



Pension Benefit Guaranty Corporation
Office of Inspector General
Final Report

Ariel Application System
Post-Implementation Audit

August 21, 2007



Pension Benefit Guaranty Corporation

Office of Inspector General

1200 K Street, N.W., Washington, D.C. 20005-4026

August 21, 2007

MEMORANDUM

To: Richard Macy
Chief Operating Officer

From: Luther Atkins 
Assistant Inspector General for Audits

Re: Final Report on the *Ariel* Application System Post-Implementation Audit

The Office of Inspector General's final report resulting from our Post-Implementation audit of PBGC's *Ariel* Application System is enclosed. The primary objectives of this audit were to answer the following questions about the *Ariel* project:

- Has the *Ariel* application implementation met its established performance and cost projections?
- Has the vendor complied with PBGC policy and procedures during modifications and development, implementation, and operations?
- Have appropriate information technology and business controls been implemented and tested for proper functionality?

Where appropriate we have included recommendations for improving controls and overall project management. PBGC's and Morneau's responses to these recommendations are included in the report and as Appendix V for PBGC and Appendix III for Morneau. We consider recommendation numbers COO-8, COO-9, and PD-83 as significant recommendations for reporting purposes and the status of corrective actions on these will be reported in OIG's semi-annual report to Congress.

We would like to take this opportunity to express our appreciation for the overall cooperation that we received from your office and all parties involved in performing this audit.

Enclosure

cc: Charles E. F. Millard, Interim Director
Marty Boehm, Director Contracts and Controls Review Department
Judith Starr, General Counsel
Susan Taylor, Procurement Department
Bennie Hagans, Director Benefits Administration and Payment Department
Stephen Barber, Chief Management Officer
Patsy Garnett, Chief Information Officer
Robert Emmons, Inspector General
Deborah Stover-Springer, Deputy Inspector General and Legal Counsel

Contents

Audit Report

Introduction	1
Results in Brief	2
Background	5
Findings and Recommendations	9
<i>Ariel</i> implementation lacked performance and cost projections	9
Vendor and <i>Ariel</i> project team generally complied with PBGC policy and procedures	11
Information technology and business controls need improvement	13

Appendices

Appendix I: Objectives, Scope, and Methodology	19
Appendix II: Abbreviations	20
Appendix III: Morneau Sobeco Site Visit Results	21
Appendix IV: Schedule of <i>Ariel</i> costs	32
Appendix V: PBGC Management Responses	38

INTRODUCTION

The Office of Inspector General (OIG) of the Pension Benefit Guaranty Corporation (PBGC) engaged Accretive Solutions, Inc. to assist the OIG in performing a post-implementation and performance audit of the *Ariel* application, a replacement system for PBGC's existing Actuarial Calculation Toolkit II (ACT).

When a single-employer pension plan terminates, PBGC assumes responsibility for paying the plan participants their benefits. To do this, PBGC must gather data and perform actuarial calculations to value each participant's benefit. Both ACT and *Ariel* can perform the actuarial calculation. The ACT application, which is still active, uses a spreadsheet approach to combine participant data and calculations in rows. *Ariel* is a pension administration system that uses a parameter driven programming approach that calculates a pension plan participant's valuation of benefits. It also supports membership data base updates, electronic data interfaces, calculations and transactions. It was developed and is used by Morneau Sobeco (Morneau) for on-going active pension administration of Canadian, Dutch and some U.S. companies' pension plans.

PBGC is using *Ariel* to perform individual calculations and plan valuations of participants' benefits, subject to the rules and regulations imposed on PBGC. The system is licensed for a fee from Morneau and as such, PBGC does not own the product or a copy of the source code for the program, though a copy is to be maintained in escrow. Normally, use of licensed software does not include payment of development costs, especially when the software is considered leased and not owned. As of June 1, 2007, PBGC has obligated over \$34 million to both develop and implement *Ariel* to meet its needs. Meanwhile, PBGC continues to use ACT, albeit in a much lesser role.

Since *Ariel* has been implemented and used by the Corporation's actuaries, many in the corporation, both users and management officials, have raised concerns about the cost, performance, and overall management of the *Ariel* project. Because *Ariel* plays a significant role in PBGC's long term business needs, has taken a long time to develop, and has been an expensive system for the Corporation to develop and implement, our office initiated a review of the *Ariel* project. Specifically, the objectives of this audit were to answer the following questions about the *Ariel* project.

- Has the *Ariel* application implementation met its established performance and cost projections?
- Has the vendor complied with PBGC policy and procedures during modifications and development, implementation, and operations?
- Have appropriate information technology and business controls been implemented and tested for proper functionality?

RESULTS IN BRIEF

Overall, we concluded that PBGC needs to reassess and verify the cost and benefits of *Ariel* before making any additional investments in this application. The project has experienced delays and the estimated cost and benefits of the project have never been adequately documented. As a result, the initial sole source contract for *Ariel's* development grew from an initial obligation of about \$500,000 with a ceiling of just over \$900,000 to over \$2.8 million after six amendments. The second sole source contract for *Ariel's* implementation grew from \$1.8 million to over \$31 million with 13 amendments. Additionally, there was a separate sole source contract for a consultant to work with the implementation of *Ariel* in the amount of \$757,000. PBGC also needs to solicit proposals, before modifying the existing contract, to determine if there are other vendors that can provide a better solution for valuing plan benefits or providing the necessary services at a competitive cost.

Performance and Cost Projections Lacking.

PBGC management did not develop a meaningful cost-benefit analysis for the *Ariel* project or establish any measurable performance goals. Those goals that were identified in a March 2003 presentation were subjective and did not include any significant benchmark to which they could be appropriately measured. Therefore this project could not be managed well as it was not expected to meet any specific documented cost and benefit goals or performance measures. Because such goals and measures were lacking, accountability was weak and the ability to govern this project was diminished. These controls should have been developed during the systems planning phase. Further, we could not find evidence where PBGC's management of the *Ariel* project tried to ensure that the changes to milestones and cost were justified based on the benefits of the project. Consequently, objective performance measures were not established for the contractor as well. Before additional investment is made in *Ariel*, PBGC needs to establish a quality oversight mechanism that ensures that the cost and benefits of the application are quantified and verified with objective performance measures.

Vendor and PBGC Ariel project team generally complied with PBGC's Application Development Policies and Procedures.

Based on the documentation and information received and reviewed related to the *Ariel* software development process followed by Morneau and PBGC, we believe improvements could have been made. With respect to a 2005 report produced by PBGC outlining "compliance" with a standard System Life Cycle Methodology in effect at the time of the report, we noted that the report represented more of a checklist approach to documentation with areas where steps were not completed and no indication of the quality of the product produced being evaluated. As such, issues related to quantifiable benefits, cost/benefit analysis, anticipated return on investment with a break-even point identified and appropriate quality oversight were incomplete or non-existent and would have an impact on the project's success.

The process that led to the award of the first contract should have included a requirement for Morneau to follow PBGC's project management and software development guidance. Unfortunately at the time, PBGC did not have a well-developed project management or software development policy or standard. Therefore, it appears that Morneau followed its own informal development process with project management oversight being provided by the PBGC project team.

By the time the second contract was awarded, PBGC had developed and implemented a methodology to be followed by all contractors in the development of any business application or system. Although this methodology still needed additional work, it was the standard at the time and there was reluctance on the part of the project team to follow this standard.

Controls Implemented and Tested But Need Improvement.

Our review identified various business and technology controls that were in place both at PBGC and at the contractor's site. These controls are related to the business processes performed by Benefits Administration and Payment Department (BAPD) staff using *Ariel* and technology controls related to application processing, change management, testing, and information security. Although we found instances where controls are generally adequate, we did identify areas where improvement is needed.

Other Observations

The original concept of the *Ariel* project has not been reassessed to ensure the validity of the original assumptions and requirements. We could not determine whether PBGC intended to simply license a software product from a company or to have a company produce a specific software product to meet PBGC's needs. We believe the original justification attempted to do both with the anticipation that only minor modifications would be required to meet PBGC's unique business needs. This also led to the original sole source contract for the development of specifications of a product to meet these anticipated needs. Based on these specifications, the second sole source contract was awarded to the same contractor, with the understanding that PBGC would not own the software, all changes to the software would be made available for use to all clients and processing and storage of data would take place at the contractor's site in Canada. In the initial phase of the contract, it became apparent that the *Ariel* product required a significant number of modifications, but other vendors were not solicited, at that time, to determine if there was a better solution for valuing plan benefits. As a result, PBGC awarded the contracts and associated amendments to the contract assuming that no other vendor could provide a solution.

We observed areas where general computer, development, and operational controls related to the *Ariel* application could be improved. Additionally, we determined through our interviews with a cross-section of PBGC management, staff and contractors involved with *Ariel* in some capacity, there are mixed reactions as to the efficiency and effectiveness of *Ariel*. Of the approximately 40 people interviewed, 50% indicated that changes affecting the process of valuing plans with the use of *Ariel* have negatively

impacted day-to-day operations and customer service, 34% said it had a positive impact and the remainder were neutral in their analysis.

