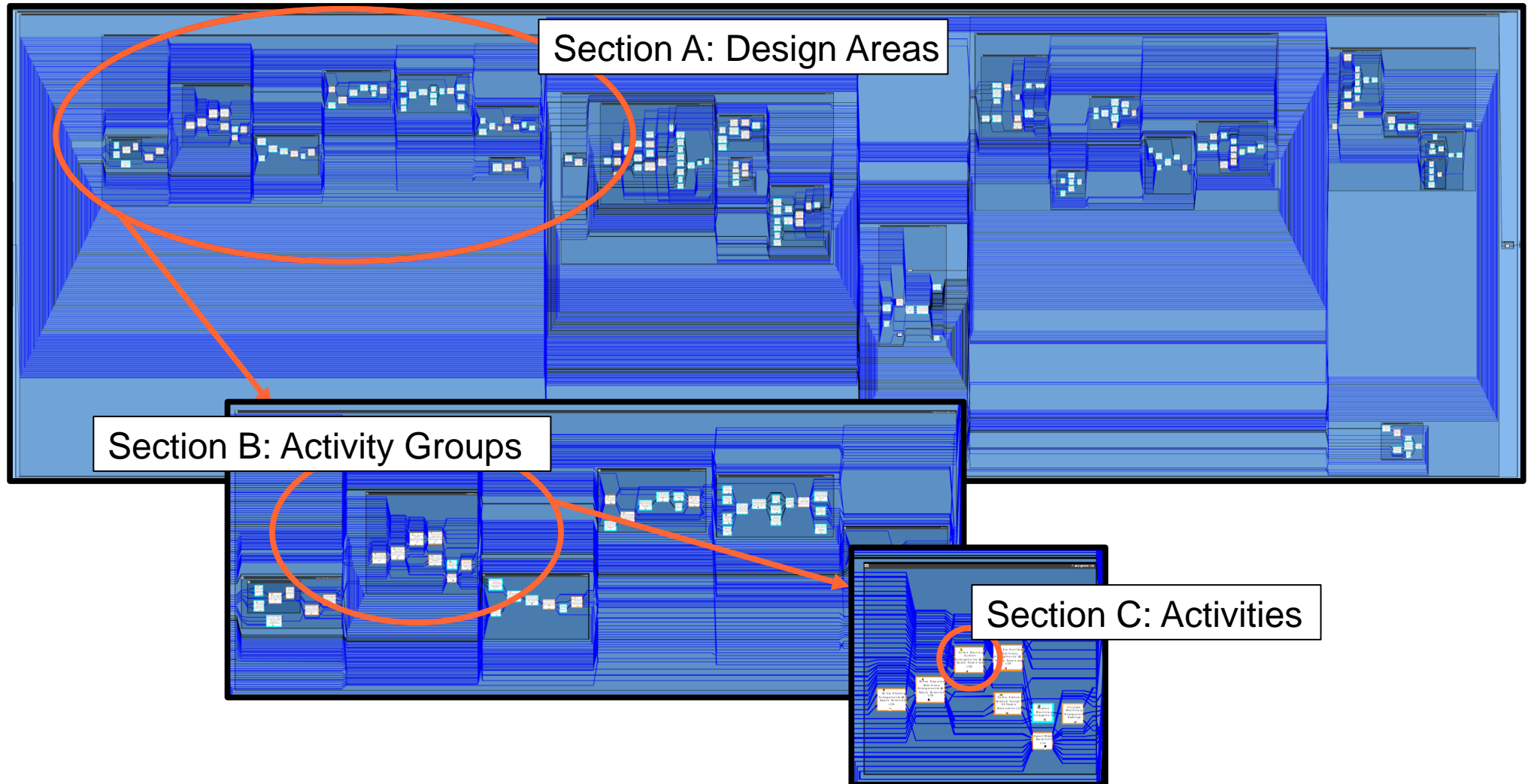


Section B – Design Activity Groups



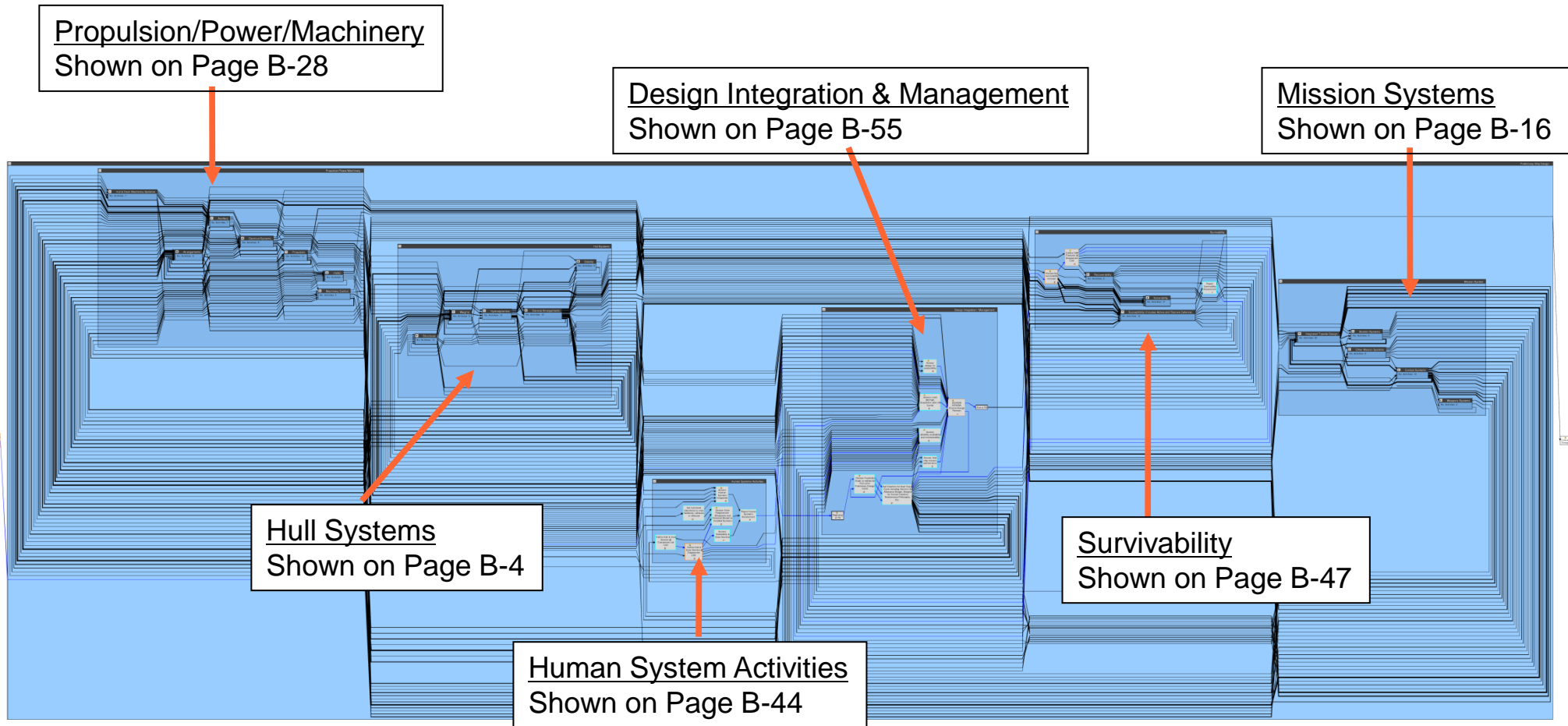
Section A introduced the Naval Ship Design Process. The six Design Areas in Preliminary Design were defined and the different Activity Groups introduced. Section B defines the Activity Groups for all the Design Areas. The Activity Groups are shown with descriptions, followed by inputs and outputs. Detailed descriptions for each Activity are in Section C.

The Navy Ship Design Process

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Structures	
Weights	
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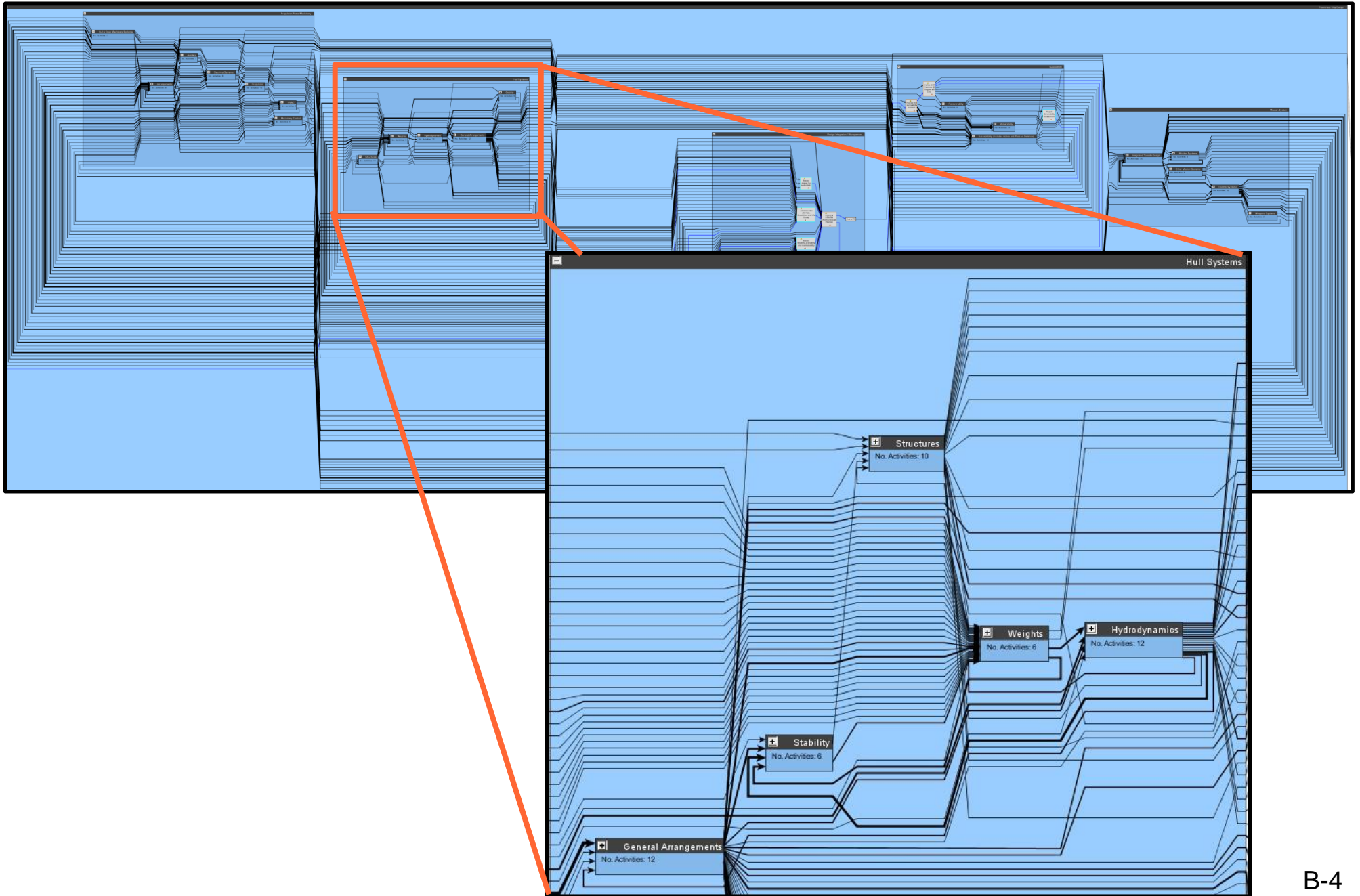
Preliminary Design – Expanded View



