Request for Quotation for AFLCMC / Detachment 12 Kessel Run, Data Science Services Contract

# Factor 1: Technical

January 8, 2020

Solicitation No. HBBK-2019-0003, FA8730-20-F-0047

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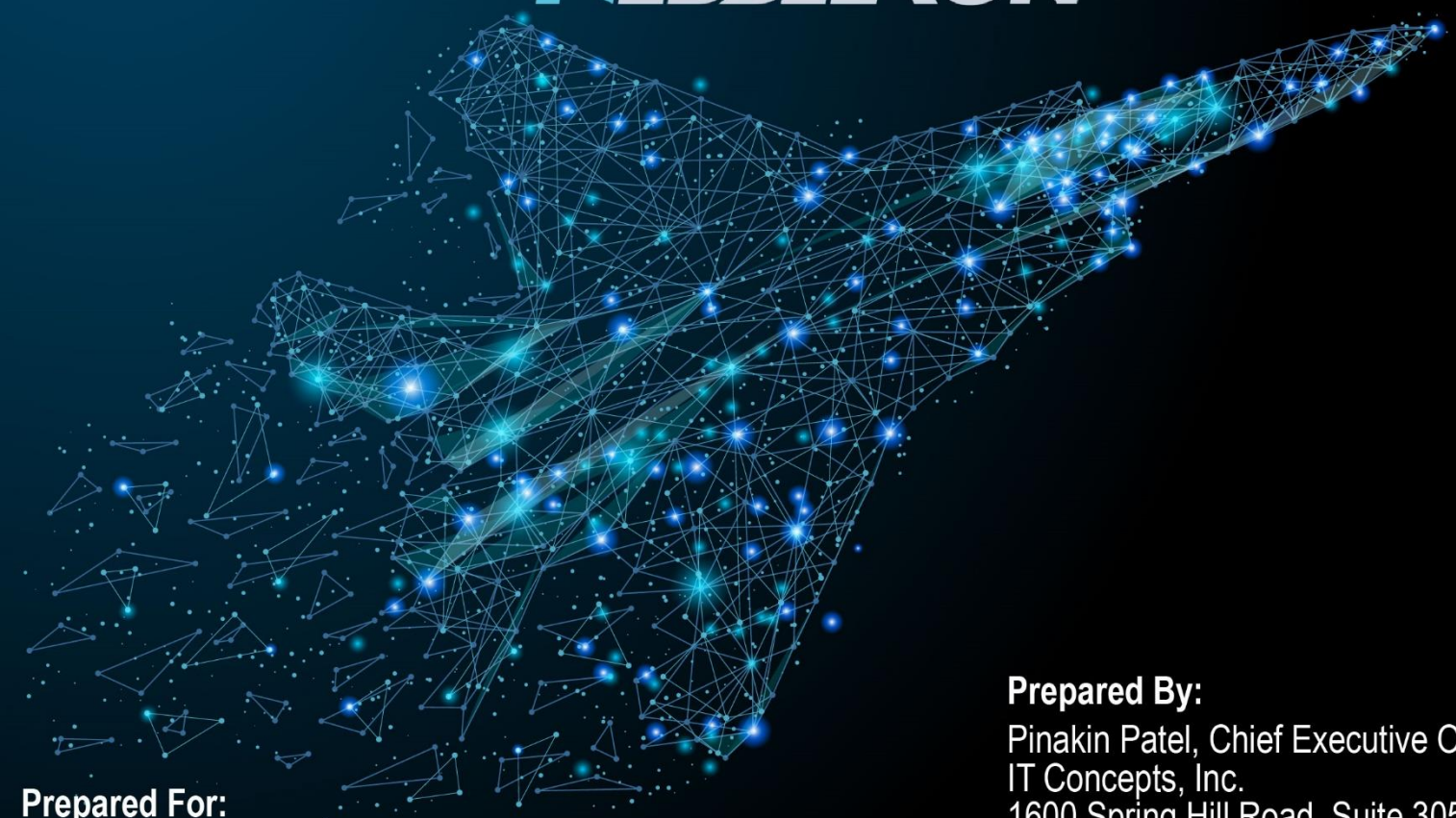

**Prepared For:**

Air Force Life Cycle Management
Center/DET-12
Attn: Ms. Sara Corsetti and Mr. Joshua Naim
25 Randolph Road, Building #1110
Hanscom, AFB 01731


**Prepared By:**

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1600 Spring Hill Road, Suite 305
Vienna, VA 22182

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Air Force Life Cycle Management Center/DET-12
Attn: Ms. Sara Corsetti and Mr. Joshua Naim
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Subject: IT Concepts, Inc. response to Request for Quotation for AFLCMC / Detachment 12 Kessel Run, Data Science Services Contract (Solicitation No. HBBK-2019-0003, FA8730-20-F-0047)

Dear Ms. Sara Corsetti and Mr. Joshua Naim,

IT Concepts, Inc. is pleased to provide this response to your request for proposal for AFLCMC / Detachment 12 Kessel Run, Data Science Services Contract. Included is the signed SF-30, Model Task Order - including the updated DD-254. Our response is comprised of this cover letter, and 2 Volumes: Volume I – Factor 1 Technical, Volume II – Factor 2 Cost / Price; and is compliant with the instructions provided in the solicitation.

This offer is valid for 180 days from the date specified for receipt of offers for the subject solicitation.

Should you require any additional information, please do not hesitate to contact me at (240) 602-2127 or by email at pinakin@useitc.com

Sincerely,

Pinakin Patel

CEO, IT Concepts, Inc

## Table of Contents

## List of Figures

## Glossary of Abbreviations and Acronyms

| Acronym | Definition |
|---|---|
| ACA | Associate Contractor Agreements |
| ACMI | Air Combat Maneuvering Instrumentation |
| ACOR | Assistant Contracting Officer Representative |
| ACT | Air Combat Training |
| ADO | Air Defense Operations |
| AFARS | Army Federal Acquisition Regulation Supplement |
| AFB | Air Force Base |
| AFI | Air Force Instruction |
| AFLCMC | Air Force Life Cycle Management Center |
| AIS | Advanced Information Systems |
| AKA | Also Known As |
| AOC | Air Operations Center |
| API | Application Program Interface |
| ASC | Analytic Services Contract |
| ASUM | Analytics Solutions Unified Method |
| AWS | Amazon Web Services |
| BMA | Business Modeling and Architecture |
| CAAF | Contractor Accompanying Armed Forces |
| CAF | Combat Air Force |
| CAFFE | Convolutional Architecture for Fast Feature Embedding |
| CAMEL | Casual Models to Explain Learning |
| CCE | Common Computing Environment |
| CDIR | Classless Inter-Domain Routing |
| CDO | Chief Data Officer |
| CDR | Commander (US Navy Rank) |
| CDRL | Contract Data Requirements List |
| CFR | Code of Federal Regulations |
| CIT | Concepts Information Technology (company name) |
| CLIN | Contract Line Item Number |
| CLM | Capability Lifecycle Management |
| CMMI | Capability Maturity Model Integration |
| CMR | Contractor Management Reporting |
| CMRA | Contractor Manpower Reporting Application |
| CONUS | Contiguous United States |
| COOP | Continuity of Operations |
| COR | Contracting Officer Representative |
| COTR | Contracting Officer's Technical Representative |
| COTS | Commercial Off-the-Shelf |
| CRA | Charles River Analytics (company name) |
| CTO | Chief Technical Officer |
| CUI | Controlled Unclassified Information |
| DAE | Developer's Assistance Environment |
| DAR | Decision Analysis and Resolution |
| DARPA | Defense Advanced Research Projects Agency |
| DCAA | Defense Contract Audit Agency |
| DEV | Develop |
| DFARS | Defense Federal Acquisition Regulation Supplement |
| DHS | Department of Homeland Security |
| DIA | Defense Intelligence Agency |
| DID | Data Item Description |
| DISA | Defense Information Systems Agency |
| DMDC | Defense Manpower Data Center |
| DMO | Distributed Mission Operations |
| DNN | Deep Neural Network |
| DOD | Department of Defense |

| Acronym | Definition |
|---|---|
| EDI | Electronic Data Interchange |
| EOD | End of Development |
| EPS | Enterprise Platform Services |
| ETL | Extraction, Transformation, and Loading |
| FAR | Federal Acquisition Regulation |
| FCL | Facility Clearance Level |
| FEDRAMP | Federal Risk and Authorization Management Program |
| FMLA | Family and Medical Leave Act of 1993 |
| FOIA | Freedom of Information Act |
| FSO | Facilities Security Officer |
| GOTS | Government Off-The-Shelf |
| GPS | Global Positioning System |
| GWU | George Washington University |
| HAC | High Availability Clustering |
| HIPAA | Health Insurance Portability and Accountability Act of 1996 |
| IAW | In Accordance With |
| ICADS | Individual Combat Aircrew Display System |
| IDIQ | Indefinite Delivery, Indefinite Quantity |
| IMS | Integrated Master Schedule |
| IPR | In Progress Review |
| ISO | International Standards Organization |
| ISR | Intelligence, Surveillance, and Reconnaissance |
| ITAR | International Traffic Arms Regulation |
| ITC | IT Concepts, Inc. |
| JPAS | Joint Personnel Adjudication System |
| JSON | JavaScript Object Notation |
| JWICS | Joint Worldwide Intelligence Communications System |
| KPP | Key Personnel Position |
| KREL | Kessel Run Experimentation Lab |
| LOE | Level of Effort |
| MAPE | Monitor, Analyze, Plan, and Execute |
| MARS | Monitoring, Analysis and Response System |
| MCTS | Microsoft Certified Technology Specialist |
| MDO | Military Deception Officer |
| MEME | Mission Ecosystem Microservice Environment |
| MGMT | Management |
| MIT | Massachusetts Institute of Technology |
| MPP | Massively Parallel Processing |
| MRI | Magnetic Resonance Imaging |
| MSE | Mean Squared Error |
| MSR | Monthly Status Report |
| MSSQL | Microsoft SQL Server |
| NDA | Non-Disclosure Agreement |
| NDAA | National Defense Authorization Act |
| NGA | National Geospatial Agency |
| NIST | National Institute of Standards and Technology |
| NLP | Natural Language Processing |
| NLT | No Later Than |
| NTE | Not to Exceed |
| OCI | Organizational Conflict of Interest |
| OCONUS | Outside Continental United States |
| ODC | Other Direct Cost |
| ODNI | Office of Director of National Intelligence |
| OMS | Open Mission Systems |
| OPM | Office of Personnel Management |
| OPSEC | Operational Security |
| OSP | Organizational Standard Process |

| Acronym | Definition |
|---|---|
| PAAS | Platform-as-a-Service |
| PCF | Pivotal Cloud Foundry |
| PCO | Procuring Contracting Officer |
| PKI | Public Key Infrastructure |
| PMBOK | Program Management Body of Knowledge |
| PMI | Program Management Institute |
| PMO | Program Management Office |
| PMP | Program Management Plan |
| PMR | Program Management Review |
| POC | Point of Contact |
| PRS | Performance Requirement Summary |
| PWS | Performance Work Statement |
| QAP | Quality Assurance Plan |
| QASP | Quality Assurance Surveillance Plan |
| QCP | Quality Control Plan |
| QMP | Quality Management Plan |
| RDB | Relational Database |
| RDS | Relational Database Service |
| RFQ | Request for Quotation |
| RMSE | Root Mean Square Error |
| RNN | Recurrent Neural Network |
| SAF | Deputy Under Secretary of the Air Force |
| SBIR | Small Business Innovation Research |
| SCI | Sensitive Compartmented Information |
| SCM | Scrum Master |
| SCON | Service Continuity Plan |
| SDS | Service Delivery Summary |
| SDVOSB | Service-Disabled Veteran Owned Small Business |
| SME | Subject Matter Expert |
| SMLD | Service Management Lifecycle Document |
| SOO | Statement of Objectives |
| SOP | Standard Operating Procedure |
| SPEAR | Simplified Planning Execution Analysis and Reconstruction |
| SPOT | Synchronized Pre-deployment and Operational Tracker |
| SQL | Structured Query Language |
| SSL | Secure Sockets Layer |
| STINFO | Scientific and Technical Information |
| SVC | Services |
| SWE | Society of Women Engineers |
| TBD | To Be Determined |
| TCP | Total Compensation Plan |
| TRN | Task Requirements Notice |
| UCI | Universal Command and Control Interface Standard |
| USAF | United States Air Force |
| USD | Under Secretary of Defense |
| USMC | United States Marine Corps |
| USN | United States Navy |
| VPC | Virtual Private Networks |
| VPN | Virtual Private Network |
| WBS | Work Breakdown Structure |
| XAI | Explainable Artificial Intelligence |
| MGMT | Management |
| MIT | Massachusetts Institute of Technology |
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| ODC | Other Direct Cost |
| ODNI | Office of Director of National Intelligence |
| OMS | Open Mission Systems |
| OPM | Office of Personnel Management |
| OPSEC | Operational Security |

# A Criteria A: Overarching Technical Approach and Plan (PWS Executive Summary) (11.2.1)

## A.1 Executive Summary

### A.1.1 IT Concepts (ITC) Advantage

The ITC Team brings broad experience implementing data science best practices and lessons learned to overcome the most challenging software and data engineering/science challenges. With science and technology experts from the DoD's top data science firms, we provide the right balance of management, process, technology, and innovation to achieve Kessel Run Program Objectives (**Figure A-1**).

**Figure A-1: ITC Team Approach to Meet Kessel Run Program Objectives**

| | Program Objective | Approach to Meet Kessel Run Program Objectives |
|---|---|---|
| 1 | **Data Management** | Data is the central concern with any application and proper data management and architecture is required to ensure all data collected is stored in an appropriate manner enabling it to be used across the enterprise in an efficient and scalable way. The ITC Team data management strategy involves our data engineers at the beginning of any effort, working with the customer so that they can gain understanding of not only what data is to be collected, but how that data is to be used, where it comes from, while adhering to data retention or data privacy policies - architecture is created with the full picture in mind. |
| 2 | **Data Visualization** | Data is only powerful if it can be effectively disseminated across a wide range of people. The ITC Team works to ensure this by leveraging established COTS and open source visualization tools, such as Tableau and Plotly, to provide a flexible and comfortable environment for users to explore their data. To capture the value behind the data, and provide an accessible way to see and understand trends, outliers, and patterns, our approach focuses on: (1) Identifying the User, (2) Identify the data, and (3) Hosting the Visualizations |
| 3 | **Data Optimization** | The ITC Team builds and uses sophisticated optimization models to provide better mission value and transform data into better decisions and make the most of the resources available. In order to handle the multitude of interdependent parameters inherent in any complex decision system, we work to identify and evaluate alternative designs and operating policies in our model and compare their predicted performance with the desired mission goals and objectives. Our optimization methods are designed to provide optimal values for design variables that will lead to the highest levels of system performance. |
| 4 | **Reinforcement Learning** | The ITC Team approach to Reinforcement Learning revolves around machine learning concepts to explore, understand, and implement models, specifically Reinforcement Learning models, whilst mitigating those risks. We accomplish this by distributing the work amongst functional teams that coordinate within preexisting frameworks, ensuring that any solution remains adaptable and deployable in our dynamic learning environment. |

We built the ITC Team (**Figure A-2**) to provide modular enterprise data science services to support Kessel Run's rapid growth and complex technical demands. Each team member embraces Agile principles, SecDevOps, and cutting-edge data management practices to deliver against the most challenging problems.

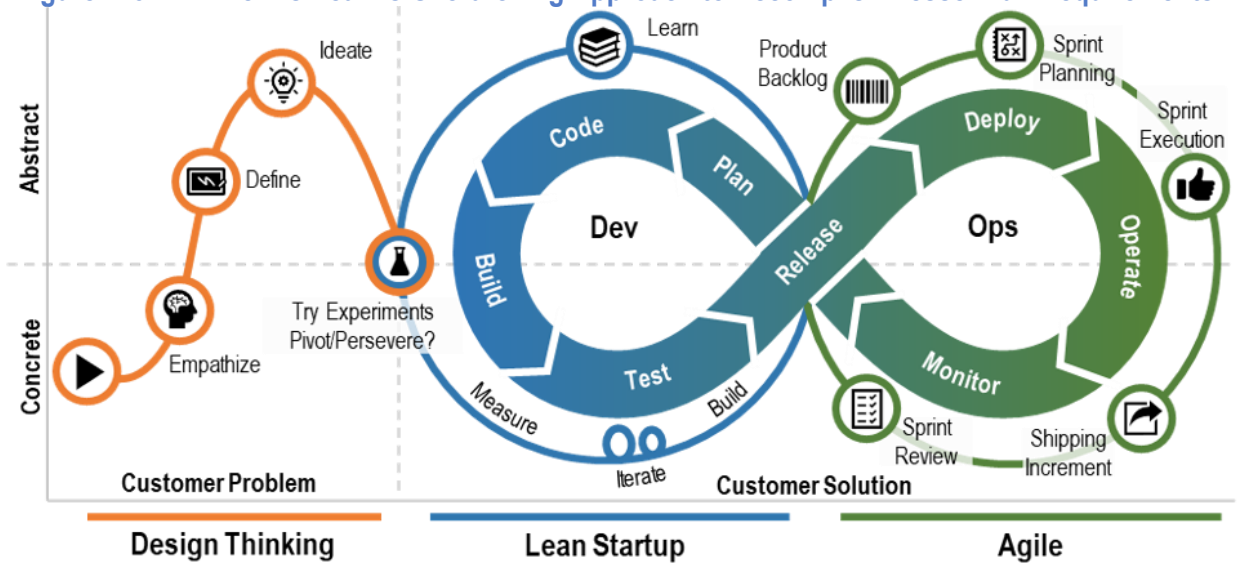
**Figure A-2: ITC Kessel Run Team**

| Teammate | Benefits to Kessel Run |
|---|---|
| ITC (8(a), SDVOSB) | ▪ Dynamic IT engineering supporting DoD and intel community (IC) data-centric programs<br>▪ Award winning, (8)a) SDVOSB - Washington Business Journal's Best Places to Work, etc.<br>▪ SecDevOps expertise provides an integrated and standard set of tools and methods that reduce security risk while simultaneously meeting objectives of faster and more cost-effective delivery<br>▪ For DIA, 20+ SCM-certified engineers deployed 75+ microservices across 17 apps; achieved 50+ ATOs<br>▪ Cloud-agnostic service expertise – e.g., AWS, Azure IAW NIST 800-53, 800-171, FEDRAMP<br>▪ TS/FCL; CMMI DEV/SVC-3 and ISO 9001:2015, ISO 20000-1:2011, and ISO 27001:2013 |
| Metron | ▪ Dedicated to solving challenging operation research problems in national defense through the development and application of advanced mathematical methods<br>▪ Use of A9 STORM tool; NSS, ExAMS/Assassin, and other modeling from physical to operational; 4+ non-linear data fusion products (NodeStar, Paladin, TerrAlert) |

## A.2 Overarching Technical Approach and Plan to Accomplish Performance Requirements

Our overarching approach to support our Kessel Run performance requirements combines a Lean Start-Up with Agile mindset using SecDevOps with the Analytics Solutions Unified Method for Data Mining (ASUM-DM) framework maximizing the success of Data Engineering and Analytics projects. Our three-part approach meets the overall program objectives for Kessel Run Data Science Services.

**Figure A-3: The ITC Team's Overarching Approach to Accomplish Kessel Run Requirements**




**Lean Startup and Agile.** Lean Startup and Agile brings quick delivery of product that is continuously integrated. It emphasizes the need to test ideas through frequent iterations to discover customer preferences and behavior through objective metrics. It allows for preliminary results while the data engineering and SecDevOps teams focus on the data pipeline and to resolve the data collection, validation, and cleaning prior to any in-depth analysis. Accuracy and consistency of estimation is important for Lean Agile Scrum teams that deliver high quality code ready for frequent deployments to production. Teams estimate tasks via story points, and scrum masters use these measures to predict task completion given time and manpower. Inaccuracies lead to over and underruns of story points. In either case, higher costs are incurred, and leads to the customer questioning the capability of the team. The ITC Team's 20+ Certified Scrum Masters (CSM) follow Agile principles to improve accuracy. We breakdown work items into small units in order to reduce risk. Smaller work units avoid issues when multiple people work the same problem and create unintentional bottlenecks. In our approach, the assignee is given high consideration in sprint planning. This gives them experience and lets them leverage senior resources to improve future accuracy. Consistency of estimation is also important. A team's velocity measures how much relative work they can complete in a sprint. Without consistent estimation, velocity can't be used to predict completion times or manpower needs. Without measures to predict time to complete or relative difficulty, a project can't be efficiently planned, and will cost more. A team's consistent estimates can be measured, and even if underperforming can be accounted for. We review velocity for consistency rather than an as expectation of increases in productivity. We look at the deltas between sprints during retrospectives to address causes for inconsistency whether related to estimation, sizing, or process. Improving processes over time also adds to the consistency of estimation and stabilization of velocity. We look at the burndown within each sprint to look for sudden drop-offs toward the middle and end of the sprint which indicates errors in estimation of size. We examine external business pressures in order to minimize impact on the Scrum team.

**SecDevOps.** Leveraging lessons learned from our DIA MEME program (**Reference C.1**), we first focus on building a strong SecDevOps culture to continuously deploy our data engineering and analytic tasks. This removes issues involving building and configuring the environments and platform and frees our data scientists to spend their time building and refining models instead of worrying about the data pipeline creation. This approach affords us a solid platform to build our data engineering solutions on and results in a stable platform for our data scientists to build from when creating analysis and models. Continuous Integration and

Continuous Deployment (CI/CD) is key to any successful Agile development program. Without CI/CD, Agile programs run the risk of not providing mission ready tools, and essentials become Agile in name only. For CI/CD, maintaining standardized configurations across multiple environments is challenging, yet critical, for consistent and reliable deployments of services and microservices in an Agile environment. Providing a consistent, robust and secure means to maintain service configurations while maintaining language-agnostic support for a multitude of microservices can make or break continuous deployments. With deployments often happening in different environments, it is important to make configurations manageable and reusable as possible, as there may be fewer operations resources with the proper credentials and authorizations to manage them in production environments.

**Data Mining Framework.** The ASUM-DM framework brings focus and repeatability to the data science tasking in all aspects of performance from performing reinforcement, supervised or unsupervised machine learning using AI techniques. The framework allows data-scientists to quickly model the data, obtain insights and understanding of the problem and appropriate data preparation and validation.

**Figure A-4: ASUM-DM Framework**

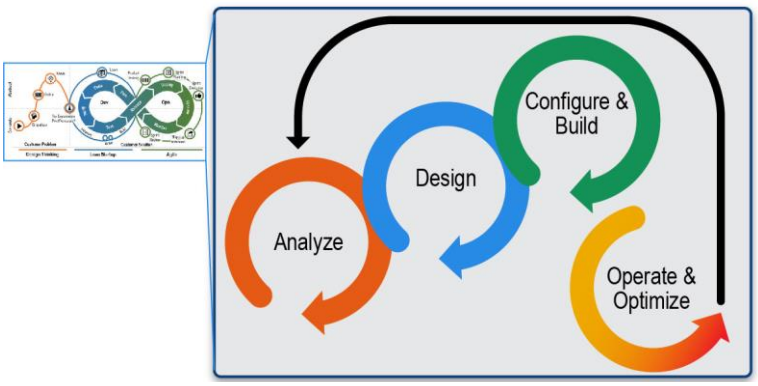



**Figure A-5: ASUM-DM Framework Phases**

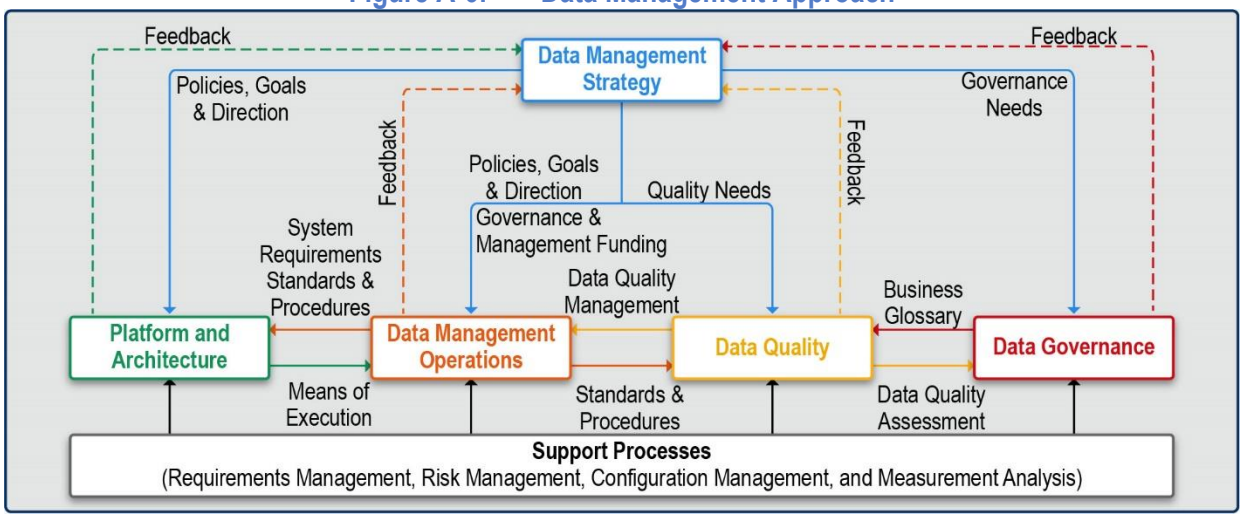
| Definition | Approach |
|---|---|
| **Analyze** | |
| Define what the solution needs to accomplish, both in terms of features and non-functional attributes (performance, usability, etc.); Obtain agreement. | **Business Understanding**: which means the data scientist should properly understand the business of his/her client. Why is analytics important to them? How analytics can be of a great value for the business |
| **Design** | |
| Define all solution components and their dependencies, identify resources, and install a development environment. Iterative Prototyping Sprints are used when applicable to clarify requirements. | **Data Discovery**: Working with the business owners to determine the provenance of their data, what is missing, and what is needed<br>**Data Preparation**: most time-consuming step; preparation for ingest<br>**Data Understanding**: which means the data scientist should go through all the fields within the data to understand the data like a domain expert. With a poor understanding of the data, a data scientist can barely provide high-quality data science solutions<br>**Modelling**: turns raw data to actionable insights<br>**Evaluation**: checking the accuracy of the model and determining which type of metric to use such as RMSE, MAPE, and MdAPE |
| **Configure & Build** | |
| Configure, build, and integrate components based on an Iterative and incremental approach. Utilizes multi- environment testing and validation plan. | **Platform**: Taking advantage of the platform capabilities.<br>**CI/CD:** Using CI/CD processes to build and configure environments using Kubernetes, Docker, Jenkins, and SaltStack. |
| **Deploy** | |
| Create a plan to run and maintain the solution, including a support schedule. Migrate to Production environment, configure, and communicate the deployment to the business user audience. | **DevOps:** Making the use of the model with the new data. Deployment and continuous and iterative operations are important for the optimization and reevaluation of deployed analytics and models |
| **Operate & Optimize** | |
| Operate includes the maintenance tasks and checkpoints that facilitates a successful employment of the solution and preserve its health. | |

### A.2.1 Approach and Plan to Meet Kessel Run Project Objectives

### A.2.2 Project Objective (a): Approach and plan to create and maintain data pipeline architectures to automate the processing of large and complex data sets [SOO 3.a]

Data is the central concern with any application and proper data management and architecture is required to ensure all data collected is stored in an appropriate manner enabling it to be used across the enterprise in an efficient and scalable way. Our data management strategy involves our data engineers at the beginning of any effort, working with the customer so that they can gain understanding of not only what data is to be collected, but how that data is to be used, where it comes from, what data retention or data privacy policies might be involved so the architecture is created with the full picture in mind.