We also noted that *Ariel* grew well beyond the scope of the original contracts with Morneau. PBGC awarded contracts and modifications totaling over \$34 million, or approximately thirteen times the original \$2.7 million scope of the project. In follow-on work, we will review whether PBGC had effective controls over contract modifications for *Ariel*.

We recommended that PBGC improve the management of the *Ariel* project by:

- Re-assessing and verifying the cost and benefits of *Ariel* before making any additional investment in this application;
- Soliciting other contract proposals to determine if there are other vendors available for valuing plan benefits; and
- Ensuring compliance with the requirements in the ITSLCM when investing additional resources in *Ariel*.

Agency Comments

PBGC management agreed with our recommendations and stated that a number of the recommendations in the report already are being implemented, and welcome the opportunity to improve our processes in planning and obtaining information technology solutions for participant services.

Our detailed recommendation and management's response follow each finding. Management's verbatim comments can be found in Appendix V.

BACKGROUND

Before *Ariel*, PBGC used Actuarial Calculation Toolkit II (ACT) a spreadsheet-based approach to calculating valuations. Using ACT, each participant's data is entered on a row or number of rows (depending on the number of data items or "pieces" of data needed) within a spreadsheet with all relevant data recorded in specific cells within the rows. Also within these rows, the actuaries built programs and added spreadsheet calculations that use the available data to calculate that participant's benefit. The advantage here is that the data collection personnel and the actuaries can make changes and estimations for an individual's data then paste the changes into the spreadsheet with the results available almost immediately. The disadvantage was there was little or no security. ACT did not provide an audit trail of changes, and the set up and format of the data may not be consistent from one analysis to another.

In ACT, if the pension plan contained provisions that PBGC had not encountered before, then new programs and spreadsheets would have to be built, tested and the calculations added as appropriate to each participant's row. As each calculation may be programmed by a different actuary (potentially), there was an opportunity for the calculation methods to vary as well. The methods would be sound, but may reflect each actuary's different approach or professional judgment. Again, this introduced an element of inconsistency.

Since PBGC had identified a number of drawbacks to the spreadsheet approach, a new system was considered to replace ACT. As PBGC pursued their replacement strategy, they did not seriously consider upgrading ACT once they were introduced to the concept of a "parameter-driven" system for benefit calculations. *Ariel* was selected based on the following considerations:

- *Improved PBGC staff and contractor efficiency.* PBGC staff and contractors would not have to set up each participant's calculations for each provision. Instead, one or more parameters can be set up to define each participant's calculations. In addition, the *Ariel* Plan Analysis Document (APAD), which provides information to select and define *Ariel* parameters, would provide the first step in the documentation of how the pension plan calculations were decided upon. This would potentially reduce the amount of time spent documenting the plan calculations for the Blue Book. The Blue Book is a summary of the specific plan provisions, how the pension plan is valued and other information on the plan.
- *Consistency of the calculations used.* ACT allowed the actuaries to define the calculations used for each valuation of the individual participant. In ACT, actuaries may select different calculation methods for the same types of valuations. *Ariel* uses parameters to set up the calculations then processes the individual participant's data using the appropriate calculation to produce consistent results.

- *Improved security and audit capability.* With ACT there is no ability to implement and monitor security. If an individual could access the participant database, s/he could make changes. There was a risk of the data integrity being compromised. Furthermore, ACT did not maintain an audit trail of who changed what data. *Ariel* provides the ability to define multiple levels of security and provides an audit trail, recording who changed data and when.
- *Enhanced data integrity.* *Ariel* has the capability to flag data as “estimated,” “verified” or “unknown” reflecting the source of the data. Data auditors can use this capability to identify estimated data and later replace it with verified data as it is collected. ACT did not have this capability.
- *Reduced number and frequency of change requests.* As PBGC identifies and requests changes to the parameters and other features of *Ariel*, it is expected that the number of changes will decrease. The expected decrease will be due to PBGC having already defined a library of parameters to leverage knowledge for re-use.
- *There is only one version of the calculation program.* The sets of parameters (defined by the pension plan provisions) and the participant data are used by the *Ariel* calculation program to create consistent individual valuations. Using ACT, the whole spreadsheet had to be stored (data and the spreadsheet formula). If there were changes to the spreadsheet application program itself, there was a risk that the old stored spreadsheet might not work using the new program. Also, due to limitations of the spreadsheet application, one plan may be divided over a number of spreadsheets. The *Ariel* application is independent of the participant data. Upon approval of an updated version of *Ariel*, all the old data from previously valued plans are migrated, maintained to be able to be read by the new version of *Ariel* and reproduce the original calculations.

The *Ariel* application was developed by a Canadian-based firm, Morneau, and was originally designed and built for internal use in support of the company’s pension plan administration business. In 1998, PBGC discovered the application through a presentation by its then external auditors. At that time, the same external auditors were a part owner of Morneau who reluctantly agreed to partner with the external audit firm and modify its *Ariel* application for PBGC. However, PBGC decided to contract directly with Morneau to modify the application for its use, thus eliminating the “middleman.” Being a Canadian-based firm, Morneau’s experience was in Canadian and Dutch pension plans with little to no experience or specialized knowledge in U.S. pension laws. Also, Morneau’s major business was in pension administration of viable, ongoing pension plans. They did not have the unique experience needed to understand PBGC’s business of terminating and administering terminated pension plans. As a result of Morneau’s lack of experience in U.S. pension law and PBGC’s business, Morneau engaged a U.S. pension consulting firm to assist them in the initial setup of *Ariel* for PBGC. In the future, it was expected that PBGC would provide U.S. pension law knowledge and experience.

Morneau was eventually awarded the project on a sole source basis, resulting in two contracts. The first was to develop the “system specifications for the modification of the *Ariel* software package.” These modifications were, to the extent practicable, “to conform to existing PBGC business practices.” The initial obligation amount was for approximately \$500,000 with a ceiling price of \$900,000. There were six modifications that added money, and the final value of the initial contract was \$2.87 million. The second sole source contract, which is still open, was to modify *Ariel* software to meet the business needs of PBGC. Initial funding of \$1.78 million was provided; there was no cost ceiling. This contract has had 13 modifications that added funds and the contract value currently stands at \$31.29 million. We have identified an additional \$440,000 directly attributable to the project for legal advice expenses and the development of the initial training courses for *Ariel*. In addition another sole source contract was awarded to one individual as a consultant on this project for about \$757,000. With this and other associated expenses, total contract costs are now in excess of \$34 million, excluding the costs attributable to contract actuaries and PBGC personnel involved with defining, testing, migrating and implementing *Ariel* changes. In conversations with Morneau, we were informed that further costs will be incurred to enable the application to carry out calculations for provisions that have not yet been encountered; however, both PBGC and Morneau that the number of changes should decrease as the library of parameters expands. This assumption is based upon PBGC and Morneau being able to avoid defining and programming parameter changes to address specific plan requirements and allowing existing parameters sufficient flexibility to be re-used.

Ariel was modified to meet the initial specifications and a decision made to implement the system using Morneau as an Applications Service Provider (ASP). This means the *Ariel* application and PBGC data are housed on servers at Morneau offices in Montreal, Canada. PBGC connects to these servers through the internet to update and process the data.

To get the application installed early, PBGC agreed to forgo the programming and implementation of a user friendly front-end that would allow PBGC actuaries to set up parameters. Instead it was agreed to train three PBGC actuaries on the old parameter set-up methodology, use the contractor’s integrators, and postpone training other actuaries until the new interface could be programmed. This led to the contractor providing integrator services to PBGC. Our interviews with PBGC and PBGC contractors indicated some difficulties existed in communicating with the contractor personnel in setting up the parameters for integrations. These difficulties were mainly related to nomenclature, technical definitions, some minor language and cultural differences, and the time it took to get things done. In all cases our interviewees noted that the contractor personnel were always helpful.

Ariel’s initial implementation took place in October 2004, with the Bethlehem Steel plans chosen as one of five plans in the pilot program. PBGC determined that the Bethlehem Steel plans would provide *Ariel* with a rigorous test considering its size and complexity. It did not take long for PBGC and the contractor to recognize that the existing parameters already developed and included with the licensing of the product were not sufficient to

meet the needs of the plan valuation. Therefore, several new parameters would have to be identified, defined, programmed and tested to accommodate the pension plan calculations and increase the cost of *Ariel*. The Bethlehem Steel plans are still being processed today.

FINDINGS and RECOMMENDATIONS

Ariel implementation lacked performance and cost projections.

Information systems project controls are considered important for adequate project management and to identify the best use of PBGC's scarce resources. Such controls include:

- Accurately identifying the needs of the organization;
- Developing and documenting an evaluation of alternatives; and
- Creating a detailed cost/benefit analysis that would include an expected return on investment.