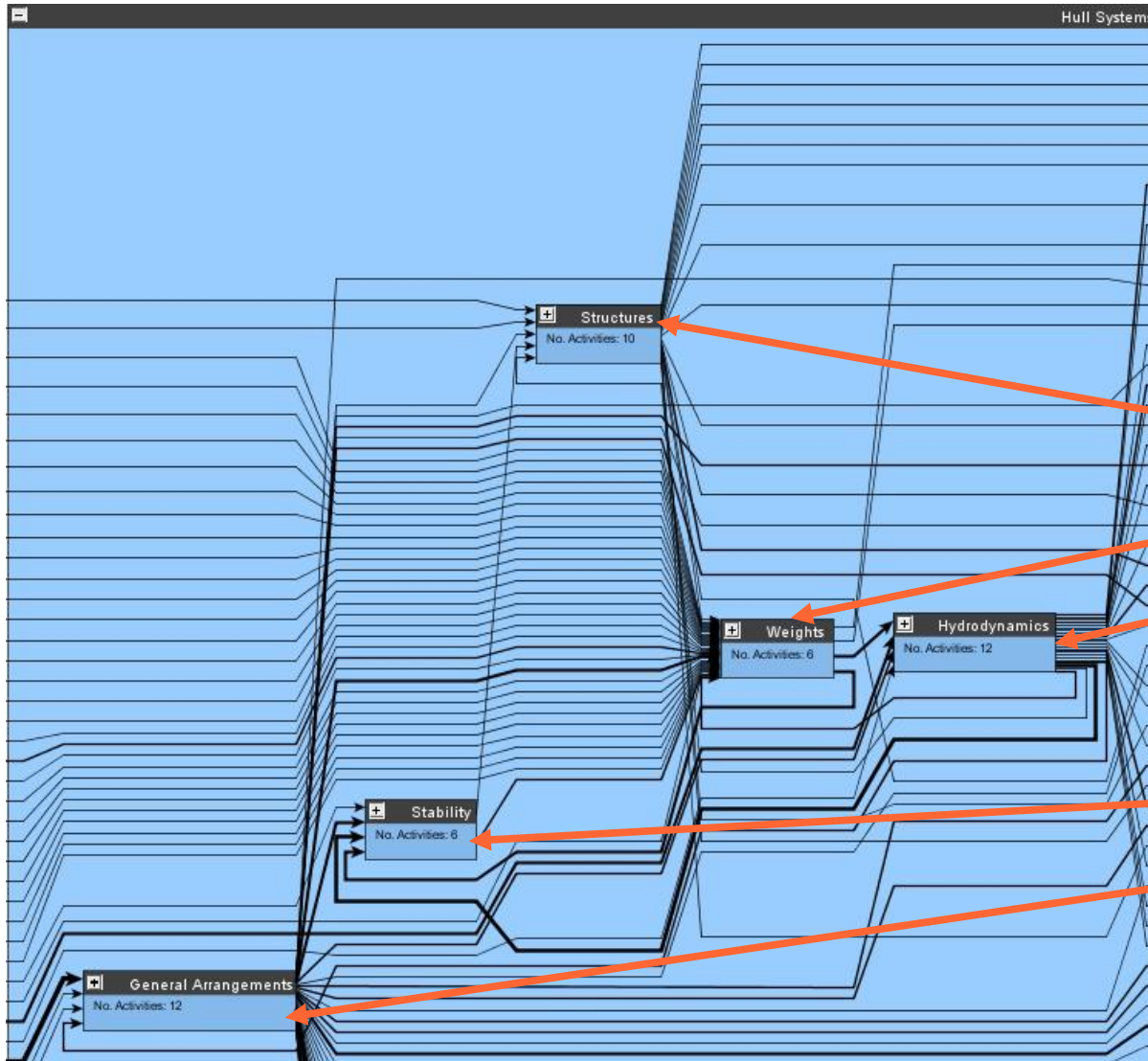
The Preliminary Design Process expanded to 2-levels of detail.

Hull Systems Design Area

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



Hull Systems Activity Groups



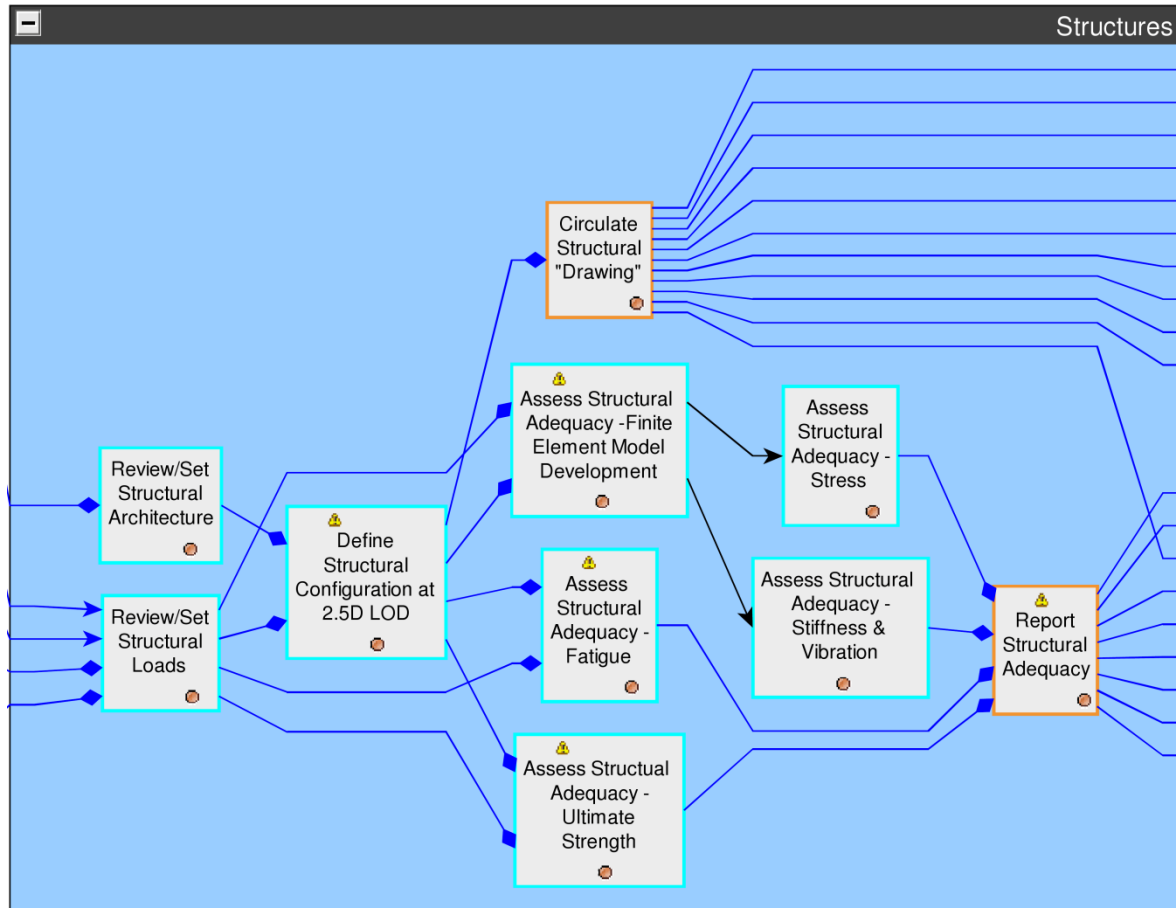
This picture shows the activity groups involved with the Hull Systems Design Area. The next page shows the input and output activities that link Hull Systems Activity Groups.

This group focuses on the activities needed to ensure the ship “floats”.

The primary Activity Groups include:

1. **Structures** (Page B-6)
2. **Weights** (Page B-8)
3. **Hydrodynamics** (Page B-10)
4. **Stability** (Page B-12)
5. **General Arrangements** (Page B-14)

Hull Systems Activity Group: Structures



This picture shows the activities involved with the Structures Activity Group. The next page shows the input and output activities.

This group focuses on the structural integrity of the design needed to withstand environmental conditions and a degree of external damage.