**Figure A-6: Data Management Approach**




The ITC Team's approach to data management complies with the Office of the Director of National Intelligence (ODNI) and the Office of Personnel Management (OPM) guidelines by aligning functional requirements to business needs. As we execute our data management approach (**Figure A-6**) the ITC Team incorporates other key aspects of AF's data management program and tailors an approach that meets their needs. Our data management and architecture strategy are defined in **Figure A-7**.

**Figure A-7: Data Management and Architecture Strategy**

| Strategy | Description |
|---|---|
| **Data Management Strategy** | How we define the scope, mission, and short-term/long-term goals. Beginning with a high-level data reference model, the ITC Team will evaluate data management capabilities and identify areas for measuring improvement – benchmark and guidance. This strategy definition follows our approach in order to best define the overall strategy aligned to guidelines. |
| **Data Governance** | Assess the overall management, governance, policies, availability, integrity, and security of data within the CDO guidelines and work with the Government to assess the defined set of procedures and a plan to execute. This is how where the ITC Team aims at establishing compliance standards. |
| **Data Quality** | Assess the condition of the sets of values of qualitative or quantifiable variables and determine what data is "high quality" whereby it fits its intended uses in operations, decision-making, and planning. High quality data must also be consistent and unambiguous. When we identify low quality data, we perform data cleansing and remediation techniques. |
| **Data Operations** | Defining the "high quality" data instances and values by prescribing directives and/or consensual agreements on the data as well as establishing policies on managing the flow of data from creation and initial storage to when it becomes obsolete. |
| **Platform & Architecture** | Assess all applications which comprise the Kessel Run mission set and document points of data integrations, networks, etc. to determine what standards shall be used to ensure seamless integration and "high quality" data across the enterprise. |
| **Supporting Processes** | Assess current state processes which occur and identify problems which exist (i.e. difficult to repeat, frequent failures, etc.) and look for ways to improve and simplify. These support processes include requirements management, risk management, configuration management, and measurement and analysis |

Data needs a way to be created, updated and presented so that it can become useful to the data customers. Our team has extensive system and software experience from building customer applications through moving prototype applications into production ready tools to implementing, enhancing and integrating COTS and GOTS tools into overall system architectures. Working with standards such as AF OMS and UCI to ensure data compatibility and consistency in analysis and combined with our data architecture and management experience we provide all the tools and engineering expertise to take your data from collection to action. During the creation of data pipelines, ITC assess the current environment, maps the existing data sets, and pilots and builds out an initial solution. Unique to the DoD and IC environments, data must be ingested and migrated between sharing environments. While ITC has experience building Data Lakes, it is far more important to ensure the data is exposed and available through common APIs. ITC typically implements, manages, and uses Kafka for the extraction, transformation, and loading (ETL) of data in parallel pipelines. This allows us to provide stream processing, message queues, and pub/sub capabilities in our data pipelines and event driven architectures. Kafka topics are divided into partitions across multiple Kafka brokers which gives us parallel processing of data pipelines. We set the Kafka cluster retention period which persists the data on the cluster and are able to replay the data flowing through the pipeline if needed. For each individual topic within a pipeline, we configure the partition number and replication factor to allow for fault-tolerance and give high availability as well as load balanced parallel processing. In addition to Kafka event processing, we also have experience using AWS Kinesis Streaming and Analytics to achieve the same parallelization and scaling as Kafka. For Kinesis, we configure AWS lambda functions to provide for serverless processing of the data as it flows though the streams. Kinesis is typically quicker to implement and requires fewer DevOps personnel to manage than Kafka but is reliant on the availability of that functionality, for example it is not available yet on C2S on JWICS. To manage our data pipelines, we use Saltstack for centralized configuration management of our data pipelines. Today at DIA, we deploy 60+ microservices across 4 environments, both unclassified and classified. Saltstack provides us the ability to support complex and nested configuration directories/files, inheritance of commonly shared configurations between services, and encryption of sensitive passwords and values in source control. By establishing a standardized way for microservice owners and developers to generate and manage their service configurations low-side, it alleviates a lot of headaches the cleared SecDevOps team would have if all services were to implement their own configuration management solution. It also allows for a smaller cleared team to manage a large microservice and application infrastructure. Where appropriate we use automated testing to validate that the data traversing the environment is accurately transformed for use in the data science platform. When the testing detects anomalies, we send a notification to the migration team so that we can evaluate the migration errors and modify the migration scripts accordingly. Using automated data validation enables us to migrate data using fewer man hours than by manual data validation. It also enables us to test all of the migrated data, not just spot checks. To deploy our data pipelines, we implement automated deployments via Jenkins with a canary deployment model that leverages metrics provided within Kafka and Kubernetes with Istio.

Using critical time-based metrics such as error percentages, latency averages, and as percentage-based routing we automatically deploy a new version of the pipeline alongside the old version and routes a percentage of traffic through it. We then monitor this subset of traffic. If a negative threshold is reached, we automatically roll back to the original version and alert the SecDevOps team of the failed deployment. If the threshold is not reached, we route all traffic to the new version and clean up the old. This allows for automated CI/CD without outage risk. We have experience and expertise with developing, testing, implementing, managing, and storing data in both non-relational (MongoDB) and relational (MySQL/Postgres) databases, as well as providing search capabilities on this data via multiple indexing technologies. We configure, deploy, and manage multi-node clusters within both unclassified and classified environments. These clusters contain

terabytes of data that are persisted and replicated across the nodes to provide a level of high availability and redundancy. We manage these databases both locally on Docker containers or machine installs, using AWS's RDB. While AWS abstracts the data redundancy and availability, we configure through scripting/SaltStack in Docker, we manage proper indexing to allow for querying based on requirements. To enhance discovery of data, ITC configures, deploys, and manages multi-node Elasticsearch clusters within both unclassified and classified environments. These clusters provide an analytics engine designed for horizontal scalability, maximum reliability, and easy management. Elasticsearch gives services the advantage of having relevance-based search results of virtually any type of data. Once the data pipelines are operational and appropriately monitored with data cleaned to remove errors, inconsistencies and anomalies, and mapped into known common schemas and stored, the data is ready for algorithmic categorization and classification using both supervised and unsupervised methods. Various analytical layers are added as needed, to include multi-variate regressions, feature engineering/selection and model fitting for calculations of optimal coefficients of determination, allowable error-rates, and overall fit. Our team continues to rigorously test models over time, continuously tweaking variables as needed, while pushing outputs via interactive, ergonomically designed web-based visualization platforms. During the initial analyzation and model stages, we use opensource tools like Plot.ly, Bokeh and Shiny to provide explorations of the data and their models with confirmation before migrating visualizations to more enterprise scale tools like Tableau, Qlik, or PowerBI.

**Defense Intelligence Agency (DIA) Experience**

- ITC designed, documented and implemented a data ingest architecture and analytic pipeline to populate a data repository comprised of multiple, dispersed data feeds from across the IC.
- We led the effort to design an architecture that is cloud based, while also being platform independent and extensible in order to handle both structured and unstructured data and to store the data securely based on the data classification.
- We used open source tools such as Apache NIFI, Kafka and ElasticSearch in our ingest architecture allowing DIA, in addition to contracted developers, to design their own ingest workflows that can process data in parallel on a NIFI cluster for any data that they would want to be indexed and analyzed in our pipeline. NIFI allows for multi-step extraction, transformation and load (ETL) operations on the data for both data ingress and egress through the architecture.

### A.2.3 Project Objective (b): Approach and plan to work with product teams, users, and other stakeholders to identify opportunities for data-driven solutions. [SOO 3.b]

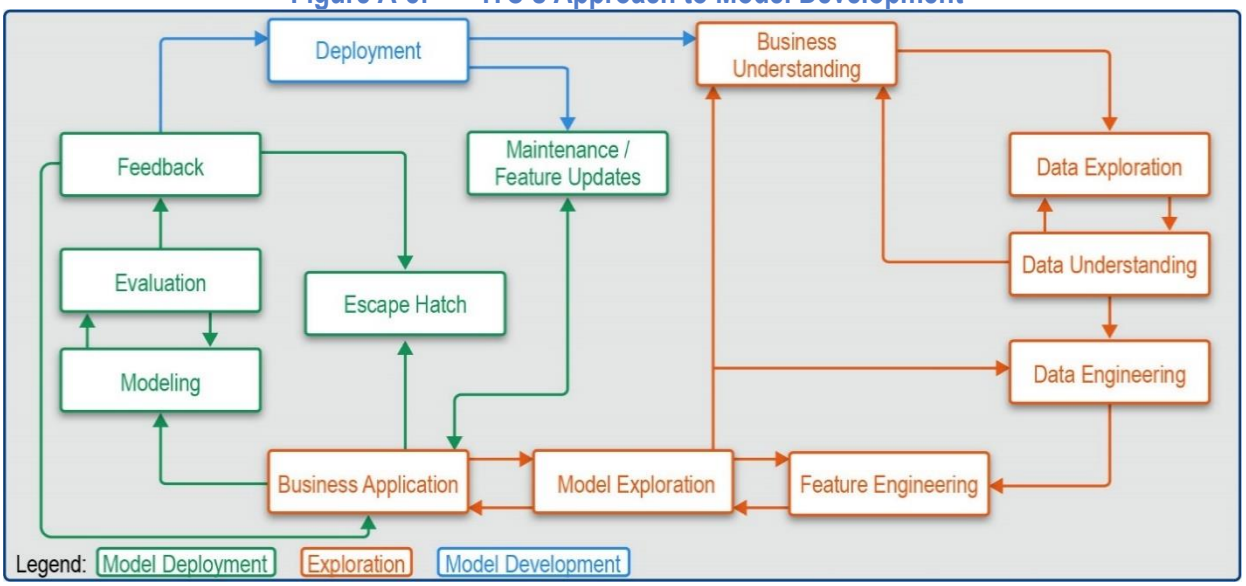
ITC augments routine database and data administration services with data science expertise. We assist Kessel Run and fuse the multiple data sources into a federated repository allowing for application of advanced analytical algorithms that efficiently and effectively help answer operational questions and make data-driven decisions. Pairing data scientists with mission SMEs and SW engineers, we deliver fully functional and supported analytical support systems in cloud-based environments, through examination and creation of algorithms. Leveraging our experience at DIA, DARPA, DHS, etc. and using platform-based tools like OpenShift, Azure, and AWS combined with and open sourced technology like Kubernetes, Kafka, and Anaconda, we can scale analytics beyond the workstation and into cloud-native scale applications and systems. We develop, implement, and optimize algorithms that drive new capabilities, and examine and combine data in interesting and innovative ways. We accomplish this through data mining, machine learning, statistics, computational geometry, applied mathematics, dynamic systems, and control theory, using methodologies such as unsupervised cross-modal clustering algorithms, principle component analysis, independent

**ITC DIA Experience**

- For QUAKE, developed predictive analytics to provide analyst features based on best practices.
- Implemented Latent Dirichlet Allocation (LDA) as provided by Gensim for Python to provide a classification of documents by subject based upon understanding those subjects that are present from the corpus. Used multiple types of entity extraction on unstructured data – e.g., NLTK, Spacy, and CoreNLP which informs analytics without requiring the heavy license investment of Watson, etc.

component analysis, regression, zeroth order processing, nonlinear optimization, autoregressive models, time-series analysis, and HAC models. We effectively communicate findings within the project team, leadership, and the broader community using visualizations (e.g., Plot.ly, Tableau) to inform and drive the improved collection of new and existing data.

**Figure A-8: ITC's Approach to Model Development**




Exploration of a problem space is the default mode when initiating the development of a data-driven solution. **Figure A-8** (**Exploration**), highlights the ITC approach to understanding the organization, exploring the space, and aligning with to develop and deploy ML features/solutions.

**Figure A-9: Approach to Handling Development and Deployment of ML Features and Solutions**

| ITC Approach to Handling Development and Deployment of ML Features and Solutions |
|---|
| **Understanding the Organization (AKA Business Understanding)** |
| The only reason to explore the possible is to identify the desirable. In this manner ITC hones in on opportunities by focusing on the organization first. The needs across teams/users/stakeholders/etc. will be varied, and thus the first step is to meet with as many people as reasonable. The viability of any solution identified throughout this process will depend on the buy in and perceived value of the end users and senior stakeholders. Therefore, understanding the inefficiencies, pain points, growing pains, etc. within the organization can help highlight areas in which data-driven solutions can alleviate these issues. By learning about existing processes, it becomes easier to identify innovation. |
| **Diving into the Data** |
| By exploring the needs of an organization and exploring new capabilities the range of opportunities gets rather large. To decrease the volume of solutions worth exploring the next phase focuses on grounding the opportunities based on the available data. While some of the existing architecture may have been exposed during the initial exploration with the product teams/end users/stakeholders, diving deeper into the architecture will clarify what resources are available for the development of solutions. In addition, this provides a chance for the team to explore the capabilities being developed by the team managing SOO 3.b. With the depth of knowledge gained, data and opportunities can be aligned to determine which identified opportunities are achievable given current or proposed architectures. This also begins to lay the groundwork for creating the data workflows required to support the opportunities. Depending on the timeline and feedback from stakeholders, exploration and experimentation of sample pipelines may occur to ascertain the viability of certain tools and use cases. |
| **Model Exploration** |
| Not all opportunities will require that the solution be vetted at the model level, but this step can provide feedback on what data-driven solutions are worth pursuing. In this manner leveraging tools like Jupyter Notebooks provides environments and processes that can enable rapid proofing. Notebooks provide the programming environment for fast exploration, while enabling scientists to create a narrative around their findings. In this manner opportunities can be represented in an easily digestible format. In addition, tools like H20 provide handy auto-ml capabilities that give strong indicators to a proposed model's productional viability, prior to digging through model configuration hell. Together ITC uses tools like these to quickly determine what opportunities might translate to real world impact. |
| **Weighting the Values** |
| While many opportunities are evaluated and pruned throughout the exploration process, the solutions that make it to the end require extra attention. At this stage, there should be a general sense of the feasibility of the opportunity, thus the primary concern is understanding the |

| ITC Approach to Handling Development and Deployment of ML Features and Solutions |
|---|
| value of moving forward. Therefore, at this point the focus shifts back to the end users, stakeholders, product teams, etc. to understand what it would take to develop a solution around their requirements and what value it would provide back to them. This analysis is not guaranteed to capture all risks and rewards, but to give enough context that actionable information is generated. |

### A.2.4 Project Objective (c): Approach and plan to work closely with product teams to implement Reinforcement Learning features at the application and database level [SOO 3.c]

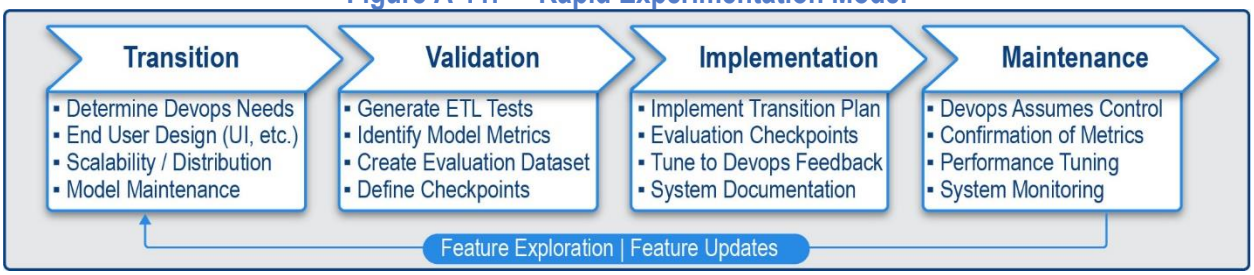
Reinforcement Learning has improved to the point where it holds a lot of potential to revolutionize how we approach certain data-driven solutions. Our approach to Reinforcement Learning revolves around ways to explore, understand, and implement machine learning models, specifically Reinforcement Learning, whilst mitigating risks. We accomplish this by distributing the work amongst functional teams that coordinate within preexisting frameworks, ensuring that any solution remains adaptable and deployable. Key concepts of our Reinforcement based Learning Approach are provided in **Figure A-10**.

**Figure A-10: Key Concepts of Reinforcement Learning Approach**

| Key Concepts | Description |
|---|---|
| **Requirements Understanding and Exploration** | It is important to ensure that high-level objectives can be integrated with end users. By keeping this consideration in mind throughout exploring, developing, and implementing a feature, we work to guarantee that the feature remains valuable to all parties. Driven by the Business and Data Understanding/Exploration identified in **Figure A-8**. |
| **Rapid Model Experimentation** | By leveraging existing frameworks for model development (Scikit-Learn, Tensorflow, H20, etc.) ITC can rapidly explore a wide range of models and approaches to a problem (Model Exploration – **Figure A-8**). While not providing the full depth of what those approaches can produce, this does enable ITC to catalog summary information for a wide array of algorithms and methods. |
| **Escape Hatch** | The uncertainty in stochastic processes means there is inherent risk in developing machine learning models. Failing fast is built around quickly identifying which approaches are/aren't valuable. These aren't failures in the traditional sense, but rather places where an opportunity has been found non-viable, and thus exploration should end. |
| **Continual Improvement** | The Maintenance/ Feature Updates (**Figure A-8**) section of ITC's approach to model development hones in on the concept of continual improvement. In this manner there is a clear designation for these processes to loop back and provide a pathway to improve and/or iterate on an approach. |

Outside of the core data analysis loop, reinforcement learning also requires a couple of specific considerations above and beyond a standard data-driven solution. This primarily revolves around the need for an environment with which the model can interact and learn. Since the environment plays such a significant role in developing RL models, ITC splits the responsibilities of model development and environment development into separate teams. This provides the opportunity for both needs to be explored and developed simultaneously. To avoid these two teams from diverging in their approaches, we keep development aligned to the same general framework by leveraging OpenAI's Baselines for creating the skeleton for our projects. OpenAI baselines are high-quality implementations of reinforcement learning algorithms to build research on, including in TensorFlow open source machine learning platform and the MuJoCo physics simulator. OpenAI's Baselines provides several benefits that lends itself to our model development approach. First, it provides a set structure for the interactions between the environment and the actor or model. This ensures that both the Simulation team and RL team can coordinate their implementations without the need to explicitly develop a custom mechanism. Baselines also provide sample environments and algorithms for Reinforcement Learning. While these may not be optimal for every task, they provide a foundation to build upon, lending to our approach of rapid model experimentation. By incorporating our approach to Rapid Model Experimentation within the Agile methodology, we can build fast and fail fast when experimenting with the RL models. The ability to provide frequent updates means that when meeting with stakeholders there is actionable information. This empowers stakeholders, helping them asses the viability of a current approach and determine the next best steps; further experimentation, deployment, or pivoting away from that specific work. Through these interactions, ITC works to ensure that course corrections can happen rapidly and even in response to changing understanding and/or needs.

Figure A-11: Rapid Experimentation Model




Upon reaching the deployment phase from **Figure A-3**, we move into the Design and Build cycle within the ASUM model (**Figure A-4**). This transition phase from experimentation to production development poses several risks, as the different needs between the eventual production system and the inflexibility of the Reinforcement Learning model must be hashed out. To mitigate many of these issues and concerns, we follow the workflow highlighted in **Figure A-11**. We highlight transition planning that describes a path to implementation that assures alignment between model validity and the eventual SecDevOps needs.

Figure A-12: Rapid Experimentation Model Approach

| Phase | Description of Rapid Experimentation Model Approach |
|---|---|
| **Transition** | Once an approach or feature is cleared for deployment focus shifts to developing a transition plan. The transition planning revolves around mitigating common operationalization missteps; failure to align to end user needs/use cases, failure to adapt methodology to support DevOps needs, failure to identify and resolve scalability/distribution concerns, etc. Thus, the Simulation, Reinforcement Learning, and Development teams coordinate to design an official architecture for the final solution. This provides the team with a concreate plan that can be reviewed amongst stakeholders, end users, and DevOps teams to ensure that all requirements are being met. |
| **Validation** | Built into the plan are several validation checkpoints. These checkpoints revolve around how the development team implements the simulation environment and RL model. As transitioning from experimentation to development can alter large swaths of the backend, it is necessary to build in tests and validation methods to ensure that the results identified during experimentation are repeatable in the production system. The Simulation and Reinforcement Learning Team work jointly and/or independently to identify and/or create datasets and testing methods that ensure performance is aligned between production systems and the experimental results. This process is key to ensuring consistent results when transitioning from experimentation to development and onto production. |
| **Implementation** | Once a transition plan has been identified, the development/deployment work can begin in earnest. For this, ITC draws upon its experiences in Agile software development to follow through on the transition plan. Throughout the implementation phase, the Simulation and RL teams coordinate with the development team to confirm the functional units pass the validation checks. Simultaneously the development team coordinates with the DevOps team to hand over responsibilities. |
| **Maintenance** | Due to the complexity of these processes it is important to have proper reporting/auditing systems in place. For this reason, all teams work together to identify the metrics necessary for tracking the features status. This is because DevOps must track the health of the model and the system. By tracking and understanding these metrics the DevOps team can be empowered to tune and adjust the feature based on demand. Through this tuning and monitoring, we provide a set level of performance, and in extreme situations, notify the necessary stakeholders of changing model and/or system health. |

### A.2.5 Project Objective (d): Approach and plan to work with product teams, users, and other stakeholders to identify and build optimization and simulation models for highly complex processes [SOO 3.d]

ITC uses models (statistical ranking and selection, response surface, heuristic, stochastic, derivative-free, dynamic programming/neuro-dynamic programming, etc.) to provide better mission value and transform data into better decisions and make the most of the resources available. We use modeling to identify optimal solutions, determine performance requirements and/or identify appropriate operational concepts for system employment. In order to handle the multitude of interdependent parameters inherent in any complex decision system, we work to identify and evaluate alternative designs and operating policies in our model and compare their predicted performance with the desired mission goals and objectives. The first step is work with stakeholders to understand the processes to be modeled and the expected results. This allows us to determine what modeling (optimization, simulation, a combination system) will be required. Additionally, we

define data sources which will in turn bound the amount of complexity that can be supported by the model. Highly complex models require appropriately detailed data inputs which may not be supportable. Next, we determine the appropriate modeling techniques to answer the question(s) of interest. If applicable, ITC identifies for the government currently available modeling systems that could be used to perform the required analysis and work with the government to obtain and integrate the model(s) into the Kessel Run data and analysis system. Where new modeling is required, ITC designs the modeling system specifying data needs, algorithmic choices, and outputs. We socialize this plan with stakeholders to validate that the system will meet the analysis needs. During system development, ITC, in parallel, develops several test cases used to verify and validate the modeling. These cases span the range of expected scenarios to be analyzed. As development progresses, we run test cases to assess the accuracy of the model performance and verify that the algorithmic design is appropriate for the scenario needs. Once initial development is finished, and the model is deployed, we use our test analysis phase to refine modeling outputs and identify additional capabilities not originally planned. ITC incorporates Agile development processes to allow models to grow with user needs.

**Optimization and Simulation Model Experience**

For Joint Counter Radio-Controlled Improvised Explosive Device (RCIED) Electronic Warfare (CREW), Metron developed full-scale logistics discrete event simulator for CREW logistics planning. The model provided simulation and optimization of sustainment strategies including detailed failure modeling, maintenance strategies, sparing needs, and operational requirements. The optimization incorporated a parallelized hybrid optimization algorithm (incorporating simulated annealing, genetic algorithms, and nature-inspired metaheuristics) in order to explore cost effective sustainment plans.

### A.2.6 Project Objective (e): Approach and plan to hire and retain quality staff to support Kessel Run's Data Science needs. [SOO 3.e]

The most demanding part of the Kessel Run mission is recruiting, retaining, surging, and replacing top quality data science expertise. According to a survey by Burtch Works Executive Recruiting, 82% of organizations are planning to hire analytics or data science professionals and 70% expect to expand their analytics and data science teams. Our Kessel Run Data Science Hire and Retain approach is detailed in Section B.8

### A.2.7 Project Objective (f): Approach and plan to provide surge services in the event of unforeseen or future requirements. [SOO 3.f]

Large technical programs require a strong bench of qualified/cleared staff, readily available for placement. This is a challenge due to the strong competition for cleared technical talent and the ever-changing technical landscape surrounding cloud, SecDevOps, and Data Science. ITC successfully built relationships with highly technical talent that support programs of similar technical scope and size. We have done so by being forward thinking, understanding our customer's technical requirements, and aggressively pursuing talent to address staffing issues and fill positions before needs arise. Success in recruiting for data-driven positions means we must avoid the common trap that other firms fall into by shifting away from recruiting ""just in time"" to fill immediate needs. We are focused on building a pipeline of technical talent, constantly creating rapport with the "best in tech" candidates, sometimes even years before they are even job hunting. Regardless of project size, our average time to onboard across all programs is 14 business days.

## A.3 Organizational Conflict of Interest (OCI) Statement

Prior to the submission of our proposal, IT Concepts, Inc reviewed this proposed effort for actual, future, or potential conflicts. To the best of our knowledge and belief, given the facts available to us, no conflicts were identified that would create an actual, future, or potential conflict of interest. IT Concepts, Inc will continue to evaluate future or potential work to ensure it does not create conflicts. IT Concepts, Inc recognizes its continuing obligation to identify and report any conflicts arising during performance.

# B Criteria B: Performance Work Statement & Recruitment and Retention Plan

## B.1 PWS Part 1 - General

This is a non-personnel services contract to provide Kessel Run Enterprise Data Science services. Such contract service providers shall be accountable solely to the Contractor who, in turn is responsible to the Government.

### B.1.1 Description of Services/Introduction

The contractor shall provide all personnel, equipment, supplies, facilities, transportation, tools, materials, supervision, and other items and non-personal services necessary to perform Kessel Run Enterprise Data Science services as defined in this Performance Work Statement except for those items specified as government furnished property and services, and in accordance with (IAW) Kessel Run IDIQ and anticipated TO pricing structures. The contractor shall perform to the standards in this contract.

### B.1.2 Background

Kessel Run (KR), a detachment of the U.S. Air Force Life Cycle Management Center (AFLCMC), leverages industry best practices and products to rapidly deliver capabilities while posturing for future and potentially disruptive information technology (IT). Kessel Run revolutionizes the way that the Air Force builds and acquires software to meet the needs of Airmen across the globe. Kessel Run embraces Agile principles, SecDevOps, and lean product management practices to continuously integrate and deliver software capabilities. KR embraces a culture of rapid feedback loops (e.g. build, measure, learn) and user-centered design managed by Government-led teams to rapidly develop, produce, and deploy software across the Air Operations Centers and other Air Force programs, while continuously iterating and improving upon those software applications.

Kessel Run has rapidly expanded its personnel and scope in the last eight months. New external Air Force users are beginning to use our Pivotal Cloud Foundry (PCF) Platform as a Service (PaaS) and our on-premise Infrastructure as a Service (IaaS). Kessel Run continues to ramp up its number of product teams across the AirOps (Air Operations Centers) and WingOps (F-35s) product offices, as well as expand its platform operation, data science, engineering, and security requirements. As such, Enterprise Data Science modular service contracts need to be awarded to support Kessel Run's rapid growth.

### B.1.3 Objectives

The current program level objectives for the Data Science portfolio include:

- **Data Management**: Create and maintain data pipeline architectures to automate the processing of large and complex data sets.
- **Data Visualization**: Develop graphical representations of information and data. By using visual elements like charts, graphs, and maps, data visualization tools provide an accessible way to see and understand trends, outliers, and patterns in data.
- **Data Optimization**: Build sophisticated optimization models and create algorithms for quickly producing near optimal solutions according to those models.
- **Reinforcement Learning**: Utilize machine learning concepts to enable iterative learning in a dynamic data environment by trial and error using feedback from events and monitoring.

