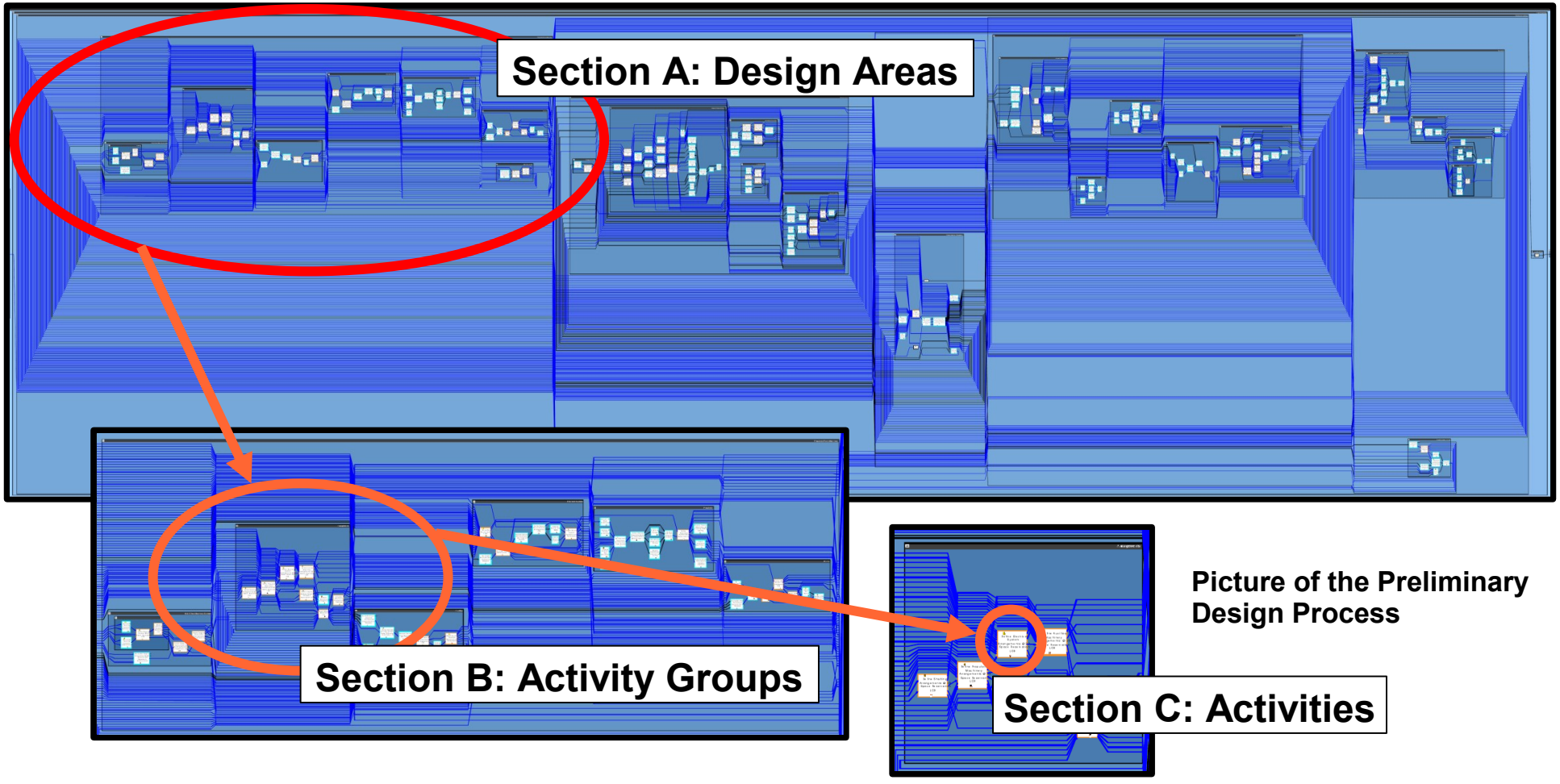
Section C - Activity Descriptions

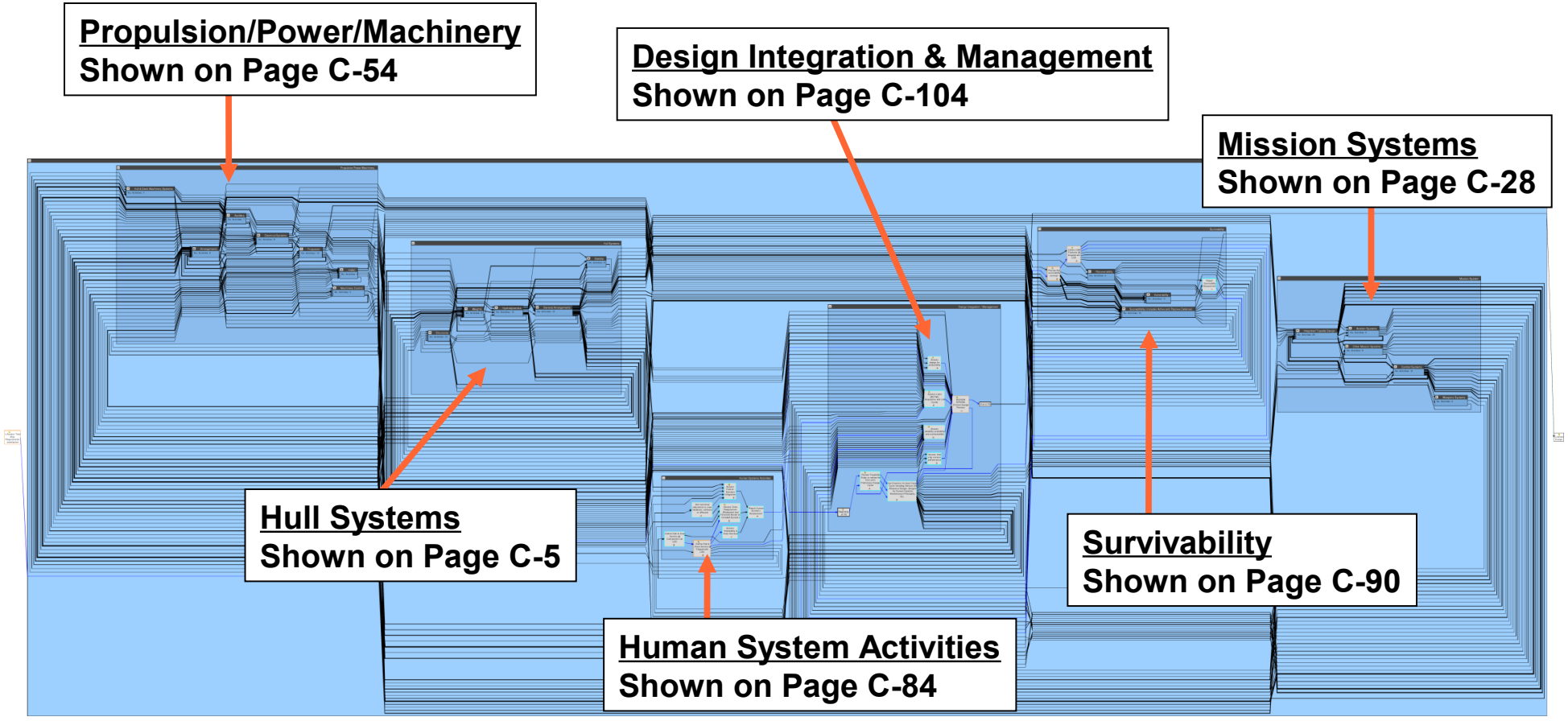


Picture of the Preliminary Design Process

The previous two sections defined the six Design Areas along with their corresponding Activity Groups. Individual Activities are defined in this section. Along with the Activity description, the people involved (based on the experience levels of Seniors, Journeymen and Juniors) and a typical duration is listed.

Table of Contents: Activity Descriptions

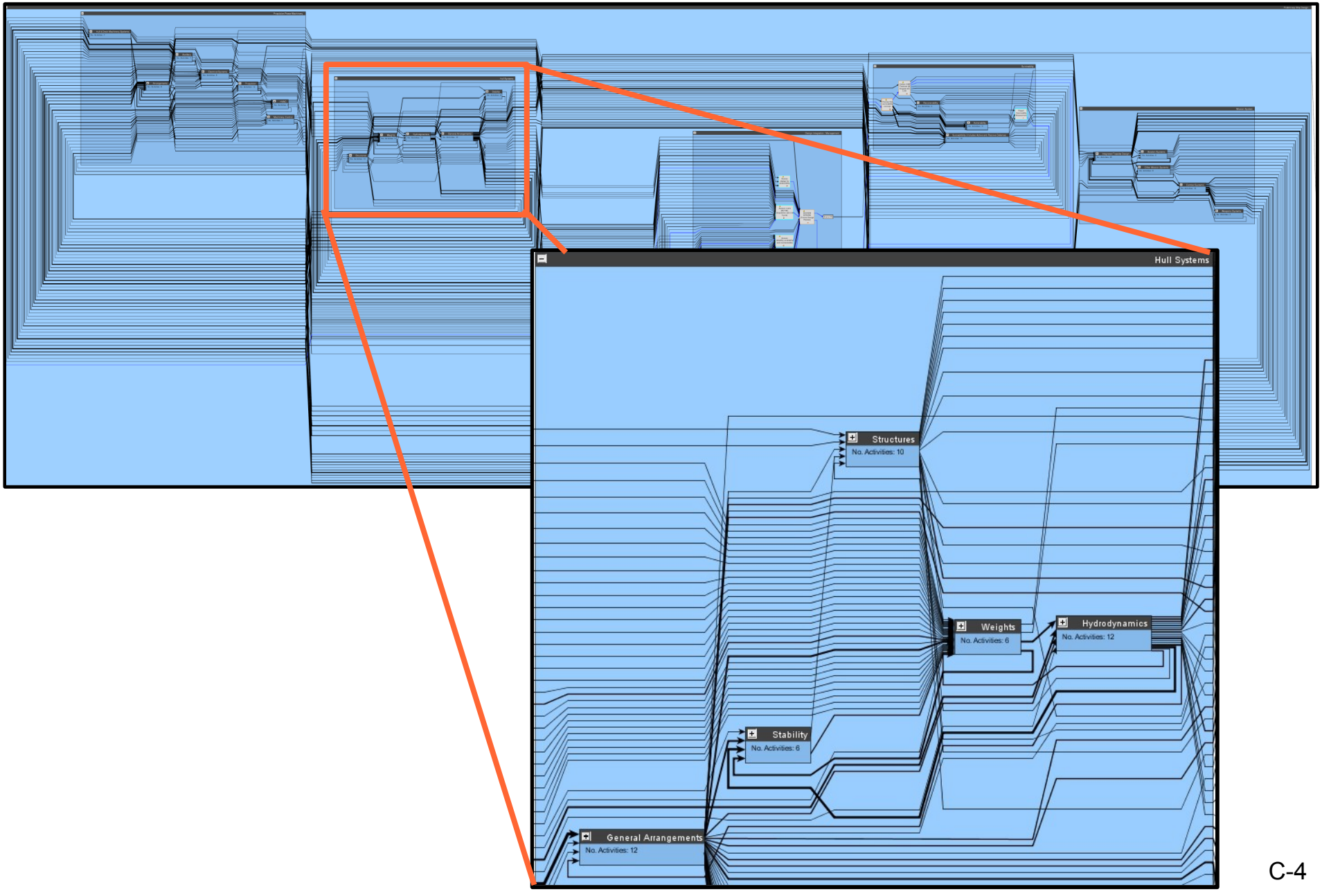
Preliminary Design - Expanded View



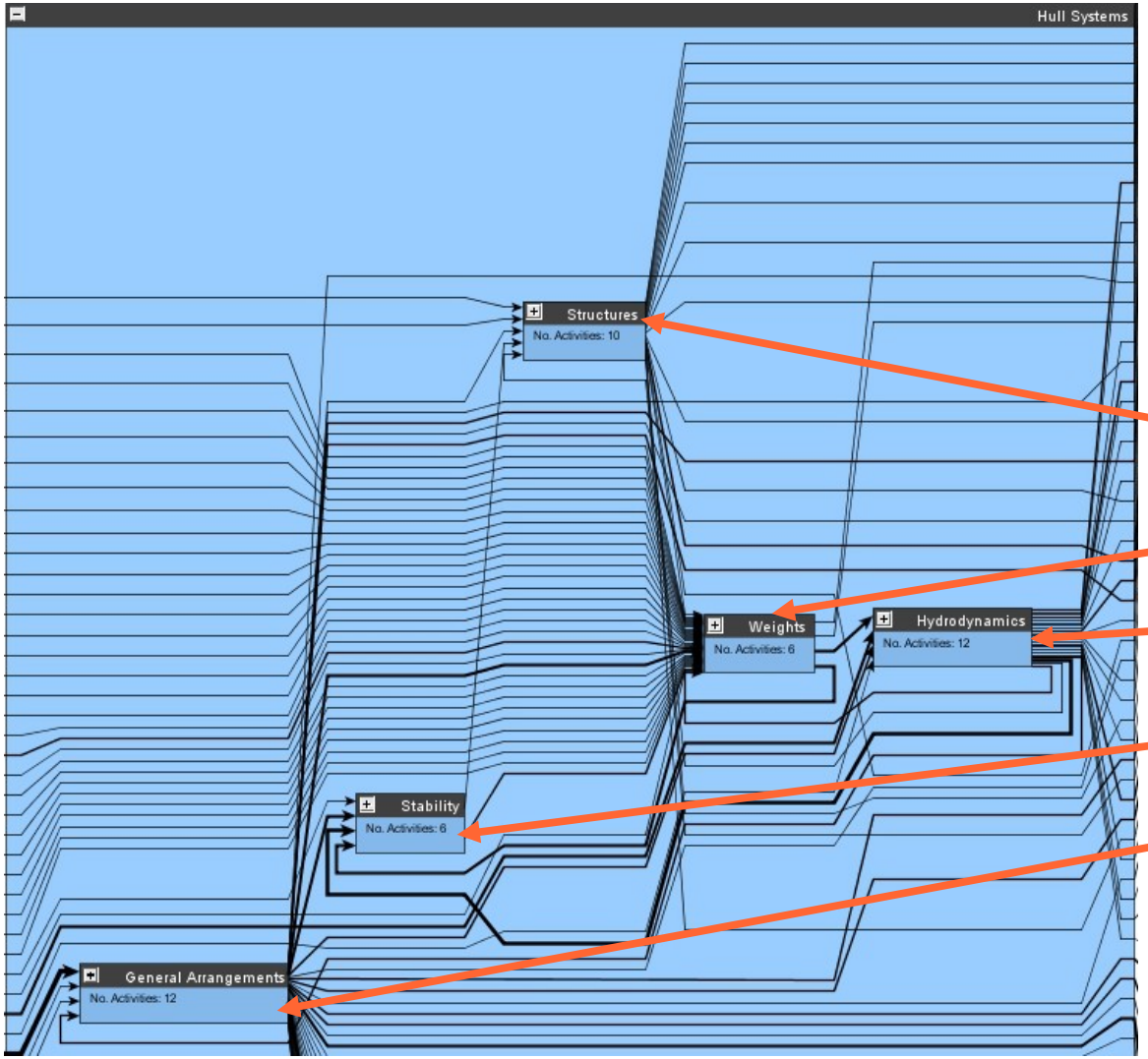
The Preliminary Design Process expanded to 2-levels of detail.

Hull Systems Design Area

Shown is the Hull Systems Design Area from the greater Preliminary Design Process.
The Hull Systems Activity Groups are discussed on the next page.



Hull Systems Activity Groups

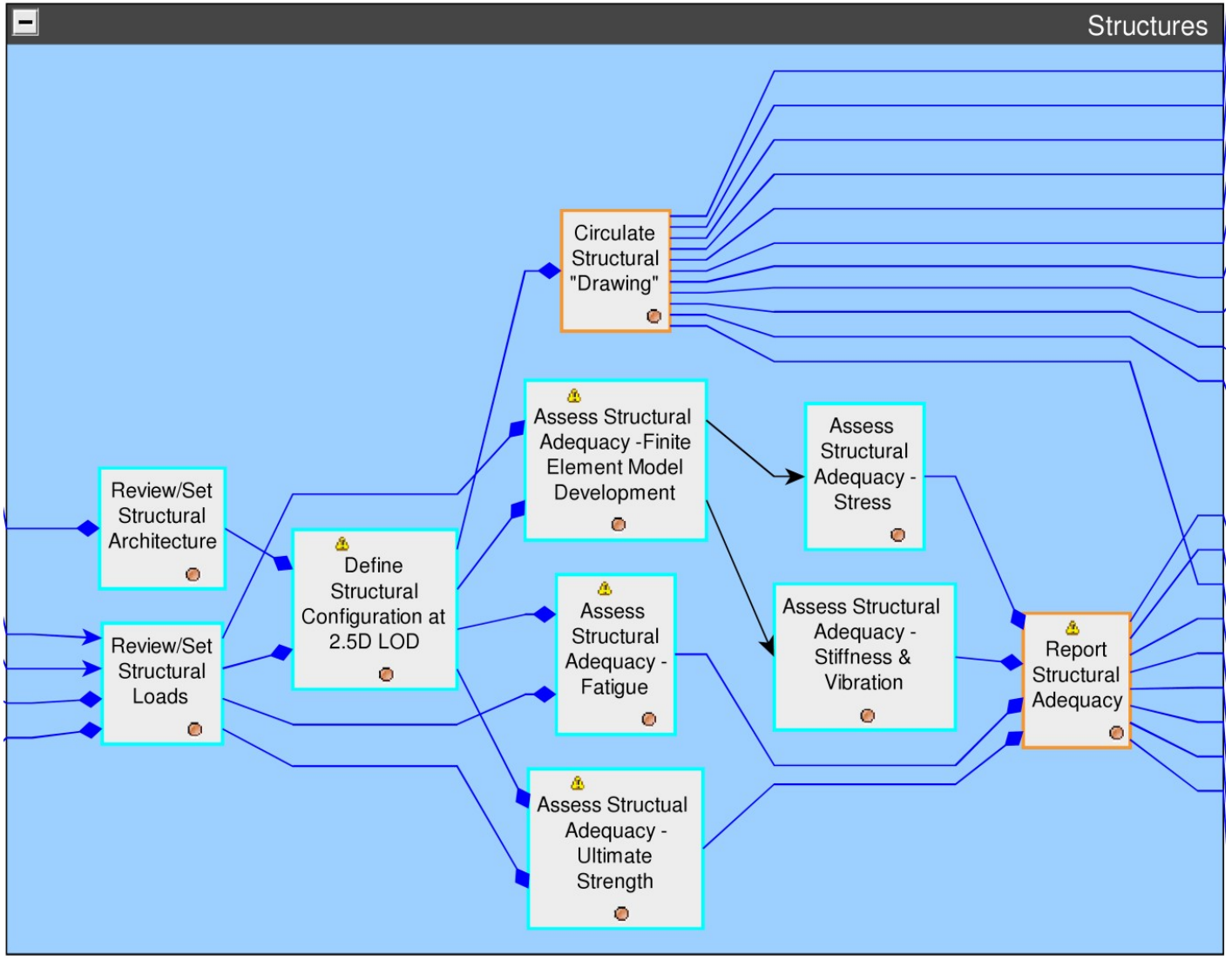


This picture shows the activity groups involved with the Hull Systems Design Area. The next pages show the individual Activities for each Design Area.

The Activity Groups include:

1. **Structures (Page C-7)**
2. **Weights (Page C-12)**
3. **Hydrodynamics (Page C-15)**
4. **Stability (Page C-20)**
5. **General Arrangements (Page C-23)**

Activity Group: Structures



This picture shows the activities involved with the Structures Activity Group. The next pages show individual activities.