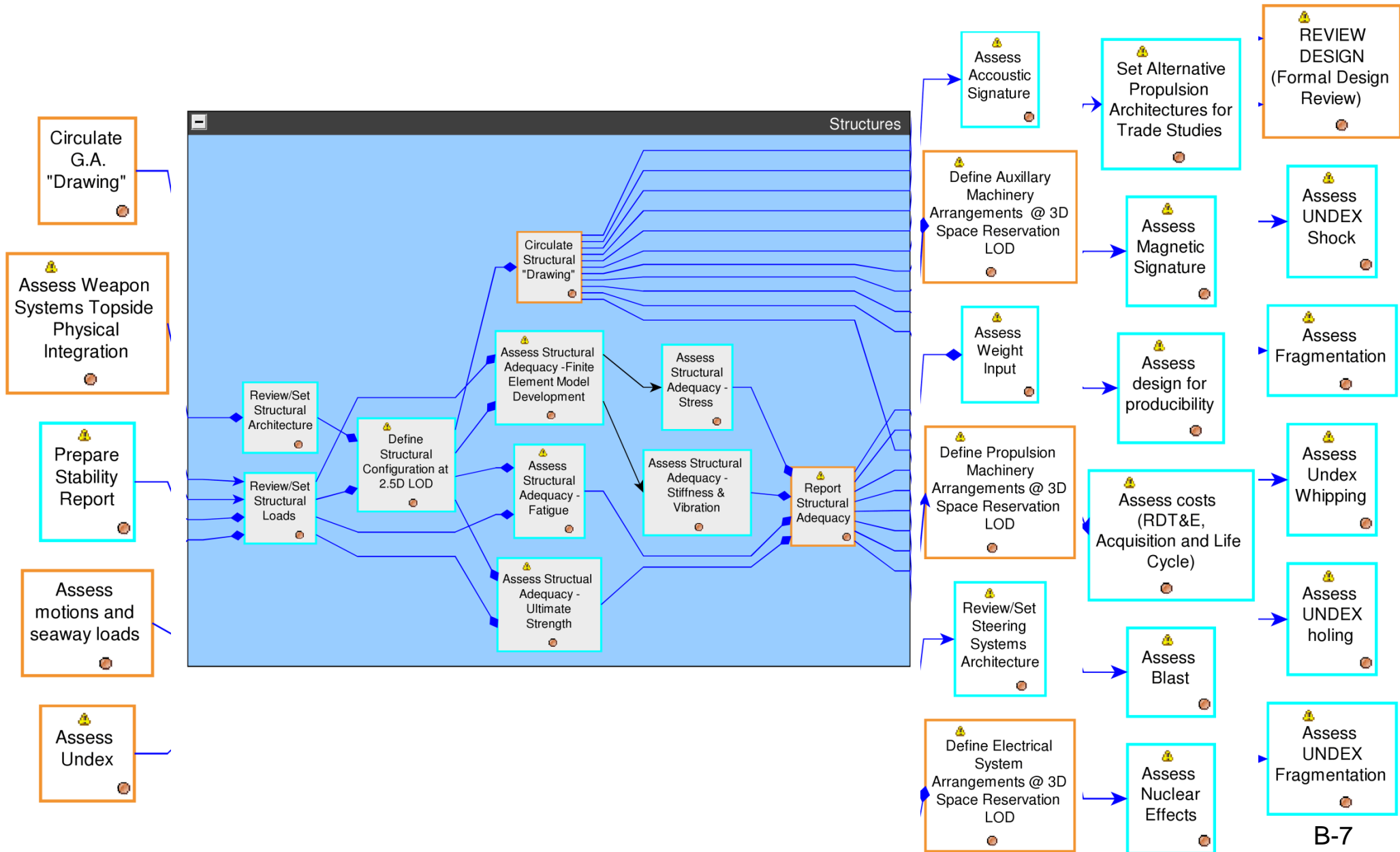
Descriptions of the activities are in Section C.

Hull Systems Activity Group: Structures

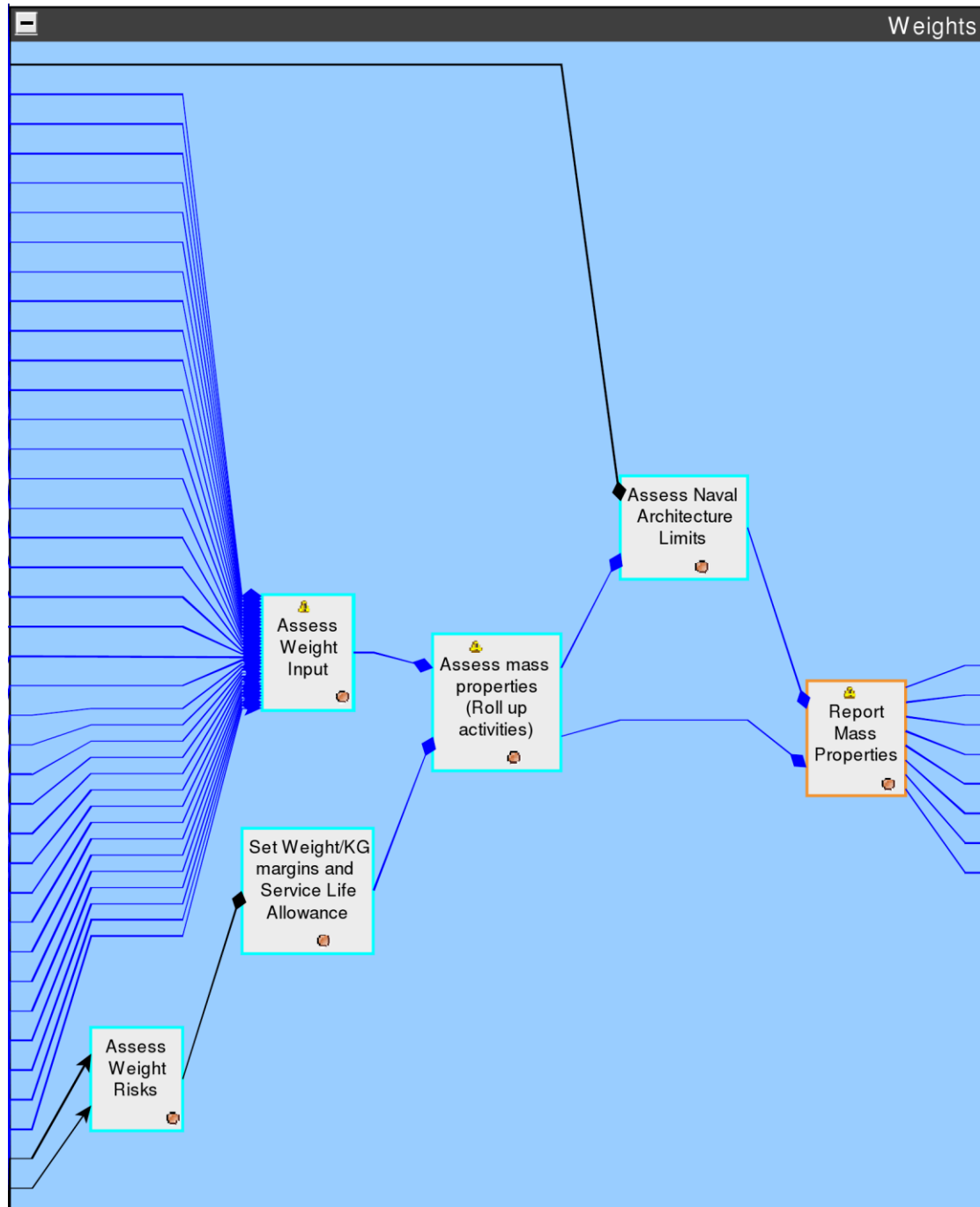
Inputs

Activities

Outputs



Hull Systems Activity Group: Weights



This picture shows the activities involved with the Weights Activity Group. The next page shows the input and output activities.

This group focuses on vessel weight and center of gravity.

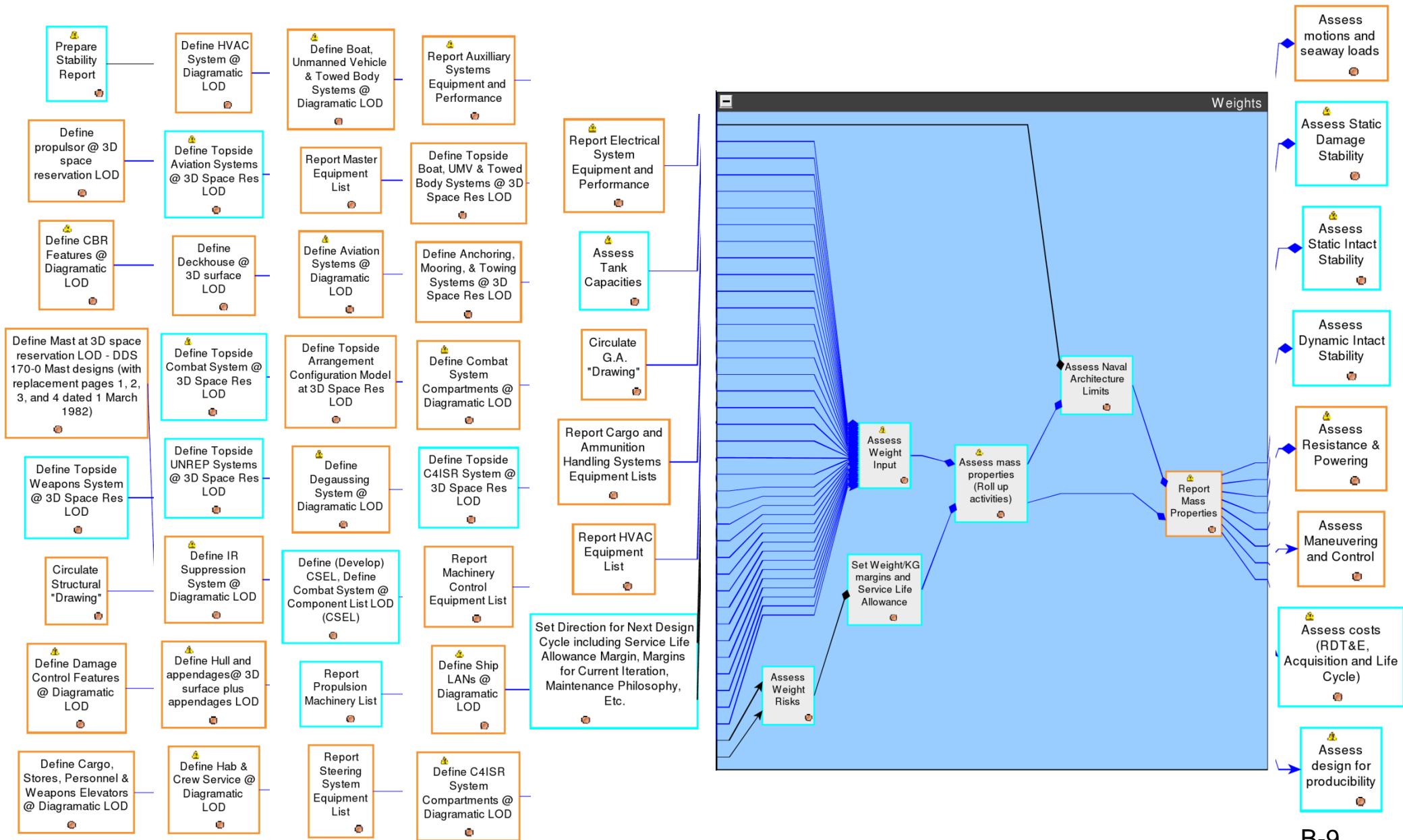
Descriptions of the activities are in Section C.

