# Collaborate to Innovate and Drive Training Efficiency

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## Abstract

The primary focus of military training organizations is to continually supply qualified, operation ready individuals that meet the operational needs of various commands. To achieve this requirement:

- Training operations are organized to a great extent as a production/assembly line; with a relatively linear path that follows the Analysis, Design, Development, Implementation & Evaluation (ADDIE) model.
- The responsibilities for each phase is designated to a specific unit - Training Requirements Authority (TRA) or Training Delivery Authority (TDA), for example. In many cases, interaction among the units is limited to deliverables and typically flow in one direction – from an earlier phase to the next.
- Training requirements, in most cases, are occupation/position centric – i.e., driven by the training requirements of each job/position. Overlaps in training requirements among various jobs/positions are rarely factored into training decisions.
- Training requirements for major platforms/weapons/systems acquisitions are analyzed, produced, delivered and managed separately. Overlaps in training requirements among various platforms/ weapons/systems are rarely factored into training decisions.
- Desktop tools (such as MS Word, Excel, etc.) are typically used to analyze, design, manage and update training requirements, and communicate among the various phases, units and projects.

Although current structure/processes are designed to produce effective training programs, they are not necessarily efficient. The paper will highlight the shortcomings of current approaches; and illustrate the added benefits that can be realised by facilitating communication and interaction among various teams through a decision support tool.

## Biography

J. (Jay) Bahlis, Ph.D., P. Eng. is the president of BNH Expert Software. Participated in the training analysis of multiple large scale military projects, assisted dozens of organizations in developing effective and efficient training strategies, and aligning training with missions/goals, evaluated several eLearning technologies, directed research on adult learning theory and managed the design/development of the decision support tool ADVISOR Enterprise. Dr. Bahlis is the author of “Technologies in Distance Learning and Workplace Training” Guide and “From Classroom to Boardroom – Strategies to Maximize Impact of Training” booklet. He holds a Doctorate in Engineering and Applied Mechanics from McGill University.

## Why Training is Inefficient

The primary focus of military training organizations is to continually supply qualified, operation ready individuals that meet the operational needs of various commands. To achieve this requirement:

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- The responsibilities for each phase is designated to a specific unit - Training Requirements Authority (TRA) or Training Delivery Authority (TDA), for example. In many cases, interaction among the units is limited to deliverables and typically flow in one direction – from an earlier phase to the next.
- Training requirements, in most cases, are occupation/position centric – i.e., driven by the training requirements of each job/position. Overlaps in training requirements among various jobs/positions are rarely factored into training decisions.
- Training requirements for major platforms/weapons/systems acquisitions are analyzed, produced, delivered and managed separately. Overlaps in training requirements among various platforms/ weapons/systems are rarely factored into training decisions.
- Desktop tools (such as MS Word, Excel, etc.) are typically used to analyze, design, manage and update training requirements, and communicate among the various phases, units and projects.

Although, current structure/processes are designed to produce effective training programs, they are not necessarily efficient for the following reasons:

- **Common training requirements are often ignored.** Although systems and sub systems are operated and maintained by various jobs/roles with overlapping responsibilities; training tends to focus on the specific requirements of each job/position. This implies that in lieu of developing and maintaining the content once and delivering to everyone that needs it, in many cases the same content is being developed and maintained multiple times.

- **Training alignment with operational needs is lagging.** Although training courses and activities are well aligned with operational requirements after a training needs analysis is concluded, no simple mechanisms currently exist to maintain the alignment as new capabilities are introduced, systems/sub systems upgraded, policies modified, and so forth. As a result, discrepancies between operational requirements and training delivered at the schools grow over time. This implies that future graduates may be wasting valuable time on topics that are no longer relevant and worse, not receiving the training needed to adequately perform their job.