The project objectives include:

**a. Create and maintain data pipeline architectures to automate the processing of large and complex data sets.**

The contractor shall have experience developing, testing, implementing, and managing various database types with a particular emphasis on MySQL and Postgres. The contractor shall capture metrics utilizing instrumentation from the application level, with a specific focus on Event Driven Architecture and Event Driven Finite State Machines. The contractor shall suggest, implement, maintain, and update data processing infrastructures. Finally, the contractor shall work with the product teams and other stakeholders to develop a wide variety of data visualization products.

**b. Work with product teams, users, and other stakeholders to identify opportunities for data-driven solutions.**

The contractor shall utilize creative problem-solving to build optimization models and create algorithms for producing near optimal solutions. In addition, the contractor shall transform complex analytical models into fast, scalable, and production-ready solutions, and use supervised and unsupervised Machine Learning approaches to develop insights and provide recommendations or predictions for future events. Furthermore, the contractor shall implement algorithms and processes from public research, white papers, research posters, or other scientific papers to generate hypotheses, design experiments, gather and transform data, and test hypotheses using modern and statistically rigorous methodologies in support of Section 3, paragraph a., above.

**c. Work closely with product teams to implement Reinforcement Learning features at the application and database level.**

For the purposes of this PWS, Reinforcement Learning is defined as a computational approach to learning whereby an agent tries to maximize the total amount of reward it receives while interacting with a complex, uncertain environment. The contractor shall identify possible workflows for Reinforcement Learning systems over a wide range of data types. The contractor shall also identify opportunities for new Reinforcement Learning-focused products across Kessel Run's portfolio. The contractor will be responsible for working closely with product teams to implement Reinforcement Learning features at the application and database level. In addition, the contractor shall identify opportunities for new Reinforcement Learning focused products across the portfolio of products and services.

**d. Work with product teams, users, and other stakeholders to identify and build optimization and simulation models for highly complex processes.**

The contractor shall build optimization models and create algorithms for quickly producing near optimal solutions according to those models. In addition, the contractor shall build detailed, agent-based, discrete-event, and continuous-time simulation models of highly complex processes. The offeror shall have hands-on project experience and/or academic training in one or more of the following areas: optimization, stochastic modeling, simulation, statistics, predictive modeling, machine learning, or artificial intelligence.

**e. Hire and retain quality staff to support Kessel Run's Data Science needs.**

Kessel Run needs talented and reliable support for our Data Science needs. The contractor shall propose a strategy to recruit, hire, and retain talent. The contractor shall also propose its required staff levels to meet the objectives of this PWS and propose three (3) Key Personnel Positions who will support Kessel Run's data science needs. At least one of the specified Key Personnel must be able to travel more than 50% of the time to various locations. Potential travel locations include Al Udeid AB, Qatar; Osan AFB, South Korea; Elmendorf AFB, Alaska; Hickam AFB, Hawaii; Ramstein AFB, Germany; Tyndall AFB, FL; Davis-Monthan AFB, AZ; Nellis AFB, NV; and McDill AFB, FL. The Key Personnel shall be considered the most senior

members of the team, and the Level of Effort (LOE) is indicated in the pricing template provided by the Government. The offeror may propose different labor categories and skill levels that meet the objectives laid out in the PWS. The contractor shall also identify any labor competencies and personnel that can work remotely. In addition, the contractor shall propose its plan and timeline to provide staff in the event of a vacancy or by a Government request.

#### f. Provide surge services in the event of unforeseen or future requirements.

The contractor shall supply data engineering, data science, Reinforcement Learning engineering, and operational research analyst support in single occurrence or short duration activities in support of the Kessel Run Data Science services. Examples of those activities include those tasks outlined in the PWS, Project Objectives. Task requirements will be defined by issuance of a Task Requirements Notice (TRN). TRN's will be established and proposed by the contractor as required using the labor rates established in the B-Tables put on contract. The Procuring Contracting Officer (PCO) is the only authorized individual that can issue TRNs. Both parties shall track all TRN requests, approvals, respective values and status for audit and reconciliation purposes. Each TRN shall contain a TRN-unique identification number. Each TRN request shall identify the task that requires action. The contractor's response shall provide an action recommendation, labor categories, and estimated labor hours to complete task. An estimated duration to complete the work shall also be provided. Upon PCO approval the contractor shall begin work.

The contractor shall provide services to complete the effort specified in the TRN and applicable worksheet write-ups. The contractor shall perform the tasks necessary to complete the scope of work specified in each TRN and shall be paid up to the not-to-exceed (NTE) amount designated on the TRN letter/form issued by the PCO.

### B.1.4 Scope

The scope of this opportunity is to support Kessel Run's data science needs. The Kessel Run Data Science team supports the entire Kessel Run enterprise including all product and platform teams.

This team develops, maintains, and implements data architectures capable of handling complex data sets quickly and securely. Additionally, Data Science teams will develop data implementation approaches across the entire Kessel Run ecosystem and provide core data services for applications residing on the Kessel Run platform.

The team supports Kessel Run's requirements to define the baseline for measurement needs and instrument consistent data capture practices inside Kessel Run. In addition, the data science team enhances system resiliency by measuring application and platform performance, network and platform security, intrusion detection, as well as support the ability to track attribution of system instability.

Data scientists and engineers design, implement, and maintain a data pipeline and analytical environment using reporting tools, modeling metadata, and building reports and dashboards. The team should use creative problem-solving to automate the collection and analysis from available data sources in order to deliver metrics and analyses. Efforts include, but are not limited to, data auditability, data sharing across applications, data translation, data standardization, metrics generation, and algorithm development.

Proposed labor competencies shall include Data Engineers, Data Scientists, Machine Learning Engineers, and Operations Research Analysts, with a distribution of approximately eight (8) Data Engineers, two (2) Data Scientists, one (1) Reinforcement Learning Engineer, and one (1) Operations Research Analyst.

Upon contract award, one KPP and one Data Engineer are required to be provided to the Government. Within two weeks after contract award, remaining KPPs must be provided.

The Government shall liaise with the contractor on scaling timelines and number of remaining personnel required, at contract award. In the case of a vacancy or Government request, the contractor shall be prepared to provide qualified manpower within fourteen 14 business days.

#### B.1.4.1 Constraints

This section lists laws, rules, regulations, standards, technology limitations and other constraints that the contractor must adhere to or work under and will be provided for individual task orders.

### B.1.5 Period of Performance

The period of performance shall be for one (1) Base Period of 12 months and one (1) 12-month option period followed by one (1) 6-month option period. The Period of Performance:

- Base Period (12 months)
- Option Period I (12 months)
- Option Period II (6 months)

### B.1.6 General Information

#### B.1.6.1 Quality Control

The government shall evaluate the contractor's performance under this contract in accordance with the Service Delivery Summary. The service delivery summary shall outline the plan to properly surveil its performance and ensure all objectives are met based on the PWS. The service delivery summary provided by the offeror may be transitioned into a Quality Assurance Surveillance Plan (QASP) developed by the Government. The SDS is attached.

#### B.1.6.2 Program Management / Business Relations

The contractor shall provide all the tools, manpower and support required for successful execution of the contract. The contractor shall propose/recommend innovative collaborative approaches for a recommendation for any software tools, manpower, and support required for successful execution of the contract. Examples may include automated governance and testing methods, virtual engineering support, PMBOK and Agile program management processes, and any other support required to ensure mission success.

The contractor shall have a single integrator between the Government and contractor personnel to support business relations. The contractor shall integrate and coordinate all activity required to execute this contract and manage the timeliness, completeness, and quality of problem identification. The contractor shall provide corrective action plans, timely identification of issues, and effective management of subcontractors.

##### B.1.6.2.1 Kick-Off Meeting

Within ten (10) business days of contract award, the contractor shall lead a kick-off meeting for the government and team members. This **Kick-Off Meeting (A001)** is not the same as the Discovery & Framing Product Team Kick-Off Meeting (A008). The contractor shall introduce team members and staff, and shall present and discuss organizational structure, administrative operations pertinent to this task order, staffing timelines, technical approaches and preliminary plans for performing contract tasks, format of reports and quarterly reviews, and a general overview of the overall approach to execute this contract. Subsequent Program Management Reviews shall be as requested by the Government through the Contract Data Requirements List (CDRL) A001.

##### B.1.6.2.2 Financial Reporting

The contractor shall submit cost/financial reports in accordance with CDRL A002.

#### B.1.6.2.3 Monthly Status Reports

The contractor shall submit monthly status reports, IAW with Deliverables/CDRL requirements, of all work in progress and identifies any problems with the potential to affect the PWS' task requirements, schedule, deliverables, or risk mitigations. The reports reflect all resources assigned to the contract by physical work location detailing the status of their task and delivery date, along with any travel expenditures. If there are any anticipated or actual schedule delays, we immediately notify the COR. The contractor shall provide the rationale for any schedule delay in the monthly progress reports, along with a "get well" plan, to ensure satisfactory task completion.

#### B.1.6.2.4 Contractor Manpower Reporting Application (CMRA) Compliance

The contractor shall report all contractor labor hours (including Subcontractor labor hours) required for performance of services provided under this contract, including option periods, for the project via the Air Force secure data collection site http://www.ecmra.mil. The contractor is required to completely fill in all required data fields at aforementioned collection site. Reporting inputs will be for the labor executed during the period of performance for each Government fiscal year (FY) which runs 1 October through 30 September. While inputs may be reported any time during the FY, all data shall be reported no later than 31 October of each calendar year or the end of the period of performance if prior to 31 October of each year. Contractors may direct questions to the Contractor Manpower Reporting Application (CMRA) help desk found at the collection site. Information from the secure web site is considered to be proprietary in nature when the contract number and contractor name are associated with the direct labor hours and direct labor dollars. At no time will any data be released to the public with the contractor name and contract number associated with the data. Data for Air Force service requirements must be input at the Air Force CMRA link. However, user manuals for Government personnel and contractors are available at the Army CMRA link at http://www.ecmra.mil.

The contractor shall submit cost / financial reports in accordance with CDRL A002.

### B.1.6.3 Recognized Holidays

**Figure B-1: Recognized Holidays**

| | |
|---|---|
| New Year's Day | Labor Day |
| Martin Luther King Jr.'s Birthday | Columbus Day |
| President's Day | Veteran's Day |
| Memorial Day | Thanksgiving Day |
| Independence Day | Christmas Day |

In addition to the days designated as holidays, the Government observes the following days:

- Any other day designated by Federal Statute
- Any other day designated by Executive Order
- Any other day designated by President's Proclamation

It is understood and agreed between the Government and the contractor that observance of such days by Government personnel shall not otherwise be a reason for an additional period of performance, or entitlement to compensation except as set forth within the contract. If a contractor believes that an unplanned absence has an impact on the price or period of performance, it should notify the contracting officer of the changed condition and submit a claim for equitable adjustment (see FAR 52.233-1).

Nothing in this clause abrogates the rights and responsibilities of the parties relating to "stop work" provisions as cited in other sections of this contract.

#### B.1.6.4 Hours of Operation

The contractor is responsible for conducting business, between the hours of 8:30 to 4:30 Monday thru Friday except Federal holidays or when the Government facility is closed due to local or national emergencies, administrative closings, or similar Government directed facility closings. For other than firm fixed price contracts, the contractor will not be reimbursed when the government facility is closed for the above reasons. The Contractor must at all times maintain an adequate workforce for the uninterrupted performance of all tasks defined within this PWS when the Government facility is not closed for the above reasons. When hiring personnel, the Contractor shall keep in mind that the stability and continuity of the workforce are essential.

#### B.1.6.5 Place of Performance

The Kessel Run Experimentation Lab (KREL) is located in Boston, MA. Activities within this PWS may be performed remotely. Infrequent travel to KREL may be required as directed by the Government. Other travel IAW section 6.7 of the SOO may be required.

#### B.1.6.6 Type of Contract

The government will award a Time and Materials (T&M)/Labor Hour contract.

#### B.1.6.7 Security Requirements

Contractor personnel performing work under this contract must have a minimum SECRET Facility Clearance Level at time of the proposal submission and must maintain the level of security required for the life of the contract. The security requirements are in accordance with the DD254.

The contractor performing work under this contract must comply with all applicable security requirements.

##### B.1.6.7.1 Security Clearance Requirement

The contractor shall maintain appropriate security clearances for contractor personnel as required. All contractor personnel must have at least a secret security clearance or have the ability to obtain a secret security clearance. Those that do not show up with a secret clearance must have an interim secret security clearance within 60 days of arrival. All contractor personnel must be US citizens. The Government reasonably anticipates a future need for Top Secret/Sensitive Compartmented Information (TS/SCI) clearances for some requirements, such a change would be subject to supplemental agreement during contract performance. Those indicated that would eventually need Top Secret/Sensitive Compartmented Information (TS/SCI) will need to obtain an interim Top Secret/Sensitive Compartmented Information (TS/SCI) within 120 days of direction

##### B.1.6.7.2 DoD Contract Security Classification Specification

A DD Form 254 will be issued in support of this contract. The contractor shall hold a Secret Facility Security Level (FCL). The offeror shall submit a redacted DD Form 441 “Department of Defense Security Agreement” as verification the offeror has been granted its FCL.

##### B.1.6.7.3 Operations Security (OPSEC)

The contractor shall ensure OPSEC is incorporated into the appropriate area of the contract IAW DoD Directive 5205.02E, DoD Operations Security (OPSEC) Program and AFI 10-701 Air Force OPSEC Program. The Contractor shall flow down all OPSEC requirements to subcontractors that handle Critical Information (CI). CI is defined as specific facts about friendly intentions, capabilities, or activities needed by adversaries to plan and act effectively against friendly mission accomplishment.

##### B.1.6.7.4 Controlled Unclassified Information (CUI)

The contractor shall comply with DoDM 5200.01, Volume 4, DoD Information Security Program: CUI, Enclosures 3 & 4, for identification, protection and training requirements of CUI. The contractor shall be responsible for training their personnel and accomplishment of the out-processing procedures identified in

DoDM 5200.01, Volume 4, Enclosure 4. The contractor shall comply with DoDM 5400.07/Air Force Manual 33-302, DoD Freedom of Information Act (FOIA) Program requirements. Protection of unclassified DoD information not approved for public release on non-DoD Information Systems will be protected IAW DoDI 8582.01, Security of Unclassified DoD Information on non-DoD Information Systems, Enclosure 3.

The contractor shall distribute controlled unclassified information IAW DoD Instruction 3200.14, Principles and Operational Parameters of the DoD Scientific and Technical Information Program, and DoD Instruction 2040.02, International Transfer of Technology, Articles, and Services. The Contractor shall properly mark all such documents IAW DoD Instruction 5230.24, Distribution Statements on Technical Documents. Technical documents not subject to distribution are defined in DoD Instruction 5230.24, DoD Directive 5230.25, and DoD Manual 5010.12-M, Procedures for the Acquisition and Management of Technical Data.

The contractor shall, upon request, provide to the government, a system security plan (or extract thereof) and any associated plans of action developed to satisfy the adequate security requirements of DFARS 252.204-7012, and in accordance with NIST Special Publication (SP) 800-171, "Protecting Controlled Unclassified Information in Nonfederal Systems and Organizations" in effect at the time the solicitation is issued or as authorized by the contracting officer, to describe the contractor's unclassified information system(s)/network(s) where covered defense information associated with the execution and performance of this contract is processed, is stored, or transmits. System Security Plan and Associated Plans of Action for a Contractor's Internal Unclassified Information System as statement in CDRL A003.

#### B.1.6.7.5 Non-Disclosure Agreements

The contractor shall require all employees, prime and subcontracted, sign a non-disclosure agreement (NDA) prior to starting work. The purpose of the NDA is to prevent disclosure of sensitive Government information the contractor may be exposed to through performance of this contract. Copies of signed NDAs shall be submitted to the PCO.

#### B.1.6.7.6 Theatre/Country Clearances

The contractor shall obtain special theatre and/or country clearances and comply with theatre/country specific requirements for applicable OCONUS work. The DoD 4500.54-E and DoD Foreign Clearance Guide states the requirements for travel to specific countries.

##### B.1.6.7.6.1 Passports, Visas, Licenses and Permits

The contractor shall be responsible for timely and complete submittal of the necessary information and forms directly to the appropriate Government Agency for the required passports, visas, licenses, and permits. The contractor shall be responsible for the sponsorship of its employees and their dependents and shall process said permits directly through the appropriate Government Agency.

#### B.1.6.7.7 Disseminating Scientific and Technical Information (STINFO)

The contractor shall use AFI 61-204, Disseminating Scientific and Technical Information and DoDI 5230.24, Distribution Statements on Technical Documents, when developing, reviewing, or assisting the US Government and other supporting contractors, to identify any "sensitive" media that should not be placed into the Public Domain (e.g., Classified, For Official Use Only), as well as ensuring applicable Distribution Statement, Handling and Destruction Notice, Warning Statement (for technical information with Space/Military Application under the International Traffic Arms Regulation (ITAR) or the Export Arms Regulation for dual-use technologies), along with the Expanded Exemption Statement are applied.

#### B.1.6.7.8 Physical Security

The Contractor will be provided the contact information for Installation police forces – Security Forces. All government facilities, equipment, and materials used by the Contractor must be secured before leaving the site of the mediation.

### B.1.6.8 Post Award Conference/Periodic Progress Meetings

The Contractor agrees to attend any post award conference convened by the contracting activity or contract administration office in accordance with Federal Acquisition Regulation Subpart 42.5. The contracting officer, Contracting Officers Representative (COR), and other Government personnel, as appropriate, may meet periodically with the contractor to review the contractor's performance. At these meetings the contracting officer will apprise the contractor of how the government views the contractor's performance and the contractor will apprise the Government of problems, if any, being experienced. Appropriate action shall be taken to resolve outstanding issues. These meetings shall be at no additional cost to the government.

### B.1.6.9 Contracting Officer Representative (COR) / Contracting Officer Technical Representative (COTR)

The (COR/COTR) will be identified by separate letter. The COR/COTR monitors all technical aspects of the contract and assists in contract administration The COR/COTR is authorized to perform the following functions: assure that the Contractor performs the technical requirements of the contract: perform inspections necessary in connection with contract performance: maintain written and oral communications with the Contractor concerning technical aspects of the contract: issue written interpretations of technical requirements, including Government drawings, designs, specifications: monitor Contractor's performance and notifies both the Contracting Officer and Contractor of any deficiencies; coordinate availability of government furnished property, and provide site entry of Contractor personnel. A letter of designation issued to the COR/COTR, a copy of which is sent to the Contractor, states the responsibilities and limitations of the COR/COTR, especially concerning changes in cost or price, estimates or changes in delivery dates. The COR/COTR is not authorized to change any of the terms and conditions of the resulting order.

### B.1.6.10 Personnel and Labor Requirements

#### B.1.6.10.1 Hiring and Recruiting Plan

The contractor shall establish a Hiring and Recruiting Plan (A009) that describes the contractor’s strategy to provide personnel in case of a vacancy or “surge” capacity for unforeseen or future requirements. The contractor shall be responsible for any subcontract management necessary to integrate work performed on this contract and shall be responsible and accountable for subcontractor performance.

#### B.1.6.10.2 Project Manager / Business Relations

The contractor shall have a single Point of Contact (POC) between the Government and contractor personnel to support business relations. The contractor shall integrate and coordinate all activities required to execute this contract and manage the timeliness, completeness, and quality of problem identification. The contractor shall provide corrective action plans, timely identification of issues, and effective management of subcontractors.

#### B.1.6.10.3 Key Personnel Positions

The follow personnel are considered key personnel by the government: Senior Data Scientist, Data Engineer, Reinforcement Learning Engineer. The contractor shall provide a contract manager who shall be responsible for the performance of the work. The name of this person and an alternate who shall act for the contractor when the manager is absent shall be designated in writing to the contracting officer. The contract manager or alternate shall have full authority to act for the contractor on all contract matters relating to daily operation of this contract. The contract manager or alternate shall be available between 8:00 a.m. to 4:30p.m. Monday

thru Friday except Federal holidays or when the government facility is closed for administrative reasons. Qualifications for all key personnel are listed below:

Minimum requirements from Key Personnel shall include the following:

All KPPs (KPP 1, 2, and 3) shall have:

- At least 2 years of experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS
- Experience working with multiple database types such as SQL, Redis and MongoDB
- Experience building and integrating the at the application and database level
- Experience developing REST/SOAP APIs and messaging protocols and formats

KPP 1 and 2 shall each specifically have:

- At least 2 years of theoretical and practical background in statistical analysis, machine learning, predictive modeling, and/or optimization
- Experience implementing event/data streaming services such as Kafka
- Experience prototyping front-end visualizations utilizing data visualization suites such as Kibana or Splunk

KPP 3 shall specifically have:

- At least 2 years of experience developing Reinforcement learning systems utilizing at least one of the following methodologies. Finite Markov Decision Processes, Support Vector Machines, Q-Learning, Stochastic Finite State Machines, MCTS or other hybrid Deep Reinforcement Learning processes

#### B.1.6.10.4 Other than Key Personnel – Labor Categories, Labor Competencies, Labor Levels

Refer to **Section B-8**.

### B.1.6.11 Identification of Contractor Employees

All contract personnel attending meetings, answering Government telephones, and working in other situations where their contractor status is not obvious to third parties are required to identify themselves as such to avoid creating an impression in the minds of members of the public that they are Government officials. They must ensure that all documents or reports produced by contractors are suitably marked as contractor products or that contractor participation is appropriately disclosed.

### B.1.6.12 Contractor Travel

The contractor may be required to travel to various locations within the Continental United States (CONUS) and Outside the Continental United States (OCONUS) in performance of this contract, with all travel arrangements pre-approved by the Contracting Officer or Contracting Officer Representative (COR). Potential travel locations include Al Udeid AB, Qatar; Osan AFB, South Korea; Elmendorf AFB, Alaska; Hickam AFB, Hawaii; Ramstein AFB, Germany; Tyndall AFB, FL; Davis-Monthan AFB, AZ; Nellis AFB, NV; and McDill AFB, FL.

The contractor shall travel using the lowest cost mode transportation commensurate with the mission requirements. When necessary to use air travel, the contractor shall use the tourist class, economy class, or similar accommodations to the extent they are available and commensurate with the mission requirements.

IAW DFARS 252.225-7040, the contractor shall use the Synchronized Pre-deployment and Operational Tracker (SPOT) web-based system, to enter and maintain the data for all Contractor Accompanying Armed Forces (CAAF) and, as designated by USD (AT&L) or the Combatant Commander, non-CAAF supporting U.S. Armed Forces deployed outside the United States. Under this contract, the contractor will be designated

as Non-CAAF. All contractor personnel traveling to the applicable OCONUS locations shall be responsible for completion of all required training prior to deployment.

Refer to DFARS PGI 225.370(b) for any travel to Korea; DFARS PGI 225.370(d) for any travel to Qatar; and the Army in Europe Regulation 715-9 for any travel to Germany.

#### B.1.6.13 Other Direct Costs

The contractor shall identify ODC and miscellaneous items as specified in each task order. No profit or fee will be added; however, DCAA approved burden rates are authorized.

ODCs must be approved by the COR prior to obtaining or incurring the cost. The COR will advise the Contractor regarding allowable costs. The Contractor shall provide the COR with documentation or receipt(s) submitted with the invoice and a record of the prior COR approval.

#### B.1.6.14 Data Management

The contractor shall establish, document, and maintain all data for the program and provide data through **CDRLs A004** and **A005**. The contractor shall use sound data management discipline for developing, acquiring, controlling and delivering all required technical, management and other data. The contractor shall ensure on-time delivery of data; data quality; accurate updates/revisions and corrections to data as required; and proper identification, marking and control of proprietary, For Official Use Only, and classified data.

#### B.1.6.15 Electronic Data Interchange (EDI)

The contractor shall provide an electronic, secure, on-line access point for delivery of contractor prepared CDRL data to the Government. All CDRL items shall be posted on the contractor's data delivery access point and available for Government download NLT than the delivery date specified by the applicable CDRL item. The contractor shall notify the CDRL item distribution e-mail addresses (via email) when each CDRL item has been posted and is available for Government access/download. The contractor shall follow Government approved open standards for all EDI protocols, files, and formats. The contractor shall prepare/submit CDRL documentation in electronic formats compatible with Microsoft Windows operating system and Microsoft Office 2010 suite of applications, unless a different format is directed for specific CDRL items. Submission times shall be in accordance with the CDRL requirements. This requirement does not preclude contractor delivery of hard copy and/or CD-ROM copy CDRL items as required IAW with applicable CDRL instructions.

#### B.1.6.16 Data Rights

Except for Commercially available Off-The-Shelf (COTS) items (as defined in FAR Part 2.101), the contractor shall not utilize or provide any proprietary technical/engineering processes, solutions or implementations to meet the requirements without prior Government approval. With the exception of COTS items, all technical data and/or software solutions (to include, interfaces and related information, as well as processes, tools, systems and implementations) shall be first developed during the course of performance of the requirements of the present contract or be otherwise obtained with Unlimited License Rights, as defined herein, so that the Government shall be afforded with Unlimited License Rights (as defined in DFARS clauses 252.227-7013 and 252.227-7014) in all said data/software solutions incorporated into system deliverables and/or developed in this contract. However, the Government, at its complete discretion, may authorize the use of a proprietary solution(s). COTS items developed, maintained and/or sold by the contractor shall not be used without prior Government approval.

If unique configuration(s) of COTS items are utilized or provided, the contractor hereby agrees to provide the Government with the necessary license rights, as well as complete technical data, software and interface information and any configuration related documentation to allow the Government to operate and

maintain/sustain or otherwise update the unique configuration(s) of the COTS items using any combination of Government support contractors and/or third party contractors.

During execution, if the contractor leverages open source products, the contractor shall immediately identify use to the Government for review.

### B.1.6.17 Organizational Conflict of Interest

Contractor and subcontractor personnel performing work under this contract may receive, have access to or participate in the development of proprietary or source selection information (e.g., cost or pricing information, budget information or analyses, specifications or work statements, etc.) or perform evaluation services which may create a current or subsequent Organizational Conflict of Interests (OCI) as defined in FAR Subpart 9.5. The Contractor shall notify the Contracting Officer immediately whenever it becomes aware that such access or participation may result in any actual or potential OCI and shall promptly submit a plan to the Contracting Officer to avoid or mitigate any such OCI. The Contractor's mitigation plan will be determined to be acceptable solely at the discretion of the Contracting Officer and in the event the Contracting Officer unilaterally determines that any such OCI cannot be satisfactorily avoided or mitigated, the Contracting Officer may affect other remedies as he or she deems necessary, including prohibiting the Contractor from participation in subsequent contracted requirements which may be affected by the OCI.

### B.1.6.18 Associate Contractor Agreements (ACA)

Throughout the course of the contract, the contractor may be required to work with, or within proximity to, other contractors within the Kessel Run Experimentation Lab.

The contractor shall enter into Associate Contractor Agreements (ACA) with applicable third-party integrators and other stakeholders after contract award for any portion of the contract requiring joint participation in the accomplishment of the requirement. The agreements shall include the basis for sharing information, data, technical knowledge, expertise and / or resources essential to this effort, which shall ensure the greatest degree of cooperation to meet the terms of the contract. The Government will provide specific names of contractors to the contractor.

- ACAs shall include, but not limited to, the following general information:
- Identify the associate contractors and their relationships.
- Identify the program involved and the relevant Government contracts of the associate contractors.
- Describe the associate contractor interfaces by general subject matter.
- Specify the categories of information to be exchanged or support to be provided.
- Include the expiration date (or event) of the ACA.
- Identify potential conflicts between relevant Government contracts and the ACA; include agreements on protection of proprietary data and restrictions on employees.