These controls are part of the feasibility and planning phase of an information system project that occurs prior to procurement. They are essential to ensuring that PBGC and the vendor understand exactly what is needed and the vendor can provide the required product or service in an efficient and cost-effective manner. Once these items are identified and documented, they provide management with an additional tool to monitor and control the project.

Since the project was initiated in 2000 with a \$500,000 sole source contract that rose to \$2.78 million after six amendments, and followed with a 5-year, \$1.78 million sole source contract awarded in 2003, the total cost in project development and implementation has increased to over \$34 million, with additional contracts and modifications. The project has experienced delays. It has taken almost 7 years from the initial phase of the project this point, with valuations in some cases taking significantly longer than anticipated. In addition, the estimated cost and benefits of the project have never been adequately documented. This includes a lack of a break-even point for the project, an estimated return on investment, or having goals that are quantifiable, objective, and measurable.

In requesting all available documentation related to the overall *Ariel* project, we were unable to obtain or locate a detailed cost/benefit analysis for selecting this product, an analysis of the pros and cons of modifying the existing ACT system and replacing it with *Ariel*, or a retrospective evaluation of the project. Nor were we able to locate an evaluation of existing work processes or an assessment of the impact of the new system on these processes. Such an analysis may have identified several of the factors that later impacted the initial implementation of *Ariel*. For example:

- The absence of data requirements for each parameter.
- *Ariel's* requirement for additional and more consistently formatted data.
- The amount of time taken to complete a valuation.

Identifying these type of factors as part of the initial project would have the potential to reduce the time and cost associated with development and implementation. Additionally, it may have had an impact on the decision to use the *Ariel* application. In an audit report

that reviewed procurement activities from 1998-2004 surrounding the contract award for *Ariel*, we found that PBGC did not have documentation to support that it had conducted required advanced project planning, e.g., the Individual Procurement Plan and cost-benefit documentation was not completed prior to the contract award.¹ The report states: “without adequate documentation, we are unable to determine if appropriate advanced planning was performed” (see Procurement Audit Report, cited below, page 4). We concluded this was a procurement weakness and recommended that the Procurement Department establish procedures relating to retention of advanced procurement planning documents. At that time, we planned to conduct this performance audit after *Ariel* was implemented and operational.

From this implementation audit, we find that the impact of that finding is now realized. It was not simply a lack of documentation of the advanced planning to contract for *Ariel*, but rigorous advanced planning was not done. This has significantly impacted the implementation in various ways, including user dissatisfaction, substantially greater parameter development than was originally stated and exponential cost increases.

In our September 2005 report, we also noted that the contract to implement *Ariel* was executed on May 29, 2003, and through October 2004, had been “amended 13 times to modify the period of performance, expand the scope, and increase the funding” (see Procurement Audit Report, cited below, page 3). At that time, funding had increased from about \$1.8 million to almost \$12 million. Through May 18, 2007, the end of our *Ariel* audit fieldwork, the contract had been amended 7 more times, and the funding increased to approximately \$33 million. We will be conducting follow-on work to review the effectiveness of PBGC’s controls to prevent out-of-scope modifications to contracts.

Advanced procurement planning defines PBGC’s business needs, processes and performance goals, thereby setting the expectations for effective project management. Better overall governance of this project through the use of proper management and oversight would have enhanced the potential for accountability with respect to costs, performance, and project effectiveness and efficiency.

Recommendations:

For the Chief Operating Officer:

Re-assess and verify the cost and benefits of *Ariel* before making any additional investment in this application. **(OIG Control Number COO-8)**

Management Response:

We agree and are currently performing such an analysis that is due, September 30, 2007. Additional investments will not be made until the study is complete but we will continue to process the work currently under way in *Ariel*.

¹ Audit of Procurement Activities Related to Award of Morneau Sobeco Contracts PBGC01-CT-00-0597 and PBGC01-CT-03-0667 (September 29, 2005).

For the Contracting Officer:

Solicit proposals before modifying the existing contract to determine if there are other vendors that can provide better solutions for valuing plan benefits or providing the necessary services at a competitive cost. **(OIG Control Number PD-83)**

Management Response:

We agree. A Request for Information (RFI) has been published. Information from this solicitation will be used in determining future contract actions. Because of the timing of this effort, it may be necessary to extend the current contract vehicle to complete work already in progress, but we will make that decision only when required. Additionally, we may need to amend the current contract to finalize the Service Level Agreements and for other items to improve PBGC's interests.

Vendor and Ariel project team generally complied with PBGC's Application Development Policies and Procedures

Based on the documentation and information received and reviewed related to the *Ariel* software development process followed by Morneau and PBGC we believe improvements could have been made. With respect to a 2005 report produced by PBGC outlining "compliance" with a standard System Life Cycle Methodology in effect at the time of the report, we noted that the report represented more of a checklist approach to documentation with areas where steps were not completed and no indication of the quality of the product produced being evaluated. As such, issues related to quantifiable benefits, cost/benefit analysis, anticipated return on investment with a break-even point identified and appropriate quality oversight were incomplete or non-existent and would have an impact on the project's success.

Overall, Morneau and the *Ariel* project team generally complied with PBGC's project management and development policy and procedures where they existed and could be enforced. However, due to the lack of a comprehensive set of standards to follow, Morneau was allowed to apply its own development process with oversight from the PBGC project team. This approach provided opportunities where both the process and the management could have been improved. This included compliance by both Morneau and PBGC with standards and guidance provided by Federal agencies such as the Office of Management and Budget (OMB) and the National Institute of Standards and Technology (NIST). Both of these organizations provide guidance on security and operation of federal systems both on-site and by a service provider such as Morneau. PBGC should take all measures available to it to ensure compliance is achieved and Morneau understands PBGC's expectations.

Throughout the development of *Ariel*, PBGC was in the process of establishing a standard method for software development and project management, continually enhancing and refining its approach. Although the *Ariel* project team determined how to proceed with its development project, a better understanding of overall project management would have enhanced the project outcomes. For example, establishment of

specific guidelines and appropriate requirements should have been of heightened importance considering that Morneau, by their own admission, was and to this day is not in the business of software development to provide commercially available software products for purchase.

PBGC has recently released and is training its employees with a new Information Technology Solutions Life Cycle Methodology (ITSLCM). Compliance with these new standards is mandatory for all future project development at PBGC and should be adhered to in any additional development efforts for *Ariel*.

As a part of this audit we made a site visit to Morneau's offices in Montreal, Canada. The primary purpose of this visit was to review and test the general computer controls to ensure the integrity of the PBGC data throughout the development and processing of the *Ariel* application. The extent of the controls established and followed by Morneau over changes to PBGC programs, data, and processing are important to ensure the accuracy of the processing and the security of PBGC data.

Although Morneau is not in the software development business for commercial purposes, their controls over modifications and development appear adequate. We did note some missing documentation for modifications, but PBGC established new procedures to address this point. Also, it is Morneau's practice to test each modification at the unit and system levels before it is released for PBGC User Acceptance Testing. This is supplemented by Morneau's regression testing which is done nightly.

However, we did note a number of issues from our Montreal visit related to data protection and general computer controls. Below are examples of some of these issues.

- Morneau does not have an independent method for tracking and accounting for backup tapes at all times. Morneau documented the backup media as it moved to the off-site vendor, that vendor's holding tape inventory process and receipt back at the contractor's site. However, tracking for the tape stops there. So, there is no accounting for the tape between the point where it is received back at Morneau's site and the point where it rotates into usage again as a backup tape and is sent back offsite. Morneau has agreed to the finding and will implement an independent tape inventory system.
- When the *Ariel* application is undergoing a conversion, regular backup of PBGC servers is suspended and backup tapes are not produced. In this case we identified a gap of one week where the backup tapes were not produced. Morneau indicated that this was their regular practice, as creating backup tapes during a conversion negatively impacts the conversion process. Morneau has agreed to the finding and will be cooperating with PBGC in addressing the issue.

All issues identified during our site visit were documented, presented, discussed, and Morneau's responses received. These issues, with their associated documentation, are detailed in Appendix III.

Recommendation for the Chief Operating Officer:

Ensure compliance with the requirements in the ITSLCM when investing additional resources in *Ariel*. (**OIG Control Number COO-9**)

Management Response:

We agree. Continued compliance with the Information Technology Solutions Life Cycle Methodology (ITSLCM) is planned by the *Ariel* project team and management.

Information technology and business controls need improvement.

Our review identified various business and technology controls that were in place both at PBGC and at the contractor's site, including such controls related to the business processes performed by Benefits Administration and Payments Department (BAPD) staff using *Ariel* and technology controls related to application processing, change management, testing, and information security. Although we found instances where controls are generally adequate, we did identify areas where improvement is needed and noted below.