- **Budget, personnel and resource requirements are difficult to assess.** In most cases, the allocation of budgets, personnel and resources are based on historical data versus actual needs. In other words, they are not based on the number of trainees, length of course, training activities, method/media used, and so forth. As a result, in addition to overfunding or underfunding schools, it is difficult to uncover key cost drivers and in-turn venues for improving training efficiency. For example, what would be the costs and benefits of delivering training in one versus multiple locations; building versus buying versus leasing; utilizing internal versus external resources to develop, deliver, administer, manage, support and maintain training programs; and so forth.

- **Viability, risks and financial impact of training technology are difficult to assess.** Although guidelines for selecting the most cost effective blend of delivery options are provided in most standards; the effectiveness directives tend to be highly subjective, with no tools to forecast and compare the costs, personnel and resource requirements for each alternative. As a result, it is difficult to objectively

assess when eLearning would be a viable alternative to instructor-led training, as an example; and what would be the impact on start-up and recurring budgets, personnel and resources. This implies that in addition to missing opportunities to drive training efficiency, introduced technologies may not be yielding the desired benefits.

- **Inadvertently penalizing desired initiatives.** Although school staff are well positioned to detect venues for improving training efficiency; initiatives with perceived negative consequences will be avoided. For example, recommendations that could lead to the loss of job security, benefits, and so forth. In other words, if the impact and benefits of change are not clearly articulated, school staff will be discouraged from identifying venues to improve training efficiency, as well as increase resistance to positive change.

## Challenges for Improving Training Efficiency

**Rigid Organizational Structure.** The structure of most military training organizations is aligned with the original ADDIE model. It assumes a linear progression with data cascading from one step to the next. This structure limits teams' ability to innovate, since decisions are being based on a subset versus the entire data.

**Lack of Collaboration.** Analysis is often compartmentalized. Each specialty focuses on their own area of expertise with minimal consideration on how the recommendations will impact others. For example, instructional designers rarely factor the impact of recommended delivery method/media on budget, personnel and resources. Moreover, the analysis tend to focus on the requirements of a specific job/role versus the entire crew. For example, can the training for one job/role be leveraged by others; and is there a more efficient way to achieve objectives by considering the needs of all crew versus one job/position?

**Analysis is Data and Time Intensive.** Requires:
- Collecting Data from Subject Matter Experts (SMEs), Human Resources and others;
- Analyzing Data including missions, jobs, tasks, media, costs, personnel, resources and so forth;
- Managing Data from multiple SMEs, Instructional Designers, Financial Analysts, etc.;
- Updating Data and reassessing its impact as the design matures;
- Managing Requirements to ensure that all tasks have been addressed;
- Generating Actionable Reports

**Analysis is Complex.** Identifying the optimal training strategy requires in-depth understanding of organizational needs; time, budget, personnel and resource limitations; short and long term training requirements; current training programs; as well as an appreciation of the impact of training decisions on budget, personnel and resources. More specifically, analysts should be able to:
- Identify the training needs for each job/role – i.e., eliminate training activities that are not relevant;
- Minimize training duplication – i.e., consolidate similar courses/training material;
- Focus resources on the most critical initiatives;
- Improve resource allocation – i.e., identify excess capabilities and bottlenecks;
- Identify more efficient alternatives – i.e., forecast and compare the direct and indirect costs of viable delivery options/methods/media, build versus buy, the use of in-house versus external, and so forth;
- Preserve training programs integrity, effectiveness, efficiency and relevance as missions, goals, designs and policies evolve and mature;
- Improve performance – i.e., identify the cause of a performance deficiency and viable solutions;
- Mitigate risks