Hull Systems Activity Group: Weights

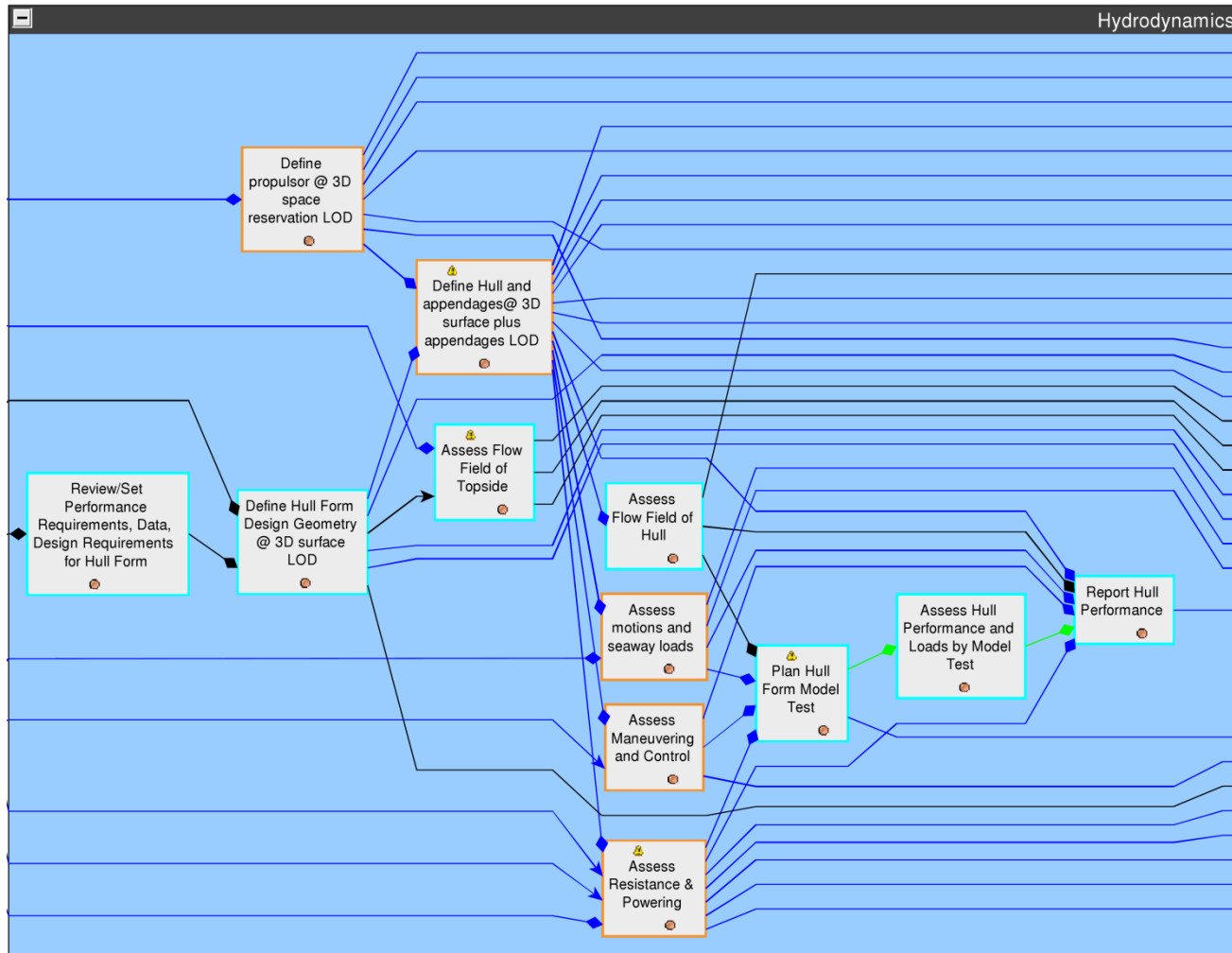
Inputs

Activities

Outputs



Hull Systems Activity Group: Hydrodynamics



This picture shows the activities involved with the Hydrodynamics Activity Group. The next page shows the input and output activities.

This group focuses on the hullform and its seaworthiness.

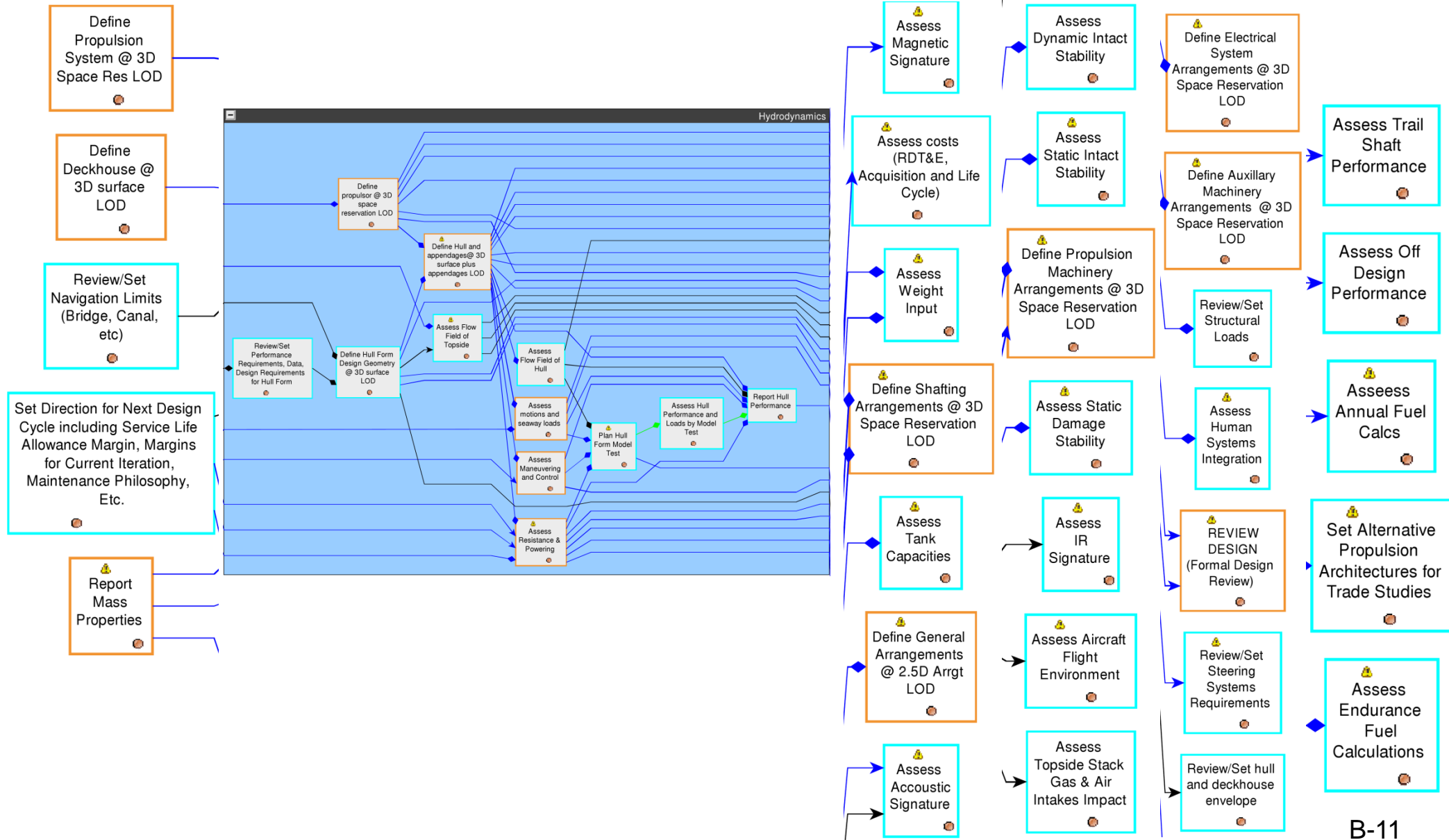
Descriptions of the are in Section C.

Hull Systems Activity Group: Hydrodynamics

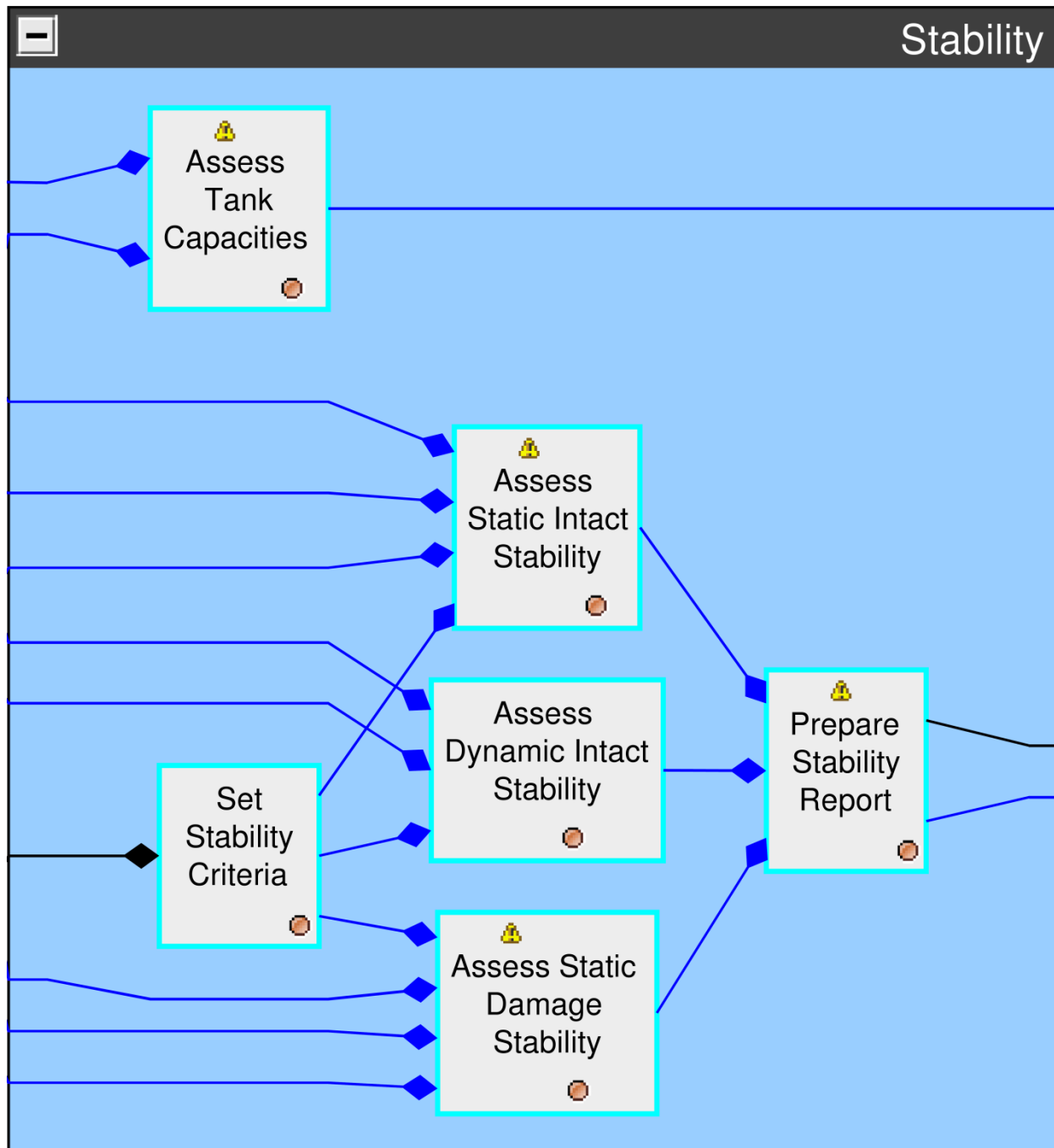
Inputs

Activities

Outputs



Hull Systems Activity Group: Stability



This picture shows the activities involved with the Stability Activity Group. The next page shows the input and output activities.