Application service provider analysis was not completed.

PBGC decided that all processing would be performed outside of PBGC by Morneau acting as an Application Service Provider (ASP). In our review, we noted that the decision to use an ASP was not fully supported. The Office of Information Technology (OIT) produced an adequate and detailed analysis of the information technology cost comparison between using an ASP and bringing the application "in-house" (OIT analysis marginally favored the ASP solution). However, a complete analysis was not performed and the final decision (signed off by the Director of IOD, the Chief Technology Officer and the project manager) stated that the analytical comparison was no longer required because "PBGC would realize several benefits from the combined accelerated project schedule and the ASP deployment option."

While we recognize that production of a detailed cost analysis for the selection of the ASP option at this point in the project may have limited use, we believe a re-assessment of this approach would validate if this choice is still appropriate. If the re-assessment shows that the benefits outweigh the costs potential for improved controls, then PBGC should continue using a third party to process its valuation calculations and store its data.

Escrow account needs to be consistently refreshed

The current contract specifies a control that supports continuity of processing in the event anything were to happen to the contractor that maintains and supports *Ariel*. This control requires the contractor to deposit and maintain in an escrow account a current copy of the software associated with the *Ariel* application to a third party to hold "in escrow." In the event that the contractor should go out of business or be incapable of supporting the

software, the escrow copies of the software are the only copies to which PBGC may have access.

During our review we noted the escrow account was not refreshed on a regular basis. The escrow account had been updated in February 2007, but there were no refreshes in 2006 and only one refresh in 2005. The escrowed version of the software code is PBGC's assurance that they will have a working copy of the *Ariel* code to continue operations. If the escrow account is not consistently maintained, PBGC operations could be negatively affected and PBGC will have to incur additional costs. However, we note this escrow account only contains the *Ariel* code and not the PBGC data processed by the application. PBGC data is maintained at Morneau's offices and backed up for storage off-site. Issues concerning data backup are in Appendix III. An additional concern is that PBGC has no access to any of the tapes containing its data stored off-site by Morneau. These two factors create vulnerabilities for PBGC if Morneau is unable to provide services to PBGC.

Service level agreements are needed to establish performance objectives and metrics.

Controls established to ensure that performance expectations are met are provided through Service Level Agreements (SLA). The SLA can be used to identify performance objectives and associated metrics to monitor compliance with contractor performance, application performance, hardware/software performance, or overall business process performance.

During our review, we noted that PBGC has identified a number of metrics used as a measure of compliance to an SLA related to *Ariel* performance. Unfortunately, the metrics developed are not very meaningful and are not enforceable because PBGC and Morneau have not executed an SLA so PBGC can monitor and hold Morneau accountable for its performance. We noted that PBGC is negotiating with Morneau to establish performance metrics for application processing and in meeting contracted deliverables. These performance measures are an extremely important tool for PBGC, especially since the development and processing of the application is performed at Morneau's site.

Continuity of operations testing does not include connectivity between sites.

PBGC has worked diligently to develop and implement a comprehensive contingency plan and testing schedule. Likewise, we noted that Morneau has in place a plan to recover its operations in the event of an unscheduled interruption to normal business processes. Unfortunately, we did not see any evidence of a test that included connectivity between Morneau's site, recovery site, PBGC's site, or PBGC's recovery site. This should be considered a crucial component of recovery of the *Ariel* application and tested routinely by both PBGC and Morneau.

Training delivery and content could be improved.

In the final stages of initial programming PBGC contracted with an outside firm, rather than Morneau, to produce training on the *Ariel* application. PBGC requested Morneau to provide assistance to the training contractor and allow them access to the application. According to interviews with Morneau, they were not requested to review the completed training package. This approach precluded Morneau, as the system developer and owner, from validating the training's integrity or appropriateness for PBGC users.

Additionally, the timing of the training appears to have been inappropriate. The training classes were held months before the actual implementation of the application and well before PBGC users had access or the need to use the *Ariel* application. Also, in the time between the training classes and the first use of *Ariel* there had been a number of changes to the system with little or no follow-up. The combination of time between training and use of the application and the addition of system changes greatly impacted the training's effectiveness.

Another training program has been developed and implemented to transition the integrator role. This would allow PBGC staff to modify or change an *Ariel* parameter without Morneau assistance. While Morneau told us it developed this program free of charge, we understand that it has been offered to PBGC staff at a set cost per seat and as of May 2007, it is being offered to all PBGC actuaries.

Access to PBGC servers need to be more restrictive and monitored.

Administrators have the ability to add, delete, or modify anything that resides or is processed on a server to which they have administrator rights. As such this capability should be granted sparingly, when needed, and the actions of the person granted the capability logged and/or monitored. These logs should then be reviewed frequently by an individual with oversight responsibility to ensure only authorized transactions were performed.

During our review of PBGC server access, we noted a number of contractor personnel were set up as administrators on PBGC servers. When the contractor was asked about the access, they indicated that two of their personnel had been set up with this capability in error. We also asked the PBGC system administrator for copies of the authorization for the other individuals with administrator rights because they did not appear on the authorized user list. We were informed that authorization is normally granted by email, but in these cases the PBGC administrator could not provide us with a copy of the emails. This, in combination with the finding that the contractor had accidentally set up two of their own personnel with administrator rights, indicates that the access to PBGC data may not be adequately controlled. In addition, PBGC does not monitor what personnel do when they possess administrator capabilities. Thus, it would be possible for intentional or unintentional changes to be made without PBGC being able to trace back to the parties responsible or identify what was done.

We also noted that normal user access to PBGC data is not reviewed on a periodic basis. Discussions with PBGC's *Ariel* systems administrator indicated that a request to automate the review was underway. However, in the meantime, there is not a periodic review of user access to ensure that only personnel with a need to access data have the ability to do so.

Change management.

The change management process today is somewhat cumbersome and involves the understanding of changes needed by both PBGC and the contractor. If either party does not fully understand the change needed or cannot communicate the change appropriately to the contractor, then timeliness becomes an issue. With *Ariel* all changes are initiated by PBGC and authorized via email. Once the change is documented and placed in the contractor's hands, a specific process takes place that includes some good controls including the design, development, unit testing, system testing, and regression testing of the change before handing the finished product to PBGC for User Acceptance Testing.

PBGC has experienced some problems with change control. In discussions with Morneau and PBGC staff these problems appear to have two root causes: (1) PBGC's poorly developed requirements or (2) Morneau's misunderstanding of requirements. If changes relate to poorly developed requirements, Morneau charges PBGC to fix the issue. However, if the changes relate to Morneau's misunderstanding, there are no additional charges. It appears that a cause of some of Morneau's misunderstanding is their lack of experience with United States pension law and concepts along with the uniqueness of PBGC's business.

Since this application is not owned by PBGC and changes to it will at some point become critical, documentation related to these changes must be kept and available as needed for reference.

User Acceptance Testing as a control in the whole change management or software development process is extremely important. Through this type of testing the user of the application can exercise a completed modification or change in a production-like environment to see if it operates as intended. If not, then the request is returned to Morneau for further refinement.

During our review of Change Management Documentation we found that not all of the change documentation was available. In discussions with the User Acceptance Testing (UAT) manager, she indicated that she was aware that for some of the earlier User Acceptance testing some of the documentation had been lost. However, she is in the process of updating the UAT procedures and she expects the new procedures will rectify the problem. The procedures she described and the procedures used to monitor and control the October 2006 and March 2007 releases did have good documentation; but, the procedures used have not been documented.

Recommendations for the Chief Operating Officer:

If PBGC decides to continue *Ariel* development, we recommend that PBGC:

- Implement a process to ensure that a current copy of the *Ariel* software is routinely deposited and maintained in the established escrow account. **(OIG Control Number COO-10)**

Management Response:

We agree. The PBGC COTR will verify each time there is a system release provided to PBGC, that in fact a copy has been put into escrow.

- Implement a meaningful Service Level Agreement that includes quantifiable performance objectives and measures for *Ariel* and Morneau and monitor performance. **(OIG Control Number COO-11)**

Management Response:

We agree. The ASP working group is in the process of finalizing service levels for *Ariel*. The final product from this group is expected on August 30, 2007. When this document is approved by BAPD management, a modification to the contract will be processed.

- Perform disaster recovery testing of connectivity between PBGC's recovery site and the contractor's site and performance of the *Ariel* application. **(OIG Control Number COO-12)**

Management Response:

We agree. Morneau's next COOP testing effort is planned to take place during September and October 2007. PBGC's *Ariel* Project Manager will work to develop a plan for inclusion in the semi-annual COOP testing.

- Re-assess training needs and provide additional training to *Ariel* users. Where follow-up is required, ensure the training meets the application's functionality. **(OIG Control Number COO-13)**

Management Response:

We agree and have recently completed full training on the *Ariel* setup process. On an ongoing basis, the Lead Integrator will monitor requests for support and questions in order to determine areas of emphasis that could indicate a training need.