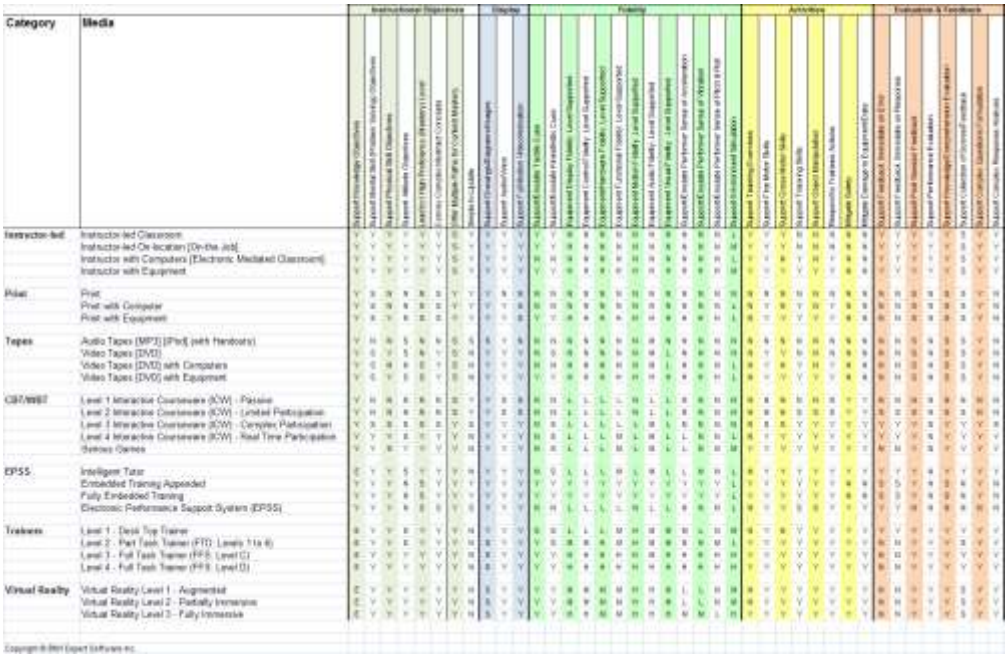
## How Can Training Efficiency Be Improved

To gain insights into all items impacted by a training course, activity, lesson or teaching point – from missions, goals, jobs and tasks, to budget, instructors, classrooms and equipment; the data from all phases including Analysis, Design, Development, Implementation & Evaluation should be stored in a centralized relational database accessible through a decision support tool by all team members. In addition to facilitating collaboration among various training authorities as well as mitigate data flow; the right decision support tool can provide the following benefits:

- **Reduce Time Needed to Conduct the Analysis**, as follows:
  - ✓ **Simplify & Speed Data Collection:** This can be accomplished by supporting various venues for collecting data from Subject Matter Experts (SMEs) through Excel spreadsheets, for example; as well as the exchange of data with other systems – such as Learning Content Management System (LCMS), Learning Management System (LMS), Human Resources, Financial, etc.

  - ✓ **Simplify & Speed Data Analysis**: This can be achieved by automating the:
    - ❑ Difficulty, Importance & Frequency (DIF) Analysis. To identify tasks training requirements and priorities. The reasons behind the recommendations should be available to the analyst with the option to override and justify decision.

    - ❑ Media/Option Analysis. To identify viable delivery media/options for each learning objective based on time, cost, equipment, technology and infrastructure limitations; personnel safety and equipment/data integrity considerations; characteristics of target audience; complexity of content; instructional design strategies as well as equipment display, control, hardware, system, motion, audio and video fidelity requirements; and so forth. Once again, the reasons behind the recommendations should be available to the analyst with the option to override and justify decision.



- ❑ Media/Option Cost Analysis. To quickly forecast and compare budget, personnel and resources needed to design, develop, deliver, administer, manage and support each delivery option over the expected life cycle of the training program.


| Delivery Option | Total Cost |
|---|---|
| Instructor | $689,153 |
| CBT/WBT | $419,093 |
| Conferencing | $425,355 |
| Internet | $438,339 |

- ❑ Performance Analysis. To identify viable solutions (including training, job aids, feedback, policies, tools, etc.) that address the root cause of a performance deficiency by considering crew and supervisors' feedback, tools, policies and work environment. The performance analysis should also assess the feasibility of implementing plausible solutions; forecasts the costs, benefits & return on investment (ROI) of interventions & generates recommendations.