Structures Activity Group

Activity	Review/Set Structural Architecture
Description	Set the range of structural members needed for the ship to complete the intended mission as well as meet classification rules.
Labor	2 Seniors for 4 man days
Duration	2 days

Activity	Review/Set Structural Loads
Description	Examine the operating conditions for the intended mission to determine the range of loads and stresses the hull structure will experience.
Labor	1 Senior for 2 man days, 1 Journeyman for 2 man days
Duration	2 days

Activity	Define Structural Configuration at 2.5 LOD
Description	Develop a drawing of the hull cross sections and an inboard profile showing the necessary structural members
Labor	1 Senior for 20 man days, 2 Journeymen for 40 man days
Duration	20 days

Structures Activity Group

Activity	Circulate Structural “Drawing”
Description	Distribute structural drawing to the hull structures, design integration, and susceptibility teams.
Labor	1 Journeyman for 6 man days, 3 Juniors for 18 man days
Duration	6 days

Activity	Assess Structural Adequacy - Finite Element Model Development
Description	Develop a finite element model to evaluate loading around the hull and assess if the structure can withstand these operating loads.
Labor	1 Journeyman for 15 man days
Duration	15 days

Activity	Assess Structural Adequacy Fatigue
Description	Evaluate the structural configuration’s ability to withstand the fatigue encountered from vibrations and bending moments on the ship over the service life.
Labor	1 Senior for 2 man days, 1 Journeyman for 2 man days
Duration	2 days

Structures Activity Group

Activity	Assess Structural Adequacy Ultimate Strength
Description	Evaluate the maximum stress the hull will experience at any point along the hull and determine if this will exceed the material's ultimate strength.
Labor	2 Seniors for 4 man days
Duration	2 days

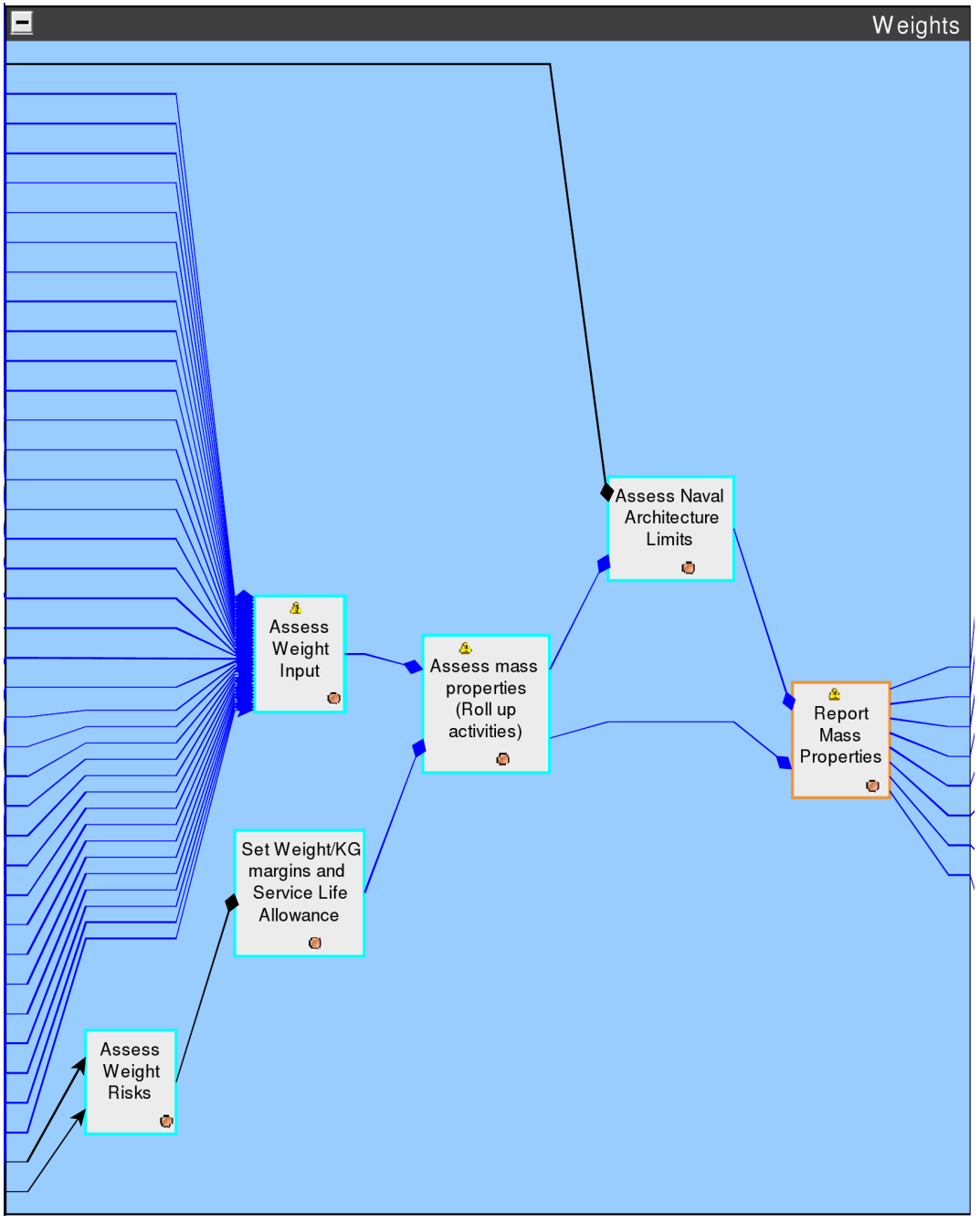
Activity	Assess Structural Adequacy Stress
Description	Evaluate the structural configuration’s ability to withstand the shear and normal stresses encountered from bending and torsion moments on the ship over the service life.
Labor	1 Senior for 2 man days, 1 Journeyman for 2 man days
Duration	2 days

Activity	Assess Structural Adequacy Stiffness & Vibration
Description	Evaluate the structural configuration, considering the material properties, to ensure it is the appropriate stiffness to avoid cracking given the vibrations the ship will incur.
Labor	2 Journeymen for 4 man days
Duration	2 days

Structures Activity Group

Activity	Report Structural Adequacy
Description	Develop a concise report of all the findings from the various structural adequacy assessments and deliver to the hull structures, vulnerability, and design integration design teams.
Labor	2 Journeymen for 2 man days
Duration	1 day

Activity Group: Weights



This picture shows the activities involved with the Weights Activity Group. The next pages show the individual activities.

Weights Activity Group

Activity	Assess Weight Input
Description	Develop a spreadsheet listing all structural elements, with the weight and location of each item, to determine the total weight and center of gravity of the hull using reasonable estimations where necessary.
Labor	1 Journeyman for 90 man days
Duration	90 days

Activity	Set Weight/KG margins and Service Life Allowance
Description	Set reasonable margins on all weights and placements to account for construction excess and structures or systems that may be added over the service life of the vessel.
Labor	0.25 Seniors for 0.5 man days, 1 Journeyman for 2 man days
Duration	2 days

Activity	Assess Weight Risks
Description	Determine the weight margin of the design, based upon the originality of the ship design. The greater the originality of the design, the greater the weight margin and the risk of excess weight.
Labor	1 Senior for 2 man days
Duration	2 days

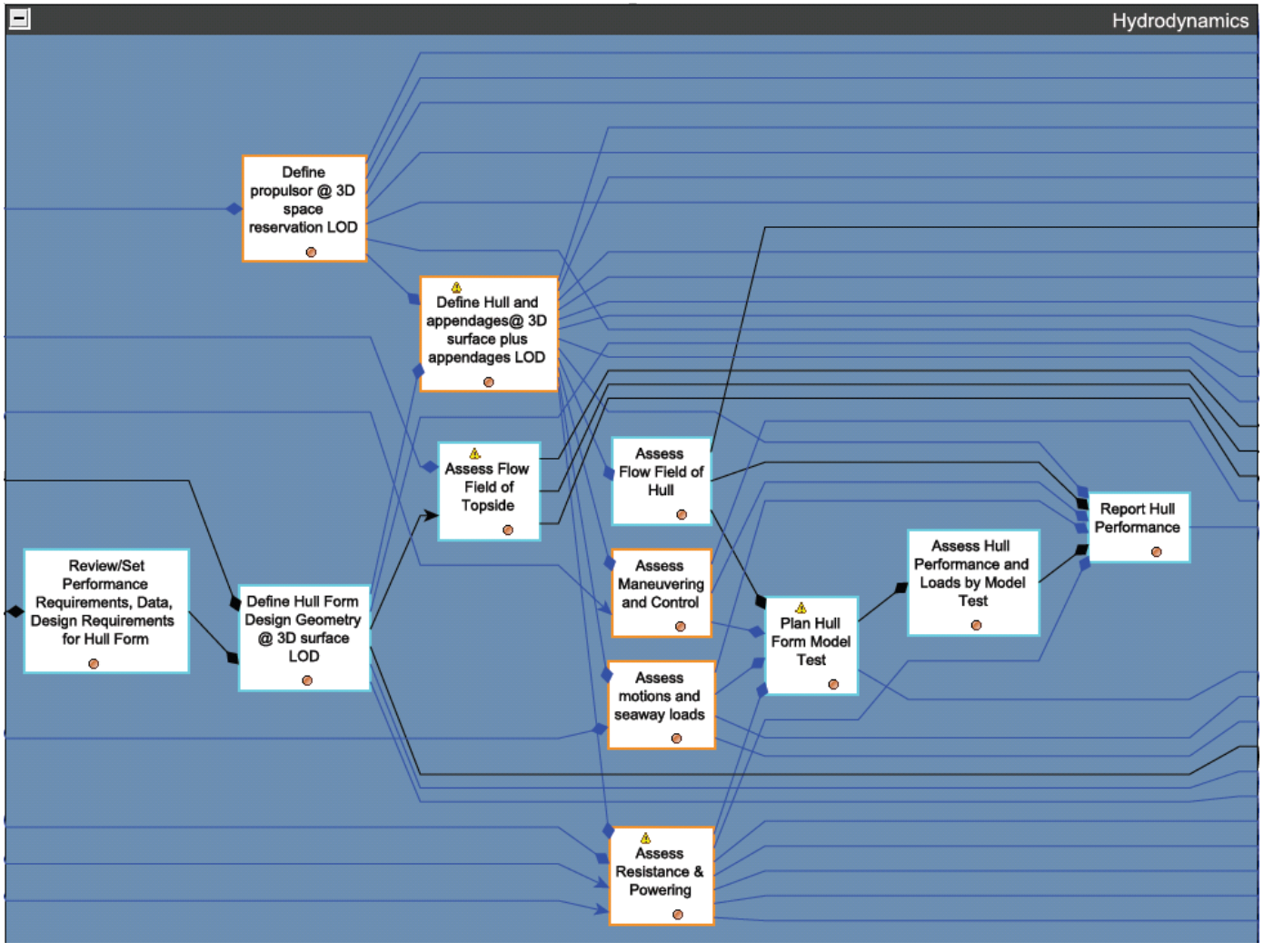
Weights Activity Group

Activity	Assess mass properties (Roll up activities)
Description	Make a comprehensive assessment of the weight properties of the ship and conclude the activities in this subsystem.
Labor	1 Journeyman for 16 man days
Duration	16 days

Activity	Assess Naval Architecture Limits
Description	Evaluate the maximum displacement of the chosen hull structure for a design draft to ensure the hull weight is within a reasonable percentage of the total allowable weight.
Labor	1 Journeyman for 5 man days
Duration	5 days

Activity	Report Mass Properties
Description	Develop a concise report regarding the ships weight information and deliver to the weights, hydrodynamics, stability, and design integration design teams.
Labor	0.25 Seniors for 2.5 man days, 1 Journeyman for 10 man days
Duration	10 days

Activity Group: Hydrodynamics



This picture shows the activities involved with the Hydrodynamics Activity Group. The next pages show the individual activities.

Hydrodynamics Activity Group

Activity	Define propulsor at 3D space reservation LOD
Description	Define the propulsor to be used on the ship including the 3-dimmensional space requirement and diagrams for the chosen propulsor and placement on board.
Labor	1 Journeyman for 10 man days
Duration	10 days

Activity	Review/Set Performance Requirements, Data, Design Requirements for Hull Form
Description	Determine the range of performance and design requirements of the hull form accounting for operating region, range, speed, mission and sea state.
Labor	2 Seniors for 10 man days
Duration	5 days

Activity	Define Hull Form Design Geometry at 3D surface LOD
Description	Develop a three dimensional surface drawing of the hull geometry design.
Labor	1 Senior for 10 man days
Duration	10 days

Hydrodynamics Activity Group

Activity	Define Hull and Appendages at 3D surface plus appendages LOD
Description	Define the geometry of the hull's outer shell including all appendages in three dimensional space.
Labor	1 Journeyman for 10 man days
Duration	10 days

Activity	Assess Flow Field of Topside
Description	Evaluate the flow field of air around the topside of the ship to check for flow separation, as well as deck wind effects.
Labor	1.5 Journeymen for 30 man days
Duration	20 days

Activity	Assess Flow field of Hull
Description	Evaluate the flow field of water around the hull of the ship to check for turbulence, flow separation, flow into the propulsor etc.
Labor	1 Journeyman for 7.5 man days
Duration	7.5 days

Hydrodynamics Activity Group

Activity	Assess motions and seaway loads
Description	Evaluate the motions of the vessel underway, when encountering waves, and the associated loads in those operating conditions.
Labor	1 Journeyman for 5 man days
Duration	5 days

Activity	Assess Maneuvering and Control
Description	Within the design operating conditions, evaluate the ability of the ship to turn, the turning radius of the ship, and the ability of the crew to control the ship while underway.
Labor	1 Journeyman for 10 man days
Duration	10 days

Activity	Assess Resistance and Powering
Description	Evaluate the total resistance of the hull, including any added resistance from operating sea states, and use to calculate the necessary power to drive the ship.
Labor	1 Journeyman for 7.5 man days
Duration	7.5 days

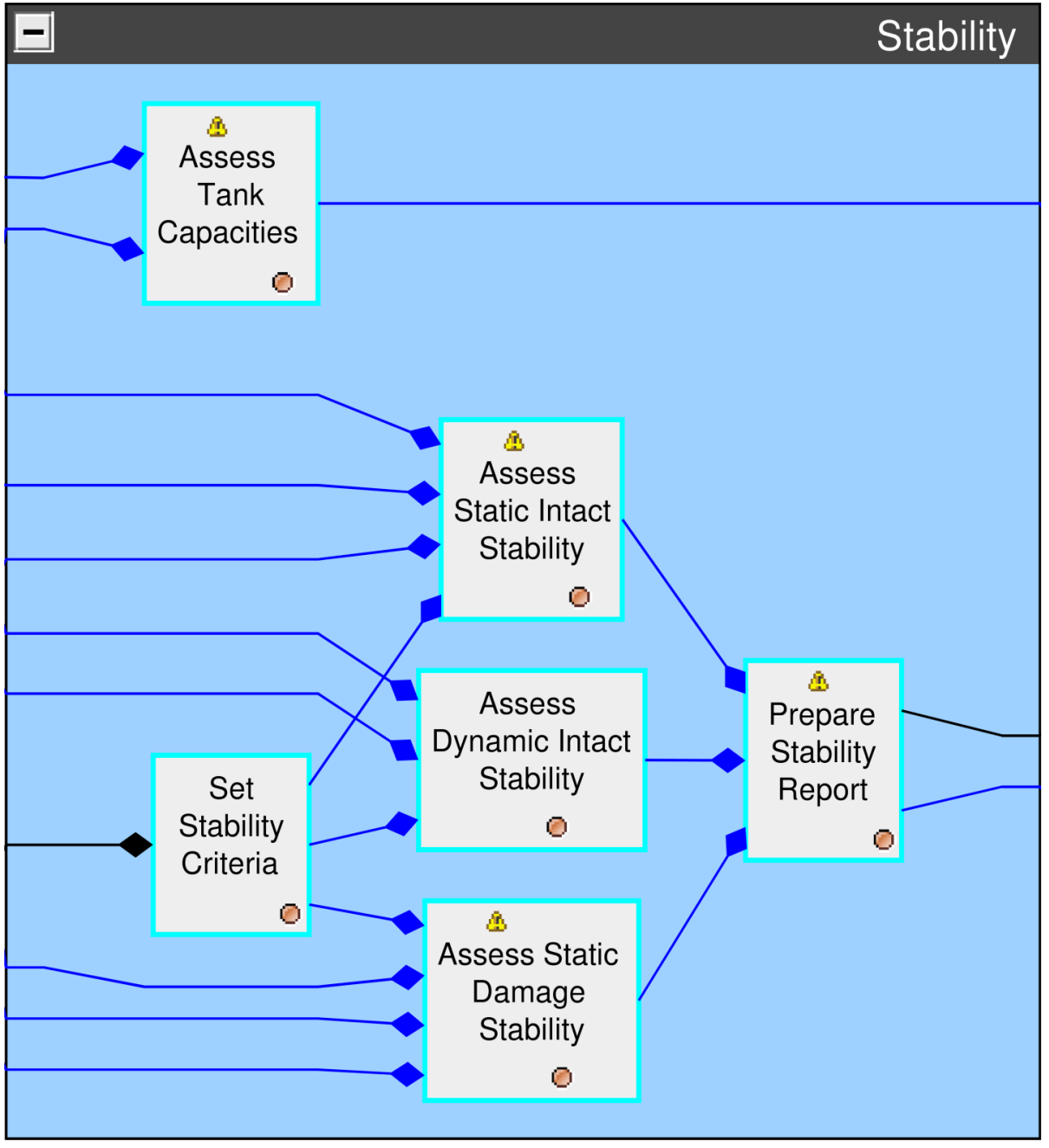
Hydrodynamics Activity Group

Activity	Plan Hull Form Model Test
Description	Develop a test matrix covering the range of operating speeds and sea states for testing a scale model of the ship in a test tank.
Labor	2 Journeymen for 60 man days
Duration	30 days

Activity	Assess Hull Performance and Loads by Model Tests
Description	Evaluate the hull performance for flow fields, motions, maneuverability, and resistance by towing a scale model in testing tanks.
Labor	1 Journeyman for 180 man days, 1 Junior for 180 man days
Duration	180 days

Activity	Report Hull Performance
Description	Develop a concise report detailing the results of hull performance testing and deliver to the hydrodynamics and design integration design teams.
Labor	0.25 Seniors for 2.5 man days, 1.5 Journeymen for 15 man days
Duration	10 days

Activity Group: Stability



This picture shows the activities involved with the Stability Activity Group. The next pages show the individual activities.

Stability Activity Group

Activity	Assess Tank Capacities
Description	Evaluate the necessary capacities of each tank (fuel oil, potable water, sewage, lube oil, ballast, etc.) considering endurance, crew size, and mission/ship specific needs.
Labor	1 Junior for 4 man days
Duration	4 days

Activity	Set Stability Criteria
Description	Determine the necessary stability factors for the ship to carry out the intended mission as well as to meet regulations.
Labor	0.5 Seniors for 3 man days, 0.5 Journeymen for 3 man days
Duration	6 days

Activity	Assess Static Intact Stability
Description	Evaluate the stability of the ship for adverse trim or roll, when intact and stationary.
Labor	1 Journeyman for 37 man days, 1 Junior for 37 man days
Duration	37 days

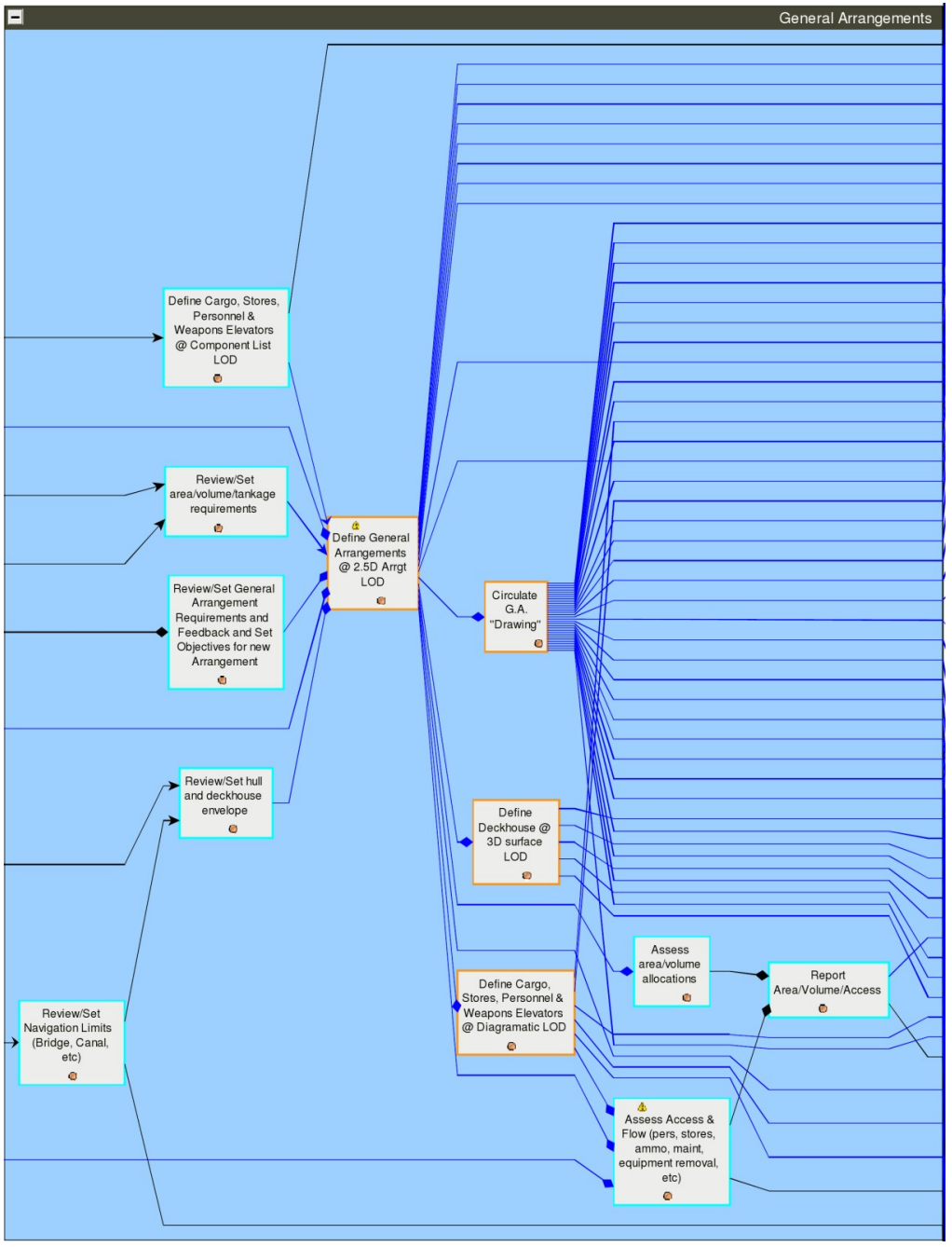
Stability Activity Group

Activity	Assess Dynamic Intact Stability
Description	Evaluate the stability of the ship for adverse motions or loads such as tank sloshing, whipping, slamming, etc. when the ship is intact and in motion.
Labor	1 Senior for 1 man day
Duration	1 day

Activity	Assess Static Damage Stability
Description	Evaluate the stability of the ship in withstanding damage, and the ability to stay afloat after damage while the ship is stationary.
Labor	1 Journeyman for 30 man days, 1 Junior for 30 man days
Duration	30 days

Activity	Prepare Stability Report
Description	Develop a concise report detailing the stability of the ship and deliver to the stability, hull structures, and weights design teams.
Labor	0.25 Seniors for 3.25 man days, 1 Journeyman for 13 man days
Duration	13 days

Activity Group: General Arrangements



This picture shows the activities involved with the General Arrangements Activity Group. The next pages show the individual activities.