The contractor is not relieved of any contract requirements or entitled to any adjustments to the contract terms because of a failure to resolve a disagreement with an associate contractor. Liability for the improper disclosure of any proprietary data contained in or referenced by any ACA shall rest with the parties to the ACA and not the Government. All costs associated with the ACAs are included in the negotiated cost of this contract. ACAs may be amended as required by the Government during the performance of this contract. The contractor shall submit copies of all ACAs to the Contracting Officer.

## B.2 PWS Part 2 - Definitions & Acronyms

This section includes all appropriate terms and phrases for this PWS. The definition must be clear and concise, not ambiguous. Carefully consider each definition because they will be binding for the duration of this contract, unless modified. In addition, include a complete listing of all acronyms and words or phrases they represent.

### B.2.1 Definitions

#### B.2.1.1 Contractor

A supplier or vendor awarded a contract to provide specific supplies or service to the government. The term used in this contract refers to the prime.

#### B.2.1.2 Contracting Officer

A person with the legal authority to administer, and or terminate contracts, and make related determinations and findings on behalf of the government. Note: The only individual who can legally bind the government.

#### B.2.1.3 Contracting Officer's Representative (COR)

An employee of the U.S. Government appointed by the contracting officer to administer the contract. Such appointment shall be in writing and shall state the scope of authority and limitations. This individual has authority to provide technical direction to the Contractor as long as that direction is within the scope of the contract, does not constitute a change, and has no funding implications. This individual does NOT have authority to change the terms and conditions of the contract.

#### B.2.1.4 Defective Service

A service output that does not meet the standard of performance associated with the Performance Work Statement.

#### B.2.1.5 Deliverable

Anything that can be physically delivered but may include non-manufactured things such as meeting minutes or reports.

#### B.2.1.6 Key Personnel

Contractor personnel that are evaluated in a source selection process and that may be required to be used in the performance of a contract by the Key Personnel listed in the PWS. When key personnel are used as an evaluation factor in best value procurement, an offer can be rejected if it does not have a firm commitment from the persons that are listed in the proposal.

#### B.2.1.7 Physical Security

Actions that prevent the loss or damage of Government property.

#### B.2.1.8 Quality Assurance

The government procedures to verify that services being performed by the Contractor are performed according to acceptable standards.

#### B.2.1.9 Quality Assurance Surveillance Plan (QASP)

An organized written document specifying the surveillance methodology to be used for surveillance of contractor performance.

#### B.2.1.10 Quality Control

All necessary measures taken by the Contractor to assure that the quality of an end product or service shall meet contract requirements.

#### B.2.1.11 Subcontractor

One that enters into a contract with a prime contractor. The Government does not have privity of contract with the subcontractor.

#### B.2.1.12 Work Day

The number of hours per day the Contractor provides services in accordance with the contract.

#### B.2.1.13 Work Week

Monday through Friday, unless specified otherwise.

## B.3 PWS Part 3 - Government Furnished Items and Services

### B.3.1 General

The Government will the provide the necessary workspace and equipment for the contractor staff to provide the support outlined in the PWS to include desk space, telephones, computers, and other items necessary to maintain an office environment.

## B.4 PWS Part 4 - Contractor Furnished Items and Responsibilities

### B.4.1 General

The Contractor shall furnish all supplies, equipment, facilities and services required to perform work under this contract that are not listed under **Part 3 (Section B.3)** of this PWS.

### B.4.2 Secret Facility Clearance

The contractor shall hold a Secret Facility Security Level (FCL). Offeror shall submit a redacted DD Form 441 Department of Defense Security Agreement" as verification offeror has been granted its FCL.

## B.5 PWS Part 5 - Performance Requirements

### B.5.1 Basic Services

As described in the objectives, the contractor shall provide services for:

- Create and maintain data pipeline architectures to automate the processing of large and complex data sets.
- Work with product teams, users, and other stakeholders to identify opportunities for data-driven solutions.
- Work closely with product teams to implement Reinforcement Learning features at the application and database level.
- Work with product teams, users, and other stakeholders to identify and build optimization and simulation models for highly complex processes.
- Hire and retain quality staff to support Kessel Run's Data Science needs.
- Provide surge services in the event of unforeseen or future requirements.

### B.5.2 Tasks

#### B.5.2.1 Create and maintain data pipeline architectures to automate the processing of large and complex data sets.

The contractor shall provide services for:

- Coordinate with internal and external stakeholders to identify the initial requirements and / or expectations for the data pipeline architecture
- Assess and document the volume, complexity, quality, and variability of the complex data sets and how that impacts the collected requirements and / or expectations
- Identify the long-term objectives for the data pipeline architectures and determine the flexibility, in the design, required to meet those objectives
- Collaborate with stakeholders, based on information identified during the discovery phase, to settle on data pipeline architecture objectives
- Create and implement data pipeline architectures
  - Identify the data pipeline architect team based on upon architecture objectives
  - Design architecture diagram while mapping architecture objectives to available hardware / software, incorporating cloud and/or serverless design paradigms
  - Determine which metrics / reports could be supported with the proposed design
  - Discuss the potential limitations, costs, requirements (hardware / software) expected to implement the architecture with senior leadership
  - Devise an implementation timeline based on the architecture design
  - Implement the architecture according to the designated timeline
  - Provide periodic touch-base points with stakeholders
  - Meet with product teams and / or senior leadership to confirm full deployment of the data pipeline architecture
- Create and implement data pipeline maintenance plan
  - Identify how long-term support would be maintained while creating initial data pipeline architectures
  - Determine which metrics / reports would be needed to assess the quality and resiliency of the pipelines
  - Estimate the support size and skillset of the team necessary to maintain the proposed infrastructure as well as the flex requirements needed to handle changes in the architectures function and / or workload

- Discuss the potential limitations, costs, requirements (hardware / software) expected to maintain the architecture with senior leadership
- Identify the data pipeline architecture maintenance team and, when necessary, engage
- Hand off control of systems as portions of the architecture become live
- Reassess the support size and skillset of the team necessary to maintain the proposed infrastructure when nearing completion of the implementation timeline
- Reassess which metrics/reports would be needed to assess the quality and resiliency of the pipelines
- Update maintenance plan based on any new findings from reassessments
- Design a continuous monitoring plan based on the updated maintenance plan
- Coordinate with stakeholders to finalize initial support team/maintenance plan, metrics, and reporting system
- Confirm that all necessary responsibilities have successfully been handed off to maintenance team
  - Reports on architecture
  - General status updates
  - Implementation deliverables
  - Performance metrics
  - Auditing/Performance reporting

#### B.5.2.2 Work with product teams, users, and other stakeholders to identify opportunities for data-driven solutions.

The contractor shall provide services for:

- Meet with senior leadership, product teams, users, and other stakeholders to better understand current operations and the role that data plays in those operations
- Coordinate to better understand what data can be made available for data-driven solutions
- Identify new and existing products that would/could benefit from data-driven solutions, leveraging current and/or planned data pipelines
- Explore what data-driven solutions would be possible with modifications to the current proposed pipeline architecture using public research, white papers, research posters, and other scientific papers to drive data hypotheses
- Calculate the cost/benefit breakdown of the proposed data-driven solutions
- Explore the feasibility and value of solutions by generating POCs when practical
- Meet with end users to better understand the feasibility of the proposed data-driven solutions to calculate the value-added from the end user's perspective
- Discuss findings with senior leadership, pulling in product teams/end users/etc. when necessary
- Provide periodic reports on current status

#### B.5.2.3 Work closely with product teams to implement Reinforcement Learning features at the application and database level.

The contractor shall provide services for:

- Exploration/Research of Reinforcement Learning Features
  - Pull from solution opportunities when possible
  - Explore new Reinforcement Learning feature opportunities
    - Work with product teams to identify areas in which Reinforcement Learning features could benefit existing products

        - Research and coordinate with product teams and end users to identify new and existing areas in which Reinforcement Learning could provide value
    - Designate a Reinforcement Learning team and a Simulation team that will coordinate on implementing the Reinforcement Learning solutions
    - Develop research environments for the Reinforcement Learning team and Simulation team to operate within
        - These environments may be team or feature specific if multiple environments are required
    - Encourage Reinforcement Learning and Simulation teams to research, explore, and proto-type solutions when possible
    - Explore what data/simulation environments would be necessary to develop the proposed Reinforcement Learning solutions
    - Identify which metrics could be used to demonstrate how well the Reinforcement Learning feature performs
    - Meet with end users and product teams to better understand the feasibility of the proposed Reinforcement Learning features to calculate the value-added from the end user's perspective
    - Work with product teams to calculate the cost/benefit breakdown of the Reinforcement Learning features
    - Advise senior leadership on the complexities, risks, and timelines for developing the reinforcement learning solutions
    - Collaborate with product teams and senior leadership to select features to pursue and document decisions
    - Design implementation strategy for approved Reinforcement Learning features
    - Implement Reinforcement Learning feature according to the implementation strategy, adjusting as necessary
    - Meet periodically with senior leadership and/or product teams to discuss progress, complications, report current metrics, and to determine if research into this feature should continue
    - Meet periodically with product teams and/or end users to better align feature implementation
    - Coordinate with senior leadership to determine if the feature should move to a production implementation, if additional time should be spent on the feature, or if the feature should be eliminated
- Production Implementation of Reinforcement Learning Features
    - Determine if a static or dynamic Reinforcement Learning model is best suited for the production model
    - Evaluate how the model would be retrained and / or updated in a production environment
    - Summarize the benefits of maintaining the research environment in addition to the production environment (potentially leverage research environment as a testing and / or staging environment)
    - Identify performance and model-based metrics that could be used to detect if the model has decayed
    - Coordinate with end users and product teams to calculate the expected demand for the feature based on current requirements and / or expectations
    - Collaborate with the product teams to develop a transition plan that addresses identified needs / requirements
    - Work with the product team to identify points in the transition plan and build in validation checkpoints

- Revise initial architecture design to incorporate changes highlighted in the production transition plan
- Assist the product teams in developing a maintenance support plan based on the revised architecture design
- Coordinate with senior leadership and product teams on production and maintenance plans
- Provide support to implement the transition plan, where necessary
- Provide support to verify checkpoints, where necessary
- Meet with product teams and / or senior leadership to confirm full deployment of Reinforcement Learning Feature

- Continual Support for Reinforcement Learning Features
  - Determine which metrics / reports would be needed to assess the quality and resiliency of the Reinforcement Learning feature
  - Estimate the support size and skillset of the team necessary to maintain the proposed infrastructure as well as the flex requirements needed to handle changes in the functional environment of the model and / or model itself
  - Discuss the potential limitations, costs, requirements (hardware / software) expected to maintain the Reinforcement Learning feature with senior leadership
  - Work with product teams to identify the Reinforcement Learning maintenance team and train the team, where necessary
  - Hand off control of systems as portions of the Reinforcement Learning feature become live
  - Reassess the support size and skillset of the team necessary to maintain the proposed Reinforcement Learning feature when nearing completion of the transition timeline
  - Reassess which metrics / reports would be needed to assess the quality and resiliency of the Reinforcement Learning feature
  - Update maintenance plan based on any new findings from reassessments
  - Coordinate with stakeholders to finalize initial support team / maintenance plan, metrics, and reporting system
  - Design a continuous monitoring plan based on the updated maintenance plan
  - Confirm that all necessary responsibilities have successfully been handed off to maintenance team

#### B.5.2.4 Work with product teams, users, and other stakeholders to identify and build optimization and simulation models for highly complex processes.

The contractor shall provide services for:

- Identify new optimization and simulation models
  - Coordinate with product teams, users, and other stakeholders to identify the initial requirements for the optimization and simulation models
  - Locate the data sources necessary to run the optimization and simulation models
  - Explore/Prototype the possible modeling solutions given the current requirements, data, and team to determine the most viable course of action
- Estimate the level of effort required and value that would be generated from identified models
- Work with product teams, users, other stakeholders, and / or senior leadership to identify models worth pursuing
- Design implementation plan for proposed optimization and simulation models:
  - Evaluate how the model would be retrained and / or updated in a production environment

- Assess the quality of the provided data sources to determine if supplemental data and / or cleaning processes are needed
- Design data processing workflows, as necessary for modeling; coordinate for any data processing needs
- Identify performance and model-based metrics that could be used to detect if the model has decayed
- Design implementation strategy for approved optimization and / or simulation model
- Coordinate with end users and product teams to calculate the expected demand for the feature based on current requirements and / or expectations
- Assist the product teams in developing a maintenance support plan based on the revised architecture design
- Advise senior leadership on the complexities, risks, and timelines for developing the optimization and simulation models
- Coordinate with senior leadership and product teams on production and maintenance plans
  - Production Implementation of optimization and simulation models
- Implement models according to the implementation strategy, adjusting as necessary
- Meet periodically with senior leadership and / or product teams to discuss progress, complications, report current metrics
- Meet periodically with product teams, users, and / or other stakeholders to better align model implementation
- Meet with product teams and / or senior leadership to confirm full deployment of the models

- Continual Support for optimization and simulation models
  - Determine which metrics / reports would be needed to assess the long-term performance of the optimization or simulation feature
  - Estimate the support size and skillset of the team necessary to maintain the proposed infrastructure as well as the flex requirements needed to handle changes to the model
  - Discuss the potential limitations, costs, requirements (hardware / software) expected to maintain the optimization or simulation model with senior leadership
  - Work with product teams to identify the maintenance team, and spin-up the team when necessary
  - Hand off control of systems as portions of the model become live
  - Reassess the support size and skillset of the team necessary to maintain the proposed model when nearing completion of the transition timeline
  - Reassess which metrics / reports would be needed to assess the performance of the optimization or simulation feature
  - Update maintenance plan based on any new findings from reassessments
  - Coordinate with product teams, users, and other stakeholders to finalize initial support team / maintenance plan, metrics, and reporting system
  - Design a continuous diagnostics and monitoring plan based on the updated maintenance plan
  - Confirm that all necessary responsibilities have successfully been handed off to maintenance team

#### B.5.2.5 Hire and retain quality staff to support Kessel Run's Data Science needs

Refer to **Section B-12**.

#### B.5.2.6 Provide surge services in the event of unforeseen or future requirements.

The contractor shall support emerging projects as required. Unpredictable world events demand that Kessel Run have the capability to maintain quick responsiveness to increased data and distribution needs in order to sustain capabilities. Accordingly, the contractor shall provide quick reaction support in response to emergent projects. This additional emergent project as-needed support applies across Tasks 1 through 5.

#### B.5.2.7 Contractor Management Reporting (CMR)

The contractor shall report all contractor labor hours (including Subcontractor labor hours) required for performance of services provided under this contract, including option periods, for the project via the Air Force secure data collection site http://www.ecmra.mil. The contractor is required to completely fill in all required data fields at aforementioned collection site. Reporting inputs will be for the labor executed during the period of performance for each Government fiscal year (FY) which runs 1 October through 30 September. While inputs may be reported any time during the FY, all data shall be reported no later than 31 October of each calendar year or the end of the period of performance if prior to 31 October of each year. Contractors may direct questions to the Contractor Manpower Reporting Application (CMRA) help desk found at the collection site. Information from the secure web site is considered to be proprietary in nature when the contract number and contractor name are associated with the direct labor hours and direct labor dollars. At no time will any data be released to the public with the contractor name and contract number associated with the data. Data for Air Force service requirements must be input at the Air Force CMRA link. However, user manuals for Government personnel and contractors are available at the Army CMRA link at http://www.ecmra.mil.

The contractor shall submit cost / financial reports in accordance with CDRL A002.

## B.6 PWS Part 6 – Applicable Publications

This section lists any publications, manuals, and / or regulations that the contractor must abide by. See example provided below:

### B.6.1 Applicable Publications (Current Editions)

If applicable, in this section list any publications, manuals, and / or regulations that the contractor must abide by. See example provided below:

#### B.6.1.1 The Contractor must abide by all applicable regulations, publications, manuals, and local policies and procedures.

- FAR 52.203-05 COVENANT AGAINST CONTINGENT FEES (May 2014)
- FAR 52.203-07 ANTI-KICKBACK PROCEDURES (May 2014)
- FAR 52.203-10 PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (May 2014)
- FAR 52.203-12 LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (Oct 2010)
- FAR 52.203-16 PREVENTING PERSONAL CONFLICTS OF INTEREST (DEVIATION 2018-O0018) (Aug 2018)
- FAR 52.203-17 CONTRACTOR EMPLOYEE WHISTLEBLOWER RIGHTS AND REQUIREMENT TO INFORM EMPLOYEES OF WHISTLEBLOWER RIGHTS (Apr 2014)
- FAR 52.204-02 SECURITY REQUIREMENTS (Aug 1996)
- FAR 52.204-09 PERSONAL IDENTITY VERIFICATION OF CONTRACTOR PERSONNEL (Jan 2011)
- FAR 52.204-12 UNIQUE ENTITY IDENTIFIER MAINTENANCE (Oct 2016)
- FAR 52.204-18 COMMERCIAL AND GOVERNMENT ENTITY CODE MAINTENANCE (Jul 2016)
- FAR 52.204-19 INCORPORATION BY REFERENCE OF REPRESENTATIONS AND CERTIFICATIONS (Dec 2014)
- FAR 52.204-21 BASIC SAFEGUARDING OF COVERED CONTRACTOR INFORMATION SYSTEMS (Jun 2016)
  FAR 52.204-23 PROHIBITION ON CONTRACTING FOR HARDWARE, SOFTWARE, AND SERVICES DEVELOPED OR PROVIDED BY KASPERSKY LAB AND OTHER COVERED ENTITIES (Jul 2018)
- FAR 52.211-15 DEFENSE PRIORITY AND ALLOCATION REQUIREMENTS (Apr 2008)
- FAR 52.212-04 CONTRACT TERMS AND CONDITIONS--COMMERCIAL ITEMS (Oct 2018)
- FAR 52.212-04 CONTRACT TERMS AND CONDITIONS--COMMERCIAL ITEMS (Oct 2018), Alternate I, (Jan 2017)
- FAR 52.212-05 CONTRACT TERMS AND CONDITIONS REQUIRED TO IMPLEMENT STATUTES OR EXECUTIVE ORDERS--COMMERCIAL ITEMS (Jan 2019)
- FAR 52.212-0502 52.203-13 CONTRACTOR CODE OF BUSINESS ETHICS AND CONDUCT (OCT 2015)
- FAR 52.212-0503 52.203-15 WHISTLEBLOWER PROTECTIONS UNDER THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009 (JUN 2010)
- FAR 52.212-0516 52.219-06 NOTICE OF TOTAL SMALL BUSINESS SET-ASIDE (NOV 2011)
- FAR 52.212-0530 52.219-14 LIMITATIONS ON SUBCONTRACTING (JAN 2017)
- FAR 52.212-0543 52.222-21 PROHIBITION OF SEGREGATED FACILITIES (APR 2015)
- FAR 52.212-0544 52.222-26 EQUAL OPPORTUNITY (SEP 2016)
- FAR 52.212-0545 52.222-35 EQUAL OPPORTUNITY FOR VETERANS (OCT 2015)

- FAR 52.212-0547 52.222-36 EQUAL OPPORTUNITY FOR WORKERS WITH DISABILITIES (JUL 2014)
- FAR 52.212-0548 52.222-37 EMPLOYMENT REPORTS ON VETERANS (FEB 2016)
- FAR 52.212-0550 52.222-40 NOTIFICATION OF EMPLOYEE RIGHTS UNDER THE NATIONAL LABOR RELATIONS ACT (DEC 2010)
- FAR 52.212-055001 52.222-50 COMBATING TRAFFICKING IN PERSONS (JAN 2019) (22 U.S.C. CHAPTER 78 AND E.O. 13627) (Jan 2019)
- FAR 52.212-0551 52.222-54 EMPLOYMENT ELIGIBILITY VERIFICATION (OCT 2015)
- FAR 52.212-0562 52.223-18 ENCOURAGING CONTRACTOR POLICIES TO BAN TEXT MESSAGING WHILE DRIVING (AUG 2011)
- FAR 52.212-056250 52.224-3 PRIVACY TRAINING (JAN 2017)
- FAR 52.212-0580 52.232-33 PAYMENT BY ELECTRONIC FUNDS TRANSFER--SYSTEM FOR AWARD MANAGEMENT (OCT 2018)
- FAR 52.215-08 ORDER OF PRECEDENCE--UNIFORM CONTRACT FORMAT (Oct 1997)
- FAR 52.216-07 ALLOWABLE COST AND PAYMENT (Aug 2018)
- FAR 52.216-31 TIME-AND-MATERIALS/LABOR-HOUR PROPOSAL REQUIREMENTS--COMMERCIAL ITEM ACQUISITION (Feb 2007)
- FAR 52.217-08 OPTION TO EXTEND SERVICES (Nov 1999)
- FAR 52.217-09 OPTION TO EXTEND THE TERM OF THE CONTRACT (Mar 2000)
- FAR 52.219-06 NOTICE OF TOTAL SMALL BUSINESS SET-ASIDE (DEVIATION 2019-O0003) (Dec 2018)
- FAR 52.219-14 LIMITATIONS ON SUBCONTRACTING (Jan 2017)
- FAR 52.222-56 CERTIFICATION REGARDING TRAFFICKING IN PERSONS COMPLIANCE PLAN (Mar 2015)
- FAR 52.222-62 PAID SICK LEAVE UNDER EXECUTIVE ORDER 13706 (Jan 2017)
- FAR 52.232-07 PAYMENTS UNDER TIME-AND-MATERIALS AND LABOR-HOUR CONTRACTS (Aug 2012)
- FAR 52.232-25 PROMPT PAYMENT (Jan 2017)
- FAR 52.232-39 UNENFORCEABILITY OF UNAUTHORIZED OBLIGATIONS (Jun 2013)
- FAR 52.232-40 PROVIDING ACCELERATED PAYMENTS TO SMALL BUSINESS SUBCONTRACTORS (Dec 2013)
- FAR 52.233-01 DISPUTES (May 2014)
- FAR 52.233-03 PROTEST AFTER AWARD (Aug 1996)
- FAR 52.233-04 APPLICABLE LAW FOR BREACH OF CONTRACT CLAIM (Oct 2004)
- FAR 52.242-03 PENALTIES FOR UNALLOWABLE COSTS (May 2014)
- FAR 52.243-03 CHANGES -- TIME-AND-MATERIALS OR LABOR-HOURS (Sep 2000)
- FAR 52.243-07 NOTIFICATION OF CHANGES (Jan 2017)
- FAR 52.244-06 SUBCONTRACTS FOR COMMERCIAL ITEMS (Jan 2019)
- FAR 52.249-04 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (SERVICES) (SHORT FORM) (Apr 1984)
- FAR 52.249-14 EXCUSABLE DELAYS (Apr 1984)
- FAR 52.252-02 CLAUSES INCORPORATED BY REFERENCE (Feb 1998)
- FAR 52.252-06 AUTHORIZED DEVIATIONS IN CLAUSES (Apr 1984)
- FAR 52.253-01 COMPUTER GENERATED FORMS (Jan 1991)
- DFARS 252.201-7000 CONTRACTING OFFICER'S REPRESENTATIVE (Dec 1991)

- DFARS 252.203-7000 REQUIREMENTS RELATING TO COMPENSATION OF FORMER DOD OFFICIALS (Sep 2011)
- DFARS 252.203-7002 REQUIREMENT TO INFORM EMPLOYEES OF WHISTLEBLOWER RIGHTS (Sep 2013)
- DFARS 252.203-7003 AGENCY OFFICE OF THE INSPECTOR GENERAL (Dec 2012)
- DFARS 252.204-7000 DISCLOSURE OF INFORMATION (Oct 2016)
- DFARS 252.204-7003 CONTROL OF GOVERNMENT PERSONNEL WORK PRODUCT (Apr 1992)
- DFARS 252.204-7004 LEVEL I ANTITERRORISM AWARENESS TRAINING FOR CONTRACTORS (Feb 2019)
- DFARS 252.204-7012 SAFEGUARDING COVERED DEFENSE INFORMATION AND CYBER INCIDENT REPORTING (Oct 2016)
- DFARS 252.204-7015 NOTICE OF AUTHORIZED DISCLOSURE OF INFORMATION TO LITIGATION SUPPORT (May 2016)
- DFARS 252.205-7000 PROVISION OF INFORMATION TO COOPERATIVE AGREEMENT HOLDERS (Dec 1991)
- DFARS 252.211-7003 ITEM UNIQUE IDENTIFICATION AND VALUATION (Mar 2016)
- DFARS 252.211-7003 ITEM UNIQUE IDENTIFICATION AND VALUATION (Mar 2016)
- DFARS 252.216-7009 ALLOWABILITY OF LEGAL COSTS INCURRED IN CONNECTION WITH A WHISTLEBLOWER PROCEEDING (Sep 2013)
- DFARS 252.225-7040 CONTRACTOR PERSONNEL SUPPORTING U.S. ARMED FORCES DEPLOYED OUTSIDE THE UNITED STATES (Oct 2015)
- DFARS 252.226-7001 UTILIZATION OF INDIAN ORGANIZATIONS, INDIAN-OWNED ECONOMIC ENTERPRISES, AND NATIVE HAWAIIAN SMALL BUSINESS CONCERNS (Apr 2019)
- DFARS 252.227-7013 RIGHTS IN TECHNICAL DATA--NONCOMMERCIAL ITEMS (Feb 2014)
- DFARS 252.227-7014 RIGHTS IN NONCOMMERCIAL COMPUTER SOFTWARE AND NONCOMMERCIAL COMPUTER SOFTWARE DOCUMENTATION (Feb 2014)
- DFARS 252.227-7015 TECHNICAL DATA--COMMERCIAL ITEMS (Feb 2014)
- DFARS 252.227-7016 RIGHTS IN BID OR PROPOSAL INFORMATION (Jan 2011)
- DFARS 252.227-7026 DEFERRED DELIVERY OF TECHNICAL DATA OR COMPUTER SOFTWARE (Apr 1988)
- DFARS 252.227-7027 DEFERRED ORDERING OF TECHNICAL DATA OR COMPUTER SOFTWARE (Apr 1988)
- DFARS 252.227-7030 TECHNICAL DATA--WITHHOLDING OF PAYMENT (Mar 2000)
- DFARS 252.227-7037 VALIDATION OF RESTRICTIVE MARKINGS ON TECHNICAL DATA (Sep 2016)
- DFARS 252.229-7002 CUSTOMS EXEMPTIONS (GERMANY) (Jun 1997)
- DFARS 252.231-7000 SUPPLEMENTAL COST PRINCIPLES (Dec 1991)
- DFARS 252.232-7003 ELECTRONIC SUBMISSION OF PAYMENT REQUESTS AND RECEIVING REPORTS (Dec 2018)
- DFARS 252.232-7008 ASSIGNMENT OF CLAIMS (OVERSEAS) (Jun 1997)
- DFARS 252.232-7010 LEVIES ON CONTRACT PAYMENTS (Dec 2006)
- DFARS 252.233-7001 CHOICE OF LAW (OVERSEAS) (Jun 1997)
- DFARS 252.239-7001 INFORMATION ASSURANCE CONTRACTOR TRAINING AND CERTIFICATION (Jan 2008)
- DFARS 252.239-7018 SUPPLY CHAIN RISK (DEVIATION 2018-O0020) (Sep 2018)
- DFARS 252.242-7004 MATERIAL MANAGEMENT AND ACCOUNTING SYSTEM (May 2011)

- DFARS 252.242-7006 ACCOUNTING SYSTEM ADMINISTRATION (Feb 2012)
- DFARS 252.243-7001 PRICING OF CONTRACT MODIFICATIONS (Dec 1991)
- DFARS 252.243-7002 REQUESTS FOR EQUITABLE ADJUSTMENT (Dec 2012)
- DFARS 252.244-7000 SUBCONTRACTS FOR COMMERCIAL ITEMS (Jun 2013)
- AF 5352.201-9101 OMBUDSMAN (Jun 2016)
- AF 5352.204-9000 NOTIFICATION OF GOVERNMENT SECURITY ACTIVITY AND VISITOR GROUP SECURITY AGREEMENTS (Oct 2017)
- AF 5352.209-9000 ORGANIZATIONAL CONFLICT OF INTEREST (Oct 2010)
- AF 5352.223-9000 ELIMINATION OF USE OF CLASS I OZONE DEPLETING SUBSTANCES (ODS) (Nov 2012)
- AF 5352.223-9001 HEALTH AND SAFETY ON GOVERNMENT INSTALLATIONS (Nov 2012)
- AF 5352.242-9000 CONTRACTOR ACCESS TO AIR FORCE INSTALLATIONS (Nov 2012)
- AF 5352.242-9001 COMMON ACCESS CARDS (CAC) FOR CONTRACTOR PERSONNEL-AF SYSTEMS (Nov 2012)
- Homeland Security Presidential Directive-12 (HSPD-12), Office of Management and Budget (OMB) guidance M-05-24, and Federal Information Processing Standards Publication (FIPS PUB) Number 201.
- National Institute of Standards and Technology (NIST) Special Publication (SP) 800-171, “Protecting Controlled Unclassified Information in Nonfederal Information Systems and Organizations,”
- Joint Publication 3-07.3
- The National Industrial Security Program Operating Manual (NISPOM) February 2006, Incorporating Change 1 dated March 28, 2013, change 2 dated May 18, 2016, and its supplements apply to all classified contract performance
- DoDM 5200.01, Volume 4, DoD Information Security Program: CUI, Enclosures 3 & 4
- DoDM 5200.01, Volume 4, Enclosure 4
- DoDM 5400.07/Air Force Manual 33-302, DoD Freedom of Information Act (FOIA) Program
- DoD Instruction 3200.14, Principles and Operational Parameters of the DoD Scientific and Technical Information Program, and DoD Instruction 2040.02, International Transfer of Technology, Articles, and Services
- DoD Instruction 5230.24, Distribution Statements on Technical Documents
- DoD Instruction 5230.24, DoD Directive 5230.25, and DoD Manual 5010.12-M, Procedures for the Acquisition and Management of Technical Data

## B.7 PWS Part 7 – Deliverables List and Schedule

### B.7.1 Deliverables List and Schedule

**Figure B-2** lists any reports or documentation that is required as a deliverable to include the frequency, # of pages, etc. A deliverable is anything that can be physically delivered but may include non-physical things such as meeting minutes. Note: All PWS deliverables should be included in this exhibit.