✓ **Simplify & Speed Data Management**: This can be achieved by:

- ❑ Storing all data in a centralized relational database that can be accessed anytime and from anywhere with only a Browser.

- ❑ Assigning privileges to each user that dictates which functions they can perform; projects and data they can access, and so forth.

- ❑ Allowing users to configure each project in line with requirements. This includes: data to be collected, analyses to be conducted, media to be considered, and so forth.

- ❑ Facilitating data manipulation. For example, users can reorganize Job Tasks hierarchy by dragging and dropping Tasks, Sub Tasks, Steps and Sub Steps to any location while preserving attributes & links to Knowledge/Skills/Attitudes, Job Aids, References, Systems, and so forth.

- ❑ Facilitating data sharing. For example, users should be able to work on any project on their own, or as a group. Moreover, the system should be able to track which changes were made by which user, when and why.

- ❑ Facilitating reusability. In other words, users should be able to search the database by mission, system, job or keyword to locate and copy and repurpose relevant data items such as Tasks, Objectives, Knowledge/Skills/Attitudes, Job Aids, etc.

- ❑ Facilitating configuration management. In other words, the ability to archive, preserve, view and retrieve multiple versions of the same analysis.

- ❑ Facilitating data updates. For example, if the hourly rate of a specific developer, instructor, administrator or manager changes, users should have the option to update this value in a centralized location and automatically re-compute the impact of this change on the entire project.

- ❑ Preserving consistency. For example, if the attributes of a Collective Task (i.e., a Task performed by multiple Jobs/Roles) is updated, users should have the option to update this value in a centralized location and automatically cascade to all corresponding Job Tasks.

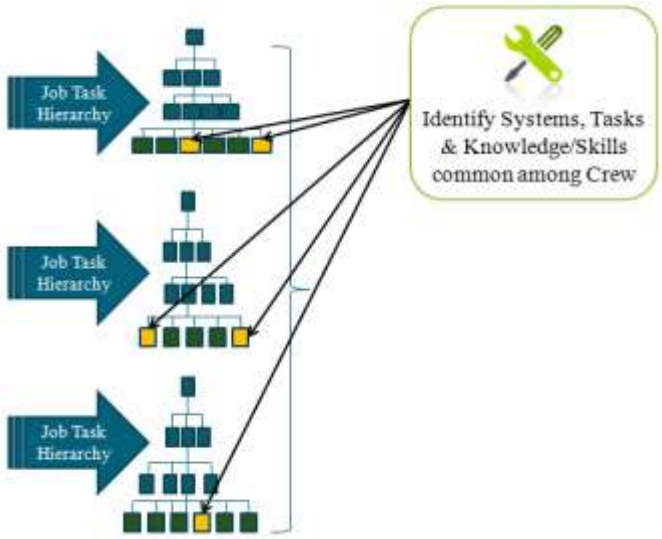
- ✓ **Facilitate Quality Control**: This can be achieved by providing:
  - ❑ Top down audit report to indicate where the training requirements for each mission, system, job and task have been addressed; and
  - ❑ Bottom up audit report to justify the need for each teaching point. In other words, to indicate which objective, task, job and mission does the teaching point support.

- ✓ **Generate Actionable Reports**: This can be achieved by providing users with the ability to quickly and seamlessly compile, analyze and generate reports in the desired format. This may include as an example: Master Task List (MTL), Master Training Task List (MTTL), Job Task Analysis Report (JTAR), Qualification Standards (QS), Occupational Specialty Specification (OSS), Training Requirements Analysis (TRA) Report, Training Plans (TP), Budget, Personnel and Resource Requirements, Utilization Rates, Project Plans, and so forth.

❖ **Drive Training Effectiveness & Efficiency**, as follows:

- ✓ **Maximize Training Impact:** This can be accomplished by mapping resources to the most critical initiatives – i.e., Objectives with highest training priority based Tasks Difficulty, Importance and Frequency.