General Arrangements Activity Group

Activity	Define Cargo, Stores, Personnel & Weapons Elevators at Component List LOD
Description	Define the necessary equipment requirement list for cargo, personnel, store, and weapons elevators, accounting for necessary machinery and loading and unloading space.
Labor	1 Journeyman for 1 man day
Duration	1 day

Activity	Review/Set area/volume/tankage requirements
Description	Determine the range of volume needed for cargo and all tanks, and the area on each deck required to accommodate that volume.
Labor	1 Journeyman for 2 man days
Duration	2 days

Activity	Review/Set General Arrangement Requirements and Feedback and Set Objectives for new Arrangement
Description	Determine requirements of the preliminary design general arrangements and the objectives of the next iteration of arrangements.
Labor	1 Senior for 10 man days, 1 Journeyman for 10 man days, 1 Junior for 10 man days
Duration	10 days

General Arrangements Activity Group

Activity	Review/Set Hull and Deckhouse envelope
Description	Determine the possible range of the hull and deckhouse envelope.
Labor	1 Journeyman for 10 man days, 1 Junior for 10 man days
Duration	10 days

Activity	Define General Arrangements at 2.5D Arrangement LOD
Description	Develop a drawing showing all decks, and an inboard profile with deck and bulkhead locations detailing the existing general arrangements with labeled distances where applicable.
Labor	1 Journeyman for 20 man days, 2 Juniors for 40 man days
Duration	20 days

Activity	Circulate GA Drawing
Description	Circulate the plan of the general arrangements to the people working on the distributed systems, auxiliary systems, ship control systems and weapon systems, for the purpose of obtaining feedback to the ship design manager and for them to understand the need for their own work.
Labor	1 Junior for 4 man days
Duration	4 days

General Arrangements Activity Group

Activity	Define Deckhouse at 3D surface LOD
Description	Develop a 3 dimensional drawing of the deckhouse with bulkheads, portholes, and all spaces allocated as well as antenna placement.
Labor	1 Journeyman for 7 man days, 1 Junior for 7 man days
Duration	7 days

Activity	Review/Set Navigation Limits (Bridge, Canal, etc.)
Description	Determine the range of navigational limits of the ship such as draft, air draft, and beam to traverse canals and straights as well as safely cross over a tunnel or under a bridge.
Labor	1 Journeyman for 1 man day
Duration	1 day

Activity	Define Cargo, Stores, Personnel & Weapon Elevators at Diagrammatic LOD
Description	Define on a diagram of the ship where all cargo, personnel, store, and weapons elevators will be located as well as the area on each deck the elevators will occupy including equipment, loading, and unloading spaces.
Labor	1 Journeyman for 2 man days
Duration	2 days

General Arrangements Activity Group

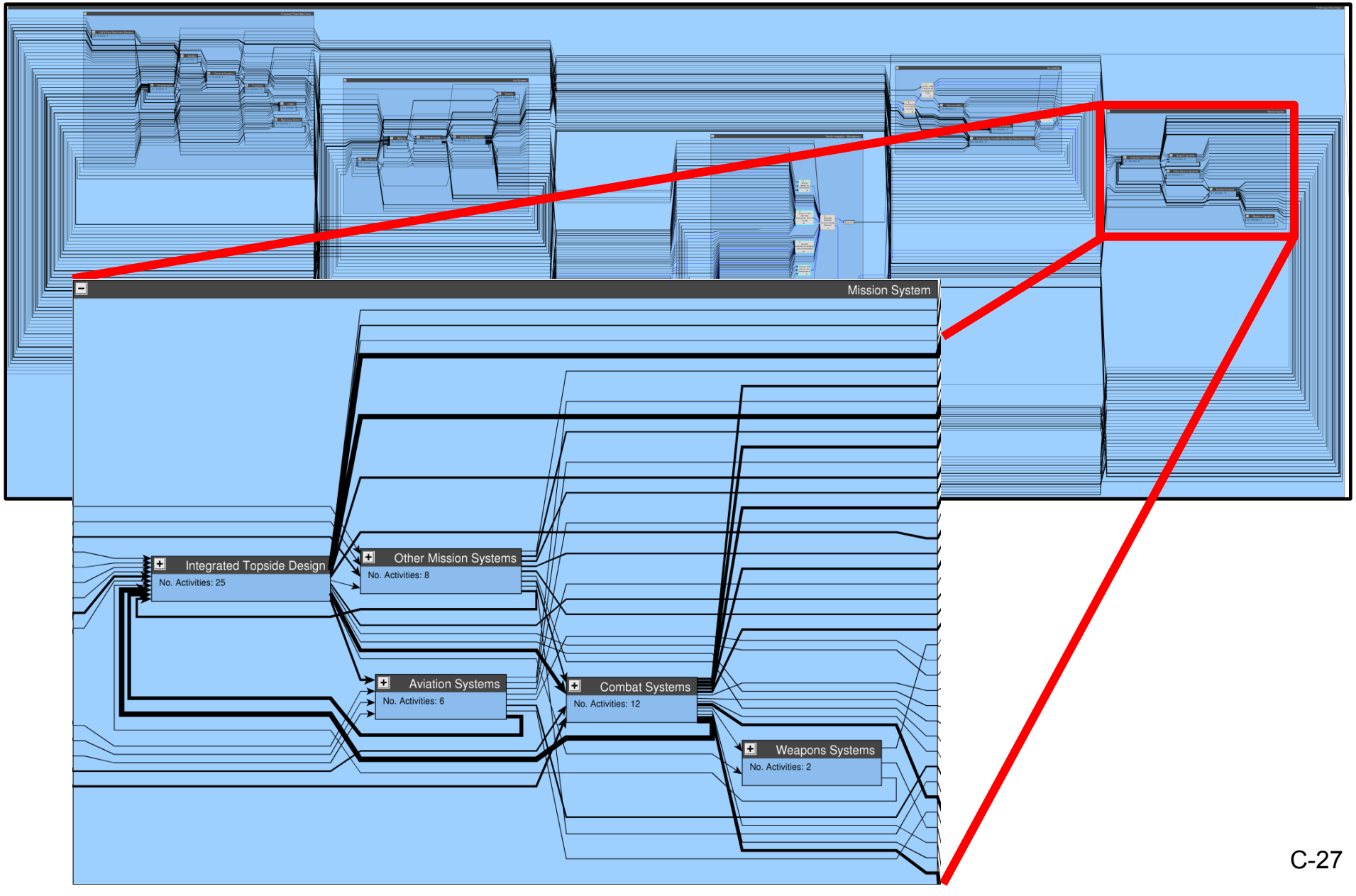
Activity	Assess area/volume allocations
Description	Evaluate the space allocations of the ship design and what space is unused, and determine if there is enough arrangable area.
Labor	1 Junior for 3 man days
Duration	3 days

Activity	Assess Access & Flow (personnel, stores, ammo, maintenance, equipment removal, etc.)
Description	Evaluate the flow of crew, supplies and ammunition under normal operation and in an emergency as well as necessary space to perform maintenance on and the removal of equipment.
Labor	1 Senior for 2.5 man days, 1 Journeyman for 2.5 man days
Duration	2.5 days

Activity	Report Area/Volume/Access
Description	Develop a concise report detailing the access and the area allocations and deliver to the general arrangements and design integration design teams.
Labor	0.25 Seniors for 0.25 man days, 1 Junior for 1 man day
Duration	1 day

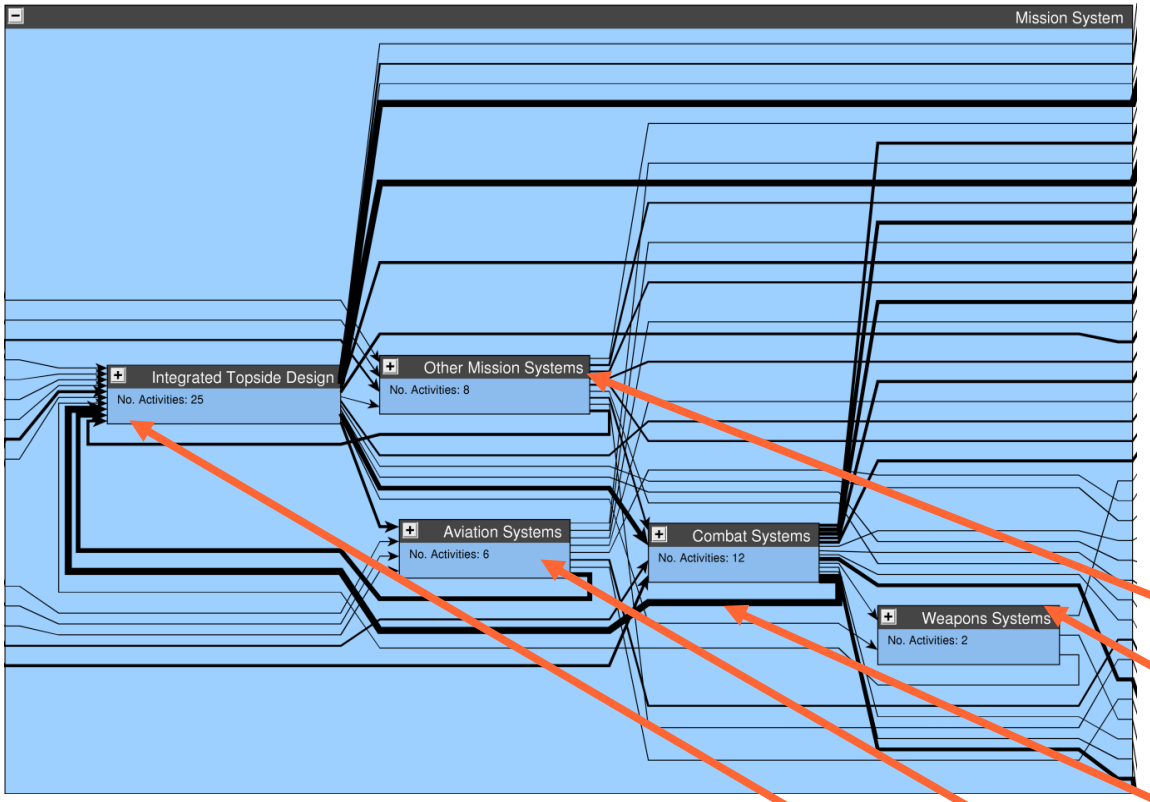
Mission Systems Design Area

Shown is the Mission Systems Design Area from the greater Preliminary Design Process. The Activity Groups are discussed on the next page.



Mission System Activity Groups*

*** From a Naval Architect Perspective**

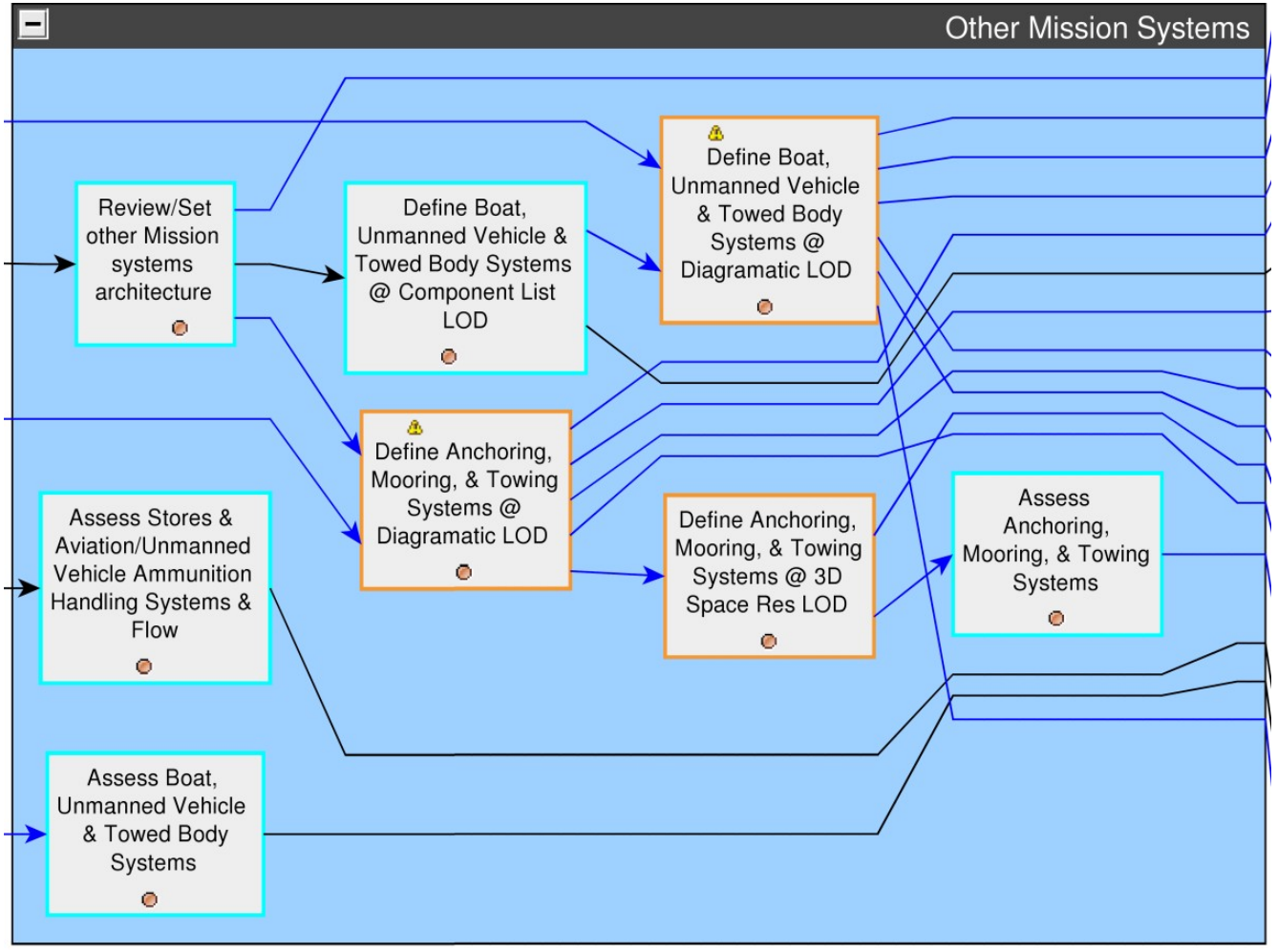


This picture shows the activity groups involved with the Mission Systems Design Area. The next pages show the individual Activities for each Design Area.

The Activity Groups shown in this model are from a Hull, Mechanical & Electrical (i.e. Naval Architect and Marine Engineer) perspective. The primary Activity Groups are:

1. **Other Mission Systems** (Page C-30)
2. **Weapon Systems** (Page C-34)
3. **Combat Systems** (Page C-36)
4. **Aviation Systems** (Page C-41)
5. **Integrated Topside Design** (Page C-44)

Activity Group: Other Mission Systems



This picture shows the activities involved with the Other Mission Systems Activity Group. The next pages show the individual activities.

Other Mission Systems Activity Group

Activity	Review/Set other Mission systems architecture
Description	Set a range of possible mission system equipment and arrangement specific to the ship.
Labor	0.25 Seniors for 0.75 man days, 1 Journeyman for 3 man days
Duration	3 days

Activity	Assess Stores & Aviation/Unmanned Vehicle Ammunition Handling Systems & Flow
Description	Evaluate the effectiveness of any stores and aviation/unmanned vehicles ammunition handling, including location, power, and space.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity	Assess Boat, Unmanned Vehicle, & Towed Body Systems
Description	Evaluate the effectiveness of any boat, unmanned vehicle, and towed body systems including location, power, and space.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Other Mission Systems Activity Group

Activity	Define Boat, Unmanned Vehicle, &Towed Body Systems at Component List LOD
Description	Develop a list of all components and equipment for boat, unmanned vehicle, and towed body systems.
Labor	0.1 Seniors for 0.2 man days, 1 Journeyman for 2 man days
Duration	2 days

Activity	Define Anchoring, Mooring, & Towing Systems at Diagrammatic LOD
Description	Develop a diagram of the ship defining the anchoring, mooring, and towing system showing size and location on the ship.
Labor	0.1 Seniors for 0.3 man days, 1 Journeyman for 3 man days
Duration	3 days

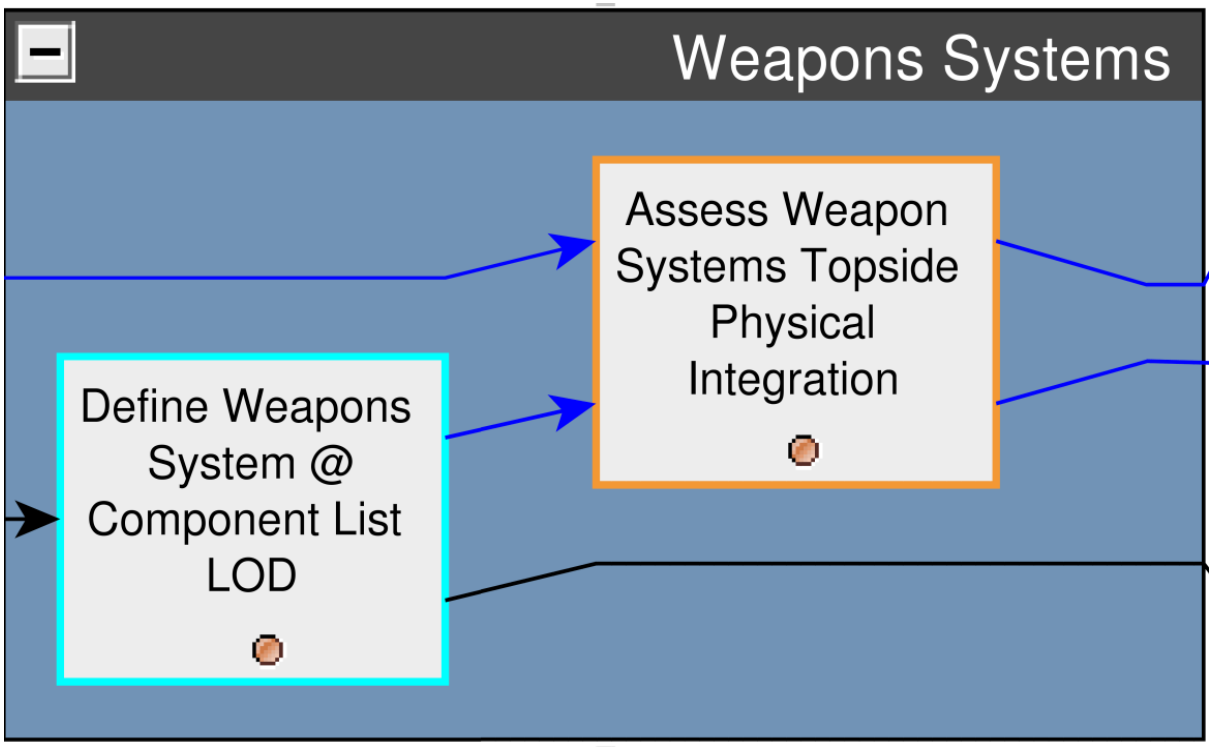
Activity	Define Boat, Unmanned Vehicle, & Towed Body Systems at Diagrammatic LOD
Description	Develop a diagram of the ship defining the boat, unmanned vehicle, and towed body systems showing size and location on the ship.
Labor	0.1 Seniors for 0.3 man days, 1 Journeyman for 3 man days
Duration	3 days

Other Mission Systems Activity Group

Activity	Define Anchoring, Mooring, & Towing Systems at 3D Space Reservation LOD
Description	Define in 3 dimensions the anchoring, mooring, and towing systems and the layout of the components and systems onboard the ship.
Labor	0.1 Seniors for 0.5 man days, 1 Journeyman for 5 man days
Duration	5 days

Activity	Assess Anchoring, Mooring, & Towing Systems
Description	Evaluate the effectiveness of the anchoring, mooring, and towing system to stabilize the ship for the intended mission or tow any intended arrays or vessels.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity Group: Weapons Systems



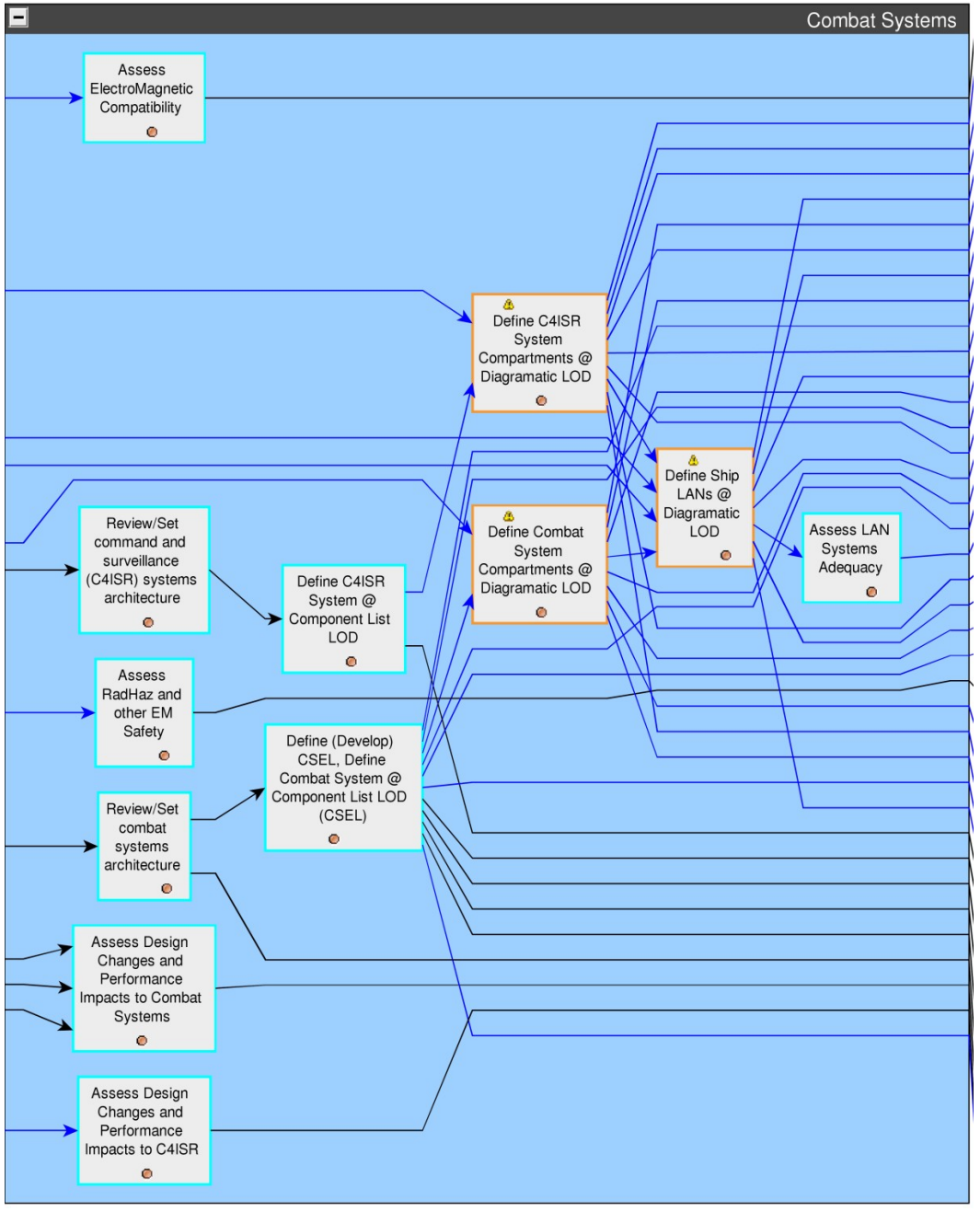
This picture shows the activities involved with the Weapon Systems Activity Group. The next page show the individual activities.