**Figure B-2: Deliverables**

| Data Item | Authority (DID) | Title of Data Item | Subtitle | # Of Pages | Frequency |
|---|---|---|---|---|---|
| A001 | DI-MGMT-81605/T | Briefing Material | Kick-Off Meeting / PMR | Unlimited | Within 10 days of project start, and monthly |
| A002 | DI-FNCL-80331A | Funds and Man-Hours Expenditure Report | Monthly Status Report (MSR) | Unlimited | Monthly |
| A003 | DI-MGMT-82247 | System Security Plan and Associated Plans of Action for A Contractor's Internal Unclassified Information System | System Security Plan | Unlimited | Within 30 days of project start, and monthly |
| A004 | DI-IPSC-81488/T | Computer Software Product | Computer Software Product | Unlimited | Within 30 days of project start, and monthly |
| A005 | DI-IPSC-80590B | Computer Software End Item and Documentation | Computer Software End Item and Documentation | Unlimited | Within 30 days of project start, and monthly |
| A006 | DI-MGMT-81808 | Risk Management Plan | Risk Management Plan | Unlimited | Within 15 days of project start, and monthly |
| A007 | DI-MGMT-81809 | Risk Management Status Report | Risk Management Status Plan | Unlimited | Monthly |
| A008 | TBD | Discovery & Framing Product Team Kick-Off Meeting | Discovery & Framing Product Team Kick-off Minutes | Unlimited | Monthly |
| A009 | TBD | Hiring and Recruiting Plan | Hiring and Recruiting Plan | Unlimited | Within 10 days of project start |
| A010 | TBD | DD254 | DD54 | Unlimited | Within 2 days of project start |
| A011 | TBD | Program Management Plan (PMP) | Program Management Plan (PMP) | Unlimited | Within 2 days of project start |
| A012 | TBD | Master Schedule | Master Schedule | Unlimited | Within 15 days of project start |

## B.8 PWS Part 8 – Proposed Labor Categories and Labor Competencies

### Figure B-3: Team ITC Proposed Labor Categories and Labor Competencies

| Proposed Labor Categories | | Proposed Labor Competencies | Proposed Labor Levels | Key Personnel | PWS Alignment | IT 70 Mapping |
|---|---|---|---|---|---|---|
| KPP 1 – Data Engineer | KPP 1 Requirements | ▪ At least 2 years of experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS<br>▪ Experience working with multiple database types such as SQL, Redis and MongoDB<br>▪ Experience building and integrating the at the application and database level<br>▪ Experience developing REST/SOAP APIs and messaging protocols and formats<br>▪ At least 2 years of theoretical and practical background in statistical analysis, machine learning, predictive modeling, and/or optimization<br>▪ Experience implementing event/data streaming services such as Kafka<br>▪ Experience prototyping front-end visualizations utilizing data visualization suites such as Kibana or Splunk | Senior | ✓ | B.5.2.2 / B.5.2.1 | DevOps/Cloud Engineer, Senior |
| | | ▪ MS/MA or PhD; 7+ years of relevant experience<br>▪ Experience in theoretical and practical background in statistical analysis, machine learning, predictive modeling, and/or optimization.<br>▪ Experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS<br>▪ Experience working with databases such as SQL or MongoDB.<br>▪ Experience working with large-scale data sets.<br>▪ Experience producing data visualizations for a variety of different audiences.<br>▪ Excellent verbal and written communications skills along with the ability to present technical data and approaches to both technical and non-technical audiences.<br>▪ Current U.S. security clearance or ability to obtain a U.S. security clearance | | | | |
| KPP 2 – Data Scientist | KPP 2 Requirements | ▪ At least 2 years of experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS<br>▪ Experience working with multiple database types such as SQL, Redis and MongoDB<br>▪ Experience building and integrating the at the application and database level<br>▪ Experience developing REST/SOAP APIs and messaging protocols and formats<br>▪ At least 2 years of theoretical and practical background in statistical analysis, machine learning, predictive modeling, and/or optimization | SME | ✓ | B.5.2.1 / B.5.2.2 | Data Scientist, Senior |

| Proposed Labor Categories | Proposed Labor Competencies | Proposed Labor Levels | Key Personnel | PWS Alignment | IT 70 Mapping |
|---|---|---|---|---|---|
| | ▪ Experience implementing event/data streaming services such as Kafka<br>▪ Experience prototyping front-end visualizations utilizing data visualization suites such as Kibana or Splunk | | | | |
| | ▪ PhD or MS/MA; 10+ years of relevant experience<br>▪ Experience implementing and building event driven architectures<br>▪ Familiarity with event driven finite state machines<br>▪ High proficiency in SQL to include schema design, data definition, and advanced queries<br>▪ Experience with MPP data warehouses<br>▪ Experience with scripting languages for automating repetitive tasks<br>▪ Experience with creating automated data pipelines for complex systems<br>▪ Extensive linux server management background<br>▪ Can prototype visualizations with lightweight data visualization suites<br>▪ Excellent verbal and written communications skills along with the ability to present technical data and approaches to both technical and non-technical audiences<br>▪ Current U.S. security clearance or ability to obtain a U.S. security clearance | | | | |
| KPP 3 – Reinforcement Learning Engineer | KPP 3 Requirements<br>▪ At least 2 years of experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS<br>▪ Experience working with multiple database types such as SQL, Redis and MongoDB<br>▪ Experience building and integrating the at the application and database level<br>▪ Experience developing REST/SOAP APIs and messaging protocols and formats<br>▪ At least 2 years of experience developing Reinforcement learning systems utilizing at least one of the following methodologies. Finite Markov Decision Processes, Support Vector Machines, Q-Learning, Stochastic Finite State Machines, MCTS or other hybrid Deep Reinforcement Learning processes | Mid | ✓ | B.5.2.3 | Data Scientist, Mid |
| | ▪ BS/BA; 3+ years of relevant experience<br>▪ Experience in theoretical and practical background in statistical analysis, machine learning, predictive modeling, and/or optimization.<br>▪ Experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS<br>▪ Experience working with databases such as SQL or MongoDB.<br>▪ Experience working with large-scale data sets.<br>▪ Experience producing data visualizations for a variety of different audiences. | | | | |

| Proposed Labor Categories | Proposed Labor Competencies | Proposed Labor Levels | Key Personnel | PWS Alignment | IT 70 Mapping |
|---|---|---|---|---|---|
| | ▪ Excellent verbal and written communications skills along with the ability to present technical data and approaches to both technical and non-technical audiences.<br>▪ Current U.S. security clearance or ability to obtain a U.S. security clearance | | | | |
| Data Engineer | ▪ BS/BA or MS/MA; 7+ years of relevant experience<br>▪ Experience implementing and building event driven architectures<br>▪ Familiarity with event driven finite state machines<br>▪ High proficiency in SQL to include schema design, data definition, and advanced queries<br>▪ Experience with MPP data warehouses<br>▪ Experience with scripting languages for automating repetitive tasks<br>▪ Experience with creating automated data pipelines for complex systems<br>▪ Extensive linux server management background<br>▪ Can prototype visualizations with lightweight data visualization suites<br>▪ Excellent verbal and written communications skills along with the ability to present technical data and approaches to both technical and non-technical audiences<br>▪ Current U.S. security clearance or ability to obtain a U.S. security clearance | Senior | | B.5.2.1 / B.5.2.2 | Dev/Ops Cloud Engineer, Senior |
| Data Engineer | ▪ BS/BA; 3+ years of relevant experience<br>▪ Experience implementing and building event driven architectures<br>▪ Familiarity with event driven finite state machines<br>▪ High proficiency in SQL to include schema design, data definition, and advanced queries<br>▪ Experience with MPP data warehouses<br>▪ Experience with scripting languages for automating repetitive tasks<br>▪ Experience with creating automated data pipelines for complex systems<br>▪ Extensive linux server management background<br>▪ Can prototype visualizations with lightweight data visualization suites<br>▪ Excellent verbal and written communications skills along with the ability to present technical data and approaches to both technical and non-technical audiences<br>▪ Current U.S. security clearance or ability to obtain a U.S. security clearance | Mid | | B.5.2.1 / B.5.2.2 | Dev/Ops Cloud Engineer, Mid |
| Data Engineer | ▪ BS/BA; 0+ years of relevant experience<br>▪ Experience implementing and building event driven architectures<br>▪ Familiarity with event driven finite state machines<br>▪ High proficiency in SQL to include schema design, data definition, and advanced queries<br>▪ Experience with MPP data warehouses<br>▪ Experience with scripting languages for automating repetitive tasks | Junior | | B.5.2.1 / B.5.2.2 | Dev/Ops Cloud Engineer, Junior |

| Proposed Labor Categories | Proposed Labor Competencies | Proposed Labor Levels | Key Personnel | PWS Alignment | IT 70 Mapping |
|---|---|---|---|---|---|
| | ▪ Experience with creating automated data pipelines for complex systems<br>▪ Extensive linux server management background<br>▪ Can prototype visualizations with lightweight data visualization suites<br>▪ Excellent verbal and written communications skills along with the ability to present technical data and approaches to both technical and non-technical audiences<br>▪ Current U.S. security clearance or ability to obtain a U.S. security clearance | | | | |
| Data Scientist | ▪ MS/MA or PhD; 7+ years of relevant experience<br>▪ Experience in theoretical and practical background in statistical analysis, machine learning, predictive modeling, and/or optimization.<br>▪ Experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS<br>▪ Experience working with databases such as SQL or MongoDB.<br>▪ Experience working with large-scale data sets.<br>▪ Experience producing data visualizations for a variety of different audiences.<br>▪ Excellent verbal and written communications skills along with the ability to present technical data and approaches to both technical and non-technical audiences.<br>▪ Current U.S. security clearance or ability to obtain a U.S. security clearance | Senior | | B.5.2.2 / B.5.2.1 | Data Scientist, Senior |
| Data Scientist | ▪ BS/BA; 0+ years of relevant experience<br>▪ Experience in theoretical and practical background in statistical analysis, machine learning, predictive modeling, and/or optimization.<br>▪ Experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS<br>▪ Experience working with databases such as SQL or MongoDB.<br>▪ Experience working with large-scale data sets.<br>▪ Experience producing data visualizations for a variety of different audiences.<br>▪ Excellent verbal and written communications skills along with the ability to present technical data and approaches to both technical and non-technical audiences.<br>▪ Current U.S. security clearance or ability to obtain a U.S. security clearance | Junior | | B.5.2.2 / B.5.2.1 | Data Scientist, Junior |
| Data Scientist | ▪ BS/BA; 3+ years of relevant experience<br>▪ Experience in theoretical and practical background in statistical analysis, machine learning, predictive modeling, and/or optimization.<br>▪ Experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS<br>▪ Experience working with databases such as SQL or MongoDB. | Mid | | B.5.2.2 / B.5.2.1 | Data Scientist, Mid |

| Proposed Labor Categories | Proposed Labor Competencies | Proposed Labor Levels | Key Personnel | PWS Alignment | IT 70 Mapping |
|---|---|---|---|---|---|
| | ▪ Experience working with large-scale data sets.<br>▪ Experience producing data visualizations for a variety of different audiences.<br>▪ Excellent verbal and written communications skills along with the ability to present technical data and approaches to both technical and non-technical audiences.<br>▪ Current U.S. security clearance or ability to obtain a U.S. security clearance | | | | |
| Reinforcement Learning Engineer | ▪ MS/MA or PhD; 7+ years of relevant experience<br>▪ Experience developing Reinforcement learning systems utilizing Finite Markov Decision Processes, Support Vector Machines, Q-Learning, Stochastic Finite State Machines, MCTS and other hybrid Deep Reinforcement Learning processes<br>▪ Experience in SQL and data handling across multiple data types (images, text, metadata, tokens)<br>▪ Proven proficient at building stable, scalable code or scripting processes<br>▪ Experience utilizing state-of-the-art AI frameworks such as Torch, Tensorflow, MXNET, CAFFE etc.<br>▪ Experience with basic data tools such as Flask, Jupyter Notebook or MatLab<br>▪ Experience with large volume data labeling, normalization, sanitization and general data management<br>▪ Current U.S. security clearance or ability to obtain a U.S. security clearance | Mid | | B.5.2.3 / B.5.2.4 | Data Scientist, Mid |
| Ops Research Analyst | ▪ MS/MA or PhD; 7+ years of relevant experience<br>▪ Work with product teams, users, and other stakeholders to identify opportunities for employing analytics, simulation, and/or optimization models.<br>▪ Build sophisticated optimization models and create algorithms for quickly producing near optimal solutions according to those models.<br>▪ Build detailed agent-based, discrete-event, and/or continuous-time simulation models of highly complex processes.<br>▪ Use supervised and unsupervised machine learning approaches to develop insights and provide recommendations or predictions for future events.<br>▪ Generate hypotheses, design experiments, gather, review and transform data, and test the hypotheses using modern and statistically rigorous methodologies. Develop new techniques and applications in optimization, statistics, and machine learning fields and present those findings to the academic community. | Senior | | B.5.2.4 / B.5.2.2 | Data Scientist, Senior |
| Ops Research Analyst | ▪ BS/BA; 3+ years of relevant experience | Mid | | B.5.2.4 / B.5.2.2 | Data Scientist, Mid |

| Proposed Labor Categories | Proposed Labor Competencies | Proposed Labor Levels | Key Personnel | PWS Alignment | IT 70 Mapping |
|---|---|---|---|---|---|
| | ▪ Work with product teams, users, and other stakeholders to identify opportunities for employing analytics, simulation, and/or optimization models.<br>▪ Build sophisticated optimization models and create algorithms for quickly producing near optimal solutions according to those models.<br>▪ Build detailed agent-based, discrete-event, and/or continuous-time simulation models of highly complex processes.<br>▪ Use supervised and unsupervised machine learning approaches to develop insights and provide recommendations or predictions for future events.<br>▪ Generate hypotheses, design experiments, gather, review and transform data, and test the hypotheses using modern and statistically rigorous methodologies.<br>▪ Develop new techniques and applications in optimization, statistics, and machine learning fields and present those findings to the academic community. | | | | |
| Program Manager | ▪ BS/BA; 10+ years of relevant experience<br>▪ Responsible and accountable for Kessel Run program delivery.<br>▪ Provides direct supervision for technical and non-technical staff.<br>▪ Serves as the company's authorized interface with the Government Contracting Officer (CO), the Contracting Officer's Technical Representative (COTR), government management personnel and customer agency representatives.<br>▪ Manages technical and non-technical teams providing day-to-day management of contract support operations and planning and production of contract deliverables.<br>▪ Creates project plans, identifies the schedule critical path, leads risk management, performs dependency analysis, assists in allocating resources, supports baseline management, status monitoring, and related project management activities. | Senior | | B.1-B.12 | Consultant Staff Level 4 |

## B.9 PWS Part 9 – Program Management Plan

### B.9.1 Introduction

Kessel Run (KR), a detachment of the U.S. Air Force Life Cycle Management Center (AFLCMC), leverages Program Management Body of Knowledge (PMBOK) and industry best practices and products to rapidly deliver capabilities while posturing for future and potentially disruptive information technology (IT). Kessel Run revolutionizes the way that the Air Force builds and acquires software to meet the needs of Airmen across the globe. Kessel Run embraces Agile principles, SecDevOps, and lean product management practices to continuously integrate and deliver software capabilities. KR embraces a culture of rapid feedback loops (e.g. build, measure, learn) and user-centered design managed by Government-led teams to rapidly develop, produce, and deploy software across the Air Operations Centers and other Air Force programs, while continuously iterating and improving upon those software applications.

Kessel Run has rapidly expanded its personnel and scope in the last eight months. New external Air Force users are beginning to use our Pivotal Cloud Foundry (PCF) Platform as a Service (PaaS) and our on-premise Infrastructure as a Service (IaaS). Kessel Run continues to ramp up its number of product teams across the AirOps (Air Operations Centers) and WingOps (F-35s) product offices, as well as expand its platform operation, data science, engineering, and security requirements. As such, Enterprise Data Science modular service contracts need to be awarded to support Kessel Run's rapid growth.

**Program Objectives** The current objectives for the Data Science portfolio include:

- **Data Management:** Create and maintain data pipeline architectures to automate the processing of large and complex data sets.
- **Data Visualization:** Develop graphical representations of information and data. By using visual elements like charts, graphs, and maps, data visualization tools provide an accessible way to see and understand trends, outliers, and patterns in data.
- **Data Optimization:** Build sophisticated optimization models and create algorithms for quickly producing near optimal solutions according to those models.
- **Reinforcement Learning:** Utilize machine learning concepts to enable iterative learning in a dynamic data environment by trial and error using feedback from events and monitoring.

### B.9.2 Program Scope

The scope of this program is to support Kessel Run's data science needs. This team develops, maintains, and implements data architectures capable of handling complex data sets quickly and securely. Additionally, Data Science teams will develop data implementation approaches across the entire Kessel Run ecosystem and provide core data services for applications residing on the Kessel Run platform.

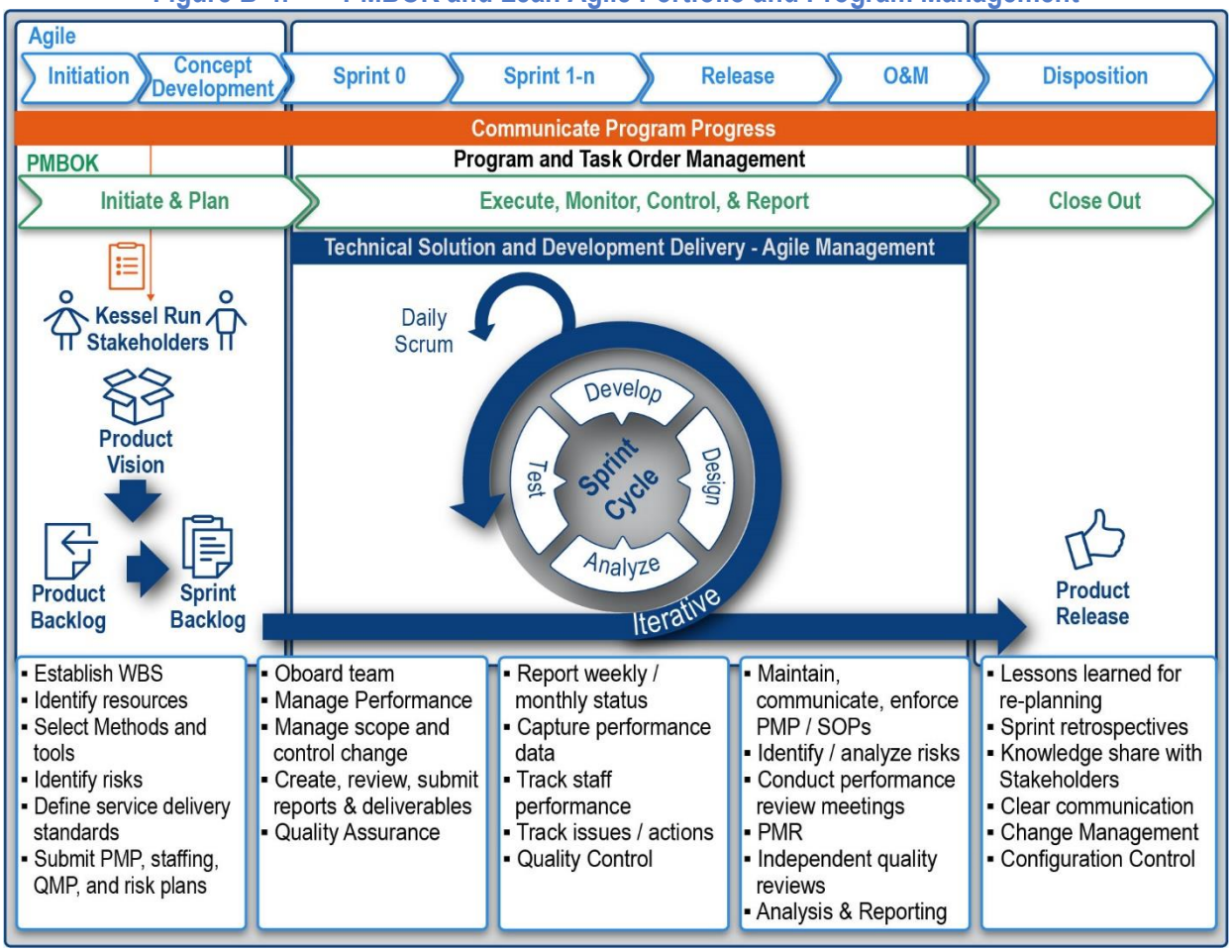
The team supports Kessel Run's requirements to define the baseline for measurement needs and instrument consistent data capture practices inside Kessel Run. Data scientists and engineers design, implement, and maintain a data pipeline and analytical environment using reporting tools, modeling metadata, and building reports and dashboards. The team should use creative problem-solving to automate the collection and analysis from available data sources in order to deliver metrics and analyses. Efforts include, but are not limited to: data auditability, data sharing across applications, data translation, data standardization, metrics generation, and algorithm development. Proposed labor competencies shall include Data Engineers, Data Scientists, Machine Learning Engineers, and Operations Research Analysts, with a distribution of approximately eight (8) Data Engineers, two (2) Data Scientists, one (1) Reinforcement Learning Engineer, and one (1) Operations Research Analyst. Upon contract award, one KPP and one Data Engineer are required to be provided to the Government. Within two weeks after contract award, remaining KPPs must be provided. The Government shall liaise with the contractor on scaling timelines and number of remaining

personnel required, at contract award. In the case of a vacancy or Government request, the contractor shall be prepared to provide qualified manpower within fourteen 14 business days.

### B.9.3 Program Management Approach

Team ITC's program management approach is based on the Program Management Body of Knowledge (PMBOK) and Lean Agile methodology and tailored for the size and complexity of the Kessel Run Program.

**Figure B-4: PMBOK and Lean Agile Portfolio and Program Management**




Many times, the value delivered using Agile methods is recognized at the project level. However, portfolio issues can be exposed when there is a mix of Agile and traditional projects. Our lean Agile approach aligns planning, requirements, risk, scheduling, communication, budgeting, and reporting first at the Kessel Run portfolio level, and then at the core work area and individual project/task levels. Aligning these functions at the portfolio, rather than the project, level creates a clear management structure, improves synchronization of cost, schedule, and delivery across the portfolio, and ensures alignment between portfolio objectives and project tasking. Furthermore, this will provide the Kessel Run Program with a comprehensive view of its resources and constraints and a better vantage point to compare and align portfolio initiatives within the larger Air Force strategy and industry standards. The government can articulate clear requirements and objectives down to the core work areas and individual projects. By integrating Agile lean practices and iterative processes into our program management approach, we can tightly integrate all Kessel Run Program core work areas and programs, ensure continuous alignment with stakeholders, and oversee the activities of our team (including subcontractors). Our lean Agile approach will give business users additional influence on

priorities by placing them in closer, more frequent contact. Our Agile consultants bring cross-functional expertise to translate business ideas into unambiguous, traceable, and valuable Epic and User Stories. Closer integration between business and stakeholders will help ensure the direct, exchange, and ongoing efforts are fully aligned with Kessel Run's organizational business goals and priorities.

### B.9.3.1 Staffing Management Plan

The ITC Program Manager has the overall authority and responsibility for managing and executing the ITC portion of this program according to this Program Plan. The ITC Program Manager will work with all resources to perform program planning. The ITC Program Manager is given the authority to act on behalf of the company to interface with the CO/COR and is responsible for responding to the customer's day to day needs in order to resolve problems in real time.

**New Hire Orientation Process:** All new hires will have Top Secret (TS), Top Secret – Special Compartmented Information (TS SCI), Secret, or Interim Secret clearance. We have an established security clearance review and submission screening process that includes a Joint Personnel Adjudication System (JPAS) verification for all contract employees requiring a security clearance supporting Kessel Run. This comprehensive effort streamlines the hiring process by eliminating potential candidates who do not meet all clearance requirements. Our process uses appropriate security forms (i.e. SF86 and SF86c) to assist staff in providing initial information or to update previous clearance data. ITC's FSO will work closely with the SAF/MG to help expedite the clearance paperwork. Once EOD is granted, ITC is familiar with the proper badging forms, requirements, and process for network access.

**Phase In:** Team ITC begins in-processing new employees immediately upon TO award and receipt of instructions to proceed from the Contracting Office. The ITC Program Management will provide oversight for in-processing with assistance from the appropriate corporate resources. The in-processing will consist of required government documentation and forms, databases, inventory of government furnished property (if any), and review of Kessel Run and corporate handbooks and materials designed to provide orientation and guidance. The ITC Program Manager will coordinate with the COR for required Kessel Run in-processing briefings. ITC Human Resources, in conjunction with Corporate Support Services, will ensure each employee is correctly slotted against his/her current position and transfer any equipment or property. At the end of the phase in, the ITC Program Manager will provide a list of employees to the COR. An employee orientation will be provided immediately following the In-Processing Phase. The orientation will focus on introductions, welcoming the employees, operational expectations, corporate requirements, Kessel Run requirements, employee issues and expectations, and the vision for the contract and the employees. The orientations will be led by the ITC Program Manager with assistance from the respective corporate experts.

**Phase Out:** The phase out plan will consist of reviewing systems, documentation, and property to ensure the employee has effectively transferred documentation, including government issued identification and property, before clearing or leaving a position. The ITC Program Manager will provide feedback to the Contracting Office and/or the designated government representative once an employee has phased out. The ITC Program Manager will develop and submit a detailed Phase-Out Transition Plan to the COR in accordance with the deliverable's description in the SOO.