- ✓ **Minimize Training Duplication:** This can be accomplished by automatically compiling the Knowledge, Skills and Attitudes for each project in a single repository to quickly identify Knowledge/Skills/Attitudes common among various jobs.



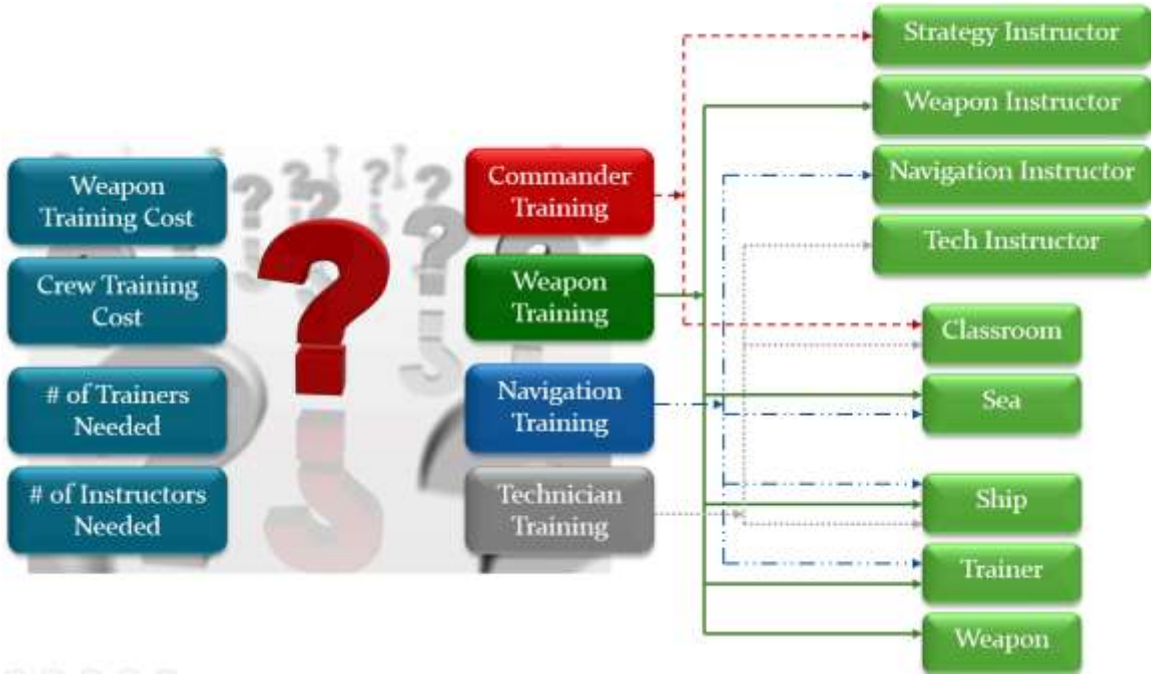

- ✓ **Reveal Training Creep:** This can be accomplished by automatically analyzing the links between Teaching Points, Objectives, Tasks, Systems and Missions/Goals, to identify training activities that are no longer relevant.

