Complete the following SEMP sections for:  
**The DARPA Urban Challenge – See Canvas/Course Documents – Or other Project**

# Technical Management Processes

## Project Technical Planning

### Major Events: Integrated Master Plan

Throughout A&Bs SE process, reviews will be scheduled to track the program readiness and ensure major milestones are hit within deadlines.

A Preliminary Design Review (PDR) will be conducted. The PDR will establish the allocated baseline of the system to ensure it is operationally effective. The timing of the PDR will be approved during official scheduling setting and will consist of third-party panel members to objectively evaluate the progress. A post-PDR assessment will be conducted in association with the Critical Design Review (CDR) and will be formally considered by the third-party panel at the CDR assessment. The purpose of the post-PDR assessment will be to reflect the updated design strategy from the CDR.

The PDR deliverables will consist of: (1) an established system allocated baseline; (2) an updated risk assessment for the engineering, manufacturing, and development phase; (3) an updated cost analysis requirements description; (4) an updated program schedule including system and software critical path drivers; and (5) an approved life-cycle sustainment plan updating program sustainment development efforts.

The Program Manager will conduct the PDR and will work to resolve critical, system-wide issues. The standard for technical reviews and audits to be performed through the acquisition life cycle will be IEEE 5288.2 “Standard for Technical Reviews and Audits on Defense Programs”. A tentative schedule will be set when the PDR should be conducted to maintain an on-time schedule but it will occur when the allocated baseline has been achieved, allowing detailed design of hardware and software configuration items to proceed. A minimum of 10 percent of the product drawings and associated instructions will be complete, with all safety-critical component drawings complete.

Following the PDR, A&B will conduct a Critical Design Review (CDR). A&B will ensure that the system can proceed into fabrication, demonstration, and test to meet stated performance requirements within cost, schedule, and risk. The CDR satisfies the Capabilities Development Documents (CDD). For key configuration items at each subsystem level, multiple CDRs may be needed to culminate in a system-level CDR. When the product baseline has been achieved and the CDR entrance criteria have been met as laid out herein, the CDR will be conducted to allow fabrication of hardware and coding of software deliverables to proceed.

The system’s final design will be assessed during the CDR as it is captured in product specifications for each configuration item in the system’s product baseline. By doing so, it is ensured that each configuration item has been captured in the detailed design documentation.

The CDR deliverables will consist of: (1) a system initial product baseline; (2) updated risk assessment for engineering and manufacturing development; (3) updated cost analysis requirements description based on the system product baseline; (4) updated program development schedule including fabrication, test and evaluation, and software coding, critical path drivers; and (5) approved life-cycle sustainment plan pdating program sustainment development efforts and schedules based on current budgets, test evaluation results, and firm supportability design features.

The Program Manager will tailor the review to the technical scope and risk of the system, and address specifics of the CDR as laid out herein. The standard for technical reviews and audits to be performed for the CDR will be IEEE 5288.2 “Standard for Technical Reviews and Audits on Defense Programs”.

Following the CDR, a Detailed Design Review (DDR) will take place. The point of the DDR is to show evidence that the design will meet specifications, through inspection, analysis, or reference to something proven. In the system architecture, subsystems will address all specifications and a concept update may be necessary. Detailed drawings, schematics, flow charts, etc. will be need to physically and functionally realize the design, from component to subsystem to system.

DDR deliverables will consist of: 3-dimensional (3D) computer aided design (CAD) drawings, mechanical simulations, factory layouts, process flow diagrams, workflow maps, supply chain maps, ergonomic drawings, lean analysis, inventory analysis, implementation plans, Matlab simulations, schematics, detailed circuit designs, and step-by-step plans to characterize the system against all of the specifications.

The fourth and final review will be a Test Readiness Review (TRR). The TRR will determine if the system is ready to proceed into formal testing by deciding whether the test procedures are complete and will verify their compliance with test plans and descriptions. Between each major test configuration item, including hardware and software, a TRR will be conducted to provide management with the assurance that the system has undergone a thorough test process and will be ready for turnover to the next phase, testing. The scope is related to the risk level associated with performing planned tests and the importance of the test evaluation results to the program success.

TRR deliverables will include: (1) completed and approved test plans for the system under test; (2) completed identification and coordination of required test resources; (3) a judgement that previous component, subsystem, and system test results form a satisfactory basis for proceeding into planned tests; and (4) identified risk level acceptable to the program leadership.

The program manager will conduct and address the TRR as part of verification and validation.

The 4 tests are used to guide A&Bs technical schedule. The focus with the program reviews is to make sure the details of the design receive significant attention because the innovation and ability to win the DARPA challenge will heavily depend on A&B adding competitive features. The TRR will validate the design as it will have sufficiently met the criteria where it will be ready to evaluate how effective the design’s features are during testing.

### Work Packages

The work packages will be the smallest unit of the WBS. Each Level-3 unit will be broken down to their respective work packages.

1.1.1 – 1.1.4 (Spare Parts, Repair Parts, Repair Tooling, Vendor Relations)

Maintenance work packages consist of electronic components, software programs, frame alloys, windshield and passenger windows, solar batteries, operating screen, electronic components, software programs, frame alloys, windshield and passenger windows, solar batteries, operating screen, tires, wheels, transmission, engine, air pressurizer, wrenches, jack, hydraulics, welding materials, anti-fire equipment, splicers, interface screen wiring, frame-bending equipment, transportation, updated documentation, and transportation personnel.