#### B.9.3.1.1 Key Personnel

Team ITC recognizes the unique nature of the USAF and Kessel Run's complex mission, technical needs, and the processes and procedures currently in place. We understand the government's concern regarding diversion of key personnel and our executive leadership has permanently assigned Jon Hammond as the ITC Program Manager to ensure the success of Kessel Run program. We further understand any changes to this assignment requires Contracting Officer notification and approval, and that the government may modify

key personnel requirements through a contract modification. Key personnel designated at the task order level will be permanently assigned and follow the above process.

Our ITC Program Manager will apply Agile Program Management principals, including a daily virtual standup meeting to track tasks being performed across programs and locations. These meetings are designed to be short and concise with team members, including subcontractors, discussing the work accomplished, what they will work on that day, and any barriers to completion of tasks. Risks and issues are discussed at the end of the meeting. The ITC Program Manager or her designee records the results of the meeting in minutes and updates program documentation, task lists, schedule, and risk log as appropriate.

#### B.9.3.2 Resource Calendar

This program will require all program team members for the entire duration of the program. The program is scheduled to last five years (base plus four option years) with standard 40-hour work weeks. If a program team member is not required for a full 40-hour work week at any point during the program, their efforts outside of this Program will be at the discretion of the ITC Program Manager.

### B.9.4 Program Life Cycle Processes

To manage this program the ITC Program Manager will use our PMBOK and lean Agile methodologies tailored for the size and complexity of the Kessel Run Program.

#### B.9.4.1 Work Planning

The ITC Program Manager (PM) has the overall authority and responsibility for managing and executing this program according to this Program Plan and its Subsidiary Management Plans. This program uses ITC and USAF program management tools (e.g. ITC Process Asset Library, Program Management Plan, Quality Plan, Transition Plan, etc.) to deliver services. Team ITC will use Capability Maturity Model Integration (CMMI) processes for managing all aspects of this program.

##### B.9.4.1.1 Schedule Baseline and Work Breakdown Structure

A key element of the PMP is the contract Integrated Master Schedule (IMS), which delineates the tasks in a way that organizes, defines, and graphically displays the requirement and work/tasks required to complete. The IMS presents a logical summary and analysis by end-product. Each IMS element is an aggregation of all subordinate IMS elements. Each control area in the IMS relates back to and is cross-referenced to a contractual requirement to ensure the entire contractual effort has been captured.

**Figure B-5: Schedule Management Features and Benefits**

| Feature | Benefit |
|---|---|
| Careful planning of all major and minor tasks and activities | On-time delivery — team has never missed a scheduled delivery date |
| Regular measurement and communication of progress against plan | Continuous quality improvement based on lessons learned |
| End-user participation throughout the planning and execution of all tasks | Functional buy-in, leading to overall success of the program |
| Complete definition of requirements, assumptions, experiences, constraints, and outcomes prior to the start of any work effort | Requirement traceability through the lifecycle of the program |
| Early identification of risk and mitigation actions | Alleviation of issues early during the planning phase of the program |
| Standard process of reporting task order expenditures | Metrics for use by the contracting officer's representative (COR) to report task order expenditure |

##### B.9.4.1.2 Work Estimation

The ITC Program Manager will develop a task list in MS Project to capture task level of effort estimation. The ITC Program Manager will consult with Subject Matter Experts to estimate level of effort a task will take using hours as the measure. Tasks that take more than 40 hours to complete we will attempt to break down to two or more tasks. The actual amount of time taken to complete a task will be recorded and the deviance, plus or minus, will be taken into account when another similar task is estimated.

#### B.9.4.1.3 Work Scope Management Plan

Scope management for this program will be the sole responsibility of the ITC Program Manager. The ITC Program Manager, Government TO Lead, and Stakeholders will establish and approve documentation for measuring program scope to include deliverable quality and work performance measurements.

Proposed scope changes may be initiated by the ITC Program Manager, Stakeholders, or any member of the program team. All change requests will be submitted to the ITC Program Manager who will then evaluate the requested scope change. Upon acceptance of the scope change request, the ITC Program Manager will submit the scope change request to the Government TO Lead for acceptance. Upon approval of scope changes by the Government TO Lead and the ITC Program Manager, the Government TO Lead will work with the COR to conduct contract modifications as necessary. The ITC Program Manager will update the necessary program documents and communicate the scope change to all stakeholders.

Changes in scope require analysis of the new tasks and redefinition of the program requirements. Priority changes that impact cost or schedule require a contract modification. The ITC Program Manager reviews the new task requirements in order to develop a new work breakdown structure. Once an approved contract modification is received, the ITC Program Manager updates the Program Plan with new schedules, deliverables, and any other related changes, reviews them with the customer and ITC Executive Management to assure concurrence, and with all staff to assure their complete understanding. No additional work outside the scope of the initial contract is performed until ITC receives formal authorization from the Contracting Officer.

#### B.9.4.1.4 Cost Management Plan

As with all programs at ITC, financial reports are reviewed monthly. The cost baseline for this program includes all budgeted costs for the successful completion of the program. The cost of the program includes labor hours and associated travel for the staff.

The ITC Program Manager will provide oversight and management for all costs associated with this program. The ITC Program Manager is authorized to approve any procurement actions for the program as long as the procurements are approved by the Government CO/COR. All selected vendor or external resources will be coordinated with the Government. The ITC Program Manager will measure performance as it relates to the vendor providing necessary goods and/or services and communicate this to the purchasing and contracts groups.

We monitor against an ITC Executive Team and look at the approved budget and track deliverables and ODCs. Any changes to the budget going forward must be reviewed and agreed upon by the CO/COR and the ITC Executive Team. The assigned ITC Program Manager is responsible for reporting on the costs throughout the life of the contract in conjunction with our Accounting Support team, the Vice President of Programs, and the Contracting Officer on the program. The burn is reported against each deliverable every month and cumulative invoices will be presented and reviewed to the COR. The report includes the following information:

- Program Information
- Deliverable Status
- Allocated Amount for the budget period
- Spent Amount
- Projected Amount
- Cumulative Total
- Work Environment

The primary location of performance will be off-site at ITC's Headquarters in Vienna, VA 22182 and program team member locations as required. ITC understands periodic onsite work at Government facilities will be required to participate in meetings, work sessions, or other temporary duties. The government will have flexible desk space for Team ITC's use when necessary and available.

### B.9.4.2 Work Monitoring and Control

To control deadlines, the ITC Program Manager will develop a detailed master schedule with critical path analysis, which will be monitored and tracked daily. The ITC Team will use Microsoft Project planning and scheduling activities. Major tasks and interim work phases will overlap to transition effectively and smoothly from phase to phase. The intent is to maintain continuity between life-cycle phases and to leverage our growing knowledge base throughout each requirement.

Team ITC will use collected data to measure work completed. Collected data includes testing and quality audit results, reported information, and documented user/customer feedback. Our approach is based on proven processes and procedures that are continually refined and enhanced through our experience with similar programs. The processes begin with a disciplined contract management process that is supported by centralized planning and tools. Measuring program (i.e., cost, schedule, risk, etc.) and technical performance is based on meaningful indicators/metrics and using them to track performance. For each performance indicator, we will identify and measure cost, schedule, quality, risk; basis or target; actual; status; and trend indicators. We submit performance reports to SAF/MG on a schedule determined and agreed upon at contract award. We will comply with all requirements outlined in the PWS and deliverables identified in Section 4 and 5 of the PWS.

#### B.9.4.2.1 Communications Management Plan

Team ITC understands that developing an environment of open communication and collaboration with stakeholders is critical to program and project success. To establish effective communications, we conduct a stakeholder analysis to identify program and project stakeholders and their expectations. This allows us to develop communication strategies and design metrics to monitor and accurately report on performance targets that are relevant to the stakeholder. Stakeholder management is reviewed periodically to make any necessary changes as the program evolves. In this way, we do not waste the stakeholder's time with meaningless reporting, but rather provide genuinely impactful information. This in turn cultivates the trust necessary for a truly collaborative environment.

Our communication efforts incorporate face-to-face meetings, print, and electronic communications. Our approach for contract management fosters open and frequent interaction between the ITC Program Manager, the COR, and the Government TO Lead. The ITC Program Manager will communicate regularly to discuss contract status, open risks, and pending decisions. Per an agreed upon schedule, the ITC Program Manager will:

- Coordinate with the COR and Government TO Lead to organize, plan, and schedule Monthly In Progress Reviews (IPRs), discuss program status, deliverables, and identify and solve problems;
- Prepare and submit a Monthly Status Report (MSR) by the 15th of each month for the duration of the contract that outlines TO accomplishments and progress against requirements, future planned activities, program risks and concerns, an overview of the costs (burn-rate and earned value analysis), and items that will impact cost or overall task completion;
- Proactively identify, communicate and mitigate risks, issues and challenges; offer solutions, recommendations, and opportunities for resolution; provide documentation via standard reporting, in-person meetings, and email; work together with the government TO Lead and COR to resolve

risks, issues, and challenges in a timely fashion and in the best interest of the program according to the government's priorities and needs;

- Coordinate with the COR and Government TO Lead on the review, acceptance, and/or rejection process for all contract deliverables; and

The ITC Program Manager will take the lead role in ensuring effective communications on this program. The communications requirements are documented in the Communications Matrix below. The Communications Matrix will be used as the guide for what information to communicate, who is to do the communicating, when to communicate it, and to whom to communicate.

**Figure B-6: Communications Management**

| Communication Type | Description | Frequency | Format | Participants/ Distribution | Deliverable | Owner |
|---|---|---|---|---|---|---|
| Weekly Program Team Meeting | Meeting to review action register and status | Weekly | In Person/ Conference Call | Program Team | Updated Action Register and Risk List | ITC Program Manager |
| Monthly Status Report (MSR) | Email summary of program status | Monthly | Email | COR, Government TO Lead, Team and Stakeholders | Status Report | ITC Program Manager |
| Monthly In Progress Review (IPR) | Present contract performance and initiatives to team and sponsor | Monthly | In Person | COR, Government TO Lead, Team, and Stakeholders | Status and Progress Presentation | ITC Program Manager |

#### B.9.4.2.2 Communications Conduct

##### B.9.4.2.2.1 Meetings

The ITC Program Manager or designated staff will distribute a meeting agenda at least two days prior to any formal meeting and all participants are expected to review the agenda prior to the meeting. During formal program meetings the timekeeper will ensure that the group adheres to the times stated in the agenda and the recorder will take all notes for distribution to the team upon completion of the meeting. It is imperative that all participants arrive to each meeting on time and all cell phones should be turned off or set to vibrate mode to minimize distractions. Meeting minutes will be distributed no later than 72 hours after each meeting is completed.

##### B.9.4.2.2.2 Email

All email pertaining to the Kessel Run Program should be professional, free of errors, and provide brief communication. Email should be distributed to the correct program participants in accordance with the communication matrix above based on its content. All attachments should be in one of the organization's standard software suite programs and adhere to established company formats. If the email is to bring an issue forward then it should discuss what the issue is, provide a brief background on the issue, and provide a recommendation to correct the issue. The ITC Program Manager will be included on any email pertaining to the Kessel Run Program.

##### B.9.4.2.2.3 Informal Communications

While informal communication is a part of every program and is necessary for successful program completion, any issues, concerns, or updates that arise from informal discussion between team members must be communicated to the ITC Program Manager, so the appropriate action may be taken.

##### B.9.4.2.2.4 Program Issue Management

The approach for managing issues for the Kessel Run Program includes a methodical process by which the program team identifies issues and conducts a root cause analysis to determine the resolution strategy. Every

effort will be made to proactively identify and mitigate risks ahead of time to prevent them from becoming an issue. Team members identify and log issues in an issue register and all issues are tracked to close.

In close coordination with our customers, we analyze any issues to determine the proper resolution and potential mission impact. Based on this assessment, the team develops specific resolution strategies/steps and will communicate status in reports. An issue register is maintained for all projects and contains the issue identification number, title, issue description, date identified, issue owner, root cause analysis, issue resolution, status, and date closed. The issue register is updated whenever a new issue is identified, changed, or resolved and appropriate management levels are involved throughout the entire process. The ITC Program Manager is the issue manager for the program. The Issue Owners will provide status updates on their assigned issues during the weekly status meeting. Throughout the life of the program, the ITC Program Manager will analyze each issue as well as the issue management process. Based on this analysis, the ITC Program Manager will identify any improvements that can be made to the issue management process for future projects. These improvements will be captured as part of the lessons learned knowledge base.

#### B.9.4.2.2.5 Program Reporting

The ITC Program Manager submits monthly status reports of all work in progress and identifies any problems with the potential to affect the PWS' task requirements, schedule, deliverables, or risk mitigations. The reports reflect all resources assigned to the contract by physical work location detailing the status of their task and delivery date, along with any travel expenditures. If there are any anticipated or actual schedule delays, we immediately notify the COR. We provide the rationale for any schedule delay in the monthly progress reports, along with a "get well" plan, to ensure satisfactory task completion.

Additional reviews and reports are identified in **Figure B-7**:

**Figure B-7: Program Reporting**

| | |
|---|---|
| **In-Progress Reviews** | Establish monthly status review meetings with SAF/MG program management team to review progress to date, potential issues risk mitigation, and overall performance on the contract. The program management plan will be the basis for the meetings in a presentable format. |
| **Periodic Progress Reviews** | Establish quarterly review meetings, or upon request by the Contracting Officer and Contracting Officer Representative, to review contract performance to date and resolve any outstanding issues that reside with the contractor or government. |
| **ITC Program Reviews** | Establish quarterly review meeting with ITC leadership and quality management staff to ensure quality delivery on the contract and to address issues and risks at the ITC corporate level. |

- **Problem Notification Reports.** Problem Notification reports will be delivered within two business days of issues being identified. Resolution is handled by the ITC Program Manager and will include working with the customer to understand the problem. If the problem is a personnel issue, the ITC Program Manager will counsel the team member and, if necessary, find a replacement. If the problem is of a technical nature, management may call a team meeting to discuss and resolve the problem. If the issue remains open for a period of time it will be noted in the Monthly Status Report.
- **Travel Expense Report.** All travel will be conducted in accordance with the Joint Travel Regulations and the Travel Expense Report will be delivered with the MSR.
- **Technical Reports/Ad-Hoc Reports.** The ITC Team will provide meeting minutes upon completion of all meetings. In addition, the team will provide technical reports and/or Ad-Hoc Reports which may include; status reports, meeting agendas, point papers, and publications as required.
- **Transition-Out Plan.** The ITC Team will provide a Transition-Out Plan 90 days prior to contract expiration.
- **On-Site Inspection.** The ITC Program Manager and executive managers will be designated to visit the work site at least once a month to make sure that needs are being met. Management will talk to

staff informally while assessing performance through a discreet evaluation process that includes observation and speaking with supervisors and co-workers.

#### B.9.4.3 Program Support

##### B.9.4.3.1 Decision Analysis and Resolution

ITC's Decision Analysis and Resolution (DAR) Process provides standard, objective activities to be implemented when making formal business decisions. The objectives of this process are to ensure that for each formal decision analysis performed, the evaluation criteria, evaluation methods, alternatives, and selected solutions are documented, and measures are recorded.

The ITC Program Manager is responsible for determining whether the formal evaluation process should be applied based on the following situations:

- When a decision is directly related to topics assessed by the manager as being of medium or high risk
- When a decision is related to changing program work products under configuration management
- When a decision would cause program schedule delays over a certain percentage or specific amount of time as specified by the customer
- When a decision affects the ability to achieve the documented program objectives
- When the costs of the formal evaluation process are reasonable when compared to the decision's impact

If it is determined a formal evaluation is needed, the ITC Program Manager will establish the evaluation criteria and methods. The ITC Program Manager will document the results and the rationale for selecting the recommended solution in the DAR Report; explain why it was selected and why the others were rejected; publish all the documented information collected from the previous activities in the DAR Report; distribute the DAR Report for review and feedback to the Evaluation Team members and to those who provided input into the evaluation process; incorporate review comments as appropriate; and distribute the final version of the Evaluation Report to all those affected by the recommended decision. The final version of the DAR Report will be placed under Configuration Management (CM) control.

Periodically, the ITC Quality Assurance representative will review all DAR Reports and collect information from those who initiated the DAR activities to determine whether they still considered the selected solution a wise decision. If the decision was inadequate or incorrect, the Quality Assurance Coordinator will discuss why the DAR process did not yield an acceptable result. The results of these discussions will be captured in the Lessons Learned.

### B.9.5 Quality Management Plan

All members of the Kessel Run program team will play a role in quality management. It is imperative that the team ensures work is completed at an adequate level of quality from individual work tasks to the final program deliverables and IAW the government's Quality Control/Management Plan.

### B.9.6 Cost Baseline

The cost baseline for the Kessel Run program includes all budgeted costs for the successful completion of the program. The cost baseline for the first year of this program includes the proposed labor and travel requirements. Accounting for labor costs is accomplished through the corporate timekeeping system and area of support (Management Support, BMA Chief Data Officer Support, Enterprise Architecture and Analysis Support) based charge codes are available for staff authorized to charge the program.

### B.9.7 Procurement Management Plan

It is expected that this program will not require procurement, in the event procurement is required, the ITC Program Manager will work with the program team and government to identify all items or services to be procured for the successful completion of the program. The ITC Program Manager will provide oversight and management for all procurement activities under this program. The ITC Program Manager will then ensure these procurements are reviewed by the Program Management Office (PMO) and presented to the contracts and purchasing groups. The contracts and purchasing groups will review the procurement actions, determine whether it is advantageous to make or buy the items or resource required services internally, and begin the vendor selection, purchasing, and contracting process.

In the event a procurement becomes necessary, the ITC Program Manager will be responsible for managing any selected vendor or external resource. The ITC Program Manager will measure performance as it relates to the vendor providing necessary goods and/or services and communicate this to the purchasing and contracts groups.

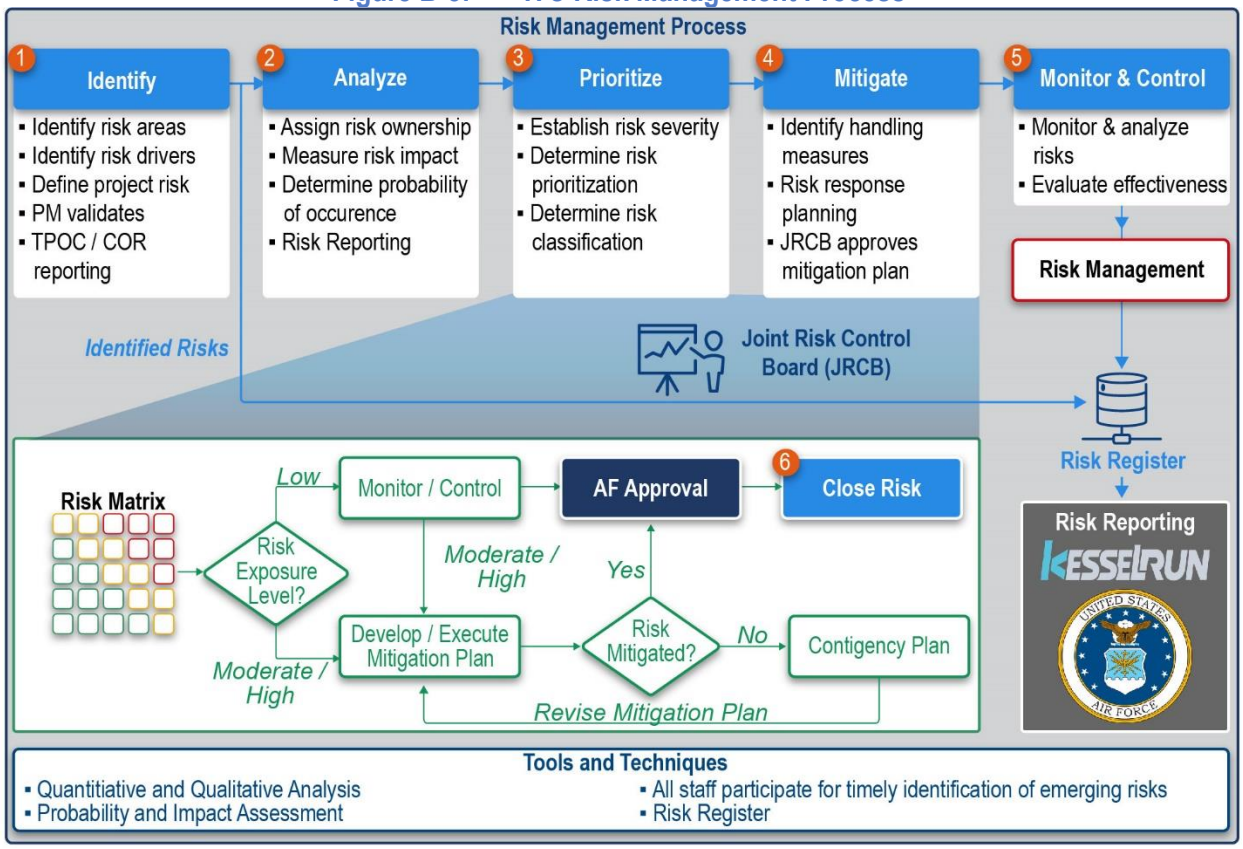
### B.9.8 Quality Baseline

The Kessel Run Program must meet the quality standards established in the quality baseline. The quality baseline is the baseline acceptable quality levels of the Kessel Run Program. All deliverables must meet or exceed the quality baseline values in order to achieve success (reference SDS).

## B.10 PWS Part 10 – Risk Management

The ITC Risk Management Approach is based on and is our means to verify compliance with industry proven CMMI and PMI practices, the ITC Organizational Standard Process (OSP), contractual obligations, and appropriate technical delivery. As part of ITC's commitment to high-quality technical delivery and the implementation of predictive risk management processes, ITC leadership institutes a Risk Management Review Board for the Kessel Run contract. The technical and functional members of the Risk Management Review Board (e.g., subject matter experts who possess specialized skills, knowledge, experience, and qualifications) will leverage their expertise to help the Kessel Run program solve any delivery challenges, and provide recommendations, guidance, and assistance informed by years of delivery and program experience. Figure B-24 illustrates our Risk Management process with a mechanism for continuous risk monitoring, risk identification, mitigation, resolution, and reporting. Our program managers review the risk register at least weekly and communicate any changes in their periodic status reporting. Upon the completion of a program, during the closing process, the ITC Program Manager analyzes each risk as well as the risk management process. Based on this analysis, the ITC Program Manager identifies any improvements that can be made to the risk management process for future projects.

Figure B-8: ITC Risk Management Process



## B.11 PWS Part 11 – Service Delivery Summary

Figure B-9: Kessel Run Service Delivery Summary (SDS)

| SDS | Performance Objective | PWS Paragraph | Performance Threshold | Surveillance Method | Frequency |
|---|---|---|---|---|---|
| 1 | On Time Delivery (of Deliverables) | B.7 | 100% On Time Delivery | Program Management Review (PMR) | As required |
| 2 | Deliverable Accuracy | B.7 | 5% or less deliverables will be returned for corrections | Monthly Status Report (MSR) | As required |
| 3 | Staffing (as required by each TO) | B.1.6.11 | Within 14 days of project start (PS) or vacancy | Daily monitoring by Program Manager | As required |
| 4 | Labor CLIN Invoices and Travel CLIN Invoices are submitted timely, and accurately with required information | B.1.6.13, B.1.6.14 | 95% of invoices are timely and accurate | MSR | Monthly |
| 5 | Accurate and timely MSRs | B.1.6.2 | 99% of MSRs are timely and accurate | PM monitoring and approval of MSR | Monthly |
| 6 | DD254 Compliance | B.1.6.8 | Maintenance of Top Secret FCL and staff with appropriate and favorably adjudicated clearances | Facility Security Officer (FSO) monitors weekly with PM | Weekly |
| 7 | Quality Control/Management Plan Compliance | B.1.6.1 | 100% compliance with QCP/QMP | PM monitor and approval of all Quality Control activities | Daily |
| 8 | Contractor Manpower Reporting Application (CMRA) Compliance | B.1.6.2 | 100% compliance | PM monitor and submission of CMRA requirements | Annually |
| 9 | Timely delivery of status updates | B.5.2.1 | On-time delivery 95% of the time | Weekly monitoring by Program Manager and MSR | Bi-Weekly Updates |
| 10 | Timely delivery of pipeline architecture design reports | B.5.2.1 | On-time delivery 95% of the time | Weekly monitoring by Program Manager and MSR | Bi-Weekly updates |
| 11 | Timely delivery of pipeline implementation deliverables | B.5.2.1 | On-time delivery 95% of the time | Daily monitoring by KPPs and MSR | Bi-weekly updates |
| 12 | Maintain a set performance level for the pipeline architecture | B.5.2.1 | Pipeline performs at agreed upon levels | Initial state overseen by KPPs, continual daily surveillance provided by DevOps and MSR | Performance won't degrade more than once or twice per month |
| 13 | Provide a periodic report on systems performance | B.5.2.1 | On-time delivery 100% of the time | Monthly/Quarterly monitoring by KPPs, DevOps, and MSR | Monthly/Quarterly |
| 14 | Timely delivery of status reports | B.5.2.2 | On-time delivery 95% of the time | Weekly monitoring by Program Manager and MSR | Bi-weekly updates |
| 15 | Respond to inquiries for additional information or materials | B.5.2.2 | Initial response provided within 2 business days | Daily monitoring by KPPs | Upon request |
| 16 | Detailed report on identified data-driven solution | B.5.2.2 | Report delivered within 5 business days from initial request | Daily monitoring by KPPs and Program Manager | Upon request and/or finishing the exploration of a data-driven solution |
| 17 | Timely delivery of status reports | B.5.2.3 | On-time delivery 95% of the time | Weekly monitoring by Program Manager and MSR | Bi-weekly updates |
| 18 | Respond to inquiries for additional information or materials | B.5.2.3 | Initial response provided within 2 business days | Daily monitoring by KPPs | Upon request |

| SDS | Performance Objective | PWS Paragraph | Performance Threshold | Surveillance Method | Frequency |
|---|---|---|---|---|---|
| 19 | Detailed report on proposed Reinforcement Learning Feature | B.5.2.3 | Report delivered within 5 business days from initial request | Daily monitoring by KPPs and Program Manager | Upon request and/or finishing the exploration of an identified feature |
| 20 | Timely delivery of feature design reports | B.5.2.3 | On-time delivery 95% of the time | Daily/Weekly monitoring by Program Manager and MSR | Bi-Weekly updates |
| 21 | Timely delivery of feature implementation deliverables | B.5.2.3 | On-time delivery 95% of the time | Daily monitoring by KPPs and MSR | Bi-weekly updates |
| 22 | Maintain a set performance level for the feature | B.5.2.3 | If pipeline performance dips below established thresholds, recover by priority (High-1 day, Medium-2 days, Low-3 days) | Initial state overseen by KPPs, continual daily surveillance provided by DevOps and MSR | Ad hoc |
| 23 | Provide a periodic report on systems performance | B.5.2.3 | On-time delivery 90% of the time | Monthly/Quarterly monitoring by DevOps, KPPs, and MSR | Monthly/Quarterly |
| 24 | Detailed report on feature updates and/or model updates for the implemented feature | B.5.2.3 | Initial report delivered within 10 business days from initial request | Daily monitoring by KPPs and Program Manager | Upon request |
| 25 | Meet acceptance criteria defined in Agile User Stories. Acceptance criteria defined during Spring planning. | B.5.2.4 | Meet 90% of story points in a given sprint | Daily monitoring by KPPs and MSR | Bi-weekly updates |
| 26 | RL Update Meetings | B.5.2.4 | Attend 100% of meetings | Weekly monitoring by KPPs and MSR | Bi-Weekly |
| 27 | Responsiveness to product teams | B.5.2.4 | Within 2 business days | Daily monitoring by KPPs and MSR | Based on checkpoints or upon request |
| 28 | Surge Response Time | B.5.2.6 | 10 Business Days | Weekly Status Review | Semi-Annually |
| 29 | # of Standby Resources Available | B.5.2.6 | Resources available3 within 14 business days | Weekly Status Review | Semi-Annually |

## B.12 Recruitment & Retention Plan

### B.12.1 Hire and Retain Quality Staff to Support Kessel Run's Data Science Needs [SOO 3.e]

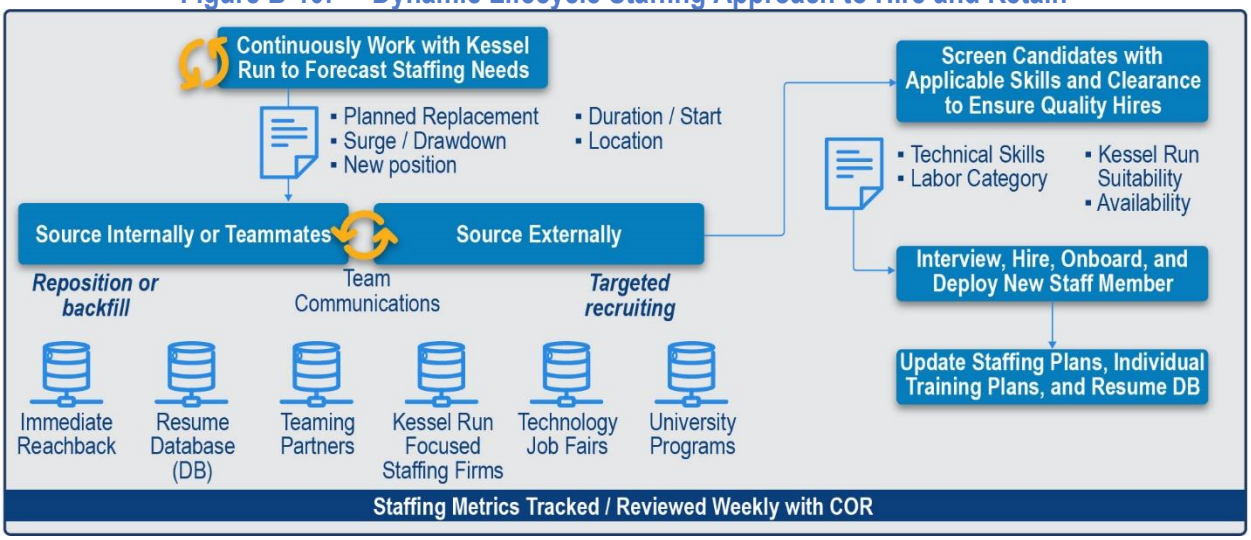
The most demanding part of the Kessel Run mission is recruiting, retaining, surging, and replacing top quality data science expertise. According to a survey by Burtch Works Executive Recruiting, 82 percent of organizations are planning to hire analytics or data science professionals and 70 percent expect to expand their analytics and data science teams in the first half of 2019. With Amazon planning to hire upwards of 50,000 employees, the tech giant poses a serious threat to our ability to attract and hire key data talent.