**Align Learning Objectives with Tasks**

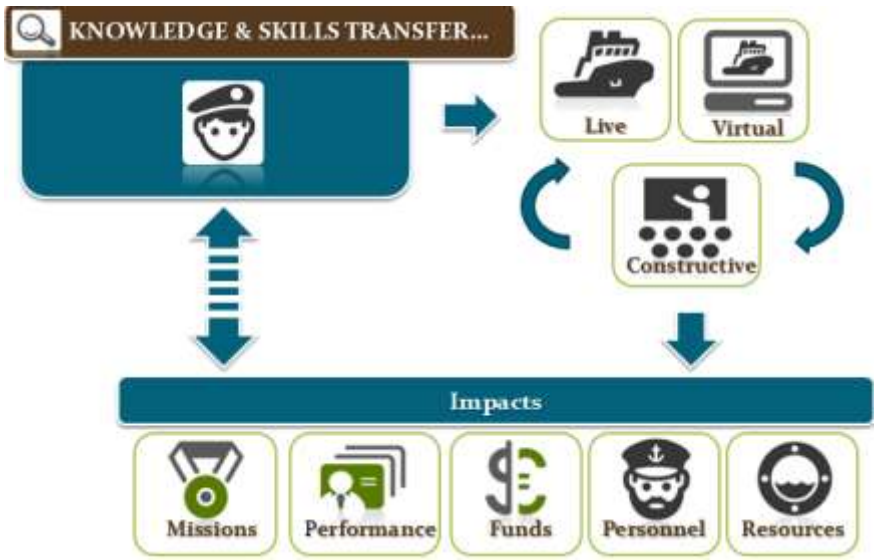
AVN Course

| Learning Objective | Length | Knowledge/ Skills | Enabling Objective | Performance Objective | Job | Tasks |
|---|---|---|---|---|---|---|
| Aircraft Primary and Secondary Structure Construction: a. Aircraft Structural Integrity, b. Types of Materials | 0.83 | Aircraft primary and secondary structure construction | 407.01 – Describe Aircraft Structures | 407 – Maintain AVN Aircraft Structures | AVN | 407.01 – Describe Aircraft Structures |
| Aircraft Structure Types: a. Criteria, b. Structural Shapes, c. Structure Classification, d. Stress | 0.83 | Aircraft structure types | 407.01 – Describe Aircraft Structures | 407 – Maintain AVN Aircraft Structures | AVN | 407.01 – Describe Aircraft Structures |
| Full Scale Structure Testing Film: e. Fuselage Structure Types, f. Wing Structure, g. Empennage | 0.17 | Full scale structure testing | 407.01 – Describe Aircraft Structures | 407 – Maintain AVN Aircraft Structures | AVN | 407.01 – Describe Aircraft Structures |
| Aircraft primary & secondary structural inspection requirements and procedures: b. Investigation of damage, c. Importance of Damage Location, d. Checking Extent of Damage, e. Aircraft Reference Planes | 0.67 | | | | | |
| Aircraft structural limits: a. Criteria | 0.33 | Aircraft structural limits | 407.02 – Perform Aircraft Structural Inspections | 407 – Maintain AVN Aircraft Structures | AVN | 407.02 – Perform Aircraft Structural Inspections |
| Aircraft alignment & symmetry check procedures | 0.67 | Aircraft alignment & symmetry | 407.02 – Perform Aircraft Structural Inspections | 407 – Maintain AVN Aircraft Structures | AVN | 407.02 – Perform Aircraft Structural Inspections |

- ✓ **Improve Resource Allocation:** This can be accomplished by automatically tracking and reporting on the overall utilization rates of personnel and resources – i.e., identify excess capabilities and bottlenecks.




- ✓ **Increase Throughput and Reduces Costs, Time to Competency & Time Away From Job:** This can be accomplished by automatically forecasting and comparing the costs of viable delivery options to identify the most efficient solutions; as well as providing users with the ability to quickly conduct multiple what if scenarios to assess the impact of blended delivery, build versus buy, use of internal versus external personnel, and so forth.