- Implement controls to monitor administrator and user access to *Ariel*, and periodically review access authority. **(OIG Control Number COO-14)**

Management Response:

We agree. On the first of the month, PBGC's *Ariel* system administration team will reconcile the active *Ariel* User Access list with the eLAN Requests (to include PBGC Headquarters, Field Benefit Administration (FBA) sites, Contract Actuary sites and Morneau) and HD Separation requests submitted the previous month. Unauthorized users will be removed.

- Improve procedures for requesting, documenting and controlling changes to *Ariel* while ensuring that these improvements and all future changes are communicated in a manner that is specific, concise, and understood by all parties. **(OIG Control Number COO-15)**

Management Response:

We agree. *Ariel* change request process has recently been updated to include: (1) sign-off by a BAPD technical actuarial reviewer for each change request developed, (2) presentation of the change request by actuary to the Change request board, (3) attendance of the original change request writer at the requirements sessions, and (4) formal review meetings with TPD actuaries of all requirements documentation.

Appendix I

Objectives, Scope, and Methodology

The Office of Inspector General (OIG) of the Pension Benefit Guaranty Corporation (PBGC) engaged Accretive Solutions, Inc. to perform a post-implementation audit of the *Ariel* application. An initial review was conducted to acquaint Accretive with an understanding of PBGC operations and the functionality of the *Ariel* application. Once this was completed, the objectives of the audit were the following:

- Has the *Ariel* application implementation met its established performance and cost projections?
- Has the vendor complied with PBGC policy and procedures during modifications and development, implementation, and operations?
- Have appropriate information technology and business controls been implemented and tested for proper functionality?

We performed our work from September 2006 to June 2007 in accordance with generally accepted government auditing standards. In accomplishing the audit, we reviewed contract and project management documents, interviewed PBGC and contractor personnel, and observed use of the *Ariel* application. Our work included a site visit to review general computer controls related to data storage, application processing, and software development including change management at the contractor's office in Montreal, Quebec, Canada. We reviewed the contractor's operations, policies, and procedures relative to PBGC's use and support of *Ariel*. We performed testing at both PBGC and the contractor site to determine if stated procedures were in place and functioning as expected. Where control issues or deficiencies were identified, we documented the issue, developed recommendations or suggestions for their resolution, and received management's response.

Appendix II

Abbreviations

ACT.....	Actuarial Calculation Toolkit
ASP.....	Application Service Provider
BAPD.....	Benefits Administration & Payments Department
CCRD.....	Contracts and Control Review Department
COTR.....	Contracting Officer Technical Representative
D&T.....	Deloitte & Touche
DRP.....	Disaster Recovery Plan
ERISA.....	Employee Retirement Income Security Act
GUI.....	Graphical User Interface
HD.....	Help Desk
H/W.....	Hardware
IOD.....	Insurance Operations Department
IRMD.....	Information Resource Management Department
IT.....	Information Technology
MS.....	Morneau Sobeco
NIST.....	National Institute of Standards and Technology
OIG.....	Office of Inspector General
OGC.....	Office of General Counsel
OMB.....	Office of Management and Budget
PBGC.....	Pension Benefit Guaranty Corporation
PwC.....	PricewaterhouseCoopers
RFI.....	Request For Information
S/W.....	Software
SLCM.....	System Life Cycle Methodology
SOW.....	Statement of Work
TPD.....	Trusteeship Processing Division

Appendix III

Morneau Sobeco Site Visit Issues

In late February 2007 a team composed of the OIG IT Audit Manager, the PBGC COTR for the *Ariel* project and two Accretive Solutions personnel visited the Morneau Sobeco Offices in Montreal, Quebec, Canada. This office is where the PBGC *Ariel* data is stored and processed with Morneau performing task of Application Service Provider (ASP).

The purpose of the visit was to identify and review the general computer controls in place at the contractor's office including physical security, logical security and access, change control practices, and backup and recovery procedures/plans. Any control issues we identified were presented to Morneau management and discussed prior to our leaving their offices. Those issues and Morneau's responses are included in the remainder of this Appendix.

OIG Control Number BAPD-29

Condition: Although the computer room fire suppression system is a dry-pipe, water-based system with a manual override, one large bare wet pipe, not associated with the fire suppression system, runs through the entire computer room directly over the PBGC servers. There are no measures in place to protect the PBGC servers from damage in the event of condensation or accidental leakage from this pipe.

Cause: The existing wet pipe above PBGC servers running through the computer room services the floor and building in which Morneau operates.

Criteria: National Institute of Standards and Technology (NIST) Special Publication (SP) 800-53, *Recommended Security Controls for Federal Information Systems*, indicates that “An organization protects its Information Systems from water damage from broken plumbing lines or other sources of water by providing master shut off valves that are working properly and known to key personnel”

Effect: PBGC servers could be damaged by accidental water leak that could cause interruption to service, loss of data, and need to replace hardware.

Corrective Action Recommended: We have discussed with Morneau the need to install some sort of protective measure to minimize the effect of condensation from the wet pipe. We would also like to recommend the posting of a contact telephone number to shut off the water, and the purchase and availability of plastic sheeting that could be used to cover the servers in the event of an accidental leak in this wet pipe until the water could be shut off and repairs made.

Morneau Response:

Morneau agrees there is a risk of having a water pipe running above the servers. We will look into obtaining a quote to have a tray installed under the pipe. Once this is obtained we will need to get this cost approved by a partner.

Morneau feels that the dry pipe system with the manual override sufficiently reduces the risk of an accidental water discharge to eliminate the need for waterproof covers. Other factors that need to be considered are employees must evacuate to room in the case of a fire. Employee’s safety takes precedence in such a case.

PBGC OIG evaluation and reply:

While we agree with Morneau’s comment concerning the fire suppression system, we maintain the posting of a contact telephone number to shut off the water and provision of plastic sheeting should be considered to protect PBGC servers in the event of a leak from the wet pipe.

Morneau reply to PBGC OIG comment:

Morneau will purchase and keep the plastic sheeting to protect the PBGC servers in case of the water leak.

There is no “shut-off” valve because this pipe is a waste water drain pipe.

Both of the above items will be completed by end of April 2007.

OIG Control Number BAPD-30

Condition: The emergency exit leading to the reception area and adjacent to the computer room is not clearly marked and is “secured” by a non-alarmed crash bar and masking tape.

Cause: Morneau had not yet addressed properly securing this location after some recently completed remodeling occurred.

Criteria: NIST Special Publication (SP) 800-53, *Recommended Security Controls for Federal Information Systems* states: “The organization develops, disseminates, and periodically reviews/updates: (i) a formal, documented, physical and environmental protection policy that addresses purpose, scope, roles, responsibilities, and compliance; and (ii) formal, documented procedures to facilitate the implementation of the physical and environmental protection policy and associated physical and environmental protection controls”.

Effect: Use of this exit for other than emergency reasons may go unnoticed and lead to the potential of unauthorized access to the File Room and the Computer Room from the Reception Area.

Corrective Action Recommended: We recommend the installation of an alarmed crash bar on the emergency exit.

Morneau Response:

An alarm for the Emergency Exit door leading to the reception has been approved. This needs to be scheduled for installation. If the door is kept ajar for a certain time the alarm will be set off.

OIG Control Number BAPD-31

Condition: There is no formally documented process for requesting, providing, or approving badge access to the computer room.

Cause: Although a process is followed by Morneau to provide badge access to the computer room, it has never been formally documented.

Criteria: NIST Special Publication (SP) 800-53, *Recommended Security Controls for Federal Information Systems* states: “The organization develops, disseminates, and periodically reviews/updates: (i) a formal, documented, physical and environmental protection policy that addresses purpose, scope, roles, responsibilities, and compliance; and (ii) formal, documented procedures to facilitate the implementation of the physical and environmental protection policy and associated physical and environmental protection controls”.

Effect: By not formally documenting the process for badging individuals allowed access to the computer room Morneau may experience inconsistencies, loss of knowledge, and the inability to measure compliance.

Corrective Action Recommended: We recommend that a formal process be documented and implemented.

Morneau Response:

Morneau will develop a formal process for requesting or providing badge access to the computer room.

OIG Control Number BAPD-32

Condition: We noted that for the only example of a swap out of hardware we obtained, there was no recorded change ticket available.

Cause: Morneau overlooked the documentation of this item in their change control process. Only software or system account changes were documented.

Criteria: NIST Special Publication (SP) 800-53, *Recommended Security Controls for Federal Information Systems* states: “The organization documents and controls changes to the information system. Appropriate organizational officials approve information system changes in accordance with organizational policies and procedures”.

Effect: If all changes including configuration changes to hardware are not included in a formal change control process there is an increased risk of failures of equipment recovery in contingency situations, and ability to monitor approval of changes to environment.

Corrective Action Recommended: Hardware and software changes should be supported by change tickets.