Weapons Systems Activity Group

Activity	Define Weapons System at Component List LOD
Description	Develop a list of all major components needed for the weapons system to carry out the intended mission.
Labor	0.2 Seniors for 3 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Assess Weapon Systems Topside Physical Integration
Description	Evaluate the ability of the topside physical portions of the weapons system to integrate and communicate with any system components under deck.
Labor	0.2 Seniors for 3 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity Group: Combat Systems



This picture shows the activities involved with the Combat Systems Activity Group. The next pages show the individual activities.

Combat Systems Activity Group

Activity	Assess Electromagnetic Compatibility
Description	Evaluate if the combat system will operate properly with the other onboard electrical systems without cumulatively generating additional unacceptable electromagnetic energy.
Labor	0.1 Senior for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Review/Set command and surveillance (C4ISR) systems architecture
Description	Set a range of necessary components for the command and surveillance systems (C41SR) to achieve the ship's intended mission.
Labor	0.25 Seniors for 3.75 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Assess RadHaz and EM Safety
Description	Evaluate the safety, for the crew, from radiation and electromagnetic hazards.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Combat Systems Activity Group

Activity	Review/Set combat systems architecture
Description	Set a range of necessary components for the combat systems particular to the ship.
Labor	0.25 Seniors for 3.75 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Assess Design Changes and Performance Impacts of Combat Systems
Description	Evaluate any necessary design changes in other design groups to accommodate the combat systems as well as any negative or positive effects the combat systems or placement of those systems to the overall performance of the ship.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Assess Design Changes and Performance Impacts to C4ISR
Description	Evaluate any necessary design changes in other design groups to accommodate the C41SR systems as well as any negative or positive effects the C41SR systems or placement of those systems to the overall performance of the ship.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Combat Systems Activity Group

Activity	Define C4ISR System at Component List LOD
Description	Develop a list of all major components associated with the C41SR system
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity	Define (Develop) CSEL, Define Combat System at Component List LOD (CSEL)
Description	Develop a list of all major components associated with the combat systems.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity	Define C4ISR System Compartments at Diagrammatic LOD
Description	Define in a 3-dimensional schematic the required equipment and power for the C41SR system.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

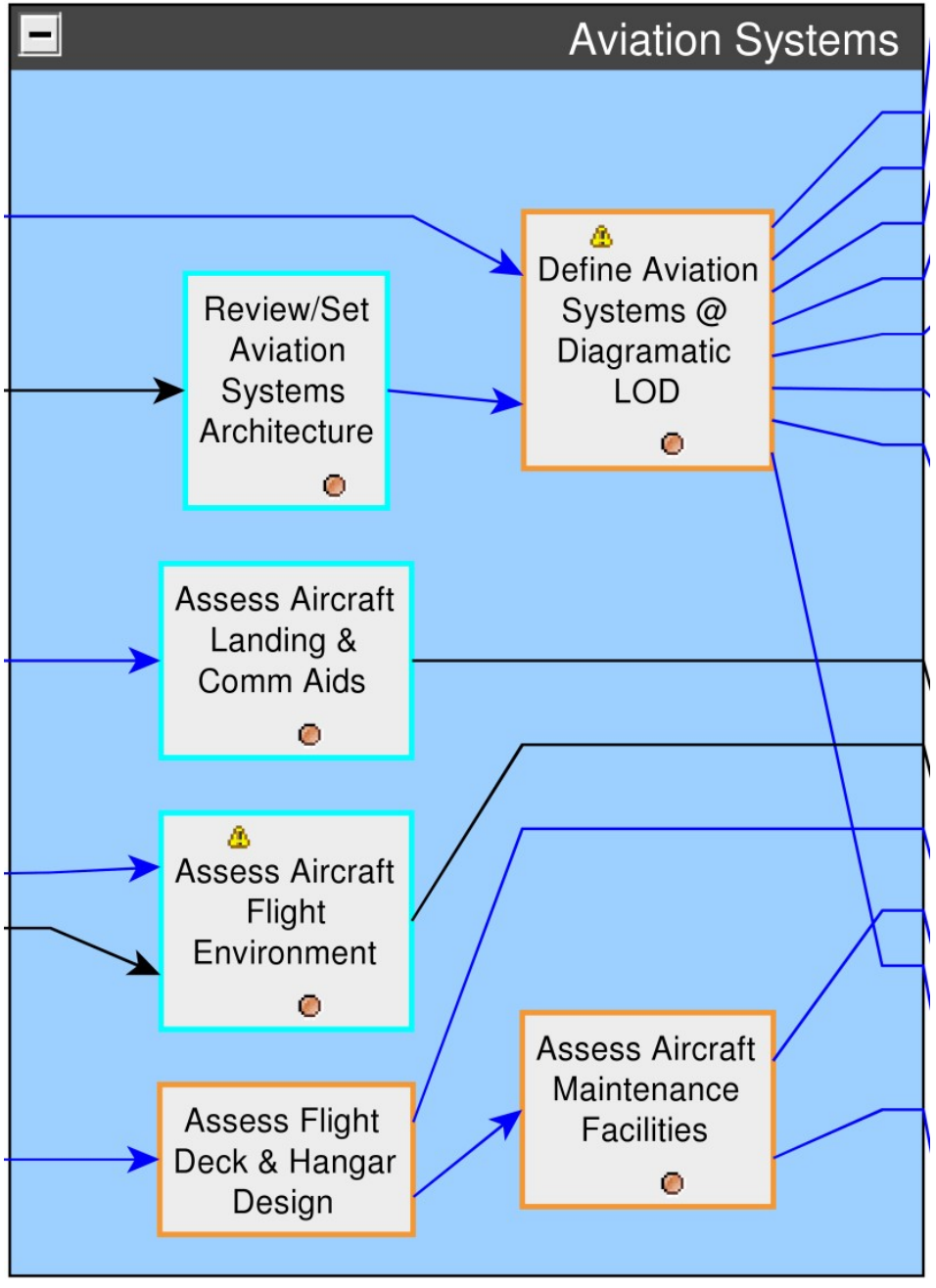
Combat Systems Activity Group

Activity	Define Combat System Compartments at Diagrammatic LOD
Description	Define in a 3-dimensional schematic the required equipment and power for the combat systems.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Define Ship LANs at Diagrammatic LOD
Description	Define in a 3-dimensional schematic the required equipment and routing for the ship's LAN system.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Assess LAN Systems Adequacy
Description	Evaluate the ability of the LAN system's security and redundancy to continue combat operations after an acceptable amount of damage.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity Group: Aviation Systems



This picture shows the activities involved with the Aviation Systems Activity Group. The next pages show the individual activities.

Aviation Systems Activity Group

Activity	Review/Set Aviation Systems Architecture
Description	Set a range of requirements for the aviation systems and the space, structure, and required placement for these systems.
Labor	1 Journeyman for 3 man days
Duration	3 days

Activity	Assess Aircraft Landing & Communication Aids
Description	Evaluate any necessary aids for aircraft landing and the types as well as additional communication aids for communicating with the aircraft.
Labor	1 Journeyman for 4 man days
Duration	4 days

Activity	Assess Aircraft Flight Environment
Description	Evaluate the required environment for take off and landing of aircraft on the ship including wind speed, ship speeds, space requirements, and physical or visual obstructions.
Labor	1 Senior for 10 man days
Duration	10 days

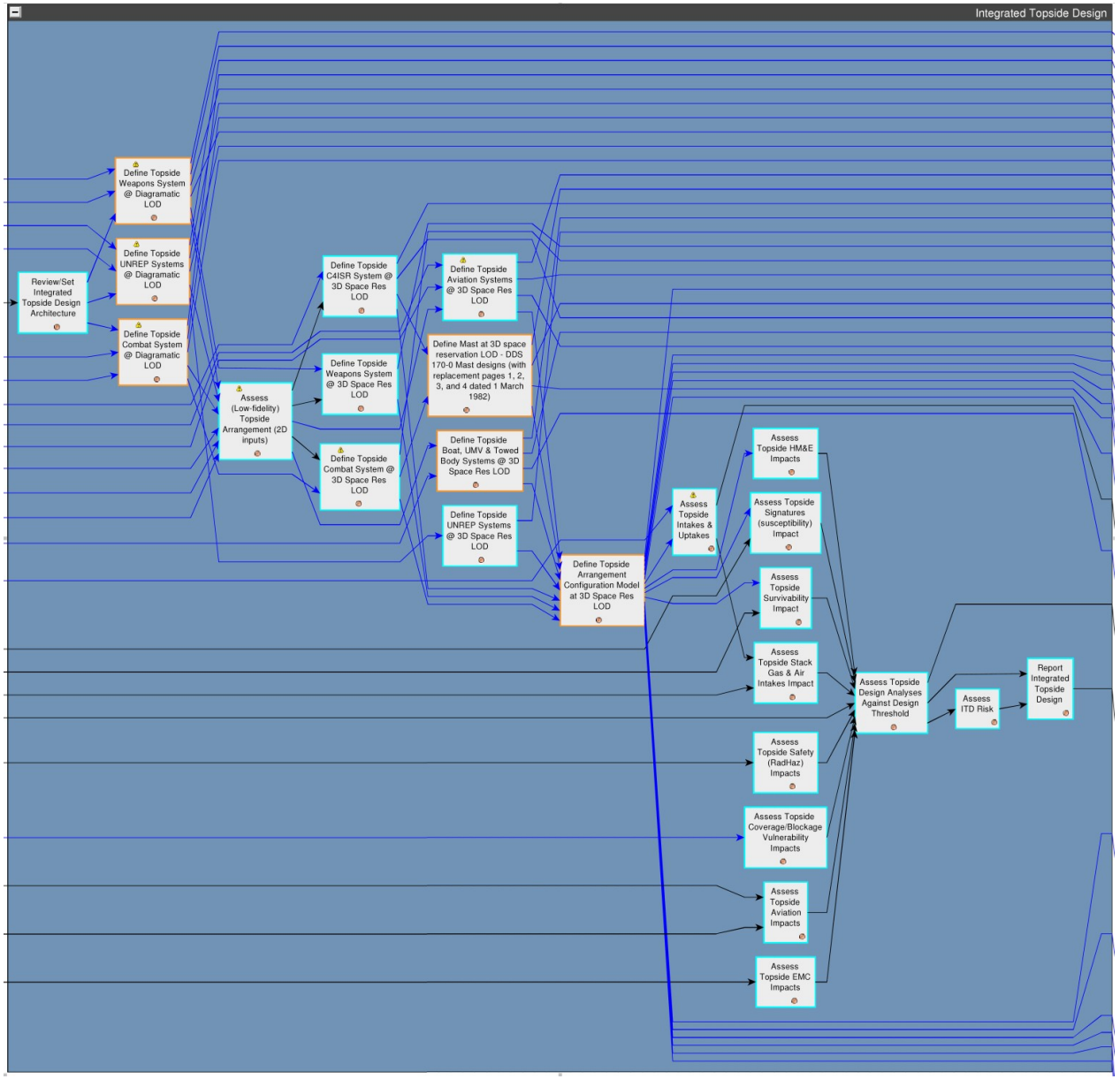
Aviation Systems Activity Group

Activity	Assess Flight Deck & Hangar Design ***[not in Plexus]***
Description	Evaluate the effectiveness of the flight deck and hangar design for storage volume and take off and landing space requirements.
Labor	
Duration	1 day

Activity	Define Aviation Systems at Diagrammatic LOD
Description	Define using a diagram of the ship the aviation system including all space allocations and equipment.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity	Assess Aircraft Maintenance Facilities
Description	Evaluate the effectiveness in placement and space of aircraft maintenance facilities.
Labor	1 Senior for 3 man days
Duration	3 days

Activity Group: Integrated Topside Design



This picture shows the activities involved with the Integrated Topside Design Activity Group. The next pages show individual activities.

Integrated Topside Design Activity Group

Activity	Review/Set Integrated Topside Design Architecture
Description	Set a range of requirements for personnel access, weapons, and sensors including any interference with each other, space requirements and safety regulations pertaining to each.
Labor	0.25 Seniors for 3.75 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Define Topside Weapons System at Diagrammatic LOD
Description	Develop a diagram of the ship detailing the topside weapons system with all necessary space, equipment, blast areas and antenna placement.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Define Topside UNREP Systems at Diagrammatic LOD
Description	Develop a diagram of the ship detailing the underway replenishment equipment, the location of the equipment, and size.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Integrated Topside Design Activity Group

Activity	Define Topside Combat System at Diagrammatic LOD
Description	Develop a diagram of the ship detailing the topside combat system including location of all equipment, size, and additional space requirements.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Assess (Low fidelity) Topside Arrangement (2D inputs)
Description	Evaluate the approximate topside arrangements of all systems, walkways, hatches, and equipment in terms of electromagnetic radiation efficiency, consumer requirements, etc.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity	Define Topside C4ISR System at 3D Space Res LOD
Description	Define in 3-dimensions the full arrangement of the topside C41SR system with the layout along the length of the ship including all necessary spaces occupied or otherwise.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Integrated Topside Design Activity Group

Activity	Define Topside Weapons System at 3D Space Res LOD
Description	Define in 3-dimensions the full arrangement of the topside weapons system with the layout along the length of the ship including all necessary space occupied or otherwise.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Define Topside Combat System at 3D Space Res LOD
Description	Define in 3-dimensions the full arrangement of the topside weapons system with the layout along the length of the ship including all necessary spaces occupied or otherwise.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Define Topside Aviation Systems at 3D Space Res LOD
Description	Define in 3-dimensions the full arrangement of the topside aviation system with the layout along the length of the ship including all necessary spaces occupied or otherwise.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Integrated Topside Design Activity Group

Activity	Define Mast at 3D reservation LOD - DDS 170 - 0 Mast designs (with replacement pages 1, 2, 3, and 4 dated 1 March 1982)
Description	Define in 3-dimensions the full arrangement of any mast(s) with the layout along the length of the ship including all necessary spaces, occupied or otherwise.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Define Topside Boat, UMV, & Towed Body Systems at 3D Space Res LOD
Description	Define in 3-dimensions the full arrangement of the topside boat, UMV and towed body systems with the layout along the length of the ship including all necessary spaces occupied or otherwise.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Activity	Define Topside UNREP Systems at 3D Space Res LOD
Description	Define in 3-dimensions the full arrangement of the UNREP systems with the layout along the length of the ship including all necessary spaces occupied or otherwise.
Labor	0.1 Seniors for 1.5 man days, 1 Journeyman for 15 man days
Duration	15 days

Integrated Topside Design Activity Group

Activity	Define Topside Arrangement Configuration Model at 3D Space Res LOD
Description	Define in 3-dimensions the full arrangement of all topside systems with the layout along the length of the ship including all necessary spaces occupied or otherwise.
Labor	0.1 Seniors for 2 man days, 1 Journeyman for 20 man days
Duration	20 days

Activity	Assess Topside Intakes & Uptakes
Description	Evaluate the topside locations of intakes and uptakes for efficient placement and spacing.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity	Assess Topside HM&E Impacts
Description	Evaluate the topside hull, mechanical, and electrical impacts from the various systems and sensors for interference as well as functionality in placement.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Integrated Topside Design Activity Group

Activity	Assess Topside Signatures (susceptibility) Impact
Description	Evaluate the signatures created by all topside systems, possible signature reduction designs, and determine if the risk is reasonable for the ship's mission.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity	Assess Topside Survivability Impact
Description	Evaluate the topside systems impact on the survivability of the ship as a whole and determine if the risk is acceptable.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity	Assess Topside Stack Gas & Air Intakes Impact
Description	Evaluate the impacts the release of hot gas from the stack gas and large volume air intake will have on other topside systems and determine if certain systems must be moved to avoid interference.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Integrated Topside Design Activity Group

Activity	Assess Topside Safety (RadHaz) Impacts
Description	Evaluate the impacts of radiation hazards from antennas to crew and other topside systems.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity	Assess Topside Coverage/Blockage Vulnerability Impacts
Description	Evaluate the vulnerability of the ship from blockage in antenna signals both receiving and transmitting from the ship structure topside.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity	Assess Topside Aviation Impacts
Description	Evaluate the impact of aviation operations topside with antenna signals, and the possibility of damage to topside systems from flight operations.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Integrated Topside Design Activity Group

Activity	Assess Topside EMC Impacts
Description	Evaluate the electromagnetic compatibility of all of the topside systems, especially antennas, to operate simultaneously without unreasonable interference.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Activity	Assess Topside Design Analysis Against Design Threshold
Description	Evaluate if all topside designs meet design thresholds for signatures, survivability, stability, air draft, etc.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

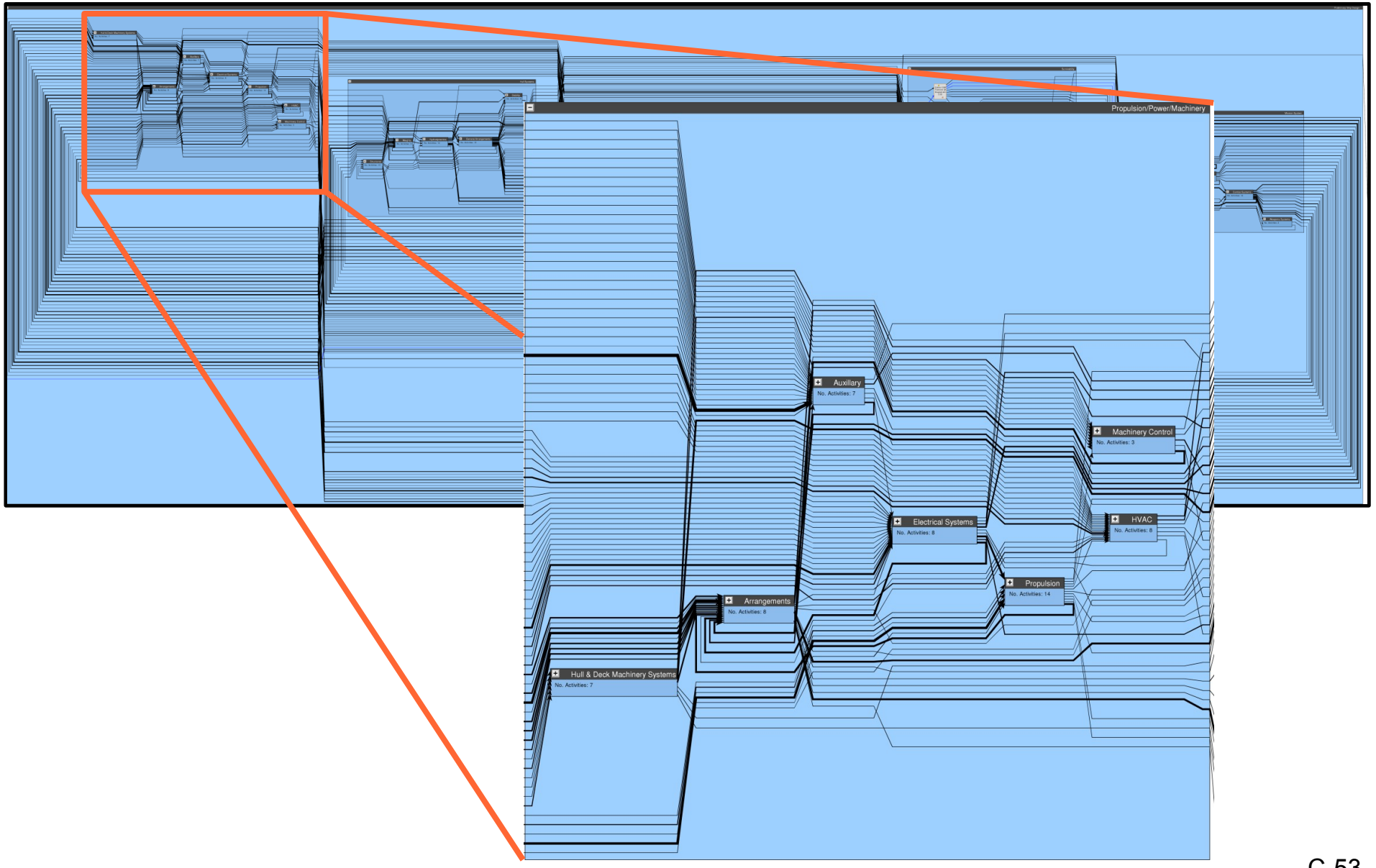
Activity	Assess ITD Risk
Description	Evaluate the margins of the design, based upon the originality of the ship design and any new systems.
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days
Duration	10 days