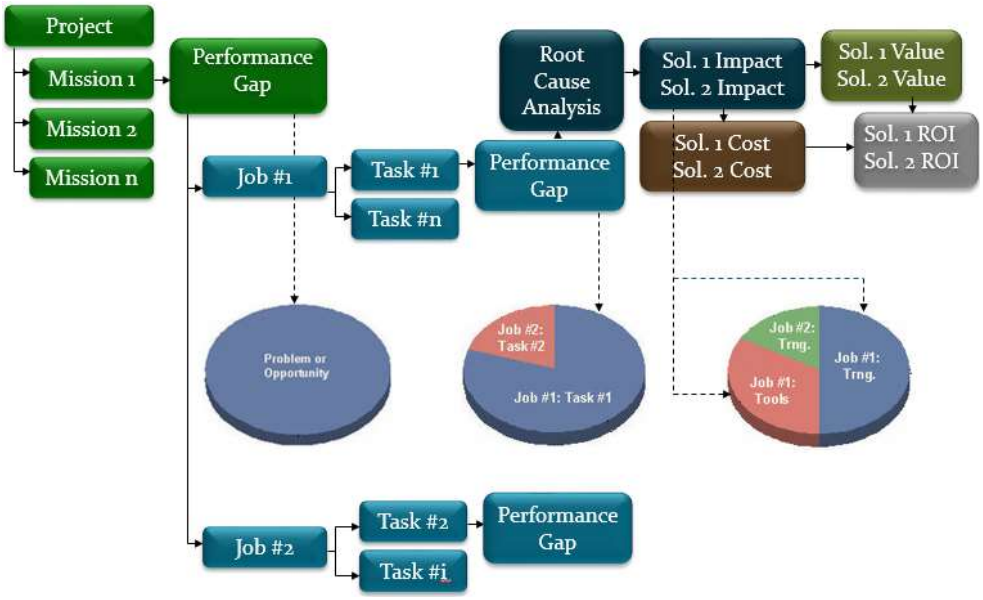
- ✓ **Preserve Training Programs Integrity, Effectiveness, Efficiency and Relevance:** This can be accomplished providing users with the ability to quickly identify Jobs, Tasks, Courses, Lessons and Teaching Points that could be impacted by a change to a system, sub system, policy or manual.

**Identify Interventions Impacted by Change**

F35: Landing Gear

| Job | Tasks | Course | Lesson | Teaching Point |
|---|---|---|---|---|
| AVN | 410.01 – Describe the Construction and Operation of the Landing Gear System and its Components | AVN Course | Lesson 4 | AC Landing Gear Indicating System/Components Operation and Construction: a. Types of Landing Gear Operation (Extension and Retraction), b. Landing Gear Control and Position Indicating System, c. Ground Landing Gear Safety System, d. Electrical Operation When Landing Gear Control Lever Selected Up, e. Electrical Operation When Landing Gear Control Lever Selected Down |
| | | | | AC Steering System Component and Operation: a. Type of Steering System, b. Component and Operation of Nose Wheel System. |
| | | | | Main Component of a Landing Gear Systems and Types: a. Main Landing Gear, b. Nose Gear, c. Tail Gear, d. Non Retractable LDG Types, e. Retractable Type and Components. |
| | | | | Undercarriage Arrangements: a. Conventional, b. Tandem Landing Gear, c. Tricycle Landing Gear, d. Advantages of Tricycles vs. Conventional. |
| | 4120.02 Describe Brake and Anti-Skid System | AVN Course | Lesson 5 | AC Brake Sys and Assemblies Inspection Requirements and Procedures: a. Visual Inspection Procedures, b. Inspection of AC Brake System. |
| | | | | AC Type, Construction and Function of Brake Assemblies: a. Single- Disk Brake, b. Dual - Disk Brake, c. Multi - Disk Brake, d. Segmented Rotor Type Brake, e. Shoe Type Brake Assemblies |
| | | | | Anti-Skid Sys Components and Operation: a. Electrical anti-skid, b. Components, c. Mechanical anti-skid, d. Deposer Valve. |

- ✓ **Improve Performance:** This can be accomplished by providing users with the ability to quickly conduct root cause analyses to zero in on the source of a performance deficiency; identify solutions (including training, job aids, feedback, policies, tools, etc.) that yield the desired level of productivity; assess the feasibility of implementing plausible solutions; forecast the costs, benefits and return on investment (ROI) of viable interventions & generate recommendations.



- ✓ **Mitigate Risks:** This can be accomplished by providing users with the ability to assess organization's readiness to implement viable solutions including available budget, resources and time constraints; compatibility with existing programs; management, supervisors and employees' attitudes towards the proposed solutions; required changes to policies/procedures and infrastructure; as well as the availability of development, delivery, and support personnel with the prerequisite experience and expertise.