Morneau Response:

The problem we have encountered here is that the change management system was not being used for any PBGC related change requests since PBGC has no access to this system. E-mail is always used to obtain approval from PBGC for changes and even for a simple server reboot. In the future Morneau will use e-mail with PBGC but will also enter any H/W and S/W changes in their change management system.

OIG Control Number BAPD-33

Condition: During our review of the vendor offsite back up inventory we noted the absence of certain backup tapes. Upon subsequent inquiry, we learned that the tapes in question were not “missing,” but had not been generated. According to Morneau the generation of backup tapes during a conversion negatively impacts the conversion process. In the case we noted, the backup tapes were not created for a week.

Cause: Conversion procedures are negatively impacted by backup programs.

Criteria: NIST Special Publication (SP) 800-53, *Recommended Security Controls for Federal Information Systems* states: “The organization employs mechanisms with supporting procedures to allow the information system to be recovered and reconstituted to the system’s original state after a disruption or failure”.

Additionally, Morneau backup policies and procedures indicate that backup is done daily.

Effect: In the case we found there were no daily backups performed for one week. The absence of these backups exposes PBGC to the potential of having to reconstruct, re-input or a potential loss of data in the event of a disaster occurring while a conversion is in process.

Corrective Action Recommended: We recommend Morneau comply with its policies and procedures for backup and produce backup tapes during the conversion process.

Morneau Response:

In the near future Morneau will implement a tape library to help reduce the backup window. This should help alleviate the problem by reducing the time it takes to write data to tapes so the migration and backup process should not conflict. Until testing is done with the new equipment Morneau cannot guarantee there will be no conflict since the two processes may still overlap.

The reason the backups were not taken during the previous conversion was due to the fact that we were working to accommodate the PBGC team. PBGC wanted a big bang approach where all "Case numbers (i.e. databases)" are converted at the same time. This made it impossible to take backups since the data was in use by the conversion process. Morneau had proposed an approach where the conversion is done on an ongoing basis and is managed by Morneau.

For the next conversion, July 2007, the issue will likely occur again unless the PBGC team changes their approach to the data conversion. In any event since the backup process and conversion process must be mutually exclusive Morneau will request a formal management approval from PBGC to proceed with a solution when there is a request to stop regular backups during a conversion.

OIG Control Number BAPD-34

Condition: During our review of the replies to our follow up questions on the backup and recovery processes at Morneau, we noted that Morneau does not have a separate inventory or tracking system to account for all backup tapes.

Cause: Backup tapes can be identified going to the offsite storage, at the offsite storage site and returning from the storage site. However, from the time the tape is received by Morneau to the time it is reused and returned to offsite storage Morneau does not account for the tapes which can contain sensitive PBGC data.

Criteria: NIST Special Publication (SP) 800-53, *Recommended Security Controls for Federal Information Systems* indicates that the organization should protect information identified (as sensitive) until the media are destroyed or sanitized.

Effect: Tapes that are unaccounted for may go missing and their loss may not be noticed. This could lead to the exposure of sensitive PBGC data.

Corrective Action Recommended: We recommend the implementation of an inventory or tracking policy and procedure that will permit Morneau to account for the location of all PBGC tapes.

Morneau Response:

Morneau does not maintain an inventory list independent of the offsite vendor. A spot check is performed to verify that the previous weeks tapes have appeared in the inventory with the correct dates. A screen shot of how this review is logged has been annexed.

PBGC OIG reply:

We accept the spot check as an adequate control for the delivery to the offsite vendor. However, given the very sensitive nature of the data on the tapes, we believe that Morneau should be independently able to account for all tape locations (onsite, in transit, and offsite).

Morneau reply to PBGC OIG comment:

Morneau will manage their own independent inventory so they can account for all tape locations.

OIG Control Number BAPD-35

Condition: In the review of the capabilities of personnel to retrieve offsite media from the secured offsite vendor we noted:

- 16 personnel had the capability to order the retrieval of offsite tapes.
- The retrieval capabilities assigned to the personnel did not reflect the needs of the organization.
- There was only one person with the authority to change the retrieval capabilities.
- A contractor has retrieval capabilities.
- There is no independent review of who is requesting delivery of backup media.

Cause: Morneau had not implemented a process to identify and monitor retrieval of data from their off-site facility.

Criteria: NIST Special Publication (SP) 800-53, *Recommended Security Controls for Federal Information Systems* states: “The information system provides the capability to determine whether a given individual took a particular action (e.g., created information, sent a message, approved information [e.g., to indicate concurrence or sign a contract] or received a message)”.

Effect: There is an increased risk of unauthorized access to PBGC information and a lack of accountability by not monitoring the retrieval of data from the off-site facility.

Corrective Action Recommended: We recommend a complete review of the access to offsite tape retrieval. We also recommend that a list of requests for backup tapes returned be produced and reviewed by an independent person on a periodic basis to ensure that requests are justified in the normal course of business.

Morneau Response:

Morneau has reduced this list to a total of 10 employees and one contractor. - 3 in Toronto and 8 in Montreal.

Toronto (individuals can assist Mtl in a disaster)

1 Level 1, Manager Technical Services and 2 Level 3, Operations

Montréal (individuals can assist Tor in a disaster)

1 Level 1, Manager Technical Support, 6 Level 3, Front-line/operations and 1 Level 6 (will be changed), Director Technology Operations.

In addition to ordering the tapes for delivery, Agent Level 3 is also able to personally pick up media from the offsite vendor’s site. However the vendor must be notified by an Agent Level 1 that the person will be presenting themselves. The Agent Level 3 person must also present the card provided by the vendor as well as 1 piece of identity to prove they are who they say they are. Agent Level 6 is setup for

DRP testing purposes. However our vendor does not play provide (sic) Morneau with any disaster recovery services. So the level 6 is not very appropriate in out (sic) case and will be changed to 1.

One specific individual who is a contractor with Morneau has had a background check performed by Morneau and has also been cleared by Canadian Government – Duties require him to have this access.

Morneau will investigate whether our off-site storage vendor can generate e-mail alerts when tapes are requested. Based on a response to this request we will look into implementing a formal documented procedure integrating alerts or if required purely manual (sic).

OIG Control Number BAPD-36

Condition: In the review of PBGC Server Accounts we noted two Morneau personnel were members of ArlDB_Admins Group which has access to PBGC data. We also noted two groups ("MS *Ariel* Developers," and "C_BBCMIT_ArlAdmins Group.") set up with *Ariel* access for which we could not find a documented list of users.

Cause: Two staff inadvertently had access to PBGC data and the other groups were missing the membership listing.

Criteria: Office of Management and Budget (OMB) Circular A-130, Appendix III, B. a. 2) c) states: "It has long been recognized that the greatest harm has come from authorized individuals engaged in improper activities, whether intentional or accidental. In every general support system, a number of technical, operational, and management controls are used to prevent and detect harm. Such controls include individual accountability, "least privilege," and separation of duties".

Effect: Unauthorized access increases the risk to data integrity and not having a process to monitor access increases the risk of unauthorized access.

Corrective Action Recommended: We recommend their removal as they have no business need for this access. We also recommend that the groups MS *Ariel* Developers and C BCMIT ArlAdmins have their membership documented.

Morneau Response:

This was an error and has been removed.

Presently, there are members of MS *Ariel* Developers who are database managers. The group is given access to specific Case #'s.

Appendix IV

Schedule of Costs – *Ariel* History

- December 1998, PricewaterhouseCoopers (PwC), PBGC’s external auditor at that time, arranged for a demonstration of the *Ariel*.
- January 1999, PBGC personnel traveled to Montreal to present “An Overview of the PBGC Valuation Process” to Morneau, which outlined PBGC’s method of performing its valuations.
- May 27, 1999, PBGC published a Request for Information (RFI) on parameter-driven pension benefit calculation software.
- June 15, 1999, the PwC/Morneau team submitted a response to the request on indicating that *Ariel* was capable of fully meeting six (mainly technical) of the fifteen requirements, and partially meeting one other requirement. According to information from an interview with former involved PwC employees who worked for PwC at that time, PwC was a part owner of Morneau and PBGC’s external auditor, which created a possible independence conflict, Morneau purchased PwC’s shares. Subsequently the shares were sold to Deloitte & Touche (D&T). At this time, PBGC and Morneau began communicating directly, rather than through a third-party. Subsequent to evaluation of all responses to the RFI, the Contracting Officer deemed it appropriate to begin negotiations with Morneau.
- August 30, 1999 PBGC issued notice in the Commerce Business Daily of its intent to award a sole source contract to Morneau.
- October 12, 1999, an objection to the announcement was made by one responding firm which suggested that their application would meet PBGC requirements.
- October 14, 1999 PBGC had completed its evaluation of the firm’s application who lodged an objection on October 12, 1999 and determined that it did not meet PBGC’s requirements. The objection was formally rescinded by the firm and instead the firm offered consulting assistance to support the conversion of a Canadian pension plan administration system (*Ariel*) to a U.S. system, along with incorporating Employee Retirement Income Security Act (ERISA) and PBGC regulations and policies. However, later, Morneau subcontracted with Palmer & Cay, a U.S.-based Benefits Consulting firm, to provide the Social Security functionality for *Ariel*.
- November 17, 1999, PBGC issued a report on the evaluation of the four RFI responses it received. Two firms’ applications were rejected as their products would require substantial modification to core software and architecture. An additional

firm's response was rejected, as they did not respond appropriately to Sources Sought document, nor provide sufficient relevant information.