Integrated Topside Design Group

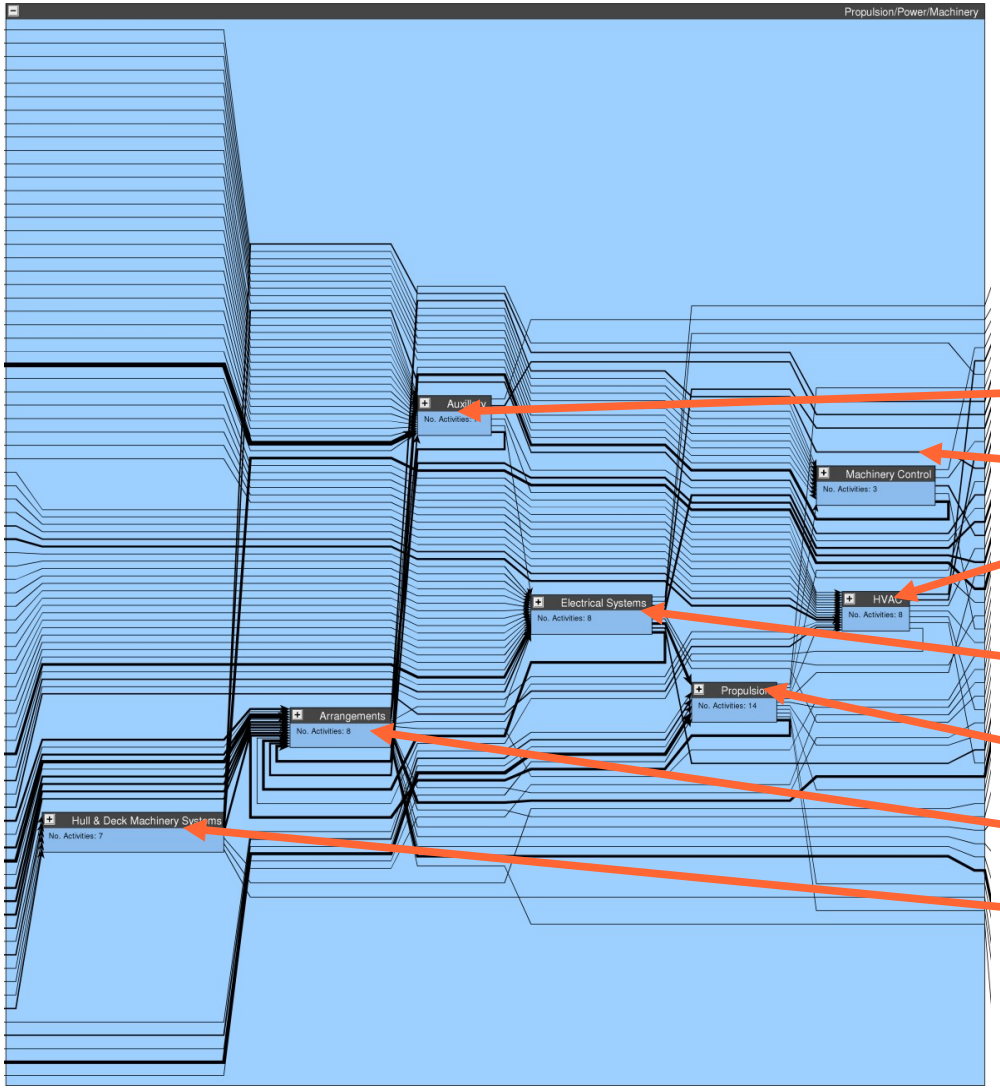
Activity	Report Integrated Topside Design
Description	Develop a concise report detailing the topside design including all drawings and deliver to the design team.
Labor	0.25 Seniors for 1.25 man days, 1 Journeyman for 5 man days
Duration	5 days

Propulsion /Power /Machinery Design Area

Shown is the Propulsion/Power/Machinery Design Area from the greater Preliminary Design Process. The Activity Groups are discussed on the next page.



Propulsion /Power / Machinery Activity Groups

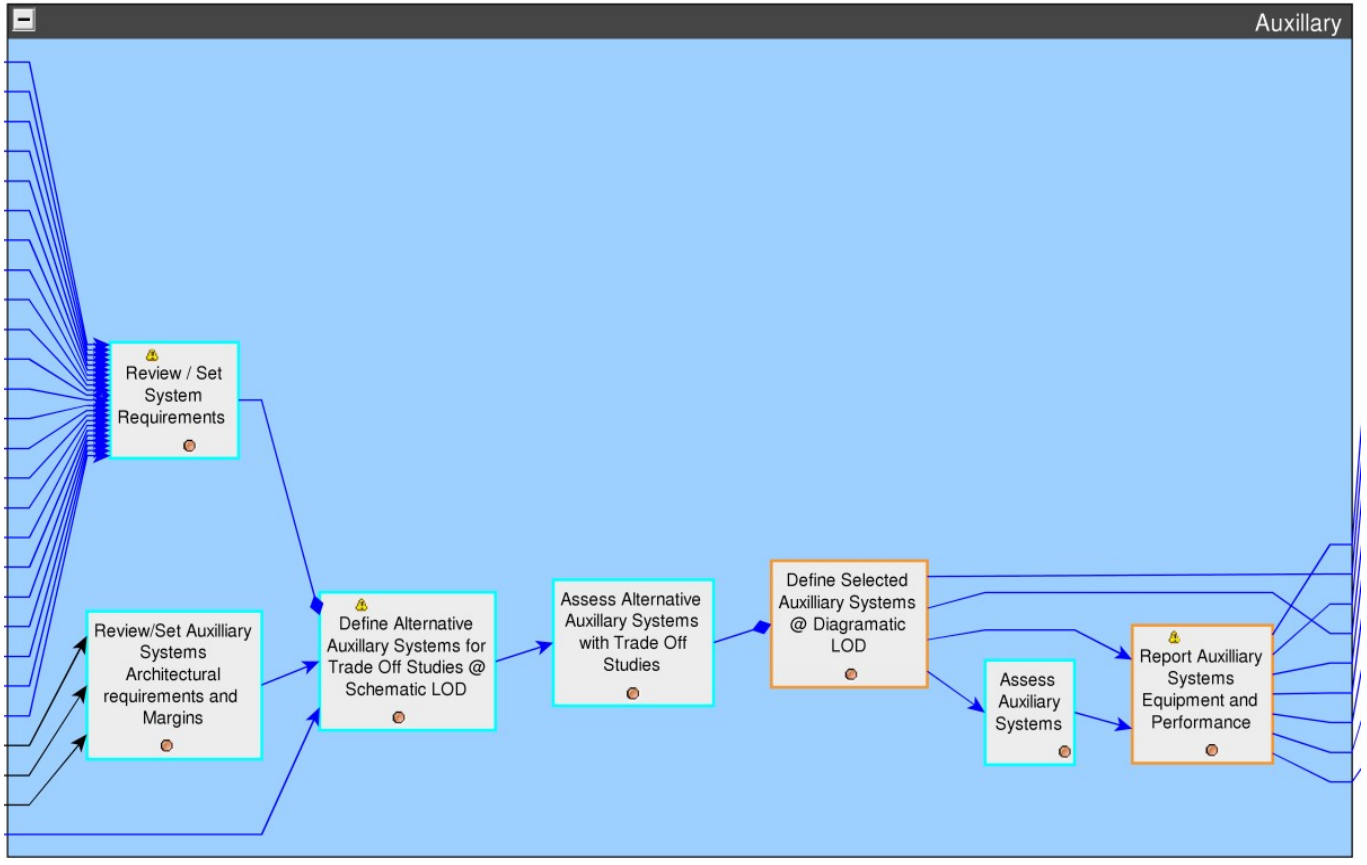


This picture shows the activity groups involved with the Propulsion/Power/Machinery (PPM) Design Area. The next pages show the individual Activities for each Activity Group.

The key Activity Groups are:

1. **Auxiliary Systems** (Page C-56)
2. **Machinery Control** (Page C-60)
3. **HVAC** (Page C-62)
4. **Electrical Systems** (Page C-66)
5. **Propulsion** (Page C-70)
6. **Machinery Arrangements** (Page C-76)
7. **Hull & Deck Machinery Systems** (Page C-80)

Activity Group: Auxiliary



This picture shows the activities involved with the Auxiliary Systems Activity Group. The next pages show the individual activities.

Auxiliary Activity Group

Activity	Review / Set System Requirements
Description	Set a range of necessary auxiliary systems on the ship.
Labor	0.5 Seniors for 2.5 man days, 2.4 Journeymen for 12 man days, 24 Juniors for 120 man days
Duration	5 days

Activity	Review/Set Auxiliary Systems Architectural requirements and Margins
Description	Set a range on additional structure or special hull definition required to support the auxiliary system.
Labor	0.1 Journeymen for 0.5 man days, 1 Junior for 5 man days
Duration	5 days

Activity	Define Alternative Auxiliary Systems for Trade Off Studies at Schematic LOD
Description	Develop a matrix of alternative auxiliary system possibilities with any disadvantages and advantages associated with each.
Labor	24 Juniors for 120 man days
Duration	5 days

Auxiliary Activity Group

Activity	Assess Alternative Auxiliary Systems with Trade Off Studies
Description	Evaluate the trade off studies for advantages and disadvantages to choose the best alternatives.
Labor	24 Juniors for 120 man days
Duration	5 days

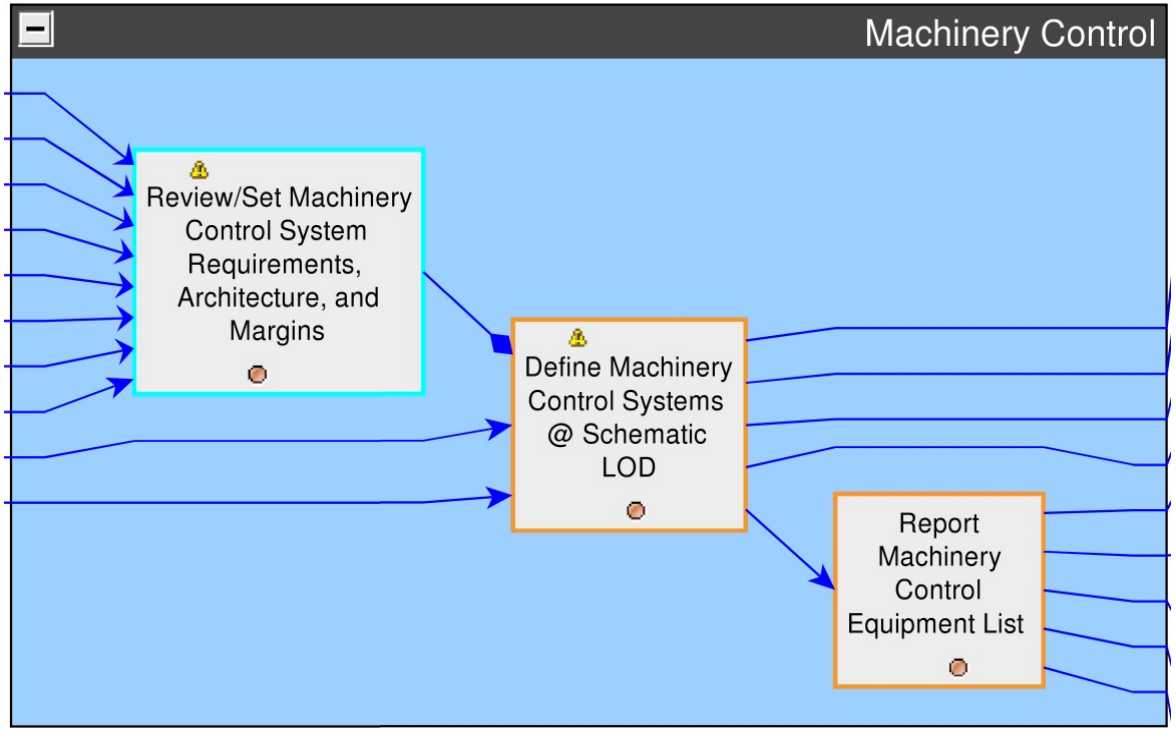
Activity	Define Selected Auxiliary Systems at Diagrammatic LOD
Description	Define using diagrams of the ship any selected auxiliary systems.
Labor	24 Juniors for 120 man days
Duration	5 days

Activity	Assess Auxiliary Systems
Description	Evaluate the auxiliary systems for equipment, performance, and power requirements.
Labor	8 Journeymen for 40 man days, 24 Juniors for 120 man days
Duration	5 days

Auxiliary Activity Group

Activity	Report Auxiliary Systems Equipment and Performance
Description	Develop a concise report detailing the auxiliary systems equipment and performance and deliver to design team.
Labor	1 Senior for 3 man days, 24 Juniors for 72 man days
Duration	3 days

Activity Group: Machinery Control



This picture shows the activities involved with the Machinery Control Activity Group. The next pages show the individual activities.

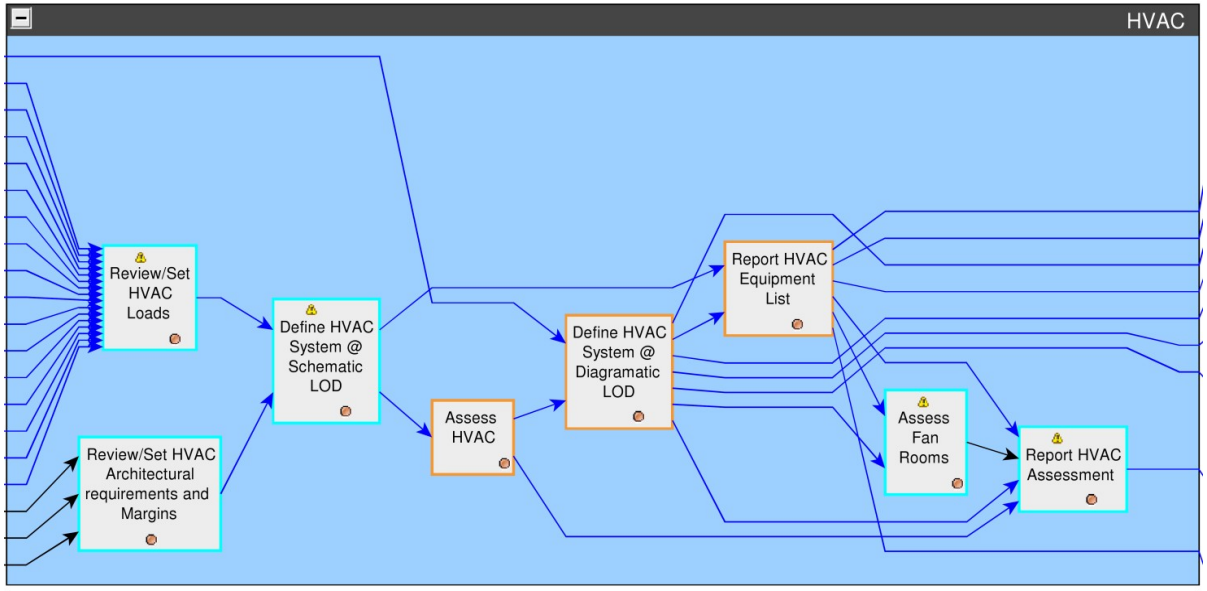
Machinery Control Activity Group

Activity	Review/Set Machinery Control System Requirements, Architecture, and Margins
Description	Set a range of necessary machinery control system requirements, any additional architecture to support those control systems, and any margins.
Labor	1 Senior for 20 man days, 0.5 Juniors for 10 man days
Duration	20 days

Activity	Define Machinery Control Systems at Schematic LOD
Description	Define using a symbol diagram the selected machinery control systems and any support needed for those systems.
Labor	0.25 Seniors for 2.5 man days, 1 Junior for 10 man days
Duration	10 days

Activity	Report Machinery Control Equipment List
Description	Develop an equipment list for all machinery control components and deliver to design team.
Labor	0.25 Seniors for 0.75 man days, 1 Junior for 3 man days
Duration	3 days

Activity Group: HVAC



This picture shows the activities involved with the Heating, Ventilation and Air Conditioning (HVAC) Activity Group. The next pages show the individual activities.

HVAC Activity Group

Activity	Review/Set HVAC Loads
Description	Set the power load range required for the HVAC system to meet regulations
Labor	0.1 Journeymen for 0.5 man days, 1 Junior for 5 man days
Duration	5 days

Activity	Review/Set HVAC Architectural requirements and Margins
Description	Set a range of additional architecture required to support the HVAC system as well as any margins in the sizing of the HVAC system based on the originality of the ship.
Labor	0.1 Journeymen for 0.5 man days, 1 Junior for 5 man days
Duration	5 days

Activity	Define HVAC System at Schematic LOD
Description	Define the HVAC system layout throughout the ship using a symbol diagram.
Labor	0.1 Journeymen for 0.3 man days, 1 Junior for 3 man days
Duration	3 days

HVAC Activity Group

Activity	Assess HVAC
Description	Evaluate the HVAC system for effectiveness, compliance with regulation, and feasibility to implement.
Labor	0.1 Journeymen for 0.2 man days, 1 Junior for 2 man days
Duration	2 days

Activity	Define HVAC System at Diagrammatic LOD
Description	Define HVAC system using full diagrams of the ship with necessary equipment laid out and labeled
Labor	0.1 Journeymen for 2 man days, 1 Junior for 20 man days
Duration	20 days

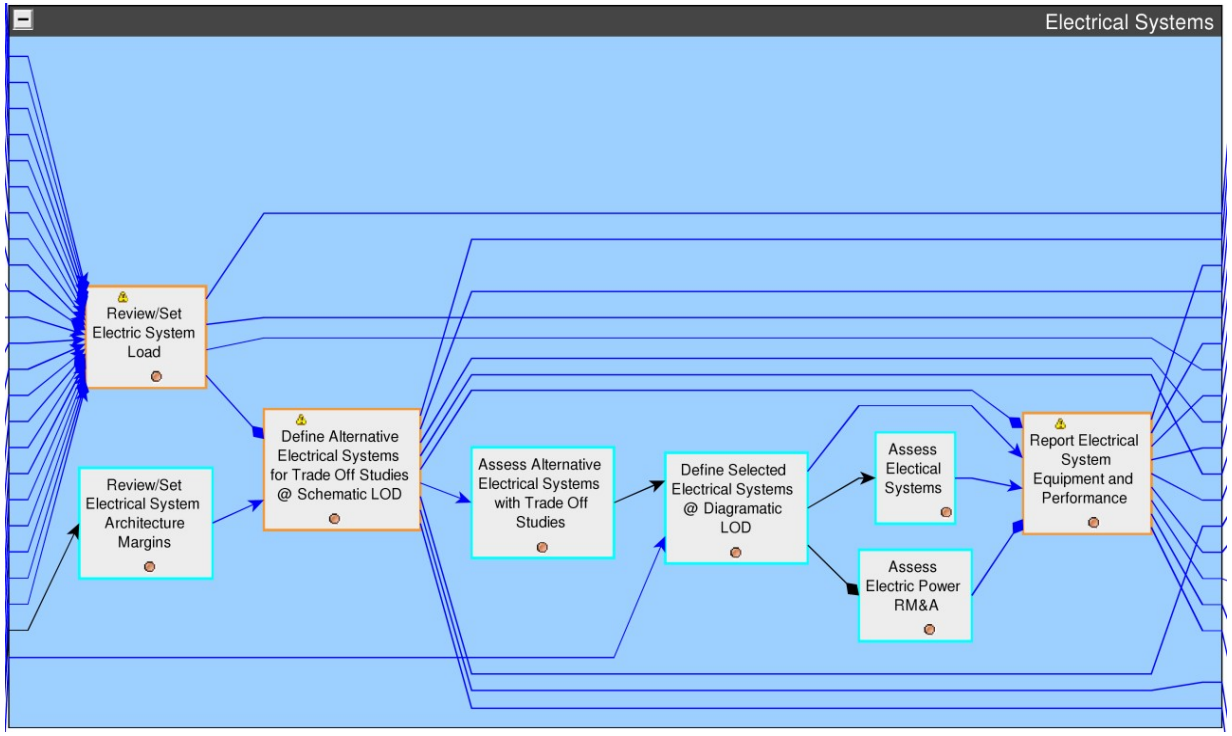
Activity	Report HVAC Equipment List
Description	Develop an equipment list for the HVAC system and deliver to design team.
Labor	1 Junior for 5 man days
Duration	5 man days

HVAC Activity Group

Activity	Assess Fan Rooms
Description	Evaluate the effectiveness of the fan rooms aboard in placement, volume, and powering.
Labor	1 Senior for 1 man day
Duration	1 day

Activity	Report HVAC Assessment
Description	Develop a concise report detailing the HVAC system and deliver to the design team.
Labor	1 Senior for 1 man day
Duration	1 day

Activity Group: Electrical Systems



This picture shows the activities involved with the Electrical Systems Activity Group. The next pages show the individual activities.