## What Has Been Achieved Thus Far

A number of examples are presented below to illustrate the various benefits that organizations have attained through BNH decision support tool ADVISOR Enterprise.

- ✓ **US Department of Treasury:** Review of Examiners in Chief training requirements revealed significant misalignment between training currently delivered and knowledge/skills required on the job. In addition to realigning training with goals, credit training was reduced from 15 months to 12 months, while improving performance.

- ✓ **Canadian Army:** Assess the financial impact of using Trainers at various training levels [individual to combat team] for Driver, Gunner, Crew and Troop Commander on LAV III, Closed Combat Vehicle and Leopard 2. The analysis uncovered that Budget, Personnel and Resources for 7 out of 12 courses could be reduced from 6% to 38%; resulting in total direct & indirect savings of $49.3 million over 10 years.

- ✓ **US Air Force Space Command Audit Agency:** Timely completion of Training System Requirements Analysis (TSAR) will lead to more effective trainers and reduce acquisition costs by $101 million over 5 years.

- ✓ **Canadian Air Force Technical Training:** Assess alternate delivery options for four types of aircraft technicians. In addition to identifying 140 hrs in Common Core & 135 hrs in Basic Electrical & Electronic training, blended instructor-led with interactive multimedia allowed the Air Force to reduce training time for the technicians between 4% to 17% as well as reduce conversion costs while improving the quality.

- ✓ **Intermec Technology:** The training team was able to quickly and accurately forecast the time, money and resources needed to administer, manage, develop and deliver instructor-led and self-directed eLearning programs. In addition to meeting ISO requirements and effectively communicating the results to customers and product managers, the management of training requirements was facilitated as project scope changed.

- ✓ **Canadian Forces College:** Assess the impact of extending the 9 month instructor-led Command and Staff course from 88 to 390 officers. A blended residential with web based delivery allowed the Canadian Forces College to use existing facilities with minor modifications and in-turn save $22 million in upfront costs for new school & residence extension and $6 million in annual recurring costs.

- ✓ **Canadian International Development Agency (CIDA).** Develop strategy for the delivery of corporate training. A blended instructor-led with computer based delivery increased the impact of CIDA's programs by extending access to partners, while reducing spending by $1.2 million over 3 years.

## Conclusions/Recommendations

Training effectiveness and efficiency can be improved by:

- ✓ Basing decisions on all factors impacted by a training course, activity, lesson or teaching point – including missions, goals, jobs and tasks, budget, instructors, classrooms, equipment and so forth – versus a subset. Since the data is collected in the Analysis, Design, Development, Implementation and Evaluation phases by various teams, the data should be stored in a relational database that can be accessed by all team members.

- ✓ Gaining insights into the training needs of all crew versus one job/position. Once again, since the analysis is conducted by various teams, the data should be stored in a relational database that can be accessed by all team members.

- ✓ Simplifying and speeding data collection and analysis. A single job with dozen of tasks, will result in thousands of data items once: the tasks are decomposed into sub tasks and steps; the standards, conditions, difficulty, importance and frequency of each element are defined; the knowledge, skills, attitudes, job aids, tools, policies and references for each element are identified; the performance, enabling and learning objectives are generated; courses to address training needs are composed; and budget, personnel and resources needed are uncovered. To effectively manage all this data over time, decision support tools are needed to simplify data collection, analysis, management and updating.

- ✓ Compiling, comparing and analyzing the data of a job/position, crew, school, command or the entire organization to identify venues for: maximizing training impact; minimizing training duplication; revealing training creep; improving resource allocation; increasing throughput; reducing costs, time to competency and time away from the job; preserving training programs integrity, effectiveness, efficiency and relevance as missions, goals, designs and policies evolve and mature; improving performance and mitigating risks. With hundreds of thousands of data items to be considered, a decision support tool is needed to facilitate the analysis, compile the results and generate actionable reports.