- January 6, 2000, the contractor was invited to submit a Request for Proposal.
- July 13, 2000 a procurement requisition was signed providing a Statement of Work (SOW) requiring the development of systems specifications (contract PBGC01-CT-00-0597). Initial Contract amount was \$541,838, with a ceiling price of \$924,472.
- September 5, 2000, the Contracting Officer requests an OGC review of the first contract; however, upon our inquiry, OGC was unable to produce any documentation indicating that a request was received and no other documentation other than an undated internal OGC memo expressing reservations with the sole source award, without soliciting competitive bids. Memo indicates that OGC concerns were overtaken by procurement action.
- December 2000 PBGC requested a \$237,396 (almost a 44% addition to the initial \$541,838) change to the SOW to modify *Ariel* Process documentation for use as a reference guide, incorporation of Cash Balance Plans to the specifications, and integration training for two PBGC actuaries.
- May 2001, the contractor had completed Phases 1 and 2, as defined in the initial SOW, and the deliverables resulting from the first modification of the SOW
- July 2, 2001 the contractor began work on Phases 3 and 4, and PBGC requested \$986,929 in additions to the SOW, thus doubling the contract value (total value \$1,786,163).
- August 2001. All work to date was completed on time and budget.
- March 2002 CCRD noted in a discussion with the Information Resources Management Department (IRMD) that the *Ariel* project was not conducted in compliance with PBGC's System Life Cycle Methodology (SLCM) and that the total projected costs for *Ariel* would be \$21 million. IRMD was uncertain that *Ariel* would cost \$21million, but indicated that the lack of SLCM compliance "is risky with that kind of money." Also, PBGC's Office of Inspector General (OIG) reports indicated that the SLCM was developed and tested by the year 2000, but that its use had not been demonstrated as of September 30, 2001.
- March 20, 2002, pursuant to FAR 5.101(a) (1) and 5.201 (b) (1), the procurement of *Ariel* was synopsisized on the FedBizOpps website. No qualification statements were submitted by other vendors.
- April 1, 2002 the Procurement Officer received a memo the PBGC Project Leader justifying the use of a Labor – Hour Contract for the modification and implementation of *Ariel*. A "Justification for other than full and open competition

Pursuant to FAR 5.101(a) (1) and 5.201 (b) (1)” document was provided on April 30, 2002 and approved by the Contracting Officer’s Technical Representative (COTR); Director of IOD, vouching for the Technical Certification; and, the Contracting Officer and Deputy Executive Director and Chief Management Officer, for the Contracting Officer’s Certification and Competition Advocate Concurrence respectively. The total value of the SOW was estimated at \$4 million.

- April 29, 2002, the second contract (Contract PBGC01-CT-03-0667) was sent to the OGC for review. The following day, the OGC identified legal issues relating mainly to PBGC’s rights to the application. The Project Leader requested expeditious approval of the contract by May 22, 2002. OGC responded that it could only promise to distribute comments on the contract by that date.
- May 8, 2002, the contractor and the PBGC development team for *Ariel* made a presentation to the then Executive Director, and other PBGC senior management, outlining the rationale for selecting the *Ariel* application. The presentation did not include a cost benefit analysis or business case for replacing ACT. The presentation provided a comparison of the Application Service Provider (ASP) versus the “hosted at PBGC” options. The ASP option, as presented, seemed to be the most beneficial solution; however, no detailed analysis and comparison of hardware, software and telecommunications costs for each option was provided, at that time.
- May 17, 2002, the Contracting Officer released a Determination and Findings memo to the file indicating this (the new 0667 contract) was a sole source contract and outlining the reasons to use a labor-hour contract. The memo also provided an estimate of the costs (\$4 million), the timeframe of the contract (five years), and the activities/phases of the contract.
- May 21, 2002, OGC requested assistance from outside counsel, Morgan Lewis & Bocklus LLP, to assist with the review and provide additional software contract expertise.
- June 5, 2002 PBGC added a further modification to the (0597) contract for \$782,594 (another 42% increase) “to allow the Contractor to produce a technical design of modifications to the *Ariel* Software package and extend the period of performance.” The addition increased the total (0597) contract value to \$2,623,157.
- June 21, 2002 Morgan Lewis indicated that a number of issues with the second (0667) contract existed, including poor structure, the wrong type of contract (Labor-Hour instead of Cost Plus), the absence of PBGC’s rights to the software, and enforceability of the contract, amongst other legal points. Morgan Lewis also raised a point that it was an uncommon practice to award the contractor which designed the specifications to also be awarded a contract for the software. Insurance Operations Department (IOD), now Benefits Administration & Payments Department (BAPD), management did not consider a re-bid once the specifications were completed, stating that *Ariel* was the only parameter-driven application available. However, it

should be noted that over a year elapsed from the initial evaluation to the completion of the specifications, during which time other products could have entered the market.

- July 17, 2002, OGC’s opinion was sought concerning a possible conflict of interest in the hiring of a subcontractor whose spouse worked on the *Ariel* project. OGC recommended that the individual not be awarded a subcontract.
- August 12, 2002, PBGC approved the technical design indicating that the contract for development of the application should be awarded to the contractor. At this point the intent of the (0597) contract appears to have changed from a specifications and general planning focus to detailed implementation and specific application modifications. Planning for the implementation included the development of training plans; however, this task was awarded to another contractor at an additional cost of \$363,515.
- August 28, 2002, OGC continued to express reservations concerning the business case for *Ariel* and the structure of the contract. The General Counsel instructed the attorneys to continue their review and provided additional funds for Morgan Lewis to re-write the contract.
- September 5, 2002, CCRD issued a report indicating the contractor’s accounting systems were not designed to meet government contracting requirements for cost plus based contracts. In addition, the CCRD noted that the contractor was the defendant in a lawsuit concerning the calculation of benefits (which was later deemed without merit) and had a negative cash position on their financial statements (a corporate structuring problem overcome by good relations with their lenders). CCRD also reported questioned costs in the amount of \$2,521,877 of the proposed costs (\$4,011,179), which resulted in a reduction of the contractor’s hourly rates.
- September 11, 2002, Morgan Lewis completed a draft of wording for the second contract and submitted it to OGC for review. The majority of the changes and recommendations were incorporated into the final version of the contract, but there were further discussions concerning wording on testing terminology and negotiations on escrow of the *Ariel* software. The contract notes that “costs associated with Delivery Option 2 (the ASP option) will be negotiated shortly after the contract award.”
- December 31, 2002, the contractor was awarded a Labor-Hour contract for “Parameter-Driven Benefit Calculation Software/Software Modification and Implementation.” (Contract Number PBGC01-CT-03-0667).
- January 3, 2003, was the effective start date of the second contract (PBGC01-CT-03-0667). The contract value was approximately \$3.5 million, not including ongoing support or software licensing fees.

- March 1, 2003, the (0597) SOW was changed instructing the contractor to begin laying the foundations for the implementation of the application. These additions (nine in total), worth \$227,708, raised the total cost to \$2,850,865 (approximately an 8.6% increase). The final contract value was \$2,875,773, as a result of a modification to extend the period of performance to May 2006. There were two outstanding items from contract PBGC01-CT-00-0597 that had not been completed. PBGC had contracted for a Graphical User Interface (GUI) for the parameter set up. The interface would make it easier for PBGC actuaries to set up and program the *Ariel* parameters that govern the calculations. The second item is the Web Calculator that would permit customers to access the estimation of their benefits. In our conversations with the contractor Project Leader, it was pointed out that work on these two parts of the project was postponed, at PBGC direction, to allow resources for the construction of new parameters identified in the pilot implementation.
- March 1, 2003, an additional \$65,827 is added to the second contract (0667) for the contractor to add 6 workstations for PBGC use in Montreal.
- March 27, 2003 The Project Charter (for 0667), which includes the goals of the project, scope and guidelines, and how the project will be managed, was presented and subsequently approved by the contractor and PBGC Project Leaders. Goals for the application consist of:
 - Reduce Valuation Costs by at least 25%
 - Shorten Valuation Time by at least 25%
 - Simplify the Valuation Process
 - Improve Audit ability of Valuations
 - Improve Security and Internal Controls
- May 28, 2003, PBGC Business worksheet claimed an internal rate of return on the project of 77% and a return on investment of 20.51. *Ariel* would begin to recognize benefits in the year 2004. Total costs through 2008 were estimated at \$11.3 million and total benefits projected out to 2008 at \$18.2 million.
- May 29, 2003, (with an effective date of January 1, 2003), the PBGC01-CT-03-0667 contract was approved for the “Software Modification and Implementation.” The modifications were to be based on the “detailed specifications for the modification of the *Ariel* Software to meet PBGC business needs” as defined in the PBGC01-CT-00-0597 contract. The initial value was \$1,788,577 for the period January 1, 2003 through September 30, 2003 and \$627,646 for October 1, 2003 through September 30, 2004.
- June 1, 2003 another \$186,983 was added (total 0667 contract value \$2,041,342) for currency exchange rate changes and increased hours due to “unanticipated complexities in coding.”
- October 1 2003, \$1,298,005 is added (to contract 0667) to fund services for FY 2003 – September 2004. (Total 0667 contract value \$3,339,347).