Electrical Systems Activity Group

Activity	Review/Set Electric System Load
Description	Set a range for the total electrical load for the ship including working gear, hotel loads, propulsion, fire fighting equipment, navigation, etc.
Labor	1 Senior for 15 man days, 1 Junior for 15 man days
Duration	15 days

Activity	Review/Set Electrical System Architecture Margins
Description	Set the margin for growth loads (sometimes 4%), the detail design and construction margin (sometimes 6%), and the service life growth load margin (sometimes 20%).
Labor	0.1 Seniors for 1 man day, 1 Journeyman for 10 man days, 1 Junior for 10 man days
Duration	10 days

Activity	Define Alternative Electrical Systems for Trade Off Studies at Schematic LOD
Description	Develop a one-line diagram that indicates quantities and ratings of major equipment and their inter-connections (cables) as an electrical wiring schematic and circuitry diagram.
Labor	1 Senior for 10 man days, 1 Junior for 10 man days
Duration	10 days

Electrical Systems Activity Group

Activity	Assess Alternative Electrical Systems with Trade Off Studies
Description	Evaluate the trade offs of each possible electrical system to select the best alternative.
Labor	0.25 Seniors for 1.25 man days, 1 Junior for 5 man days
Duration	5 days

Activity	Define Selected Electrical Systems at Diagrammatic LOD
Description	Define using a diagram of the ship the selected electrical system and its layout.
Labor	1 Journeyman for 3 man days, 1 Junior for 3 man days
Duration	3 days

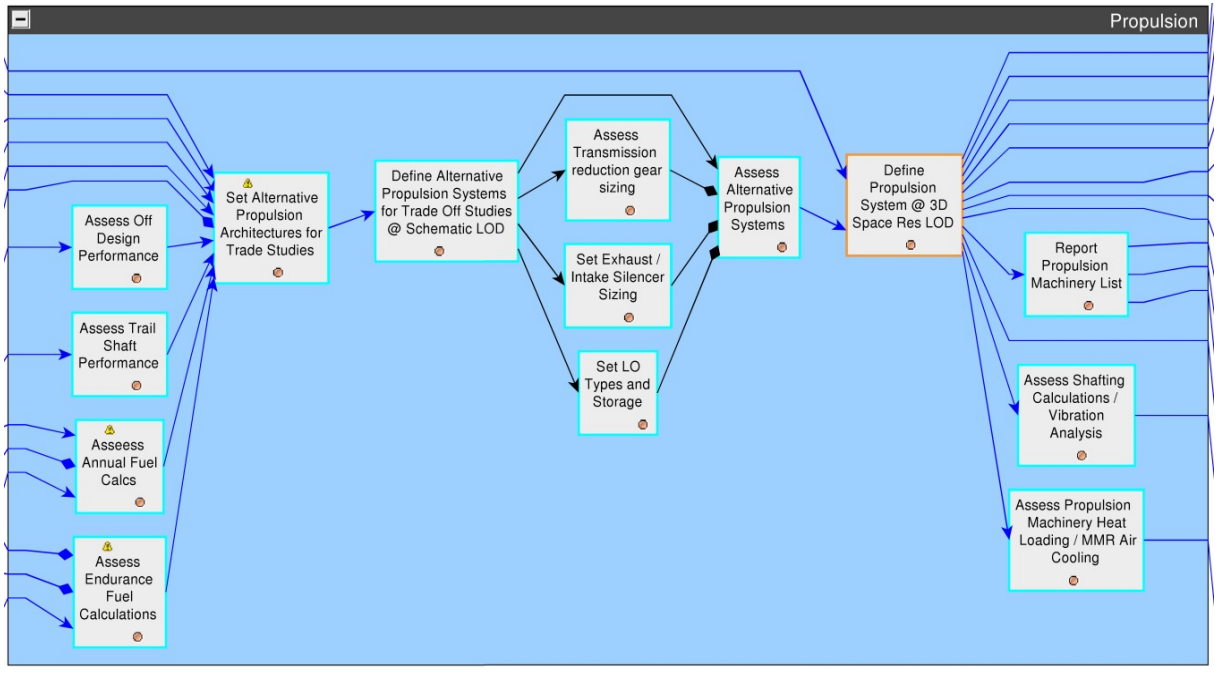
Activity	Assess Electrical Systems
Description	Evaluate the electrical system for effectiveness and feasibility.
Labor	0.25 Seniors for 1.25 man days, 1 Journeyman for 5 man days, 1 Junior for 5 man days
Duration	5 days

Electrical Systems Activity Group

Activity	Assess Electric Power RM&A
Description	Evaluate the electrical system for reliability during missions, maintainability over the service life of the ship, and the availability of necessary equipment at the time of ship building.
Labor	2 Seniors for 20 man days
Duration	10 man days

Activity	Report Electrical System Equipment and Performance
Description	Develop a concise report detailing the electrical system and the performance and deliver to the design team.
Labor	1 Senior for 3 man days, 1 Junior for 3 man days
Duration	3 days

Activity Group: Propulsion



This picture shows the activities involved with the Propulsion Activity Group. The next pages show the individual activities.

Propulsion Activity Group

Activity	Assess Off Design Performance
Description	Evaluate the performance of the propulsion system when operating outside of the design conditions.
Labor	1 Senior for 2 man days, 1 Junior for 2 man days
Duration	2 days

Activity	Assess Trail Shaft Performance
Description	Evaluate the fuel consumption and speed performance of the ship when a single shaft is being powered by one or more engines.
Labor	1 Junior for 5 man days
Duration	5 days

Activity	Assess Annual Fuel Calculations
Description	Evaluate the quantity of fuel burned in one year, referencing the database of speed vs. time profiles for all ship classes which is maintained by the Navy, using data from a ship similar to the design or to its projected use.
Labor	1 Senior for 10 man days, 1 Journeyman for 10 man days
Duration	10 days

Propulsion Activity Group

Activity	Assess Endurance Fuel Calculations
Description	Evaluate the necessary volume of fuel for the ship to operate at sea for the design endurance range and speed with a given displacement.
Labor	1 Senior for 20 man days, 1 Junior for 20 man days
Duration	20 days

Activity	Set Alternative Propulsion Architectures for Trade Studies
Description	Develop a range of alternative propulsion systems citing any advantages and disadvantages.
Labor	1 Senior for 2 man days, 1 Junior for 2 man days
Duration	2 days

Activity	Define Alternative Propulsion Systems for Trade Off Studies at Schematic LOD
Description	Define all alternative propulsion systems using symbol diagrams with advantages and disadvantages to each alternative.
Labor	1 Senior for 1 man day, 1 Junior for 1 man day
Duration	1 day

Propulsion Activity Group

Activity	Assess Transmission reduction gear sizing
Description	Evaluate the effectiveness of the transmission reduction gear size.
Labor	1 Senior for 1 man day, 1 Junior for 1 man day
Duration	1 day

Activity	Set Exhaust / Intake Silencer Sizing
Description	Set the possible range for the size of the exhaust and intake silencer to meet regulations and for volume allocation.
Labor	1 Senior for 2 man days, 1 Junior for 2 man days
Duration	2 days

Activity	Set LO Types and Storage
Description	Set a range of the lube oil types required for each alternative propulsion system and the storage associated with each type of lube oil needed.
Labor	1 Junior for 5 man days
Duration	5 man days

Propulsion Activity Group

Activity	Assess Alternative Propulsion Systems
Description	Evaluate the propulsion system alternatives to select the best alternative for the ship.
Labor	1 Senior for 1 man day, 1 Junior for 1 man day
Duration	1 days

Activity	Define Propulsion System at 3D Space Res LOD
Description	Define in 3-dimensions the propulsion system and the layout on ship.
Labor	1 Junior for 5 man days
Duration	5 days

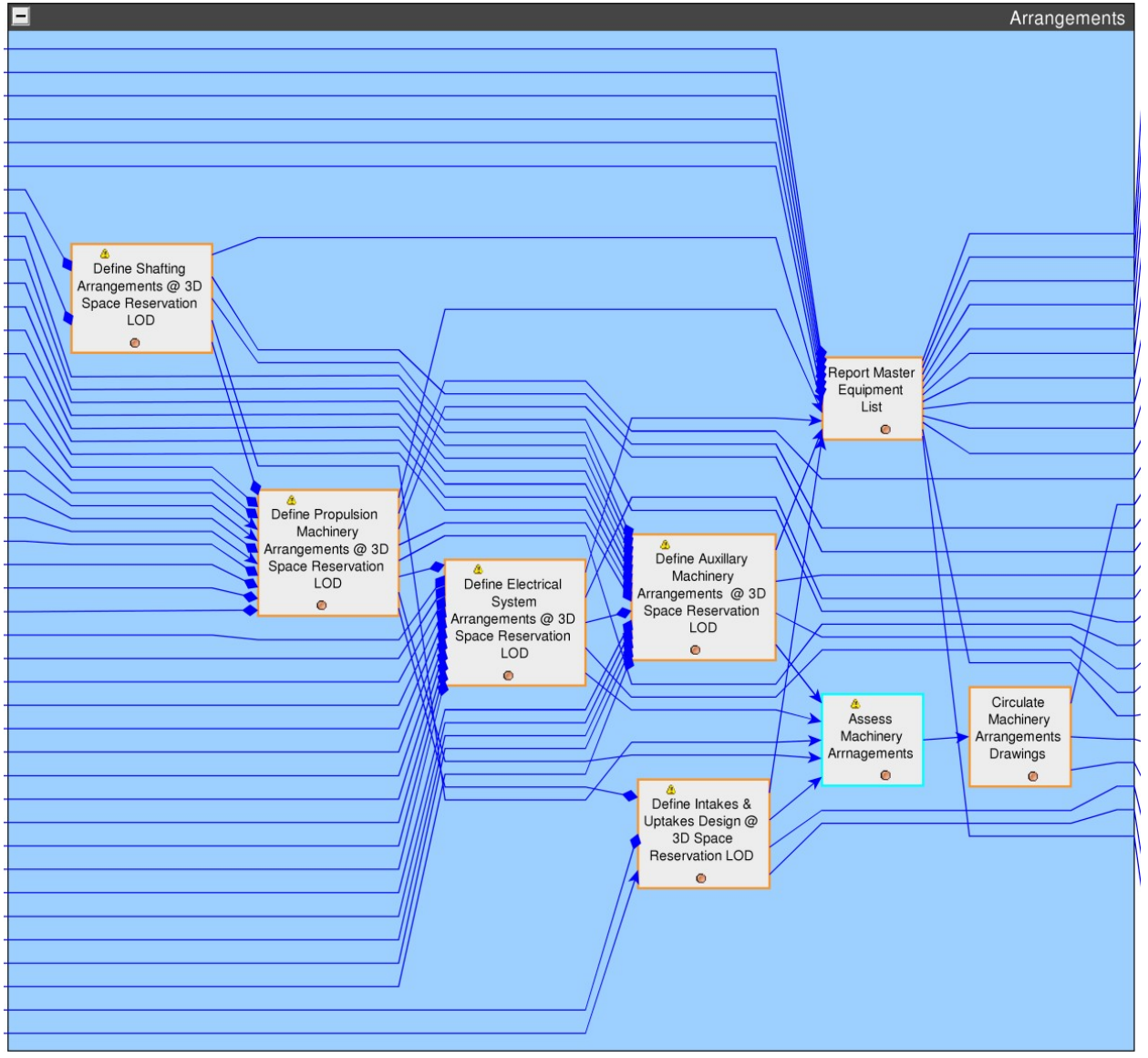
Activity	Report Propulsion Machinery List
Description	Develop a machinery list for the propulsion plant and deliver to the design team.
Labor	0.25 Seniors for 0.5 man days, 1 Junior for 2 man days
Duration	2 days

Propulsion Activity Group

Activity	Assess Shafting Calculations / Vibration Analysis
Description	Evaluate the shaft sizing calculations and any vibrations associated with the size shaft required.
Labor	1 Senior for 4 man days, 1 Junior for 4 man days
Duration	4 days

Activity	Assess Propulsion Machinery Heat Loading / MMR Air Cooling
Description	Evaluate the heat output by the propulsion machinery and the effectiveness of the air cooling system to dissipate the heat and prevent over heating.
Labor	1 Junior for 0.5 man days
Duration	0.5 days

Activity Group: Machinery Arrangements



This picture shows the activities involved with the Machinery Arrangements Activity Group. The next pages show the individual activities.

Machinery Arrangements Activity Group

Activity	Define shafting Arrangements at 3D Space Reservation LOD
Description	Set the basic shaft arrangement to determine the propulsion system location and impacts to spaces containing shafting equipment, considering the shaft removal scheme and strut needs.
Labor	1.5 Seniors for 30 man days
Duration	20 days

Activity	Define Propulsion Machinery Arrangements at 3D Space Reservation LOD
Description	Define in 3 dimensions the arrangements throughout the ship of the necessary propulsion machinery and the space required to maintain and repair the machinery, including the machinery room.
Labor	2 Seniors for 50 man days, 1 Junior for 25 man days
Duration	25 days

Activity	Define Electrical System Arrangements at 3D Space Reservation LOD
Description	Create and model electrical system arrangements in 3D. Products include plan, section, and elevation drawings sufficient to determine the location of all components and their spatial relationships to their parent systems, including electrical equipment rooms.
Labor	2 Senior for 50 man days, 1 Junior for 25 man days
Duration	25 days

Machinery Arrangements Activity Group

Activity	Define Auxiliary Machinery Arrangements at 3D Space Reservation LOD
Description	Create and model auxiliary machinery room arrangements in 3D. Products include plan, section, and elevation drawings sufficient to determine the location of all components and their spatial relationships to their parent systems, including all miscellaneous machinery spaces and pump rooms.
Labor	2 Seniors for 50 man days, 1 Junior for 25 man days
Duration	25 days

Activity	Define Intakes & Uptakes Design at 3D Space Reservation LOD
Description	Set basic combustion air arrangement to determine propulsion system location and impacts to spaces containing combustion air equipment, considering engine removal scheme (if applicable) and impact to the top side.
Labor	1.5 Seniors for 30 man days
Duration	20 days

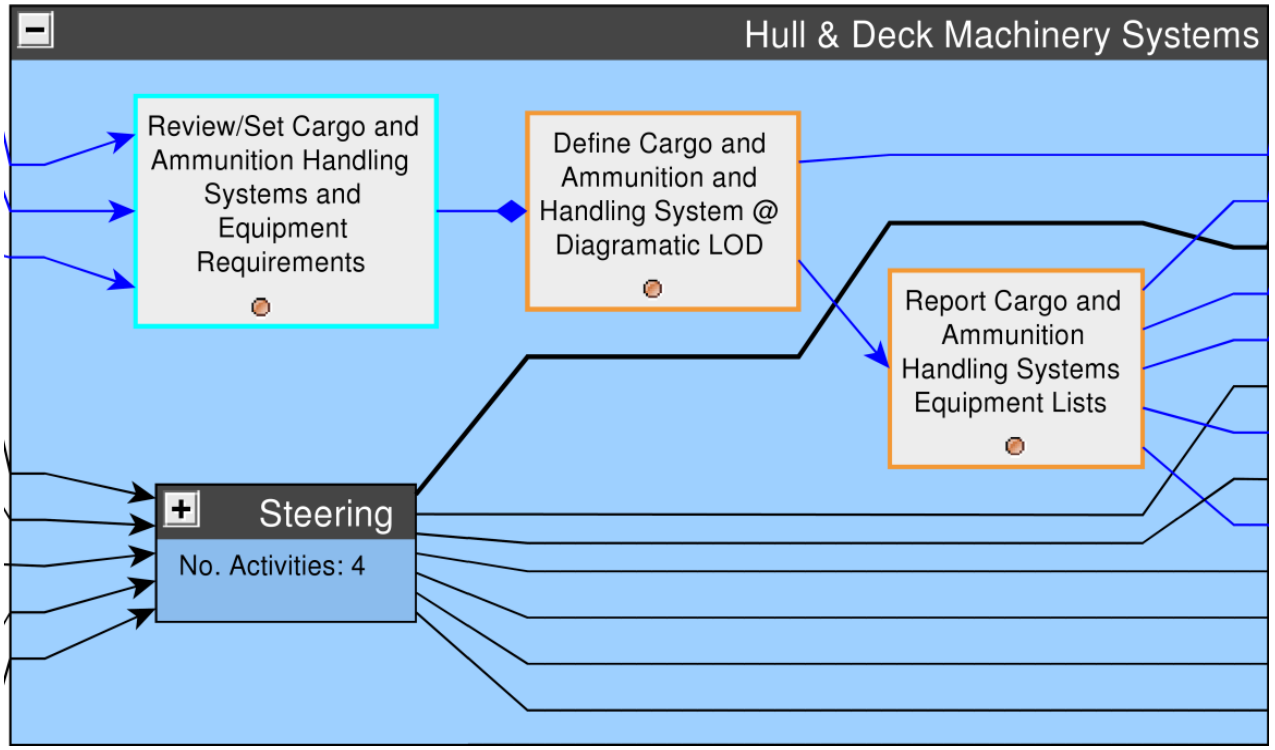
Activity	Report Master Equipment List
Description	Develop a master equipment list for all machinery for propulsion, electrical, combustion air, shafting and auxiliary systems and deliver to the design team.
Labor	1 Senior for 4 man days
Duration	4 days

Machinery Arrangements Activity Group

Activity	Assess Machinery Arrangements
Description	Evaluate all machinery arrangements to ensure walkways are available, workspace for maintenance and repairs, and all machinery is allocated the appropriate space.
Labor	1 Senior for 5 man days
Duration	5 days

Activity	Circulate Machinery Arrangements Drawings
Description	Circulate drawing of all machinery arrangements onboard to design team for review and advancement of other activities.
Labor	1 Junior for 4 man days
Duration	4 days

Activity Group: Hull & Deck Machinery Systems



This picture shows the activities involved with the Hull & Deck Machinery Systems Activity Group. The next pages show the individual activities.