1.2.1 – 1.2.4 (Construction/Conversion/Expansion, Equipment Acquisition, Maintenance, Utilities)

Facilities work packages consist of demolition equipment, building equipment, construction personnel, liquid assets, network connection for online attainment, transportation for physical acquisition, transportation methods to bring on-site, sanitization, debris removal, relevant signs (including safety), and facilities maintenance personnel, electric, water, sewage, network connection, phone connection, and secure network connections.

1.3.1 – 1.3.4 (Equipment/Apparel Purchases, State/Federally Compliant, EPA Compliant, Safety Procedures)

Safety work packages consist of liquid assets, network connection for online attainment, transportation for physical acquisition, transportation methods to bring on-site, safety compliance personnel, state and federal paperwork documentation, state and federal adherence personnel, EPA paperwork documentation, EPA adherence personnel, safety paperwork documentation, and safety personnel.

1.4.1 – 1.4.6 (System Assembly, System Installation, System Checks, Contractor Tech Support, Site Construction/Modification, System Transportation)

Operations Site Activities work packages consist of assembly building, system assembly tooling, assembly personnel, cross-trained technicians and engineers, equipment handling tools, safety equipment, installation personnel, uniform checklist, documentation, specifications, phone connections, contact information, customer relations personnel, engineering plan drawings, estimators, construction equipment, and construction materials, procuring company vehicles, fueling vehicles, registering vehicles, and insuring vehicles.

1.5.1 – 1.5.2 (Test and Measurement Equipment, Support/Handling Equipment)

Support Equipment work packages consist of procuring test and measurement equipment, calibrating equipment, setting up equipment during testing, re-calibrating between tests, demoing before event runs, procuring equipment, setting up equipment when needed, testing equipment beforehand, and handling equipment as needed for proper configuration.

1.6.1 – 1.6.4 (Defect Prevention, Defect Management, Documentation, Customer Support)

Quality work packages consist of identifying defects, tracking defects incorporating defect prevention measures, identifying defects, tracking defects, defect resolution, procuring documentation software, scanning, printing, procuring printers, procuring storage space, tracking documentation, setting up phone lines, contacting customers, tracking customer inquiries, customer support personnel, and handling customer requests.

1.7.1 – 1.7.3 (Equipment, Services, Facilities)

Training packages consist of technical equipment procurement, training materials, training simulations, allocated spared to use for equipment training, service platforms, service software, service teaching personnel, buildings for teaching, equipment for facilities manufacturing, and facilities personnel.

1.8.1 – 1.8.5 (Technical Publications, Engineering Data, Support Data, Management Data, Data Repository)

Data work packages consist of data configuration, data source collection, data verification, data validation, data training, data testing, data cleansing, data analysts, and data configuration.

1.9.1 – 19.4 (Storing Data, Retrieving Data, Transmitting Data, Manipulating Data)

IT work packages consist of data security, security protocols, data configuration, data verification, data validation, personnel security training, data analysis, data flow, and data access.

1.10.1 – 1.10.4 (Test and Engineering Support, Mock Trials,

Testing work packages consist of engineering support personnel, test equipment, trial runs, trial tracks, verification measures, test documentation, facilities configuration for testing, and analysis software.

1.11.1 – 1.11.2 (Requirements Compliance, Funds Allocation)

Program Management/SE work packages consist of program management software, program management compliance, personnel fulfillment, budget management, and schedule management.

1.12.1 – 1.12.12 (Vehicle Frame, Application Software, System Software, Communications, Navigation/Guidance, Central Computer, Fire Control, Data Display and Controls, Survivability, Automatic Handling Control, Auxiliary Equipment, Avionics)

Vehicle Design work packages consist of engineering support, engineering equipment, integration management, tooling, machining, assembly, drawings/schematics, CAD drawings, analysis, and simulations

1.13.1 – 1.13.4 (Talent Acquisition, Dispute Resolution, Contracting Negotiation, Policy Iterations)

HR work packages consist of policy/rules formations, arbiters, HR personnel, up-to-date staffing analysis, and industry pricing knowledge.

## Technical Management and Assessment

### Technical Performance Management

Program Managers will oversee the work packages along with technical leads for implementing the work packages. Management higher on the organization chart reserves the right to make changes to work packages as they may see fit within their respective branches of management.

Technical Performance Measures (TPMs) will be identified during PDR and CDR and refined at later reviews.

### Continuous Assessment

Requirements may be validated before testing through analysis and simulation. Thermal analysis, structural analysis, SPICE analysis for circuits, etc. will be used to verify the to-be-realized design matches how it will most likely perform.

During developmental testing, the focus will strictly rely on what could boost performance time regardless of the technical measures it may generate through analysis and/or simulations. Between each test run, simulations and analysis will be run, making the model as realistic as possible, to determine possible modifications to the UAV to improve time. Analysis will also be run to determine the health of each parts critical to failure.

### Other Technical Measurements

Technical measures will be generated from the requirements and architecture initially. Some technical measures will relate back to top times in past DARPA challenges and projections on competitive vehicles in the coming year’s competition. Some specifications will be set by program regulations, such as frame size, tire size, etc. Some technical measures will be pre-determined by purchasing a ready-built Tesla.