This group focuses whether the design will float upright under specific conditions.

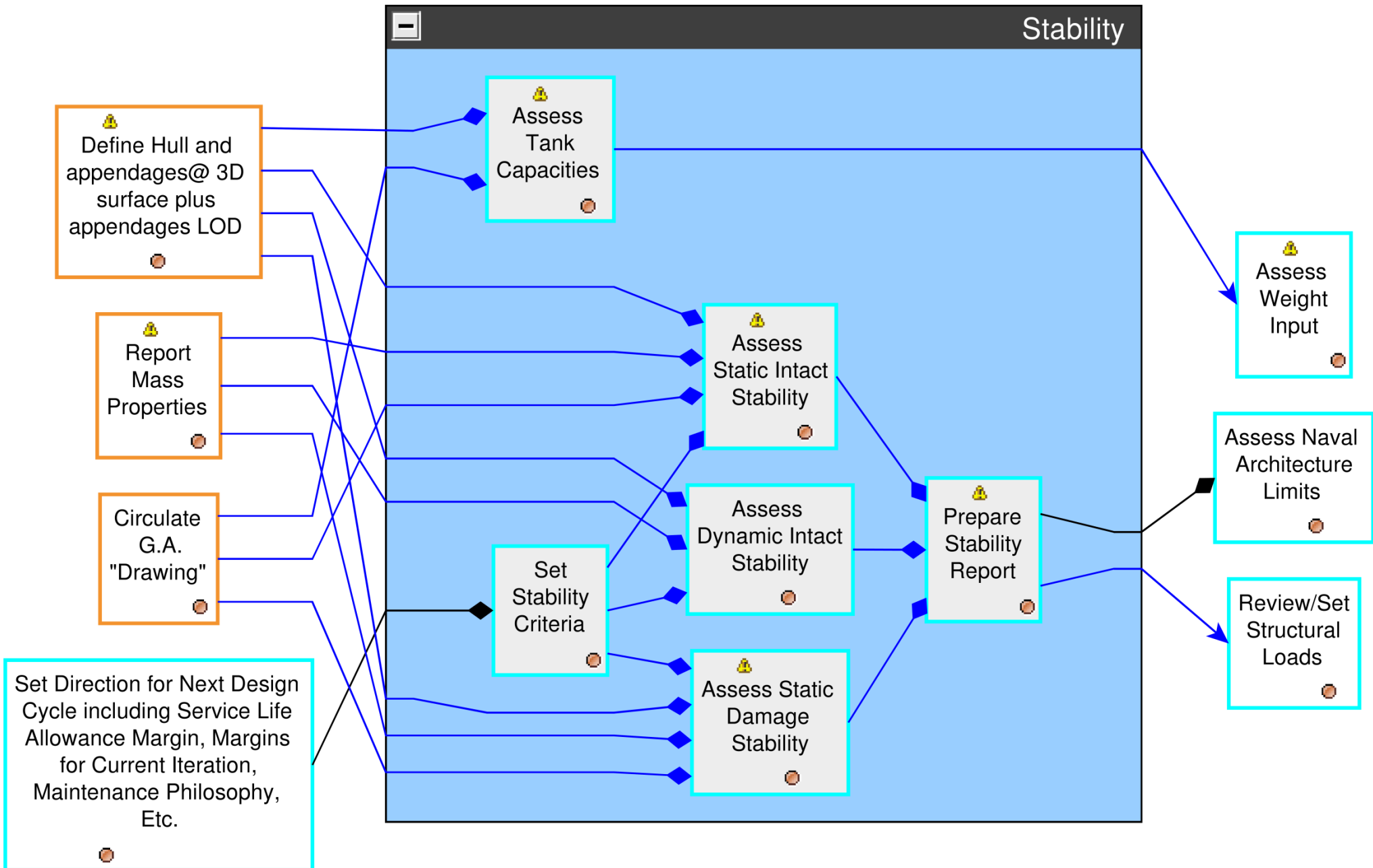
Descriptions of the activities are in Section C.

Hull Systems Activity Group: Stability

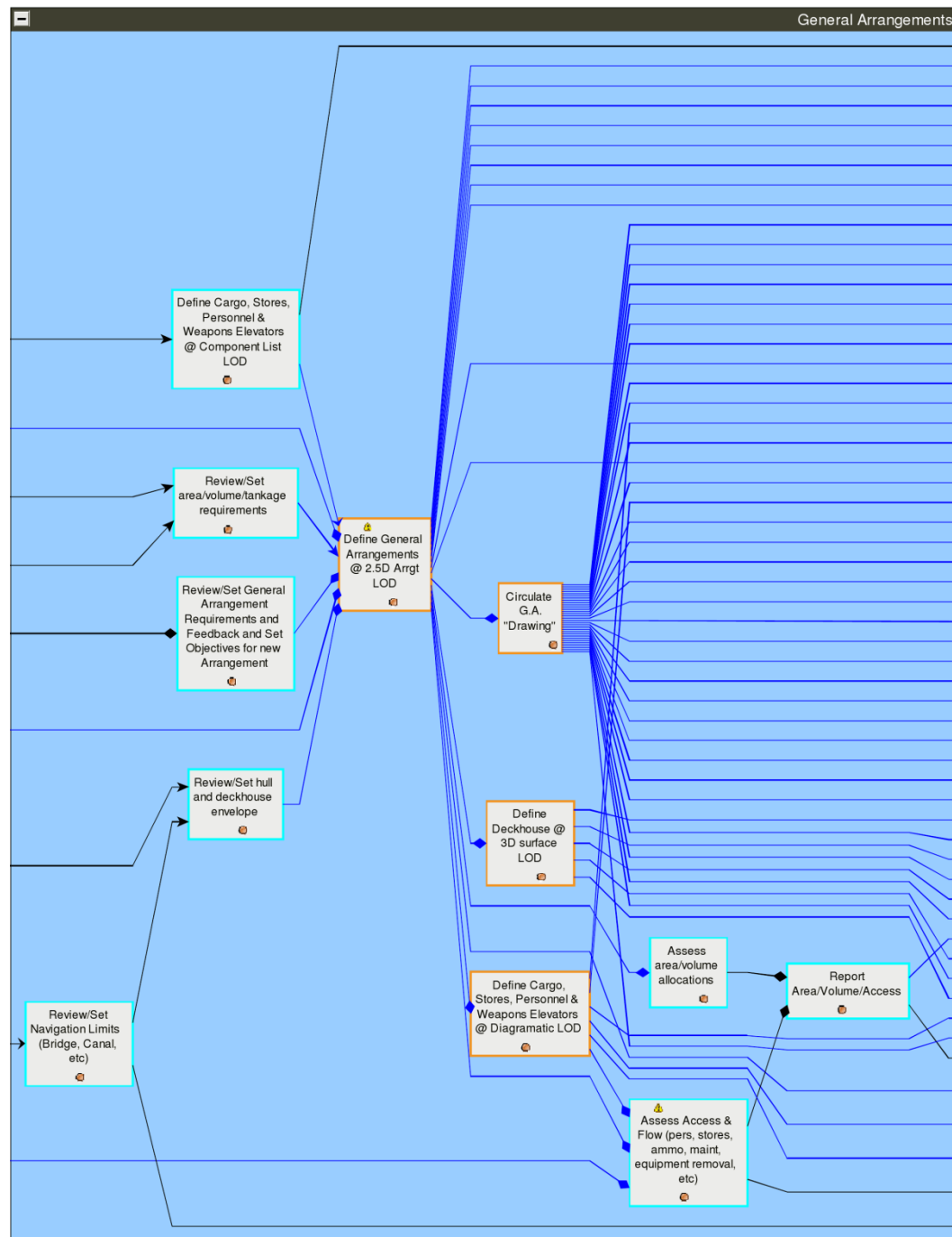
Inputs

Activities

Outputs



Hull Systems Activity Group: General Arrangements



This picture shows the activities involved with the General Arrangements Activity Group. The next page shows the input and output activities.

This group primarily focuses on onboard space allocation for the ship's equipment and systems and their areas/volumes.

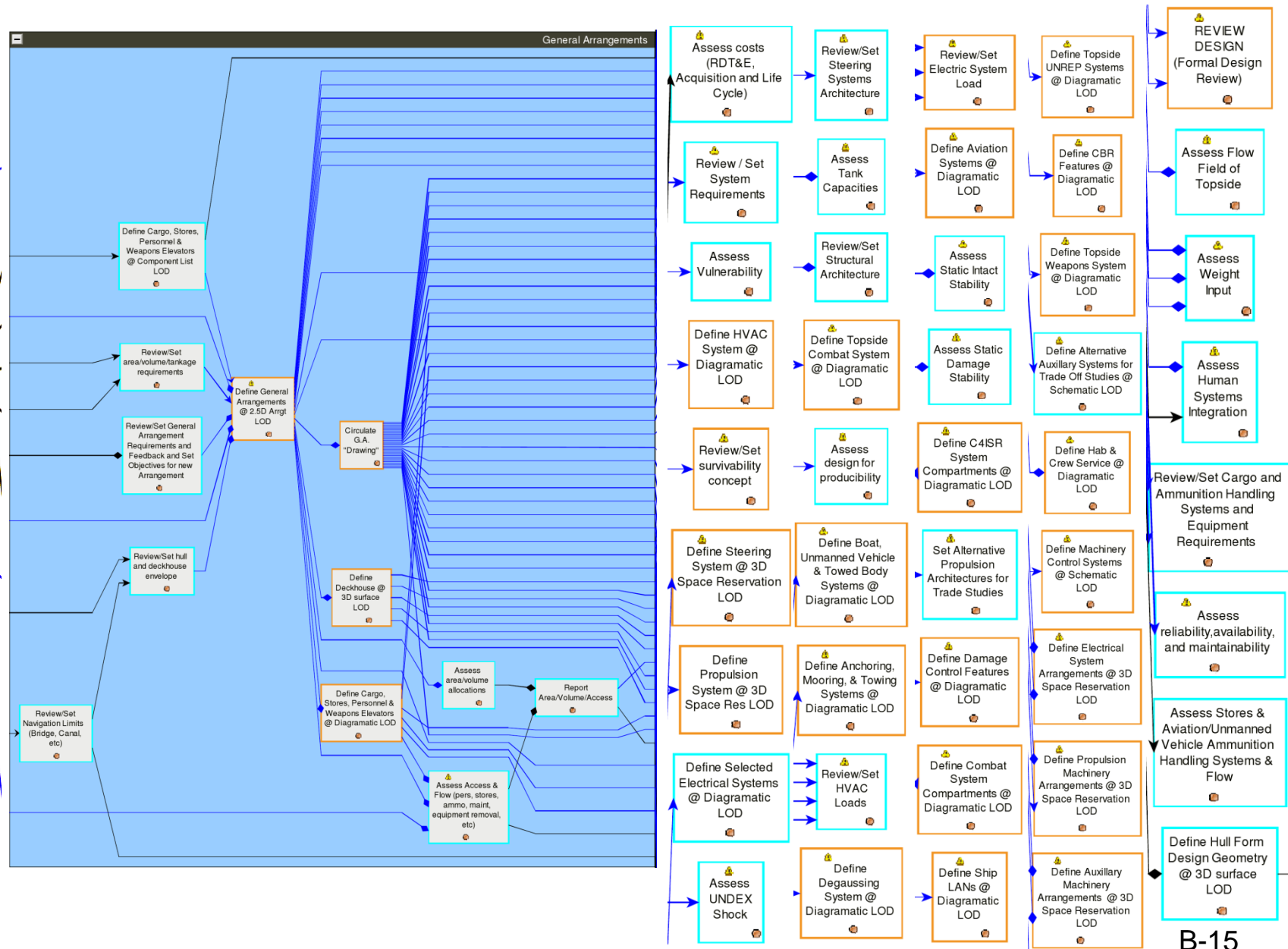
Descriptions of the activities are in Section C.