- 2004 Undated (possibly February or March) OMB 300 worksheets project costs of \$3.6 Million and projected benefits of \$6.7 million through FY 2008.
- April 7, 2004, \$1,276,678 added to the contract for systems testing, pilot training, new valuation output folder, *Ariel* demo to PBGC, and other changes. (total 0667 contract value \$4,616,025)
- April 7, 2004, *Ariel* project leader makes a presentation to an unknown audience projecting costs for *Ariel* of \$8.5 million and hard-dollar savings of \$4.8 million and other benefits, FY 2005 through FY2007.
- July 19, 2004 PBGC approved an additional \$3,030,739 (total contract value \$7,646,764) for the pilot using the Bethlehem Steel pension plan.
- September 8, 2004 a purchase requisition added \$1,300,013 to the contract for software modifications and implementation support. (total contract value \$8,946,777)
- October 1, 2004 added \$3,000,000 to fund increased labor hours for implementation support and ASP Level 1 services (total contract value \$11,946,777).
- Through 2005, more than \$12 million was added to the contract costs for the application, mostly for plan integration services, implementation, user acceptance testing support, and data support.
- 2006 saw the addition of \$3,153,000 for plan integration services and ASP support.

Currently it's estimated that the total costs of *Ariel* exceed \$34 million, which does not include the PBGC and non-Morneau contractor personnel costs involved in testing and implementation.

Appendix V

PBGC Management Response



Pension Benefit Guaranty Corporation
1200 K Street, N.W., Washington, D.C. 20005-4026

Office of the Director

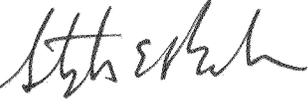
AUG 15 2007

TO: Luther Atkins, Assistant Inspector General for Audit
Office of Inspector General

FROM: Charles E. F. Millard, Interim Director 

Richard Macy, Chief Operating Officer 

Bennie Hagans, Director 
Benefits Administration and Payment Department

Stephen Barber, Chief Management Officer 

 Susan Taylor, Director 
Procurement Department

Patsy Garnett, Chief Information Officer 

SUBJECT: Post-Implementation Audit of the Ariel Application System

We appreciate your work in reviewing the Ariel system and the opportunity to comment on your draft report. We are pleased to note that a number of the recommendations in the report already are being implemented, and welcome the opportunity to improve our processes in planning and obtaining information technology solutions for participant services.

The Ariel system was selected and implemented to replace the home-grown Actuarial Calculation Toolkit (ACT) - a template system of spreadsheets, macros, programs and databases that was highly customized to each plan on an individual basis. At the time, PBGC was seeking a solution that would increase consistency, security and timeliness while reducing resource needs. To that end, PBGC issued a Request for Information (RFI) for qualified vendors, performed due diligence on the responses and determined that Morneau Sobeco (Morneau) was the only viable option of the respondents.

In implementing Ariel, PBGC faced several challenges, and we acknowledge that costs have increased significantly over time. This was due, in part, to the need to develop and integrate new benefit algorithms associated with the large, complex plans being processed – ones that PBGC had neither previously encountered nor anticipated. This functionality (which PBGC would need to implement, regardless of system) caused a delay in building a user-friendly plan set-up tool. This delay (which was not planned for in the original Statement of Work) caused PBGC to rely on Morneau resources (rather than PBGC and other contract resources) to set up plans, which contributed heavily to the growth in contract size.

As with any information technology investment, it is appropriate to assess the costs and benefits of Ariel and make an assessment as to next steps, which PBGC is in the process of performing. It is clear from the history of this project that at various stages cost-benefit and alternative analyses should have been done and that general oversight was insufficient. The executive management team of PBGC is determined to make significant progress in these areas. In an effort to better manage its information technology investments, we note that PBGC has taken steps to improve its system development and project management processes. As the report notes, PBGC released its Information Technology Solutions Life Cycle Methodology (ITS LCM) and recently provided training to employees. PBGC is implementing an IT governance structure based on an integrated life cycle management framework for architectural planning, investment management, security and solutions development to ensure IT solutions align with business needs. Additionally, appropriate investment review boards and committees are being refined to strengthen the decision points regarding IT investments. We are committed to selecting information technology investments that will provide a positive return on investment and providing appropriate oversight of those investments during the system life cycle.

As relates specifically to Ariel, the team signing the memorandum had reached a determination before the audit was received to close further investment in the system until the ongoing cost-benefit analysis has been completed.

**PBGC Responses to Recommendations -
Post-Implementation Audit of the Ariel Application System**

Recommendation (COO-8): Re-assess and verify the cost and benefits of Ariel before making any additional investment in this application.

Response: We agree and are currently performing such an analysis that is due, September 30, 2007. Additional investments will not be made until the study is complete but we will continue to process the work currently under way in Ariel.

Recommendation (PD-83): Solicit proposals before modifying the existing contract to determine if there are other vendors that can provide better solutions for valuing plan benefits or providing the necessary services at a competitive cost.

Response: We agree. A Request for Information (RFI) has been published. Information from this solicitation will be used in determining future contract actions. Because of the timing of this effort, it may be necessary to extend the current contract vehicle to complete work already in progress, but we will make that decision only when required. Additionally, we may need to amend the current contract to finalize the Service Level Agreements and for other items to improve PBGC's interests.

Recommendation (COO-9): Ensure compliance with the requirements in the ITSLCM when investing additional resources in Ariel.

Response: We agree. Continued compliance with the Information Technology Solutions Life Cycle Methodology (ITSLCM) is planned by the Ariel project team and management.

Recommendation (COO-10): Implement a process to ensure that a current copy of the Ariel software is routinely deposited and maintained in the established escrow account.

Response: We agree. The PBGC COTR will verify each time there is a system release provided to PBGC, that in fact a copy has been put into escrow.

Recommendation (COO-11): Implement a meaningful Service Level Agreement that includes quantifiable performance objectives and measures for Ariel and Morneau and monitor performance.

Response: We agree. The ASP working group is in the process of finalizing service levels for Ariel. The final product from this group is expected on August 30, 2007. When this document is approved by BAPD management, a modification to the contract will be processed.

Recommendation (COO-12): Perform disaster recovery testing of connectivity between PBGC's recovery site and the contractor's site and performance of the Ariel application.

Response: We agree. Morneau's next COOP testing effort is planned to take place during September and October 2007. PBGC's Ariel Project Manager will work to develop a plan for inclusion in the semi-annual COOP testing.

Recommendation (COO-13): Re-assess training needs and provider and provide additional training to Ariel users. Where follow-up is required, ensure that training meets the application's functionality.

Response: We agree and have recently completed full training on the Ariel setup process. On an ongoing basis, the Lead Integrator will monitor requests for support and questions in order to determine areas of emphasis that could indicate a training need.

Recommendation (COO-14): Implement controls to monitor administrator and user access to Ariel, and periodically review access authority.

Response: We agree. On the first of the month, PBGC's Ariel system administration team will reconcile the active Ariel User Access list with the eLAN Requests (to include PBGC Headquarters, Field Benefit Administration (FBA) sites, Contract Actuary sites and Morneau) and HD Separation requests submitted the previous month. Unauthorized users will be removed.

Recommendation (COO-15): Improve procedures for requesting, documenting and controlling changes to Ariel while ensuring that these improvements and all future changes are communicated in a manner that is specific, concise, and understood by all parties.

Response: We agree. Ariel change request process has recently been updated to include: (1) sign-off by a BAPD technical actuarial reviewer for each change request developed, (2) presentation of the change request by actuary to the Change request board, (3) attendance of the original change request writer at the requirements sessions, and (4) formal review meetings with TPD actuaries of all requirements documentation.

Recommendations (BAPD-29, 30, 31, 32, 33, 34, 35, 36): The report contains several recommendations to Morneau resulting from a site visit summarized in Appendix III of the draft report.

Response: We will monitor progress on the completion of these items by Morneau.