The elements of our Kessel Run Data Science Hire and Retain approach are as follows:

1. **Pre-screened Pool of Technically Qualified Data Science Experts –** We start with our current pool of 40+ technically qualified candidates and continuously refresh this pool through our recruiting and vetting process. This provides a consistent pool of highly qualified data science expertise. Our recruitment team reaches to candidates who are initially screened for placement in the pool if they meet the education, experience, and security clearance requirements. The outcome is a candidate pool readily available for further vetting.
2. **Data Science Expertise Vetting Process –** Our Data Science SMEs: Joel Klein, and Adrienne Juett will review resumes and/or interview all required candidates to assess technical acumen and fit. Additional screening by HR, and functional data science engineer, data scientist, and reinforcement learning engineer, and ops research analyst SMEs narrow the candidates based on assessment of fit and match with the requirements of the Kessel Run task order. Our streamlined clearance and credential verification process for candidates begins to further streamline the placement of staff. The outcome is a constant "bench" of candidates available for placement.
3. **Kessel Run Training Curriculum –** All candidates who clear the vetting process are sent through our comprehensive Kessel Run 101 training program designed to produce data science professional able to perform within the U.S. Air Force Life Cycle Management Center (AFLCMC) Kessel Run environment. This produces a bench of qualified, trained data science professionals available to rapidly fill open requirements (f. Surge Services).
4. **Comprehensive Onboarding and Deployment –** Data Science professionals complete required security clearance paperwork, and company specific paperwork. Any unique Kessel Run Task Order paperwork can be complete at this time. We maintain direct communications with staff through our PM (Mr. Jon Hammond). Close coordination between our PM and respective COR monitors the deployment and initial employment of the staff and to provide staff in the event of a vacancy or by a Government request. This coordination allows us to maintain a common operating picture during all phases of staff deployment. Based on our sustained hiring pool size of between 40+ data science professionals at any time, we are easily capable of on-boarding a minimum of 10 additional data scientists monthly
5. **Innovative Retention Practices –** Staffing is not a commodity business. We are committed in putting the right data science expert against tasks orders the first time to prevent retention problems. Our Team's strategies to retain personnel interested in a career supporting data science projects and initiatives include monetary incentive programs, robust professional development resources, and structured events to engage colleagues in communities of excellence and practice. Our retention plan is outlined in **Section B.8.5**.

**Figures B-10** and **B-12** present an overview of our Team's overall lifecycle staffing approach and our solution to hire and retain.

**Figure B-10: Dynamic Lifecycle Staffing Approach to Hire and Retain**




The process is dynamic and continuous, in that new positions and personnel are always being added to the program. Each Kessel Run position goes through this process with dozens of candidates and LCATs in play at different steps in the process. There are variations to the process depending on position requirements. The process itself is not overly complex, but the concurrent processing of dozens of different positions and candidates at the same time makes it highly dynamic. Issues occurring at any step can delay services provided. Poor performance in this area presents a significant risk to the Kessel Run mission. Our team will leverage the management/staffing experience and proven processes to succeed in this critical area as demonstrated with our 94% retention average across our Defense Intelligence Agency (DIA) Enterprise Platform Services (EPS) and Mission Ecosystem Micro-service Environment (MEME) contracts and on the National Geospatial Agency (NGA) Analytic Services Contract (ASC).

### B.12.2 Recruit Talented and Reliable Data Science Support

Recruiting for Kessel Run is unlike recruiting for any other services contract. Working as a data scientist in Kessel Run is vastly different than working in a consulting environment. Every company in this industry has a recruiting process, recruiters, large sourcing networks, and databases of candidates. To succeed on Kessel Run, our Team is not following this "traditional" recruiting process. We selected our partner because they have direct, first-hand experience working in the data science domain, unique skill sets (in some cases renowned; e.g., Metron) and the technical SOO/PWS coverage each lends to our Team, and most importantly the ability to procure talent not only in the Boston area but across the U.S.

To find candidates who will fit in the Kessel Run environment, the ITC Team has a rigorous screening process by people who understand the unique dynamics of each position. We describe our understanding the value of meaningful work in more detail in **Figure B-11**. It is the cornerstone of our successful recruiting process and provides the foundation for long-term data science expertise retention - e.g., team-wide data science professional retention rate averages 94%. Kessel Run data science experts, with a passion for this type of work and an aptitude to perform in an environment full of uncertainty, ultimately deliver high quality results against extraordinary challenges, are happier in their career development, and stay in their positions longer.

**Figure B-11: Critical Kessel Run Recruit Success Factors**

| What is "Value of Meaningful Work"? | How Do We Do It? | Why Is It Important? |
|---|---|---|
| The ability of our staff to engage in a meaningful manner, to innovate, ask important questions, and directly benefit the USAF | Our PM, Key Personnel, and staff other than key personnel oversee the recruiting and screening experience to look for candidates that, in addition to meeting the SOO/PWS requirements, exude confidence, resourcefulness, analytical ability, and personify the entrepreneurial spirt. | By hiring the best data science talent, with similar ethos and passion for their work, and providing meaningful work, we can not only recruit the best data talent, but retain them. |

### B.12.3 Hire Talented and Reliable Data Science Support

Our Team matured recruiting processes in support of $100M+ in contracts supporting Federal clients. The ITC Team identifies candidates from a variety of sources, such as hiring events and military transition sites, to maximize the pool of qualified candidates enabling us to hire personnel to meet Government defined forecasted dates.

**Positive Candidate Experience**

Highly focused on ensuring a positive candidate experience for these low-density/high-demand data professionals. We maintain 24/7 awareness of candidate status and engagement, resulting in successful hires in the shortest time.

**Figure B-12: Recruiting Channels and Benefit to Kessel Run**

| Recruiting Channel | Benefit to Kessel Run |
|---|---|
| University Partnerships | Joel Klein, Engineer, is an active adjunct professor at George Washington University (GWU). His leadership position with the University, provides the ITC Team access to a pipeline of data scientists, emerging with foundational understanding of statistical analysis and programming ready to apply their expertise to build cutting-edge solutions to real world data problems. |
| Data Science Events/Forums | ITC Team actively engages in data science events (Kaggle, Data Science Bowl, etc.) and data science job fairs/forums (e.g., SWE, AI Boston, Built In Boston, AI/ML) to continue to expand our network of data scientists, technologists, and data domain experts to not only explore new techniques, technologies, and approaches but leverage opportunities to grow our data science staff. |
| Experienced Recruiters | The ITC Team leverages focused recruiting power from across our team of 12+ recruiters, including reaching to staffing firms like Burtch Works, BrainWorks, DataSpace, etc. to continuously source, vet, and place data scientists, data engineers, reinforcement learning engineers, and operation research analysts. |

Our Team already interviewed, assessed, and established a staffing resume database of 40+ qualified candidates. Our Team has a track record of success for quickly filling similar positions. For example, on the Air Force Business Capability Lifecyle Management (B-CLM) contract, we were recognized for our ability to consistently fill required positions within 14 days, and when required, successfully filled positions faster. IT Concept's lifecycle staffing strategy ensures we will continue to recruit, hire, and retain people as required to rapidly replace staff for routine turnover or to fill new requirements to meet a Government defined forecasted date. Our life-cycle staffing approach (**Figure B-9**) is driven by Mr. Jon Hammond, Kessel Run PM. Mr. Hammond is supported by 12+ recruiters and recruiting firms already in place. Our experienced recruiters source candidates and facilitate interviews to find the best candidates to support this effort. Our recruiters, working collaboratively with Mr. Hammond, our Data Science SMEs (Joel Klein, Adrienne Juett) review resumes and/or interview all required candidates to facilitate the hiring process for each candidate. Only candidates who have existing clearance eligibility or who have a high likelihood of obtaining the required clearance level (as determined through our pre-screening process) are considered. If a candidate is required to complete the SF-86, it will be executed as a pre-employment action so that the candidate's clearance will be in place before the employment start date.

### B.12.4 Security Clearance Plan

**Strength of the IT Concepts Team Security Clearance Plan**

- Bench strength: 110+ cleared data professionals (Secret through TS/SCI)
- IT Concepts holds Top Secret Facility Clearance (FCL)

ITCs' ability to support Kessel Run requirements involving access to classified programs hinges on the ability to recruit and retain cleared, qualified employees postured to support Kessel Run promptly after hire. To this end, ITC made significant investments to ensure that we have the most robust, clearance initiation and application times and incorporate quality control to reduce rejections. We retain a best-in-class Facility Security Officer, providing 24x7x365 security support. This enhances our already "best in class" practices including background checks, pre-employment screening, with dedicated, well-trained, professional personnel security services. This helps ITC maintain a workforce of cleared personnel, streamlines the on-boarding process, and reduces risks to the program posed by normal attrition or processing delays. For cleared new hires, an additional clearance prescreen is conducted that aligns to the 13 Adjudicative Guidelines and verifies existing clearance information in JPAS and Scattered Castles. This practice ensures that we are providing our clients with appropriately cleared and accessed employees, and accurately estimating the time it will take for an employee to be available for client support. ITC understands the criticality of vetting our talent and maintaining their clearances at a variety of levels. We process personnel clearance actions based on program requirements and the proper need-to-know. We understand the time necessary to obtain security clearances and the various levels of access, and that delays in clearance processing pose a risk to a program. ITC's investment in personnel security differentiates the firm from other contractors because it contributes to conservation of government resources and helps ensure a quick and seamless support to our valued government clients.

### B.12.5 Retain Talented and Reliable Data Science Support

**Success of IT Concepts' TCP Evidence**

- Washington Business Journal's Best Places to Work (2015-2018)
- #19 Washington Business Journal Small Technology Company List
- SmartCEO Magazine's Washington "Future 50 Award Winner
- Best Places to Work in Boston (2017/2019)

All members of the ITC Team provide highly competitive total compensation plans (TCP). Each plan is designed to attract, retain, and motivate highly qualified and skilled employees, while maintaining overall cost consciousness. Our Team uses the TCP as a recruiting and retention tool within the life-cycle staffing process to communicate the benefits to candidates and employees (**Figure B-13**). Our TCP contributed to our 94% average staff retention rate.

**Figure B-13: Process for Communicating and Improving TCP within Staffing Life Cycle**


Competitive salaries, a quality, market-driven fringe benefit plan, and a team culture focused on serving and cultivating our employees encourages and motivates staff to focus on their clients' mission, as well as their commitment to personal development and growth. In addition to leveraging ITCs' industry leading total compensation plan (TCP), to ensure our most critical staff and top data science SMEs are motivated to remain on the Kessel Run team, ITC will use our Employee Awards and Recognition Program at no additional

cost to the U.S. Air Force Life Cycle Management Center (AFLCMC). The awards program recognizes high performing employees that exemplify our core values with performance bonus and recognition among their leadership teams. The awards program recognizes high performing employees that exemplify our core values with performance bonus and recognition among their leadership teams. This program includes spot bonuses valued from $100-$500 gift cards, monetary awards up to $15,000, and paid time off awards.

ITC rewards employees with milestone anniversaries to encourage tenure with the firm ranging from $50 - $500. Staff retention provides a stable, high-quality workforce that increases ITCs' flexibility and responsiveness for providing quality resources in a timely manner. With low turnover, we can focus on recruiting efforts to meet capacity requirements for surge, mission growth, bench strength, and additional clearance requirements. Annual staff evaluations, competitive compensation, community service, tuition reimbursement, and mentoring programs contribute to employee satisfaction and retention. The TCPs provide a powerful tool for obtaining and retaining workforce. However, just is important is our staff feeling connected to their leadership team. Once hired, we rely on our PM, Mr. Hammond and our Key Personnel (the most senior members of the team) to serve as a direct link to all staff regardless of company. Involving executive leadership is another key retention factor. ITC and several other teammates have a site visit program whereby senior leaders visit staff at client sites to enhance company connectivity. In addition, our team members ability to access our luminaries in the field of data science, data engineering, reinforcement learning, and ops research play a key role in retention.

**Data Science Luminary Program**

IT Concepts investment, in our proposed quarterly Data Science Luminary Program, engages our Kessel Run data practitioners with experts across data domains – expanding our Team's ability to learn and deliver against emerging data science requirements and technologies

**Figure B-14: ITC Team's Robust Retention Incentives**

| Teammate | Retention Incentive |
|---|---|
| **ITC** | ▪ Realistic compensation, based on market competitiveness, for highly educated, credentialed, and cleared data science professionals<br>▪ Annual bonus based on individual performance, at no cost to the government<br>▪ Tiered performance awards including contract-based awards based on client feedback, personnel receive money, certificates and recognition<br>▪ $5,250K for academic assistance/industry certifications<br>▪ 100% ITC-paid access to LinkedIn Learning, 11K+digital courses taught by industry experts with data-driven, curated courseware recommendations based on development goals |
| **Metron** | ▪ $9K tuition reimbursement, unlimited budget for professional memberships, books, journals, etc.<br>▪ Team-based approach to problem solving, and product development creates professional mentorship opportunities and an exciting opportunity to continuously refresh technical skills with peer learning |

### B.12.6 Surge Talented and Reliable Data Science Support in the Event of Unforeseen/Future Requirements

A critical element to managing unexpected turnover and maintaining full coverage with data engineering, data science, reinforcement learning engineering, and operational research analyst support is ensuring coverage in the event of unforeseen/future requirements and for both scheduled and unscheduled absences is the timely and effective exchange of information between our staff, PM, and AFLCMC. Well established "business rhythms" and communication channels allow us to aggregate and convert all daily and long-term staffing availability into our staffing tracker. The PM, subcontractors, COR, and CO use the staffing tracker to track recruiting and identify staffing challenges early to prevent gaps in service as well as to build surge capacity in response to Task Requirements Notices (TRNs). Upon receipt of a TRN, we will reach across the breadth and depth of our Kessel Run Data Science Team including Metron specifically brought to our Team to fulfill highly competitive data science and operations research surge, ad hoc, spontaneous, and

unscheduled absences, and provide an action recommendation, labor categories, estimated hours to complete tasks, and an estimated duration.

**Figure B-15: Approach to Ensure Personnel Coverage in the Event of Unforeseen/Future Requirements and Absences**

| Need/Type of Absence | Days Absent | Team's Solution | Benefit |
|---|---|---|---|
| Surge | N/A | Pre-qualified resource pool | Immediate deployment of pre-qualified staff |
| Short (sick day, jury duty, bereavement) | 2-5 | Onsite task lead guidance to shift work<br>Cross training (where appropriate) | Accelerated response time |
| Intermediate (extended illness) | 6-14 | Temporary Replacement<br>Location Cross Utilization | Immediate deployment of pre-qualified resource pool staff |
| Long (FMLA, military duty) | 15-90+ | Temporary Replacement | |
| Permanent | Permanent | Permanent Replacement | |

## B.12.7 Key Personnel Resumes

Our three key personnel form the foundation for our leadership team (Data Engineer, Data Scientist, and Reinforcement Learning Engineer – the most senior members of the team) based on an organizational structure to enhance communications and interface with the government at all levels. We name the three required key personnel, and additional proposed non-key personnel (**Figure B-16**) because they are vital to program success. At least one of the specified Key Personnel is able to travel more than 50% of the time to various locations (e.g., Al Udeid AB, Qatar; Osan AFB, South Korea; Elmendorf AFB, Alaska; Hickam AFB, Hawaii; Ramstein AFB, Germany; Tyndall AFB, FL; Davis-Monthan AFB, AZ; Nellis AFB, NV; and McDill AFB, FL).

**Figure B-16: ITC Team Kessel Run Organization Chart**

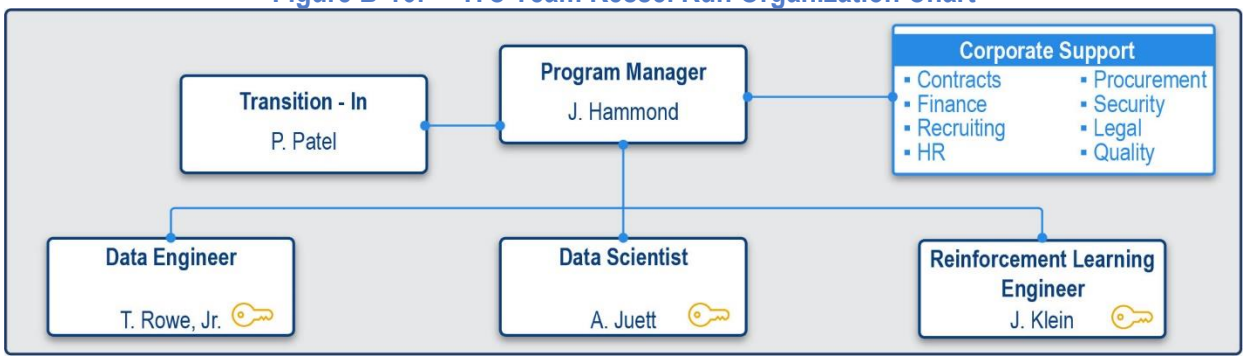



**Figure B-17: Additional Non-Key Personnel and Value to Kessel Run**

| Additional Non-Key Personnel | Overview of Experience | Value to Kessel Run |
|---|---|---|
| Jon Hammond<br>Program Manager | 20+ years technical program management and delivery Federal government experience across the intel and defense communities. | Day-to-day program management accountability and responsibility for Kessel Run success; drives technical excellence while ensuring program management best practices are followed |
| Dale Johnson<br>Operations Research Analyst | MS Operations Research (NPS); Retired Navy Aviator (CDR) with operational and analysis experience (e.g., GPS, tactical data links, etc.) | Breadth of experience utilizing modeling to answer strategic and tactical DoD challenges |

### B.12.7.1 KPP1 – Data Engineer

| Proposed Key Personnel Name: Thomas J. Rowe Jr. | |
|---|---|
| **Proposed Key Personnel Position:** KPP 1 – Data Engineer | |
| **Relevant Education:** Management Science, B.S. Degree – The Pennsylvania State University, 2004 | |
| **Minimum Requirements** | |
| **15+ Years** | **At least 2 years of experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS** |
| **(02/2008-2018)** | **Metron. Software Analyst. USN-NAVAIR/Advanced Airborne Sensor (AAS).**<br>▪ Developed warfare monte-carlo simulations in C++ & ObjectStore and analytic tooling using Matlab, SQL, Hierarchical Data Format (HDF), and Perl. The tools enabled analysis impacting many aspects of program development. |
| **(03/2017-02/2018)** | **Metron. Software Analyst. USN-BUPERS/Ready Relevant Learning.**<br>▪ Developed a manpower simulation of the USN recruiting/advancement/training/assignment/separation process using C++, SQL, and Python. The set of tooling enabled evaluation of different training schedules in terms of fleet manning effectiveness. |
| **(11/2006-03/2008)** | **Lockheed Martin. Software Analyst. NGA/RMS-GeoScout.**<br>▪ Developed designs, analysis, and tooling in support of modernizing GEOINT asset tasking and product dissemination systems. This involved parsing mainframe data in native record formats on z/OS and HP-UX with Rexx and related tools, characterizing data flows, and informing designs for the successor GeoScout system, which is now the primary means by which national assets are tasked. |
| **(05/2004-10/2006)** | **Accenture. Analyst. AstraZeneca.**<br>▪ Developed distributed handheld application and server-side software for optimal routing and tasking of thousands of pharmaceutical sales representatives. The system collated data, analyzed data, and distributed tasking to/from handheld devices using Oracle PL/SQL, C++, Powerbuilder, and SAS. The system resulted in a proven competitive sales advantage over rivals. |
| **6+ Years** | **Experience working with multiple database types such as SQL, Redis and MongoDB** |
| **(05/2003-Present)** | **Accenture/Lockheed Martin/Metron. Software Analyst. Various.**<br>▪ In previously discussed roles, used a wide variety of database technologies including Oracle, Sybase, DB2, ObjectStore, HDFS. Successful project execution has repeatedly required solid grounding in relational theory, excellent command of SQL, and development of Third Normal Form schemas. For performance considerations non-relational storage technologies including ObjectStore and HDFS have also been useful. HDFS has proven useful for analysis of large, compressable scientific computing datasets. |
| **6+ Years** | **Experience building and integrating the at the application and database level** |
| **(05/2003-Present)** | **Accenture/Lockheed Martin/Metron. Software Analyst. Various.**<br>▪ In previously discussed roles, used a wide variety of database technologies and languages including Oracle, Sybase, DB2, ObjectStore, HDFS, and C++, Java, Perl, Python. Front end interfaces have included Web/HTML, Qt, WxWidgets, Java Swing, and PowerBuilder. Server-side technologies have included CGI, Java Servlets, and PL/SQL. |

| Proposed Key Personnel Name: Thomas J. Rowe Jr. | |
|---|---|
| **2+ Years** | **Experience developing REST/SOAP APIs and messaging protocols and formats** |
| **(05/2017-Present)** | **Metron. Software Analyst. SPAWAR/CyberAssassin.**<br>▪ Developed application server functionality for the executable network architecture and tactical warfare simulation tool suite CyberAssassin. The SOAP endpoints hosted in Apache Tomcat add new functionality for manipulating an XML database of platform capabilities. |
| **5+ Years** | **At least 2 years of theoretical and practical background in statistical analysis, machine learning, predictive modeling, and/or optimization** |
| **(10/2010-2015)** | **Metron. Software Analyst. NAVAIR/AAS.**<br>▪ Integrated Extended Kalman Filter sensor fusion model in the tactical warfare simulation NSS, enabling more optimal and realistic asset behaviors.<br>▪ Used genetic-polynomial regression to approximate a large, multi-dimensional environmental performance characteristic dataset such that the reduction enabled use in a faster than real-time simulation. Lookup times in the available performance data would have been impractical.<br>▪ Implemented Latin Hypercube sampling to enable a Design of Experiment Approach to characterize multidimensional spaces in the NSS tactical warfare simulation. |
| **5+ Years** | **Experience implementing event/data streaming services such as Kafka** |
| **(10/2010-2015)** | **Metron. Software Analyst. NAVAIR/AAS/OPNAV N81**<br>▪ Implemented a distributed cluster computing parallel batch computation system for Monte-Carlo tactical warfare simulation based on HT-Condor. This enabled high-throughput computing on all available compute resources.<br>▪ Implemented distributed cluster computing system for campaign simulation with Oracle Grid Engine enabling rapid turnaround of warfare campaign simulation results fully utilizing available compute resources. |
| **9+ Years** | **Experience prototyping front-end visualizations utilizing data visualization suites such as Kibana or Splunk** |
| **(10/2010-present)** | ▪ Developed multiple front end geospatial data visualization systems for simulation outputs using both QGIS, and hand written map raster manipulations in C++.<br>Developed automatic metric graph generation systems using SQL, Python Matplotlib, and GNUPlot.<br>▪ In each case data visualizations both guided analyst efforts and informed key decisions makers of findings in briefings. |
| **Experience implementing and building event driven architectures** | |
| Extensive familiarity with POSIX select/poll server architectures, Qt threading, and Boost.ASIO. For example, Built a system to live monitor distributed computing results and collate incoming results on a cluster. | |
| **Familiarity with event driven finite state machines** | |

| Proposed Key Personnel Name: Thomas J. Rowe Jr. |
|---|
| ▪ 8+ years of experience using agent tactics in the aforementioned NSS and CyberAssasin simulations are based on finite state machines operating on a priority event queue. Implemented commander tactics to prosecute complex C4ISR driven kill chains.<br>▪ Also have implemented high performance linear time BNF parsers (based on state machines) to process legacy data formats, using the Marpa::R2 Earley parser. This enabled automated manipulation of system files that would otherwise have required time infeasible manual editing, producing study results that would have otherwise been impossible. |
| **High proficiency in SQL to include schema design, data definition, and advanced queries** |
| 10+ years of experience developing 3NF and BCNF relational schemas and writing modern advanced SQL and PL/SQL. The previously described pharmaceutical sales representative coordinating system ran on schemas I substantially developed. The previously mentioned Navy manpower simulation is based on an extensive relational schema. |
| **Experience with scripting languages for automating repetitive tasks** |
| 10+ years of experience using Perl, Python, Bash, Powershell, Windows batch scripts. Embedded the Perl runtime into the NSS tactical warfare simulation and designed a scripting API to enable advanced customized behaviors. Embedded the Python runtime into the SAFEGARD air defense simulation to likewise enable advanced customization. Recently leveraged Python's Pandas suite for data processing and data visualization in a Navy manpower simulation. |
| **Experience with creating automated data pipelines for complex systems** |
| 10+ years of experience using both parallelized and sequential batch processing approaches to processing large amounts of data. The aforementioned HT-Condor and Grid Engine systems are simulation data processing pipelines that generate data in parallel for processing into aggregate metrics. |
| **Extensive linux server management background** |
| 10+ years of experience administering and leveraging UNIX systems including Linux. Prefer to architect systems leveraging integral Linux features such as LXC & systemd. The aforementioned Navy manpower simulation was architected to scale on Linux based cloud computing infrastructure. |
| **Excellent verbal and written communications skills along with the ability to present technical data and approaches to both technical and non-technical audiences** |
| Many years of proven ability to write detailed technical reports, successful proposals, and present findings in interactive settings, beginning with pharmaceutical industry executives, and most recently to Navy N81C leadership. |
| **Current U.S. security clearance or ability to obtain a U.S. security clearance** |
| TS/SCI |

## B.12.7.2 KPP1 Data Engineer Evidence of Current Employment and / or Commitment Letter

Metron, Inc
1818 Library Street
Suite 600
Reston, VA 20190
(703) 787-8700
(703) 787-3518 FAX
www.metsci.com

January 6, 2020

To whom it may concern:

The purpose of this letter is to confirm the employment of Thomas Rowe with Metron, Inc.