Hull Systems Activity Group: General Arrangements

Inputs

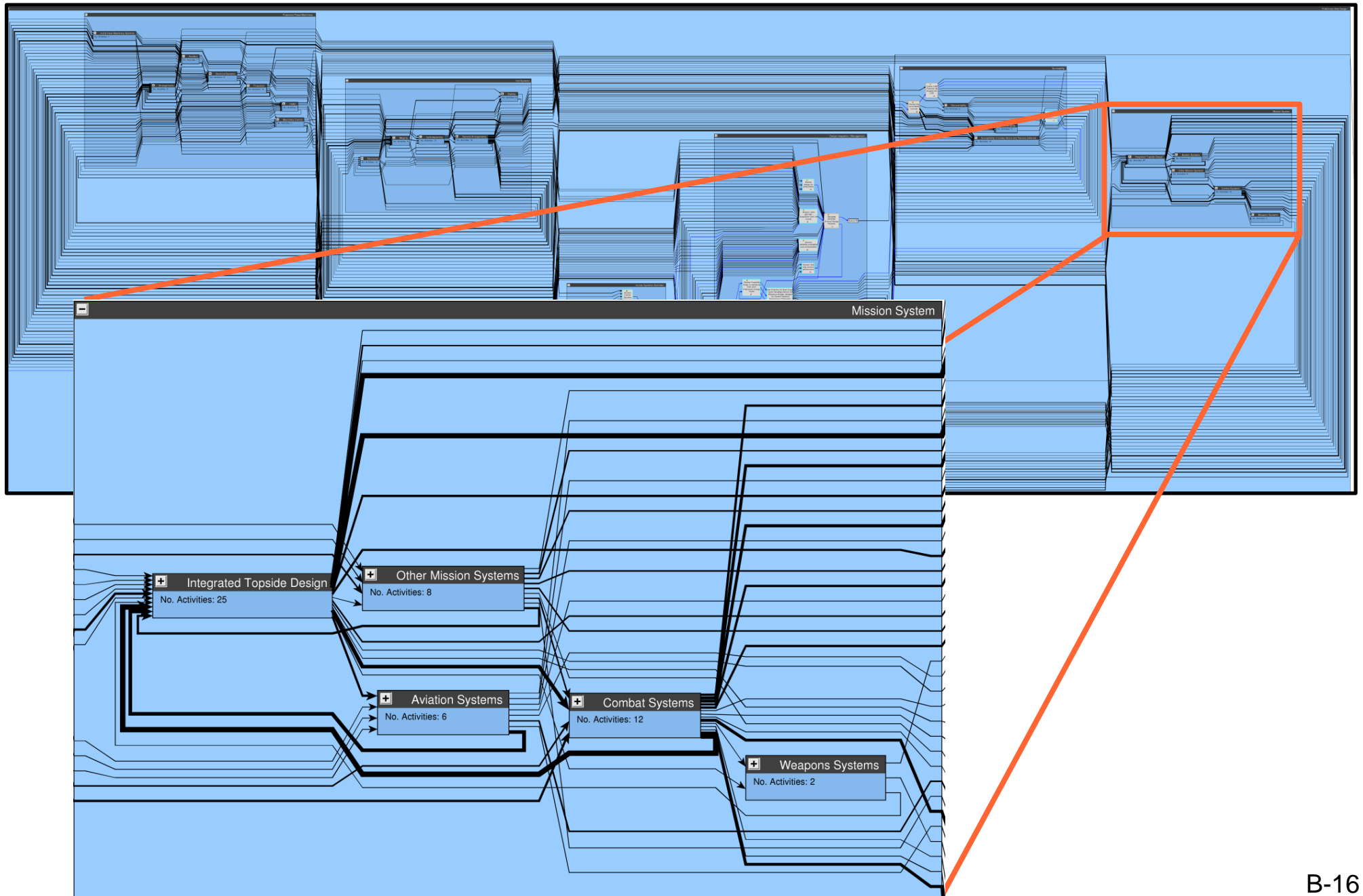
Activities

Outputs



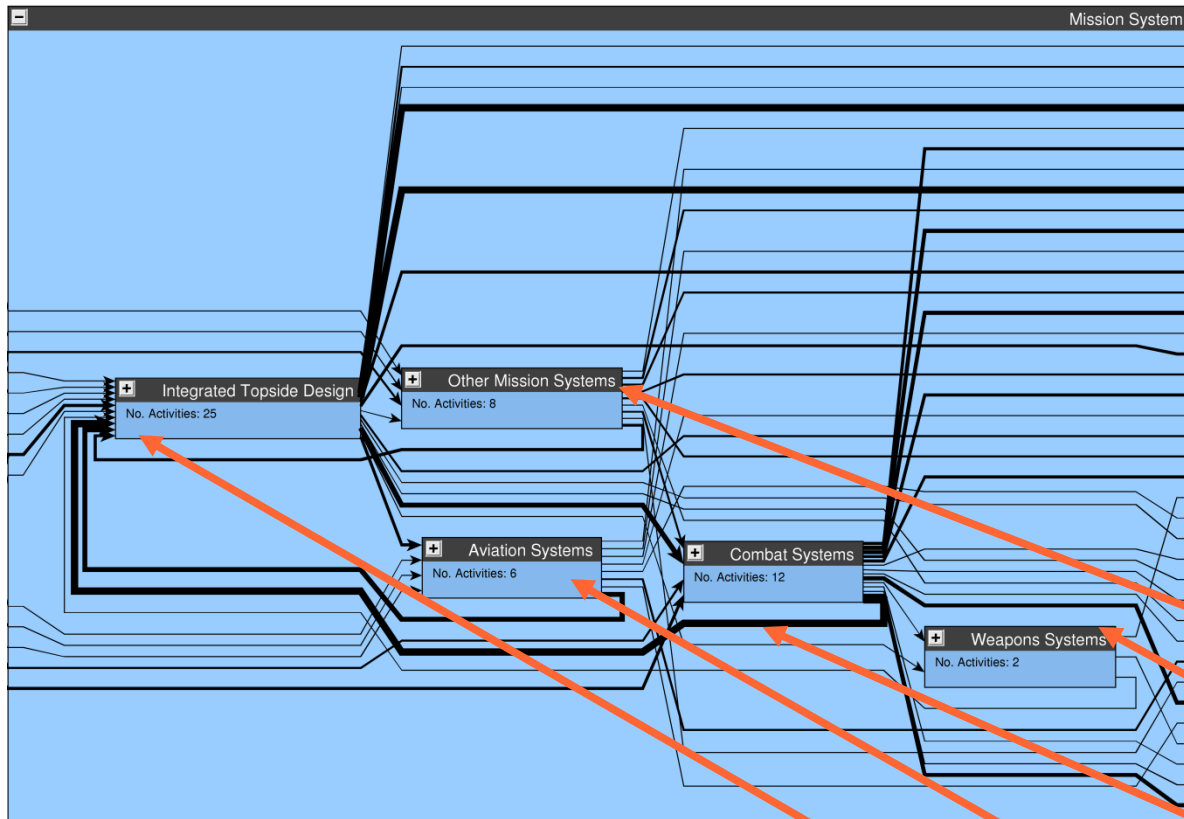
Mission Systems Design Area

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



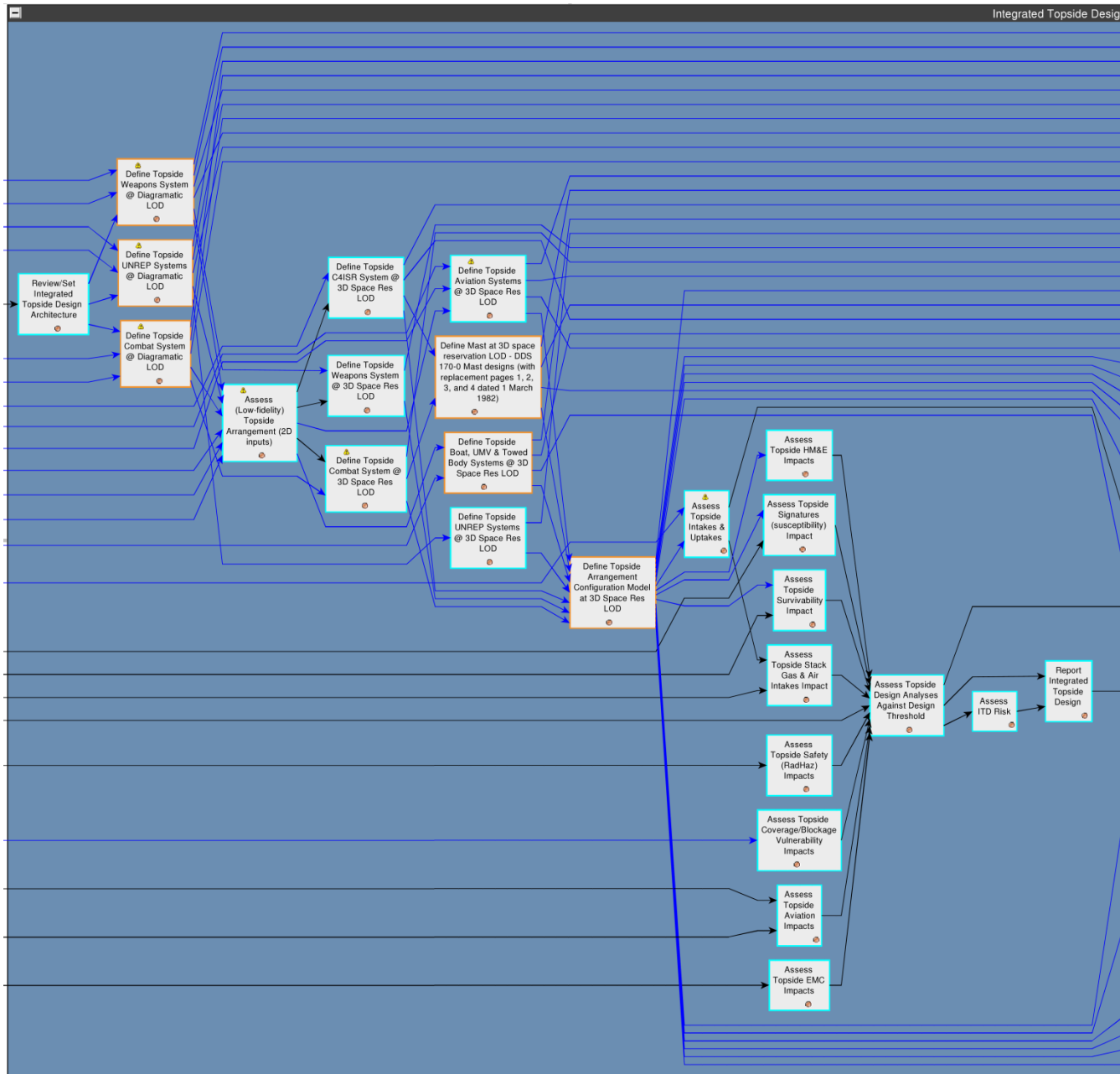
This picture shows the activity groups involved with the Mission Systems Design Area. The next page shows the input and out put activities that link Mission Systems Activity Groups.

