant opportunities to apply my new learning (10%)

Open-ended comments from IIF participants concurred with data and amplified participant perceptions that some managers fail to act effectively to safety concerns and some appear to put production before safety.

- Opportunities to improve these areas, based on employee commentary include:
 - *Taking action by following up and communicating status on items that affect safety similar to how production concerns are addressed.*
 - *Consistently enforcing safety requirements.*
 - *Role model and champion safety issues—ensure items are given attention and follow-up and acted upon as a priority.*
 - *Look for ways to engineer out the problem at the root cause.*

It is important to appreciate that these participant observations are not statistically significant evidence of the IFF program’s success or failure. They do however provide valuable, diagnostic insights that suggest some practical opportunities to improve safety and employee engagement in fostering a successful and sustainable safety culture.

Organizational Results

Evaluation Questions: Did the application of learning or improvements to job performance impact business results? What were the intangible or strategic benefits from the training investment?

“The Incident and Injury Free (IIF) engagement program that we delivered at Boeing Canada Winnipeg has been a great first step in generating a new awareness around safety and improving Boeing’s safety culture.”

**Marty Lehman
Director
Operations
Boeing Canada,
Winnipeg**

At the organizational level, the success of a program is measured by the extent to which it improves financial outcomes or strategic outcomes. Enterprise-wide safety training programs such as Boeing’s Incident and Injury Free training, are not necessarily implemented to drive bottom-line numbers. Rather, they are usually launched to help the organization satisfy a strategic goal or a high-level mission statement such as Boeing’s “Go for Zero” program.

By causing a reduction in the number of accidents or injuries, a newly-introduced safety program may very well save the organization money by reduced medical costs and fewer time-off injuries. But improving financials is usually not the overarching concern or objective of most enterprise safety initiatives. Indeed, the Boeing IFF program was a strategic change initiative aimed at a “mindset” rather than the balance sheet. Rather than a goal of boosting revenue or productivity, the IIF program aspires, in organization’s own words, “to breathe life into the guiding principles underpinning Boeing’s safety program, “Go for Zero.”

Measuring Strategic Outcomes

Measuring the success of strategic outcomes, however, can often be considerably more challenging than measuring more tangible outcomes such as increased sales, increased production-line output, etc. Culture change takes time. Hundreds of employees need to be trained. They must unlearn old habits while learning to apply the new techniques on the job.

Training’s actual strategic impact on the organization is usually qualified (and measured) in three outcome stages: immediate outcomes, intermediate outcomes and ultimate, or final, outcomes.

In the immediate aftermath of a safety training initiative one might expect to observe change in critical workplace behaviours—an uptick in such things as the use of personal protection equipment (PPE,) adherence to proper safety procedures, etc. In Boeing’s case, there was also the expectation that employees would become better at spotting and reporting potential workplace safety risks and near-misses. This reporting effort, it was hoped, would later result in reduced harm incidents. The increase in the number of employee safety reports, which should happen soon after training, will qualify as the *immediate outcome* measures from the training.

Over time, accumulating hazard and near-miss reports should trigger safety decisions and corrective actions taken by management to neutralize hazardous situations. A rise in the number of decisions and actions taken will constitute the *intermediate outcomes* from the training. These intermediate benefits, of course, may not take place for many months, even years, after initiation of the training intervention.

Finally, after this process has played out—hazards have been identified and safety measures have been implemented—we should expect this to result in a safer workplace. At some point we should be in a position to be able to measure the *ultimate outcomes*—a reduction in the number of workplace injuries and work-related illness.

The three outcome stages—immediate, intermediate, and ultimate—suggest convenient waypoints for setting goals at the outset and, later, for measuring success.

Measuring Boeing’s IFF Strategic Outcomes

Two of the signature safety measures tracked on a regular basis by Boeing are, a) the numbers of injuries and work-related illnesses and, b) the number of reported near-misses.

To evaluate the impact of the IIF training, this study compared the outcomes—both injuries and near-miss reports—in the six-month period immediately following the training, July 2014 to December 2014, with the same period in 2013.

Injuries and Work-Related Illness

This analysis revealed no appreciable change in the numbers of injuries and work-related illnesses in second half of 2014 when compared with 2013. As discussed earlier, these findings should not be surprising given the lag time before lower injury statistics would be likely to show up in the safety data.

Near-Miss Reports

An examination of the February to December 2014 near-miss reporting data, however, showed a substantial uptick compared to the 2013 data. In the second half of 2013, 76 near-miss reports had been recorded. In the same period in 2014, 96 near-miss reports were received—a 20% increase. This suggests a beneficial relationship between the Boeing’s IIP initiative and the organizations desired strategic outcomes.

It is important to bear in mind that the Boeing’s IIF training workshop were followed by a variety of other supporting activities and collateral—posters, newsletters, crew talk packages, etc. These ongoing, post-event initiatives should be expected to serve as reminders, reinforcing the safety behaviours learnt in the workshops.

Because of the short timeframe available for this case study it is not possible to predict with a high degree of certainty the success or failure of the IIF initiative over the long term. In the short term, however, it seems reasonable to view the substantial increase in post-training, near-miss reporting as an encouraging sign—a leading indicator of ultimate success.

Demographics of Participants

Appendix A

NUMBER OF YEARS AT BOEING	NUMBER OF PARTICIPANTS	%
20+	112	28%
15-19	70	17%
10-14	7	2%
5-9	115	28%
1-4	93	23%
<1	10	2%
TOTAL	407	100%

ROLE AT BOEING	NUMBER OF PARTICIPANTS	%
Manufacturing Technician (trim/ assembly/ layup/re-work/tooling tech)	200	49%
Manufacturing Machine Operator (Autoclave)	20	5%
Inspector/NDI/Lab Tech/Expeditor	24	6%
Storekeeper/Driver	7	2%
Painter	5	1%
Mechanic/Electrician/Tradesperson/Maintenance Assistant/Cleaner	11	3%
Engineer/ME/Planner/Programmer	68	17%
Finance/IT	11	3%
SM	13	3%
HR/BusOps/Ethics/other support & admin	44	11%
EHS	4	0
TOTAL	407	100%