Tom is a Lead Software Engineer with Metron. He started January 3, 2008 and is a full- time employee.

Should you require any further information, please contact Human Resources at (703) 787-8700.

Sincerely,

Erin Settle
Human Resources
Metron, Inc.

### B.12.7.3 KPP2 – Data Scientist

| Proposed Key Personnel Name: Adrienne Juett | |
|---|---|
| **Proposed Key Personnel Position:** KPP 2 – Data Scientist | |
| **Relevant Education:** PhD. Physics – Massachusetts Institute of Technology. 2004; B.S. Chemical Engineering and Engineering Physics – University of Kansas. 1999 | |
| **Minimum Requirements** | |
| **15+ Years** | **At least 2 years of experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS** |
| **(11/2009-Present)** | **Metron. Senior Analyst. OPNAV/N81 Analytic Studies.**<br>▪ Developed Monte Carlo modeling of ISR and Targeting data pathways for Navy analytic efforts resulting in recommendations of system combinations that best support Navy targeting efforts to support Navy resourcing decisions using Python (SciPy, NumPy, and Pandas) and R.<br>▪ Utilized Python and R data analysis codes to automate data processing, statistical comparisons and data visualization of results from operational modeling efforts. Results of this work were used to inform OPNAV resourcing decisions and inform the Campaign Analysis efforts for Naval Force requirements. |
| **(10/2009-8/2007)** | **NASA Goddard Space Flight Center. NASA Postdoctoral Fellow.**<br>▪ Developed numerous data processing and analysis tools in IDL to automated processing and analysis of astronomical datasets. One analysis automated the analysis of the mass-X-ray observable scaling relationship for a set of 70 galaxy clusters. |
| **(7/2009-8/2004)** | **University of Virginia, Department of Astronomy. Postdoctoral Researcher.**<br>▪ Developed numerous data processing and analysis tools in IDL to automated processing and analysis of astronomical datasets. |
| **10+ Years** | **Experience working with multiple database types such as SQL, Redis and MongoDB** |
| **(11/2009-Present)** | **Metron. Senior Analyst. OPNAV/N81 Analytic Studies.**<br>▪ Worked with multiple databases types (including MySQL, MongoDB, etc) as part of operational modeling. Databases were used to store modeling inputs and outputs. Experience with developing SQL queries to create model result reports for specific data needs. |
| **10+ Years** | **Experience building and integrating the at the application and database level** |
| **(11/2009-Present)** | **Metron. Senior Analyst. OPNAV/N81 Analytic Studies.**<br>▪ Used, led development and/or modification of numerous modeling systems for analytic analysis. This required developing system requirements and data needs for both inputs and outputs, as well as testing integration and development. |
| **10+ Years** | **Experience developing REST/SOAP APIs and messaging protocols and formats** |
| **(11/2009-Present)** | **Metron. Senior Analyst. OPNAV/N81 Analytic Studies.**<br>▪ Developed messaging protocols and formats to provide data from operational modeling systems for post-modeling analysis and visualization. Developed APIs to read data for modeling and analysis. |

| Proposed Key Personnel Name: Adrienne Juett | |
|---|---|
| **10+ Years** | **At least 2 years of theoretical and practical background in statistical analysis, machine learning, predictive modeling, and/or optimization** |
| **(11/2009-Present)** | **Metron. Senior Analyst. OPNAV/N81 Analytic Studies.**<br>▪ Used statistical analysis, machine learning, predictive modeling and optimization techniques for Navy Analytic efforts. Led and performed approximately 4-6 studies a year for last 10 years. Analysis results inform Navy resourcing priorities. Specific techniques utilized include testing for statistical significance, regression analysis, and Monte-Carlo modeling to predict future system performance. Analyses included: Campaign analysis incorporating USAF, USN, USMC assets, logistics studies of small and large scale DoD operations, Manpower analysis of USN Air training wings to determine impacts on pilot completion throughput, mission analyses of tactical, theater, and national assets for C4ISR and targeting. |
| **(10/2009-8/2007)** | **NASA Goddard Space Flight Center. NASA Postdoctoral Fellow.**<br>▪ Range of data analysis techniques used to analyze astronomical data including regression analysis, machine learning techniques for image analysis, and Monte-Carlo analysis for error estimation. |
| **(7/2009-8/2004)** | **University of Virginia, Department of Astronomy. Postdoctoral Researcher.**<br>▪ Utilized a range of data analysis techniques to analyze astronomical data including non-linear multivariate regression analysis and predictive modeling. |
| **10+ Years** | **Experience implementing event/data streaming services such as Kafka** |
| **(11/2009-Present)** | **Metron. Senior Analyst. OPNAV/N81 Analytic Studies.**<br>▪ Utilized and led development of numerous Monte-Carlo event driven simulation systems to describe mission level modeling of C4ISR, Counter-C4ISR, Strike, and Mine Countermeasures and logistics modeling of small- and large-scale defense operations. |
| **10+ Years** | **Experience prototyping front-end visualizations utilizing data visualization suites such as Kibana or Splunk** |
| **(11/2009-Present)** | **Metron. Senior Analyst. OPNAV/N81 Analytic Studies.**<br>▪ Created data visualizations for OPNAV analytic efforts to provide decision makers with summary of data and results. This includes mission and campaign modeling results and readiness analysis for manpower and logistics. Visualizations include graphics and tabular representations, violin plots, and probability distributions. |
| **Additional Qualifications** | |
| **Experience in theoretical and practical background in statistical analysis, machine learning, predictive modeling, and/or optimization** | |
| (Noted above) | |
| **Experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS** | |
| (Noted above) | |
| **Experience working with databases such as SQL or MongoDB.** | |
| (Noted above) | |

| Proposed Key Personnel Name: Adrienne Juett |
|---|
| **Experience working with large-scale data sets.** |
| ▪ Experience working on large data sets in both academic and defense applications. Academic datasets were in the multi-terabyte range including imagery analysis. Defense data sets, particularly logistics and campaign modeling, ranged in size from 10s of gigabytes to terabyte. |
| **Experience producing data visualizations for a variety of different audiences.** |
| ▪ Produce and present numerous study results for OPNAV Analytic efforts to variety of audiences from technical experts to flag-level summarizations. |
| **Excellent verbal and written communications skills along with the ability to present technical data and approaches to both technical and non-technical audiences.** |
| ▪ First author on 10 astronomical papers, Co-author on 20 astronomical papers.<br>▪ Interfaced with stakeholders to determine analysis requirements and appropriate metrics.<br>▪ Produced and presented numerous study results for OPNAV Analytic efforts to variety of audiences from technical experts, operations staff, and flag-level summarizations. |
| **Current U.S. security clearance or ability to obtain a U.S. security clearance** |
| TS/SCI |

## B.12.7.4 KPP2 Data Scientist Evidence of Current Employment and / or Commitment Letter

Metron, Inc
1818 Library Street
Suite 600
Reston, VA 20190
(703) 787-8700
(703) 787-3518 FAX
www.metsci.com

January 6, 2020

To whom it may concern:

The purpose of this letter is to confirm the employment of Adrienne Juett with Metron, Inc.

Adrienne is a Senior Operations /Systems Analyst with Metron. She started November 16, 2009 and is a full- time employee.

Should you require any further information, please contact Human Resources at (703) 787-8700.

Sincerely,

Erin Settle
Human Resources
Metron, Inc.

### B.12.7.5 KPP3 – Reinforcement Learning Engineer

| Proposed Key Personnel Name: Joel Klein | |
|---|---|
| **Proposed Key Personnel Position:** KPP 3 – Reinforcement Learning Engineer | |
| **Relevant Education:** M.S. Computer Science – The George Washington University / 2015; B.S. Economics and Computer Science – The George Washington University / 2014 | |
| **Minimum Requirements** | |
| **4+ Years** | **At least 2 years of experience developing in languages commonly used for data analysis such as Python, R, Julia, or SAS** |
| **(10/2019-Present)** | **ITC, Inc. Senior Data Scientist.**<br>▪ Developed a python application to run on embedded devices that would run a facial recognition model to identify key individuals. Upon recognition the application engaged a secondary function to engage with the identified individual. The application ran in real-time within a range < 10 meters, with a test accuracy of 90+%. |
| **(09/2015-11/2019)** | **Sphere of Influence. Data Science Studio Lead.**<br>▪ Developed an R application that read in free-form text entry and would statistically analyze the value, it's geographic coordinates, history of inputs, and more to automatically align the entry with a list of known products. The statistical model ensured the correct value was in top 3 recommended results 95+% of the time.<br>▪ Developed a python application that would take versioned JSON data and use diff-logging to compress the data. This application was designed to compress 1+TB in JSON records to minimize costs and improve performance on the Cosmos database while still providing the full history of the records. At the DB level, the app resulted in a ~7:1 compression ratio leading to a 200+GB Cosmos instance. |
| **4+ Years** | **Experience working with multiple database types such as SQL, Redis and MongoDB** |
| **(06/2017-Present)** | **The George Washington University. Adjunct Professor. MS Data Analytics Program**<br>▪ Designed course around multiple databases (MongoDB, Arango, Neo4j, MySQL, Dynamo) hosted on AWS resources to highlight their different use cases and handle 15+ concurrent student users. Curated a multi gigabyte dataset through the Twitter API and manipulated the data to conform to each type of database, enabling the class to explore how the format and distribution data changes what kinds of information we can easily query. |
| **(09/2015-11/2019)** | **Sphere of Influence. Data Science Studio Lead.**<br>▪ Built and managed a million+ node Arango graph database which tracked the relationship between medical practitioner and their practice locations, which powered a machine learning model that could impute missing information and/or predict the quality of the data with 90+% accuracy.<br>▪ Designed/implemented 400+GB MSSQL Server stored internet tracking information used to build a modified Doc2Vec NLP model. |
| **4+ Years** | **Experience building and integrating the at the application and database level** |

| Proposed Key Personnel Name: Joel Klein | |
|---|---|
| **(10/2019 - Present)** | **ITC. Senior Data Scientist. MARS**<br>▪ Designed and built a data pipeline that integrated with external databases, analyzed the data using a statistical and machine learning model, visualized results, and stored results for further processing out to Dynamo which provided analysts with the ability to interact with and customize the results of the workflow. |
| **(09/2015-11/2019)** | **Sphere of Influence. Data Science Studio Lead.**<br>▪ Designed, built, and implemented a workflow that ingested data from an AWS Redshift database, identified agricultural regions with predicted similar yield (using a random forest), and saved results out to a SQL database which powered the visualizations and reports generated on a mobile application.<br>▪ Developed an exploratory environment that could seamlessly switch between Azure Cosmos and local MongoDB databases to enable users to develop locally and in the cloud (for production implementation). Produced scripts that could compare results stored in SQL tables in multiple environments to ensure that model results were consistent across application deployments. |
| **4+ Years** | **Experience developing REST/SOAP APIs and messaging protocols and formats** |
| **(10/2019 - Present)** | **ITC. Senior Data Scientist. MARS.**<br>▪ Developed a deep learning predictive model to determine whether a ship was moving and at what speed, using AIS data, with an MSE below 1. The model was deployed using AWS SageMaker to provide an automatically scaling REST API for developers to use at the application level. |
| **(09/2015-11/2019)** | **Sphere of Influence. Data Science Studio Lead.**<br>▪ Wrapped an address correction application in a Flask application to provide a user-friendly REST API that provided address lookup, address correction, and address completion endpoints. The Flask application was then dockerized so that it could be easily deployed and/or scaled in other environments. |
| **4+ Years** | **At least 2 years of experience developing Reinforcement learning systems utilizing at least one of the following methodologies. Finite Markov Decision Processes, Support Vector Machines, Q-Learning, Stochastic Finite State Machines, MCTS or other hybrid Deep Reinforcement Learning processes** |
| **(09/2015-11/2019)** | **Sphere of Influence. Data Science Studio Lead.**<br>▪ Developed a traffic-light simulation, using the sumo simulator, demonstrating how a Reinforcement learning system could be used to improve the performance at traffic intersections. The simulation was setup to leverage DQN and Actor-Critic approaches interchangeably, so that multiple approaches could be evaluated for their effectiveness. The sensor data driving the simulation's environment was derived from features that would be available to traffic cameras, demonstrating how easily said models could be deployed to live systems. |
| **Additional Reinforcement Learning Engineer Qualifications** | |
| **4+ Years** | **Experience in SQL and data handling across multiple data types (images, text, metadata, tokens)** |

| Proposed Key Personnel Name: Joel Klein | |
|---|---|
| Built an application that maintained agricultural data in a RedShift that was used to fuel a supervised machine learning model that could predict yield for a given field. The results of the model were stored in a MySQL RDS instance so that they could be provided to a mobile application via a REST API. Designed and deployed a MongoDB application that ingests Twitter API data and prepares the data for a Neo4j and/or Arango DB.<br>Built a custom computer vision predictive model to track successful basketball shots made while looking directly up at the hoop. Used traditional computer vision techniques to identify a ball moving against a noisy foreground, then built a custom RNN model to determine if the balls movement indicated a successful shot. Designed the machine learning model to ensure it could perform in real-time on embedded devices in sub-optimal conditions with 90+% accuracy. | |
| **4+ Years** | **Proven proficient at building stable, scalable code or scripting processes** |
| Designed an ingestion and compression pipeline around a stream of unstructured healthcare provider records and the Azure Cosmos DB. This system was designed to handle the 1 TB+ backlog of data while being able to scale indefinitely going forward. This system was then leveraged to generate a 1 million+ entity graph in Arango DB that was used to monitor and analyze relationships between healthcare locations, providers, and insurance plans. | |
| **4+ Years** | **Experience utilizing state-of-the-art AI frameworks such as Torch, Tensorflow, MXNET, CAFFE etc.** |
| Built a custom computer vision predictive model to track successful basketball shots made while looking directly up at the hoop. Used traditional computer vision techniques to identify a ball moving against a noisy foreground, then built a custom RNN model to determine if the balls movement indicated a successful shot. Designed the machine learning model to ensure it could perform in real-time on embedded devices in sub-optimal conditions with 90+% accuracy | |
| **4+ Years** | **Experience building and integrating the at the application and database level** |
| Built an application that maintained agricultural data in a RedShift that was used to fuel a supervised machine learning model that could predict yield for a given field. The results of the model were stored in a MySQL RDS instance so that they could be provided to a mobile application via a REST API. Designed and deployed a MongoDB application that ingests Twitter API data and prepares the data for a Neo4j and/or Arango DB. | |
| **4+ Years** | **Experience with basic data tools such as Flask, Jupyter Notebook or MatLab** |
| Wrapped an address correction application in a Flask application to provide a user-friendly REST API that provided address lookup, correction, and completion endpoints. The Flask application was then dockerized so that it could be easily deployed and/or scaled in other environments. Built multiple graduate level courses around Jupyter Notebooks to provide students with an interactive environment to explore basic data analysis. | |
| **4+ Years** | **Experience with large volume data labeling, normalization, sanitization and general data management** |
| Designed a system that aligned healthcare provider attestations with provider audits to generate a labeled representation of the provider attestations. To prepare this data for model development, a continuous system for generating imputers and standardizers were designed that provided a means for filling in missing information and reformatting the data for model predictions. | |
| **Current U.S. security clearance or ability to obtain a U.S. security clearance** | |
| Application for TS/SCI submitted (10/2019) | |

## B.12.7.6 KPP3 Reinforcement Learning Engineer of Current Employment and / or Commitment Letter

To: Ms. Sara Corsetti / Mr. Joshua Naim

Reference: Letter of Commitment – Department of the Air Force (AF) / AF Life Cycle Management Center (AFLCMC) / Detachment 12 Kessel Run, Data Science Services Contract (Solicitation No. HBBK-2019-0003)

To Whom It May Concern:

This letter is to confirm that I am fully committed to support IT Concepts Inc. (ITC). as the ***Reinforcement Learning Engineer*** to provide support to Kessel Run and its respective customers. I understand that **ITC** will be using my name, resume, and qualification information in our proposal. I am a current employee working for **ITC**.

- Mr. Joel Klein is available to begin work upon task order award.

Sincerely,

Joel Klein — 12/26/2019

Print Name — Date

Joel Klein

Signature

**IT Concepts Inc**
1600 Spring Hill Road, Suite 305
Vienna, VA 22182
www.useitc.com

# C Relevant Domain Experience (2.1.2.3)

## C.1 ITC Relevant Experience: Defense Intelligence Agency (DIA) - Mission Ecosystem Microservice Environment (MEME)

### Relevant Experience: DIA - MEME

**Describe how you built multi-application event streaming architecture using other types of event driven systems with free and open source software.** The entire MEME system is comprised of microservices and microservice-based applications. ITC used the latest industry standards and best practices in our implementation of microservices and web-based applications to enable multi-application event streaming and other types of events with free/open source software, where possible. We used Confluence to manage all project documentation to include our architecture diagrams, roadmap, system design and meeting notes. We designed all the microservices in Confluence and then reviewed to ensure the design meets the requirement and the standards set up by the program. Once the design is complete, we begin to work on the implementation that is all documented by JIRA utilizing Agile processes. We build and deploy the software using our DevOps pipeline which includes Mongo, SaltStack, Jenkins, Gitlab, and others. These tools allow us to track and oversee all the deployments and ensure the builds are error free. We use Slack as an open communication tool for our geographically dispersed development team, this allows all of our engineers to work together and communicate with each other or entire teams instantly. By using a microservices-based framework, we are able to easily reuse all of our components across our application suite saving both time and money in the implantation of new tools. Deploying the microservices in autoscaling cloud environments allows us to maximize the use of the API, while reducing overall cost to run and increase the overall uptime and responsiveness of our systems and applications.

ITC built several new systems using our cloud-based infrastructure as well as the DIA provided Platform as a Service (PAAS) based on the openshift opensource toolset. By using these capabilities, we continue to exceed the mission requirements as well as provide a platform for other organizations to use. As part of MEME, we developed a robust set of services that provide fully documented external facing REST and Thrift services. These services are exposed so that they can be leveraged by both contract-built applications as well as third-party applications. This allowed systems to not only be quickly built by reusing existing APIs but ensures interoperability between those systems.

Our team of data engineers, data scientists, etc. supported and provided technical advice for all the IT business systems managed by ADO in our role as the DevOps lead and through our development efforts. We implement, manage, and use Kafka for the extraction, transformation, and loading (ETL) of data in parallel pipelines. Our implementation of Kafka provides MEME with stream processing, message queues, and pub / sub, among other uses. Our Kafka implementation includes is a fully featured streaming platform that can serve as the basis of a scalable, distributed data pipeline. We designed our Kafka cluster to store ordered logs of data in categories called Topics. Each record in a topic consists of a key, a value, and a timestamp. We then store this data on the Kafka cluster for a configurable retention period, and each record is associated with a sequential id called an offset, which is unique within a topic. The two primary abstractions in Kafka are the Consumer and the Producer. A Producer primarily publishes data to a topic on a Kafka cluster, while a consumer subscribes to a topic and receives the data off the Kafka cluster. A single topic can be subscribed to by zero or more consumers. The data will be persisted on the cluster regardless of whether or not it has been consumed. Each consumer maintains only a record of which offset it should process next. Each topic has a configurable partition number and replication factor. Replicating a topic allows for fault-tolerance, as one of the replicated topics will take over as master if any

**Relevant Experience: DIA - MEME**

processes fail. Partitioning allows a topic to be spread across multiple servers. Topics can be load-balanced across partitions, or split in some semantic way, such as by key.

ITC used Docker containers with Kubernetes to support orchestration and autoscaling across our service and application deployment environment to further enhance our ability to scale to enterprise need. Our deployments are done in multiple availability zones (AZ) to ensure that the overall system can survive failures of an entire AZ; this provides Continuity of Operations (COOP). Our support for MEME uses multi AZ deployments to provide for availability and COOP. We configured multiple AZs so that if one AZ is lost the other AZ can support the load until all AZs can be restored. We manage our applications and services using SaltStack which allows us to fully rebuild the entire application suite in less than an hour. We use Virtual Private Networks (VPNs), Security Groups, STIGed Centos AMIs and IPTables to fully lock down and secure all of our infrastructure. All of our services support PKI-based authentication and use the DN of a user and their security attributes to protect all data within our environment.

ITC provided guidance on data retention policies, backup policies and the tools that accessed that data across the enterprise. We implemented Enterprise Mongodb and three production Elastic Search clusters, as well as multiple AWS RDS instances in support of ADO and the MEME contract. As part of these implantations, we use the latest industry standards and best practices to include the latest Security Technical Implementation Guides (STIGs) provided by the Department of Defense and software vendors. We enforce these policies from the operation system (OS) level to the applications that ride on that OS. We built dashboards that monitor and provide information from our data sources to let us see any abnormalities before they can cause long term data issues. All of our data is stored using cloud-based storage and backup capabilities including nightly snapshots of our data systems including both managed (RDS based) databases and unmanaged databases such as MongoDB. We use S3 buckets and their data retention polices to store data and move it to lower cost storage options when they no longer need real-time access, but still need to be stored for policy reasons

In leading the test team, we were responsible for the building of test plans and test schedules - ensuring the testing team was appropriately tasked and providing quality across the ~15 applications that are deployed or deploying into MEME supporting a worldwide workforce. We provide project management support in our SecDevOps role to include leading that team with responsibility for their deployment and maintenance schedules. These schedules are then synchronized back up with the master schedule so that we can effectively track tasks from creation to deployment. We use these as part of a continuous evaluation process so that we can improve our overall project planning and ensure our planned timelines and actual timelines are the same. Our environment is built using Cloud Formation which allows us to define our entire infrastructure as code so that it can be built and rebuilt with the click of a mouse. We use SaltStack to be able to accomplish the same infrastructure building for the openshift environment.

Our ITC DevOps staff is responsible for the maintenance of all the DevOps tools and development tools used by our teams. We have checklists that we maintain to ensure that all operating systems' patches are applied, any emergency or security patches are applied to the tools, and new versions are evaluated and tested prior to installing in production. By having these tools deployed in a cloud environment, we are able to quickly duplicate the production tools and data into a test instance and test DB, perform upgrades, and test the upgrades to ensure the software and data still work and nothing has been lost; then, during afterhours, we modify the production tools by backing up the EC2 volumes and databases by using AWS snapshots and then upgrading the software. Our staff currently manage and maintain several COTS products including ElasticSearch, MongoDB, Kafka and others. We use and integrate with Splunk and

**Relevant Experience: DIA - MEME**

Logstash on all of our servers and maintain the configuration for these tools. Our team researches the new releases of these products to understand and test the upgrades. This allows our operations team to plan for upgrades and put together upgrade paths for our clients to ensure the latest versions are available to them as soon as posable. It allows us to ensure that the upgrades will not cause any issues with any of their integration points across all of the applications that use the tool.

We constantly monitor our cloud costs by using the AWS dashboard to track costs. We built custom CloudWatch metrics to alert us to cost-based changes such as new volumes, EC2 instances, or RDS instances. These alerts allow us to ensure all resources are approved prior to instantiating them and allows us to identify where our costs are coming so that we can verify the allocation of those resources. This includes monitoring the utilization of resources across our EC2s which allows us to continually “right size” instances. We use autoscaling of resources to provide us with computing resources when we need it but turn them back off once the need is over, continuing to keep our costs as low as possible.

Our team built Virtual Private Networks (VPNs) to contain all of our backend servers so that they remain segregated from the overall network. We implanted Security Groups (SGs) and managed all the firewalls of our servers to restrict all network traffic to our CDIR blocks - except for our web application server where port 443 is open to provide SSL communication between client browsers and our webservers. We implanted encrypted volumes to ensure all data would be encrypted at rest, further protecting our data.

By using a microservices-based framework, we are able to easily reuse all of our components across our application suite saving both time and money in the implantation of new tools. Deploying the microservices in autoscaling cloud environments allows us to maximize the use of the API, while reducing overall cost to run and increase the overall uptime and responsiveness of our systems and applications.

## C.2 Relevant Experience: Metron Relevant Experience

**Metron Relevant Experience (further details are classified)**

**Describe how you built multi-application event streaming architecture using other types of event driven systems with free and open source software.**

**Activity Based Intelligence (ABI).** Metron developed a suite of analytic services deployed at the National Geospatial Agency (NGA) to detect suspicious behavior and generate alerts from vehicle tracks generated from Wide Area persistent sensors. Real-time detection capabilities include anomalous motion (e.g., evasive driving or checkpoint avoidance) and threat behaviors (e.g., IED emplacements or arrivals / departures from a named area of interest such as a suspected safe house). Our complementary MATCHER capability correlates observations from air and ground sensors (e.g., people, emitters, vehicles) and expresses the correlation confidence over time as precise probabilities. The goal of these powerful analytic capabilities is to provide real-time alerts of suspicious activities and correlations of interest. Operators can use these alerts to automatically cue sensors to collect additional data or assets to interdict these threats.

**Machine Learning and Statistical Inference for Cargo and Passenger Screening.** Metron developed, matured, and transitioned critical new technology for greatly improving intelligence analysis regarding threats and illegal activity in cargo and passenger transport. For the past four years, Metron has been the primary developer of statistical inference solutions for use in detecting threat patterns in large databases at Customs and Border Protection (CBP) and Office of Naval Intelligence (ONI) in the Global Trader Program. Metron's innovative TINE supervised learning method and software has been distributed to hundreds of analysts and greatly accelerates the assessment of cargo and passenger risk. A key Metron innovation is that TINE provides the strongest threat indicator(s) and supporting evidence with each assessment.

**Cognitive Detection, Tracking, and Classification Systems.** Metron is a leader in cognitive sensing systems with ongoing development for Air Force Radar systems and Navy Active Sonar systems. Building upon our advanced signal processing capabilities, cognitive systems adaptively allocate resources to the collection and refinement of remote sensor data where the control variables are end-user specific strategic or tactical objectives and constraints. Cognitive system objectives include detection, tracking, and classification of targets and clutter, with the cognitive process providing control over the duration and focus of the collection sensors to provide the most informative data for achieving the system objectives.

**Prediction, Planning and Decision Aids.** Metron's extended history and original work in search planning, intelligence, surveillance and reconnaissance resource allocation, National Information Systems and National Overhead Systems sensor performance prediction, and similar related areas, has enabled Metron to construct and deploy a variety of Strategic and Tactical Decision Aids. These systems provide for the quantitative analysis of collection system availability and constraints, environmental conditions, threat or target prior information, and the expected value of information for selected actions. Through physical models and classical inference theory, value assessments for courses of action and subsequent "what ifs" can be quantified to support decision making. Most notable of these classes of systems are the development of a Maritime Targeting Capability (MTC) enabling Over-the-Horizon Targeting and the Search and Rescue Optimal Planning System (SAROPS) developed by Metron for employment by the US Navy and Coast Guard, respectively.