This group focuses on the activities needed to ensure the ship “fights”. The Mission Systems is one of the critical Naval Design Areas; without it, there is little to distinguish the design with a commercial ship.

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

1. **Other Mission Systems** (Page B-26)
2. **Weapon Systems** (Page B-22)
3. **Combat Systems** (Page B-20)
4. **Aviation Systems** (Page B-24)
5. **Integrated Topside Design** (Page B-18)

Mission Systems Activity Group: Integrated Topside Design



This picture shows the activities involved with the Integrated Topside Design Activity Group. The next page shows the input and output activities.

This group focuses on structure and systems above the main deck.

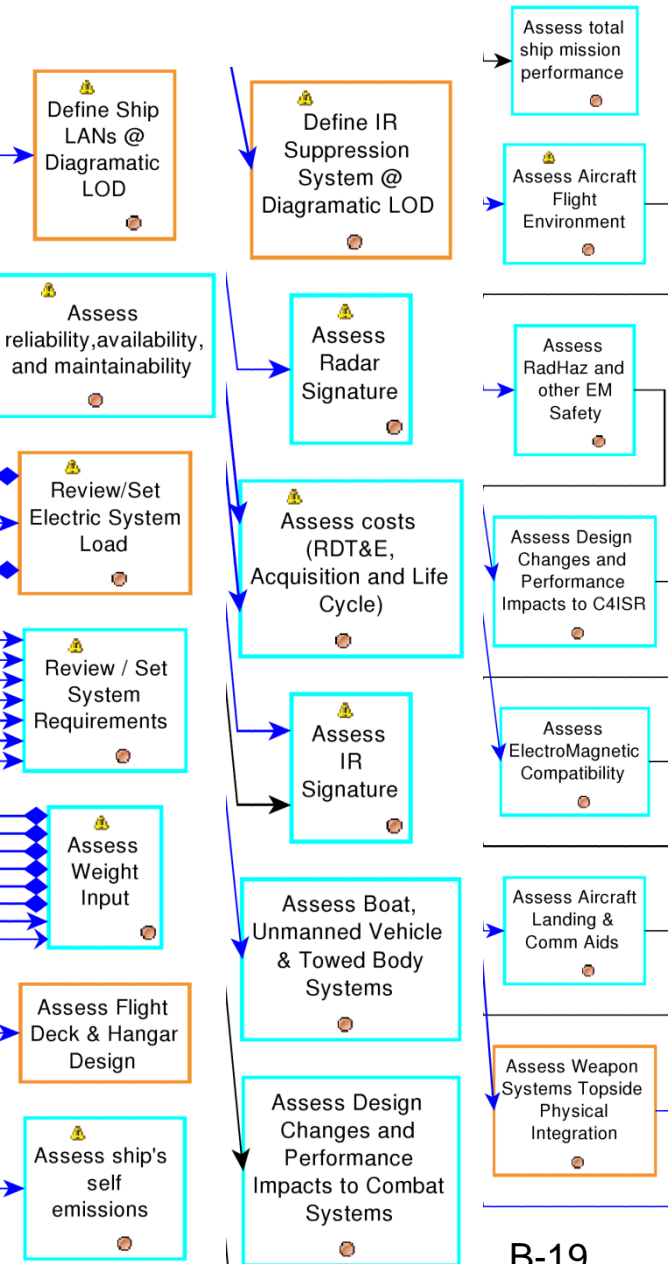
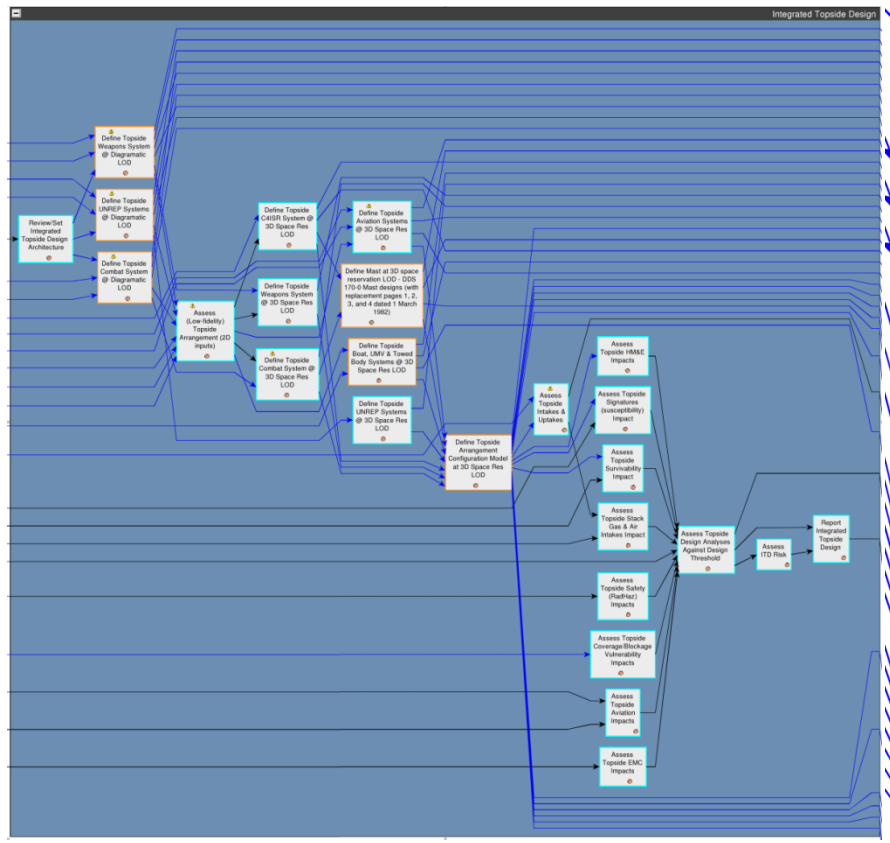
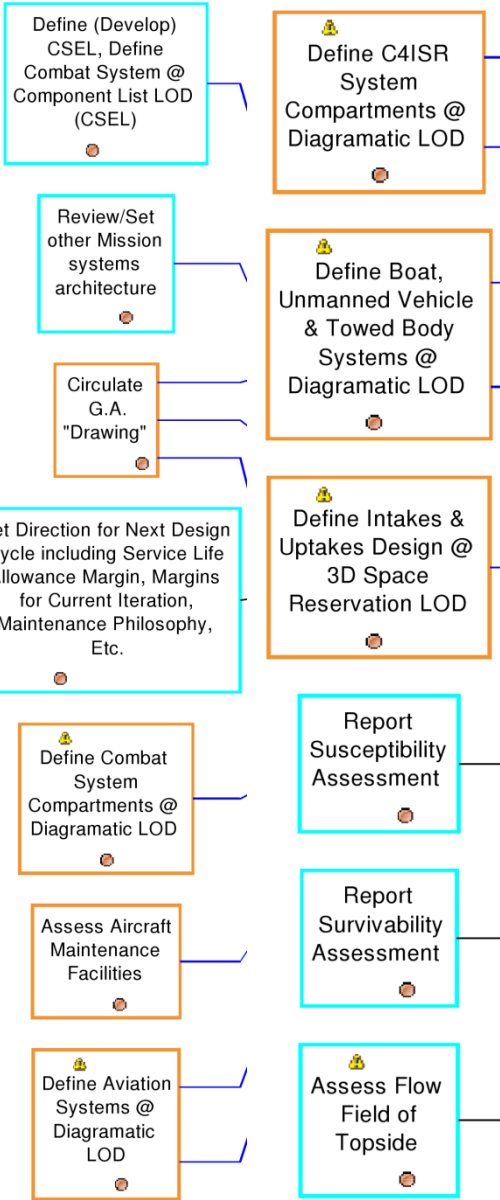
Descriptions of the activities are in Section C.