Hull & Deck Machinery Systems Activity Group

Activity	Review/Set Cargo and Ammunition Handling Systems and Equipment Requirements
Description	Set a range of systems possible to use to handle cargo and ammunition and any equipment needed to successfully employ that system.
Labor	1 Senior for 15 man days, 1 Junior for 15 man days
Duration	15 days

Activity	Define Cargo and Ammunition and Handling System at Diagrammatic LOD
Description	Define using a diagram the cargo and ammunition handling system and location on the ship.
Labor	1 Senior for 10 man days, 1 Junior for 10 man days
Duration	10 days

Activity	Report Cargo and Ammunition Handling Systems Equipment Lists
Description	Develop an equipment list for the cargo and ammunition handling system and deliver to the design team.
Labor	1 Senior for 5 man days, 1 Junior for 5 man days
Duration	5 days

Hull & Deck Machinery Systems Activity Group

Steering Subgroup

Activity	Review/Set Steering Systems Architecture
Description	Set a range of necessary steering systems equipment and location on the ship.
Labor	1 Junior for 5 man days
Duration	5 days

Activity	Review/Set Steering Systems Requirements
Description	Determine the range accuracy and speed of the steering system for the intended mission of the ship.
Labor	1 junior for 2 man days, 1 journeyman for 2 man days
Duration	2 man days

Activity	Define Steering System at 3D Space Reservation LOD
Description	Define the steering system throughout the ship in a three dimensional model.
Labor	0.25 Journeymen for 3.75 man days, Junior for 15 man days
Duration	15 days

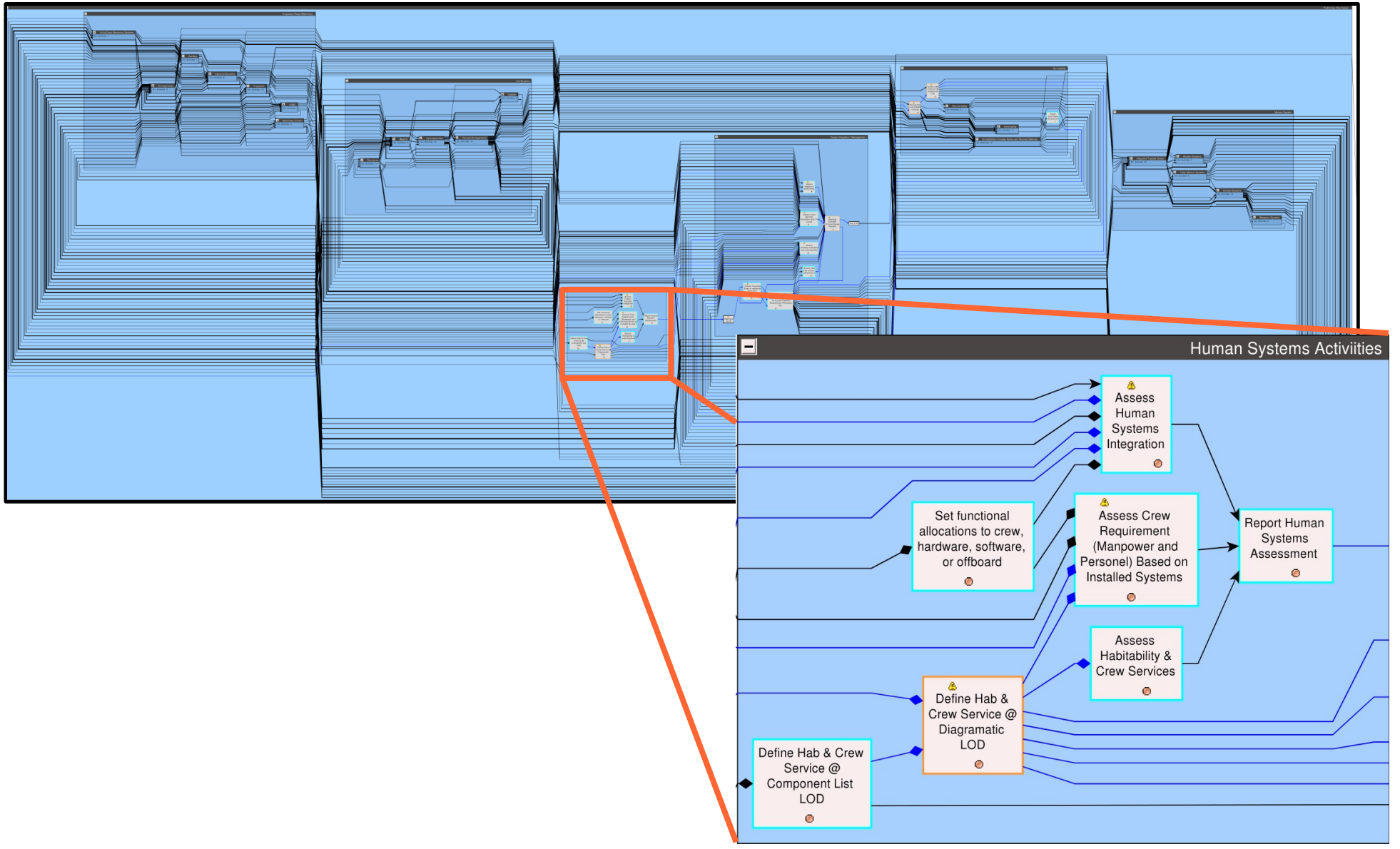
Hull & Deck Machinery Systems Activity Group

Steering Subgroup

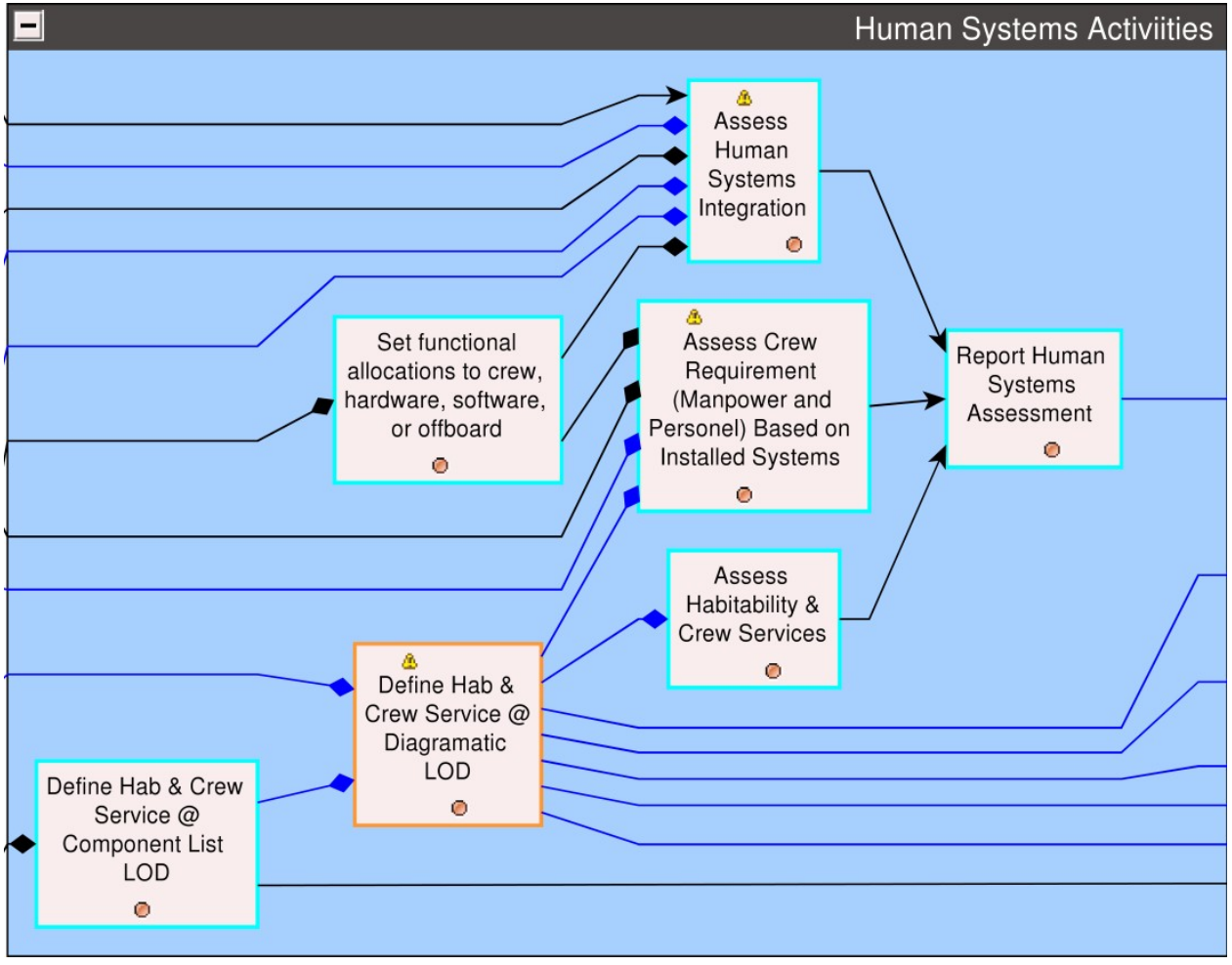
Activity	Report Steering System Equipment List
Description	Develop an equipment list with all necessary parts of the steering system and deliver to the design team.
Labor	1 Junior for 5 man days
Duration	5 man days

Human Systems Design Area

Shown is the Human Systems Design Area from the greater Preliminary Design Process. The Activities are discussed on the next page.



Human Systems Activities



The picture to the left shows the activities involved with the Human Systems Design Area. The next pages show the individual Activities.

Human Systems Activity Group

Activity	Define Hab & Crew Service at Component List LOD
Description	Develop a list of all components required for habitability and crew services necessary to meet regulations.
Labor	0.3 Journeymen for 2.1 man days
Duration	7 days

Activity	Set functional allocations to crew, hardware, software, or offboard
Description	Allocate a range of necessary crew, hardware, software and offboard support to operate the ship.
Labor	0.4 Seniors for 2.8 man days
Duration	7 days

Activity	Define Hab & Crew Service at Diagrammatic LOD
Description	Define, on a diagram of the ship, all human systems to be installed on the ship.
Labor	0.3 Seniors for 2.1 man days, 1 Junior for 7 man days
Duration	7 days

Human Systems Activity Group

Activity	Assess Human Systems Integration
Description	Evaluate the ability of the crew to interact smoothly with necessary systems including computer software and various hardware.
Labor	0.2 Seniors for 8 man days
Duration	40 man days

Activity	Assess Crew Requirement (Manpower and Personnel) Based on Installed Systems
Description	Evaluate the number of crew required to run all installed systems for all watches to operate the ship in a safe manner.
Labor	0.5 Journeymen for 3.5 man days
Duration	7 days

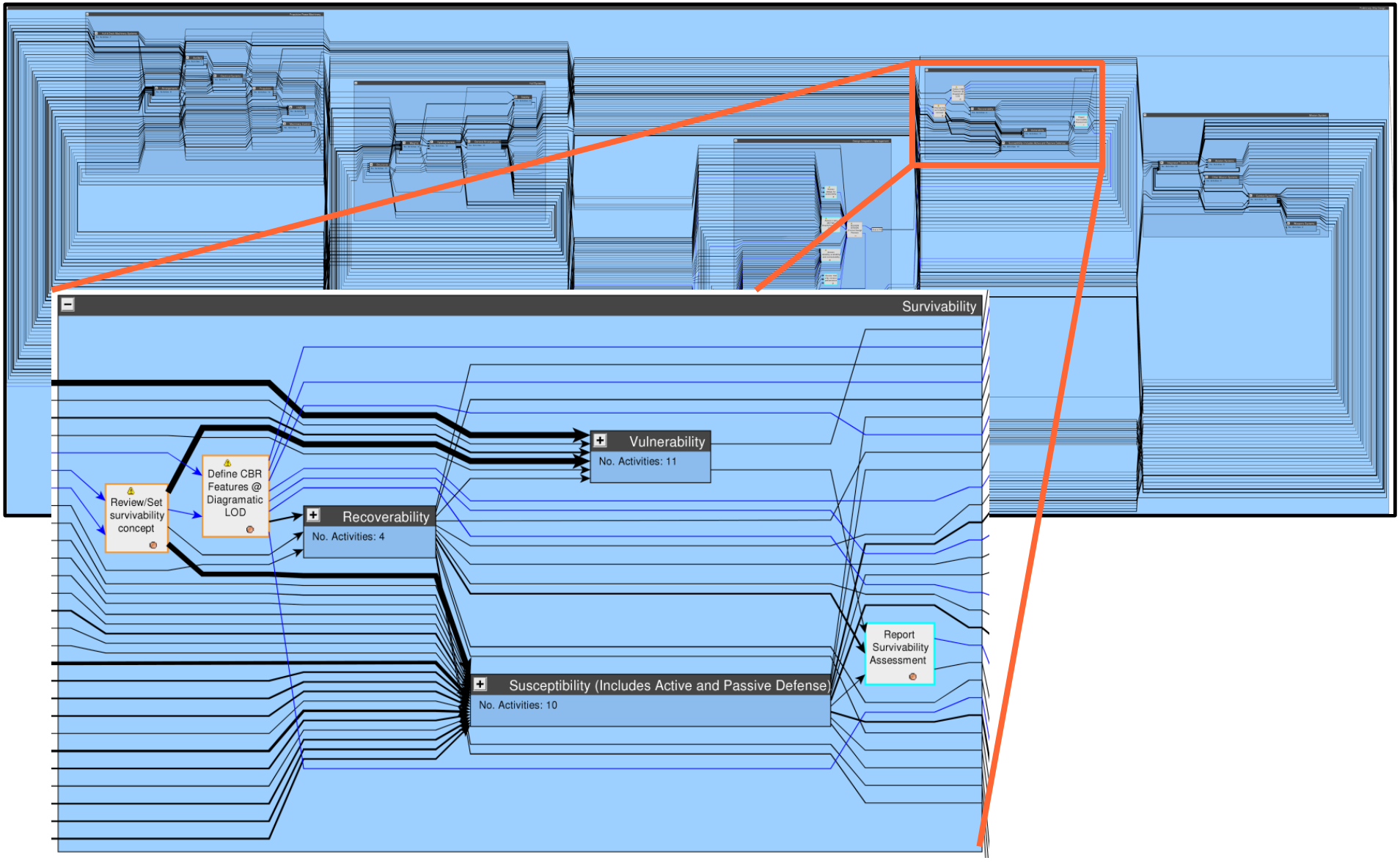
Activity	Assess Habitability & Crew Services
Description	Evaluate the crew habitability to meet crew size and crew comfort regulations.
Labor	0.3 Seniors for 2.1 man days
Duration	7 days

Human Systems Activity Group

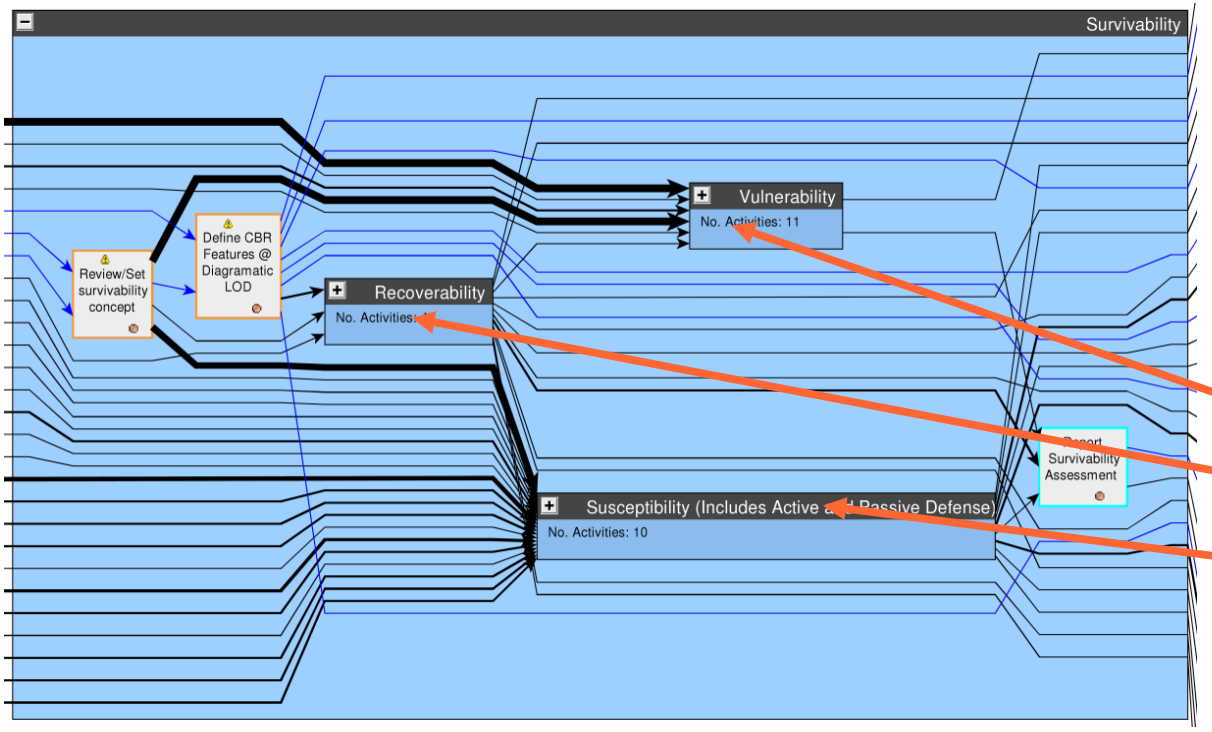
Activity	Report Human Systems Assessment
Description	Develop a concise report detailing the human systems on board and deliver to design team.
Labor	1 Senior for 2 man days, 1 Journeyman for 2 man days
Duration	2 days

Survivability Design Area

Shown is the Survivability Design Area from the greater Preliminary Design Process. The Activity Groups are discussed on the next page.



Survivability Activity Groups

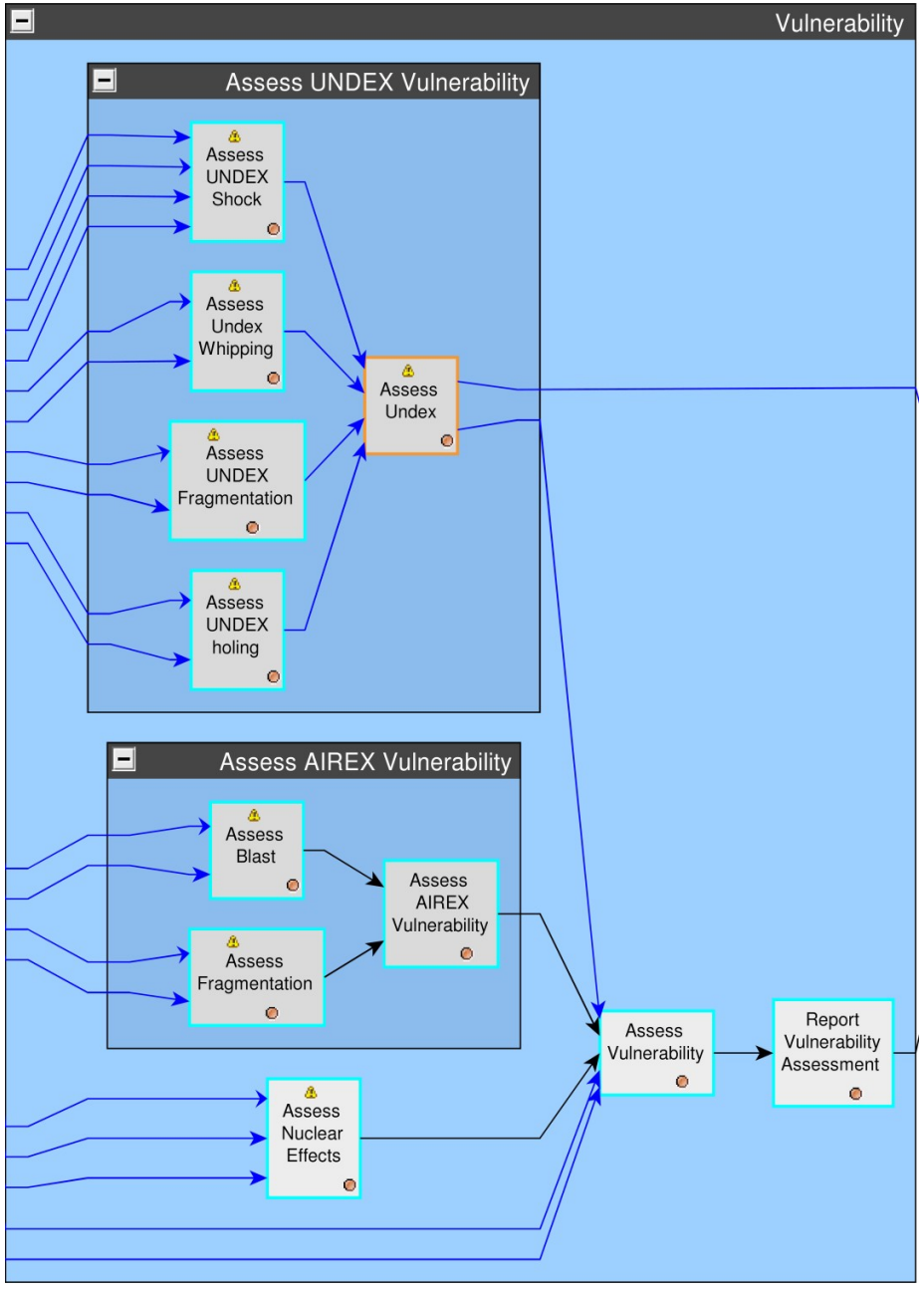


This picture shows the activity groups involved with the Survivability Design Area. The next pages show the activities for each Activity Group.

The key Activity Groups are:

1. **Vulnerability** (Page C-91)
2. **Recoverability** (Page C-96)
3. **Susceptibility** (Page C-99)

Activity Group: Vulnerability



This picture shows the activities involved with the Vulnerability Activity Group. The next pages show the individual activities.

Vulnerability Activity Group

Activity	Assess Fragmentation
Description	Evaluate the possibility and effect of fragmentation due to attack or severe operating conditions.
Labor	0.05 Seniors for 0.15 man days, 0.5 Journeymen for 1.5 man days, 0.4 Juniors for 1.2 man days
Duration	3 days

Activity	Assess AIREX Vulnerability
Description	Evaluate the susceptibility and effects of the ship to an airborne attack from fragmentation, blast, and shock.
Labor	1 Senior for 2 man days, 0.5 Journeymen for 10 man days, 0.5 Juniors for 10 man days
Duration	20 days

Activity	Assess Nuclear Effects
Description	Evaluate the effects on the ship from a nuclear blast.
Labor	0.2 Seniors for 0.6 man days, 1.5 Journeymen for 4.5 man days, 1.2 Juniors for 3.6 man days
Duration	3 man days

Vulnerability Activity Group

Activity	Assess UNDEX Shock
Description	Evaluate the susceptibility and damage effects of the ship from an underwater explosion resulting in shock damage.
Labor	0.05 Seniors for 0.15 man days, 0.5 Journeymen for 1.5 man days, 0.45 Juniors for 1.35 man days
Duration	3 days

Activity	Assess UNDEX Whipping
Description	Evaluate the susceptibility and damage effects of the ship from an underwater explosion resulting in whipping damage.
Labor	0.05 Seniors for 0.15 man days, 0.5 Journeymen for 1.5 man days, 0.45 Juniors for 1.35 man days
Duration	3 days

Activity	Assess UNDEX Fragmentation
Description	Evaluate the susceptibility and damage effects of the ship from and underwater explosion resulting in fragmentation damage.
Labor	0.05 Seniors for 0.15 man days, 0.5 Journeymen for 1.5 man days, 0.4 Juniors for 1.2 man days
Duration	3 days

Vulnerability Activity Group

Activity	Assess UNDEX holing
Description	Evaluate the susceptibility to and damage effects of the ship from an underwater explosion resulting in holing damage.
Labor	0.05 Seniors for 0.15 man days, 0.5 Journeymen for 1.5 man days, 0.45 Juniors for 1.35 man days
Duration	3 days

Activity	Assess UNDEX
Description	Evaluate the cumulative damage caused by an underwater explosion resulting in one or more of the possible damage types.
Labor	0.7 Seniors for 2 man days, 0.5 Journeymen for 10 man days, 0.5 Juniors for 10 man days
Duration	20 days

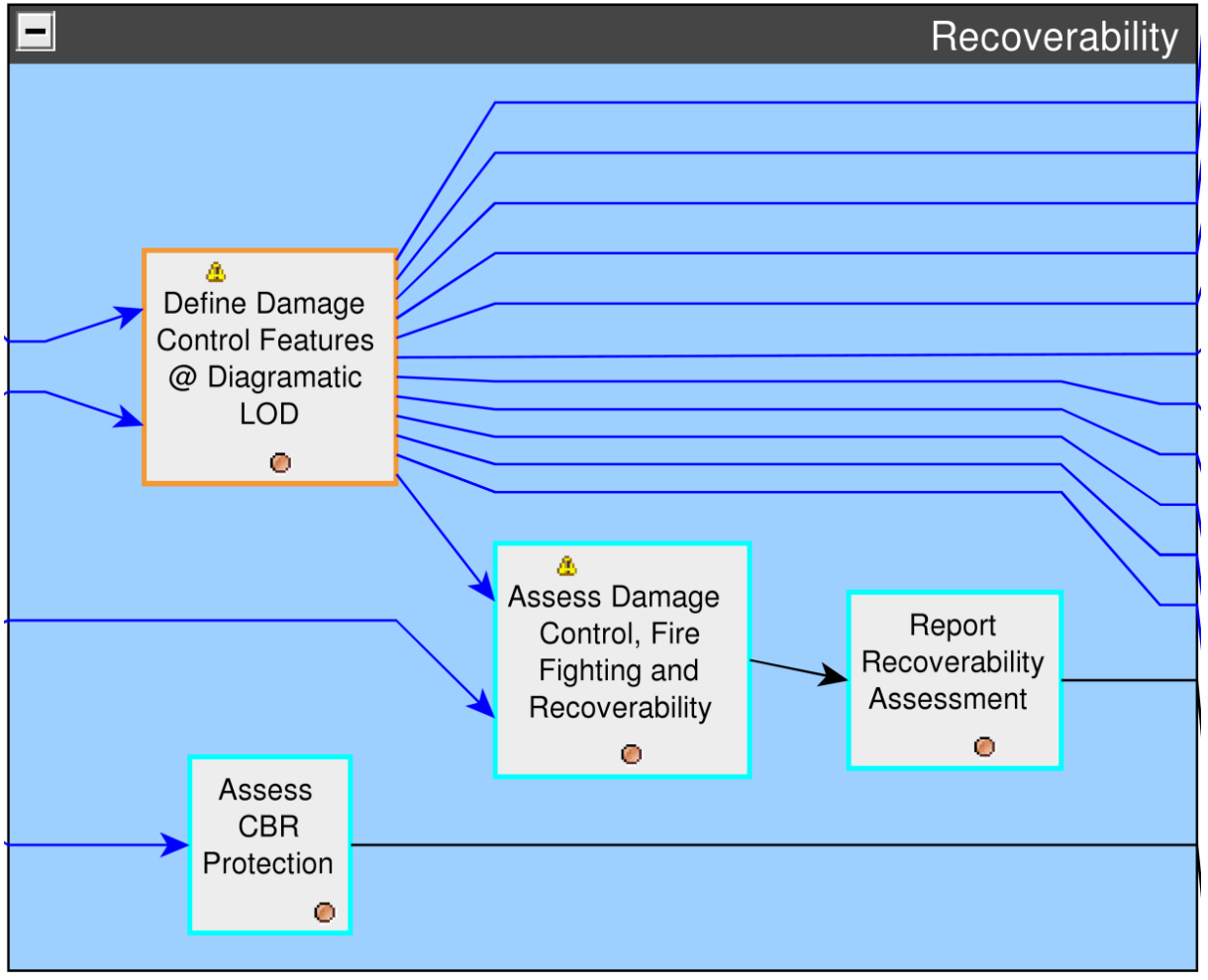
Activity	Assess Blast
Description	Evaluate the possibility and effect of a blast to the ship due to attack or severe operating conditions.
Labor	0.05 Seniors for 0.15 man days, 0.5 Journeymen for 1.5 man days, 0.4 Juniors for 1.2 man days
Duration	3 days

Vulnerability Activity Group

Activity	Assess Vulnerability
Description	Evaluate the vulnerability of the ship to the many types and effects of attack or severe operating conditions.
Labor	1 Senior for 0.5 man days, 0.5 Journeymen for 2.5 man days, 0.5 Juniors for 2.5 man days
Duration	5 days

Activity	Report Vulnerability Assessment
Description	Develop a concise report detailing the assessed vulnerability of the ship and deliver to design team.
Labor	1 Senior for 1 man day, 0.5 Journeymen for 5 man days, 0.5 Juniors for 5 man days
Duration	10 days

Activity Group: Recoverability



This picture shows the activities involved with the Recoverability Activity Group. The next pages show the individual Activities.

Recoverability Activity Group

Activity	Define Damage Control Features at Diagrammatic LOD
Description	Define with diagrams all features for damage control that allow the ship to return to port following an attack or explosion.
Labor	1 Journeyman for 5 man days
Duration	5 days

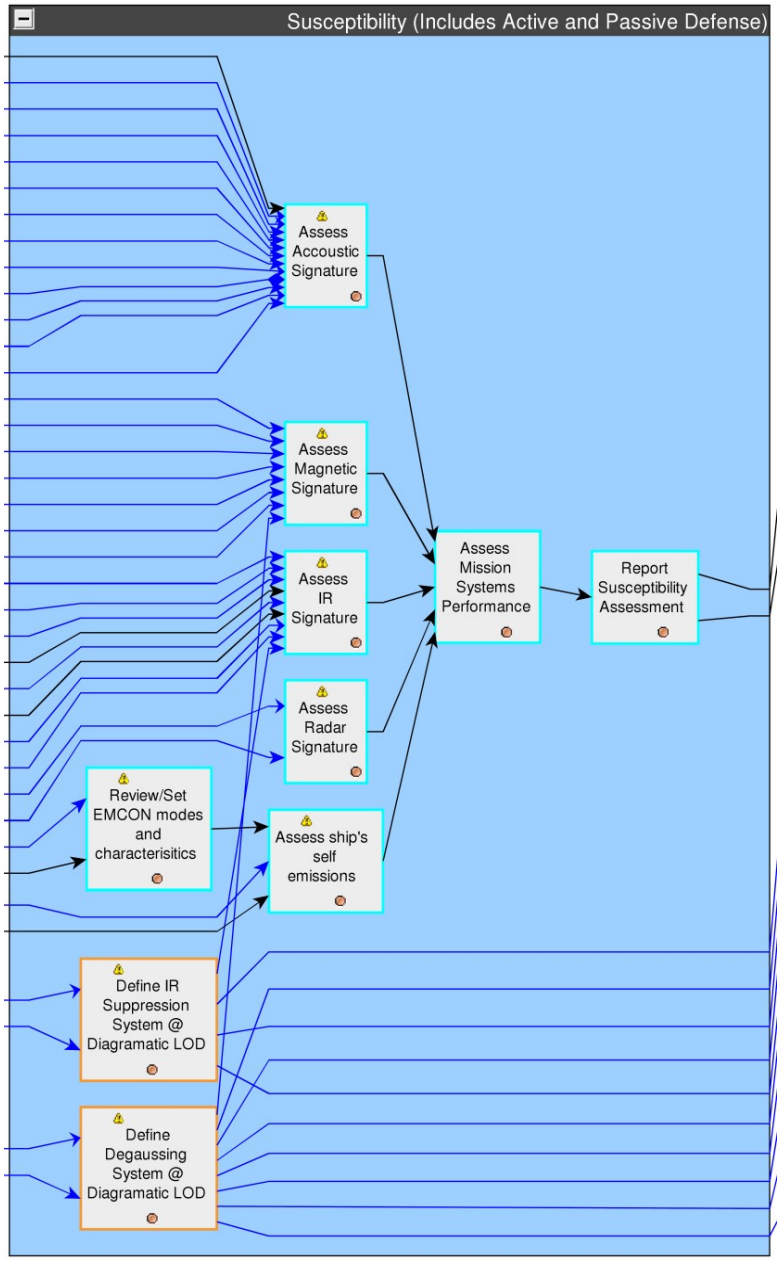
Activity	Assess CBR Protection
Description	Evaluate the ship's protection against chemical, biological, and radiological attacks for both the ship and the crew.
Labor	1 Journeyman for 5 man days
Duration	5 days

Activity	Assess Damage Control, Fire Fighting, and Recoverability
Description	Evaluate the ability of the ship to not be lost after attack, explosion or onboard fire and to return to port for repairs.
Labor	1 Journeyman for 10 man days
Duration	10 days

Recoverability Activity Group

Activity	Report Recoverability Assessment
Description	Develop a concise report detailing the recoverability of the ship and deliver to the design team.
Labor	0.25 Seniors for 1.25 man days, 0.5 Journeymen for 2.5 man days
Duration	5 days

Activity Group: Susceptibility



This picture shows the activities involved with the Susceptibility Activity Group. The next pages show the individual Activities.

Susceptibility Activity Group

Activity	Review/Set EMCON modes and characteristics
Description	Set a range of possible emission controls for the ship to avoid detection by exhaust signature locking.
Labor	0.75 Journeymen for 2.25 man days
Duration	3 days

Activity	Define IR Suppression System at Diagrammatic LOD
Description	Define with diagrams any systems to be implemented to reduce the heat signature of the ship.
Labor	0.75 Journeymen for 11.25 man days
Duration	15 days

Activity	Define Degaussing System at Diagrammatic LOD
Description	Define with diagrams any systems to be implemented to reduce the magnetic signature of the ship.
Labor	1 Journeyman for 5 man days
Duration	5 days

Susceptibility Activity Group

Activity	Assess Acoustic Signature
Description	Evaluate the acoustic signature of the ship and determine if the signature is an acceptable risk.
Labor	0.1 Seniors for 0.6 man days, 1 Journeyman for 6 man days, 1 Junior for 6 man days
Duration	6 days

Activity	Assess Magnetic Signature
Description	Evaluate the magnetic signature of the ship and determine if the signature is an acceptable risk.
Labor	0.2 Seniors for 2.8 man days, 0.5 Journeymen for 7 man days, 0.5 Juniors for 7 man days
Duration	14 days

Activity	Assess IR Signature
Description	Evaluate the infrared signature of the ship and determine if the signature is an acceptable risk.
Labor	0.75 Seniors for 3.5 man days, 0.25 Journeymen for 10.5 man days
Duration	14 days

Susceptibility Activity Group

Activity	Assess Radar Signature
Description	Evaluate the radar signature of the ship and determine if the signature is an acceptable risk.
Labor	0.1 Seniors for 0.3 man days, 1 Journeyman for 3 man days, 1 Junior for 3 man days
Duration	3 days

Activity	Assess ship's self emissions
Description	Evaluate the emissions of the ship and determine if these emissions are an acceptable risk.
Labor	0.25 Seniors for 3.75 man days, 0.25 Journeymen for 3.75 man days
Duration	15 days

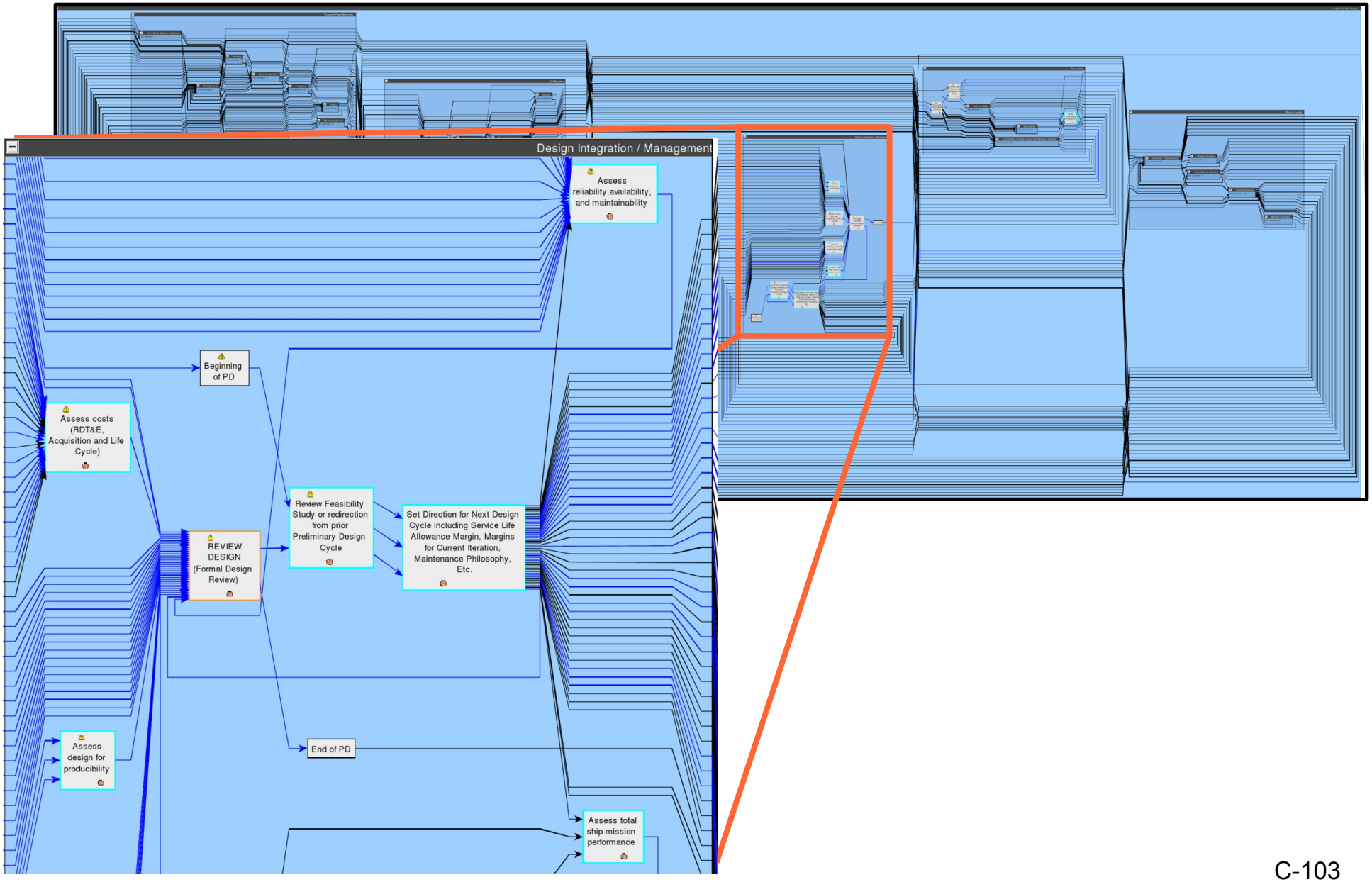
Activity	Assess Mission Systems Performance
Description	Evaluate the effectiveness of the mission systems for the given mission of the ship.
Labor	0.5 Seniors for 15 man days, 0.75 Journeymen for 22.5 man days
Duration	30 days

Susceptibility Activity Group

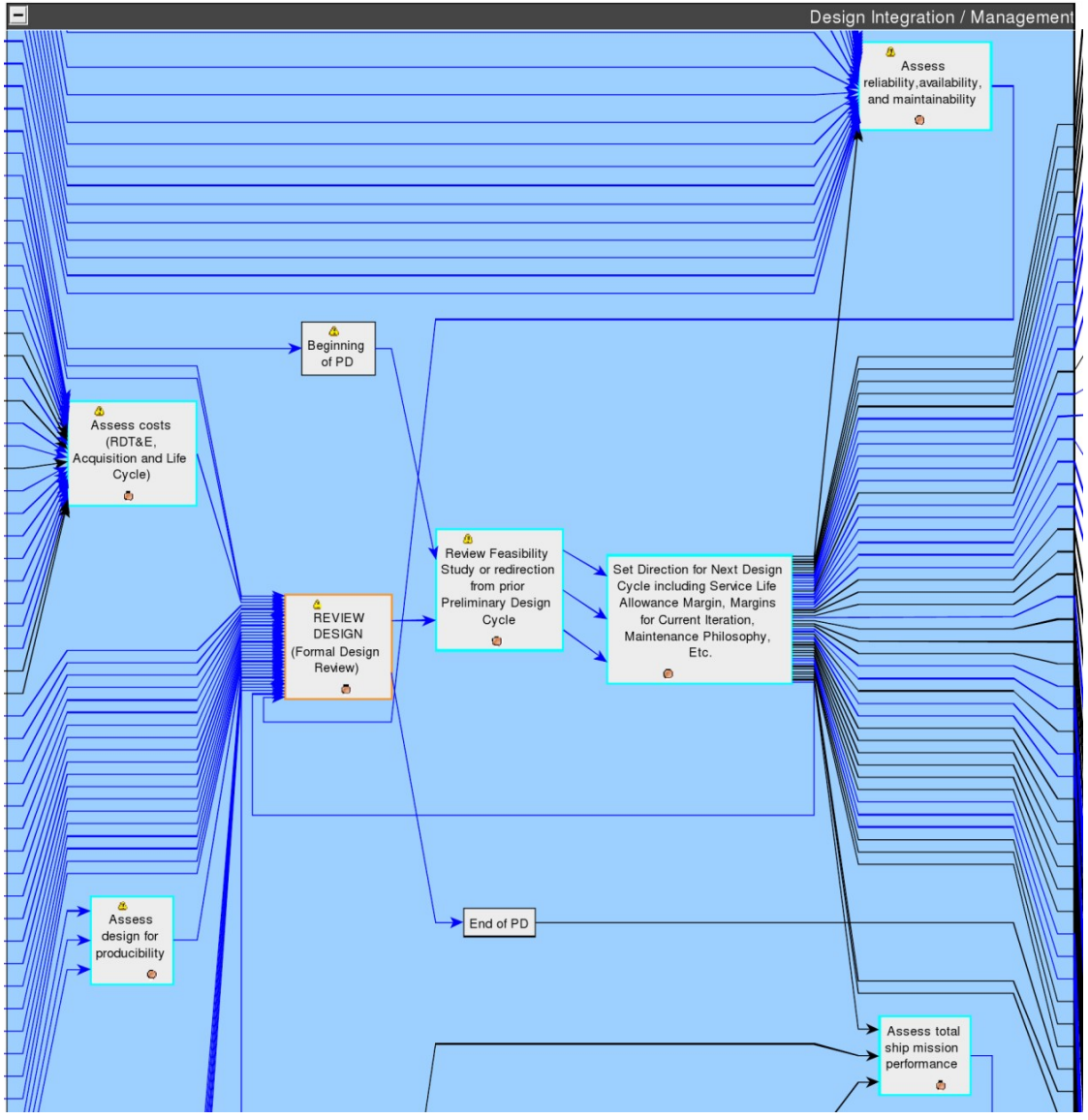
Activity	Report Susceptibility Assessment
Description	Develop a concise report detailing the susceptibility of the ship and deliver to design team.
Labor	0.1 Seniors for 1 man day, 0.5 Journeymen for 5 man days, 0.5 Juniors for 5 man days
Duration	10 days

Design Integration & Management Design Area

Shown is the Design Integration & Management Design Area from the greater Preliminary Design Process. The Activities are discussed on the next page.



Design Integration/ Management Activities



This picture shows the activity groups involved with the Design Integration & Management Design Area. The next pages show the individual Activities.

Design Integration/ Management Activities

Activity	Assess costs (RDT&E, Acquisition and Life Cycle)
Description	Evaluate the cost to design the ship, build the ship, and maintain the ship over the life cycle.
Labor	0.25 Seniors for 7.5 man days, 1 Journeymen for 30 man days
Duration	30 days

Activity	Assess design for producibility
Description	Evaluate the feasibility of producing the ship including need for the ship, work load, and budget.
Labor	1 Senior for 10 man days
Duration	10 days

Activity	Review Design (Formal Design Review)
Description	Formal review of previous designs or studies.
Labor	6 Seniors for 60 man days, 12 Journeymen for 120 man days, 12 Juniors for 120 man days
Duration	10 days

Design Integration/ Management Activities

Activity	Beginning of PD
Description	Start preliminary design and distribution of work load.
Labor	n/a
Duration	1 day

Activity	Review Feasibility Study or redirection from prior Preliminary Design Cycle
Description	Review the feasibility study to understand work break down as well as direction for design process.
Labor	7 Seniors for 35 man days, 7 Journeymen for 35 man days
Duration	5 days

Activity	End of PD
Description	Finish preliminary design and review for advancement.
Labor	n/a
Duration	1 day

Design Integration/ Management Activities

Activity	Set Direction for Next Design Cycle…
Description	Set the necessary direction of the next design cycle to advance the project if the design is still feasible.
Labor	3 Seniors for 9 man days
Duration	3 days

Activity	Assess reliability, availability, and maintainability
Description	Evaluate the requirements for acquiring the ship, the ship's ability to perform the intended mission regularly, and the ability of the ship to be reasonably and economically maintained over it's service life.
Labor	0.05 Seniors for 2.5 man days, 1 Journeyman for 50 man days
Duration	50 days

Activity	Assess total ship mission performance
Description	Evaluate the mission performance of the ship and determine if the ship is capable of performing the intended mission without unreasonable risks.
Labor	3 Seniors for 9 man days, 3 Journeymen for 9 man days
Duration	3 days