Mission Systems Activity Group: Integrated Topside Design

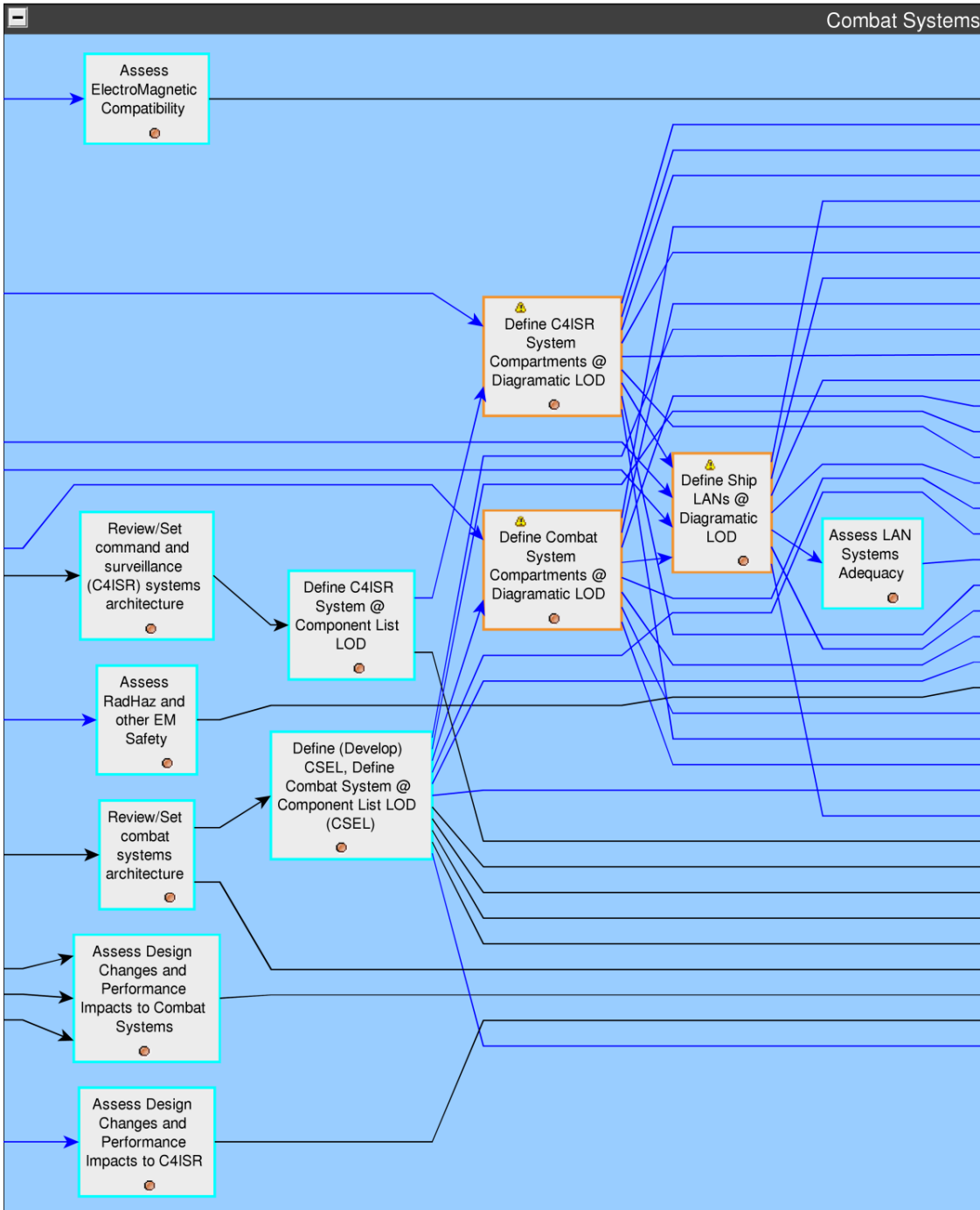
Inputs

Activities

Outputs



Mission Systems Activity Group: Combat Systems



This picture shows the activities involved with the Combat Systems Activity Group. The next page shows the input and output activities.

This group focuses on the interfaces between the weapon systems and the rest of the ship & crew.

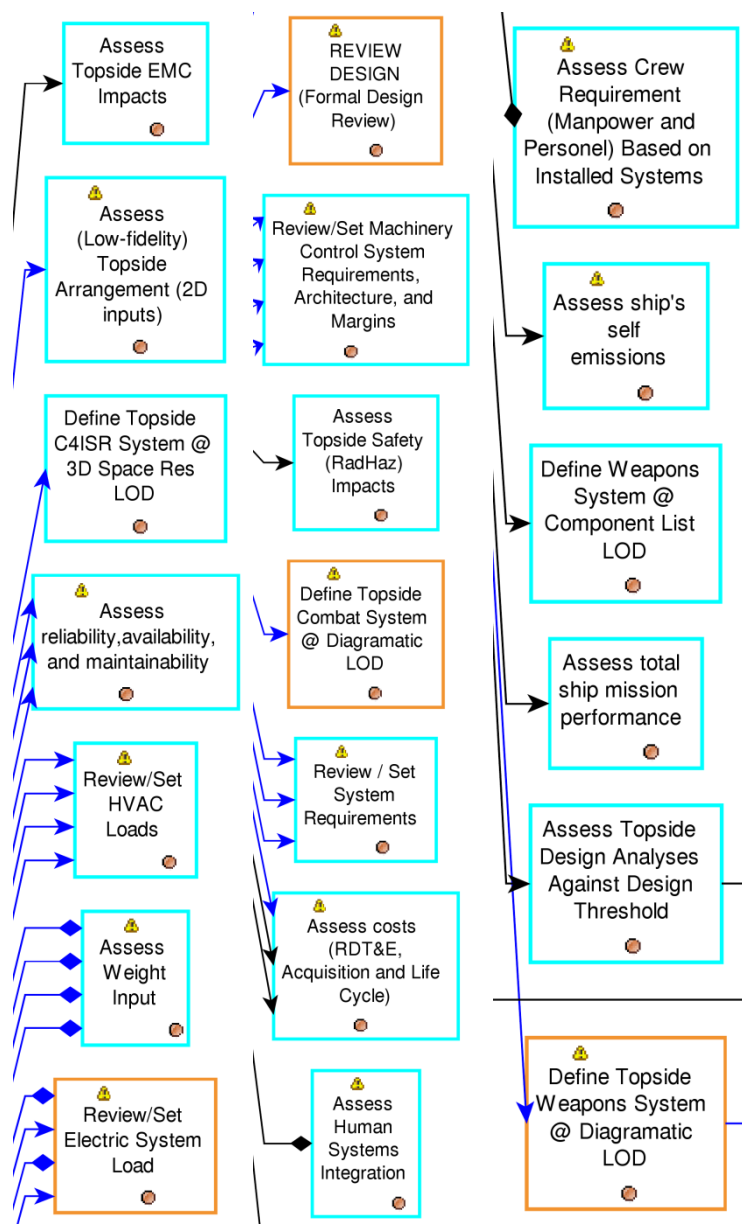
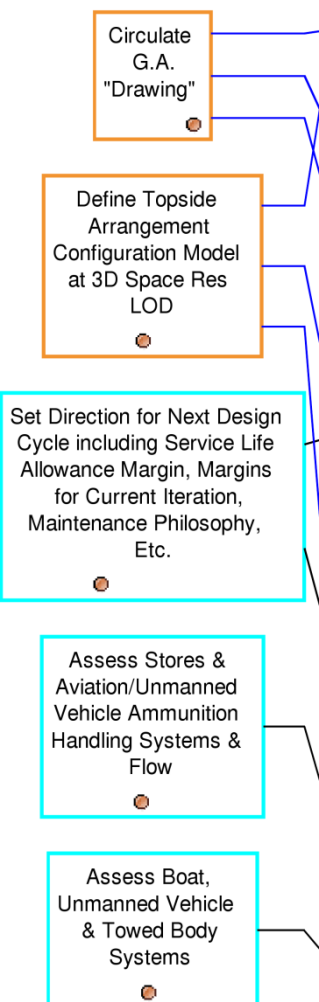
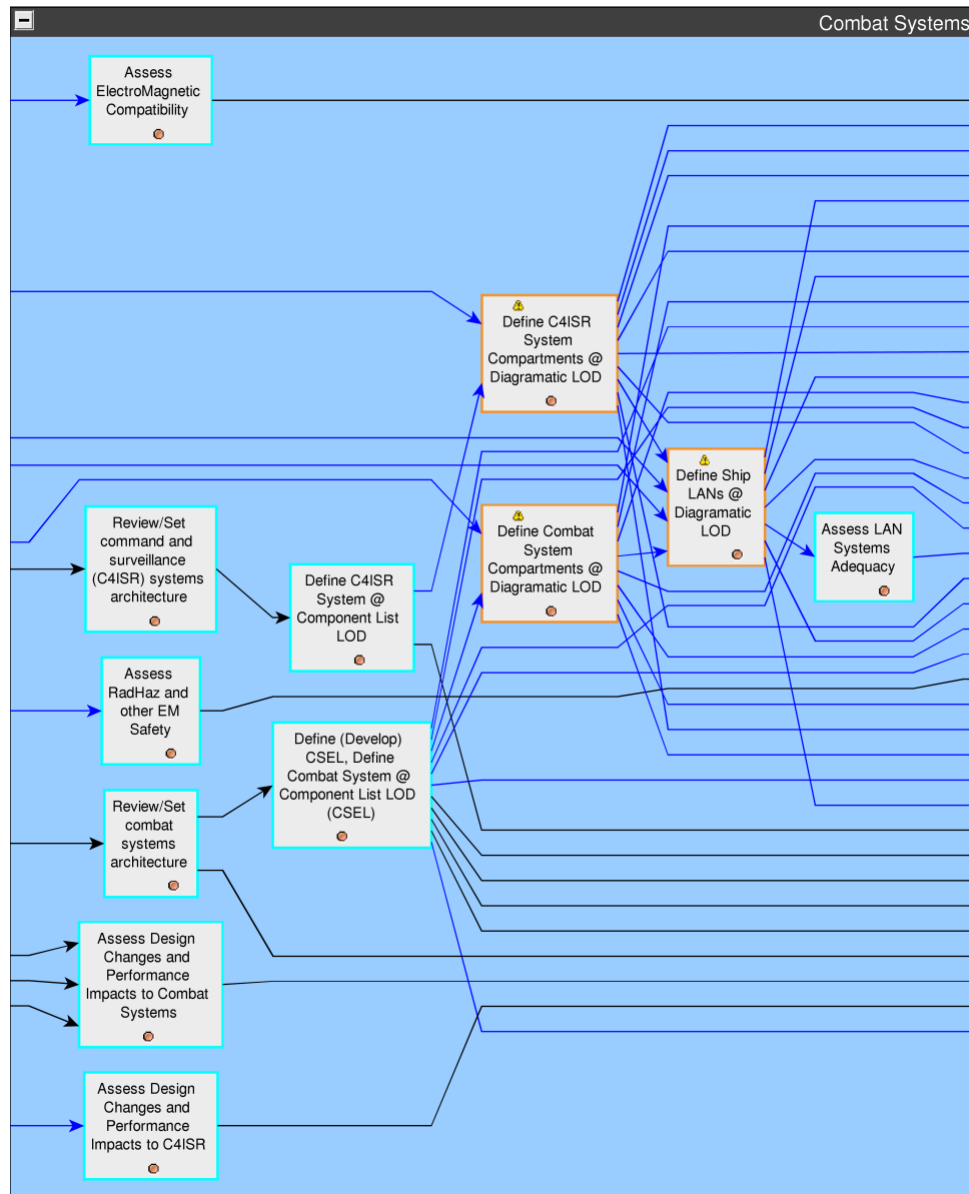
Descriptions of the activities are in Section C.

Mission Systems Activity Group: Combat Systems

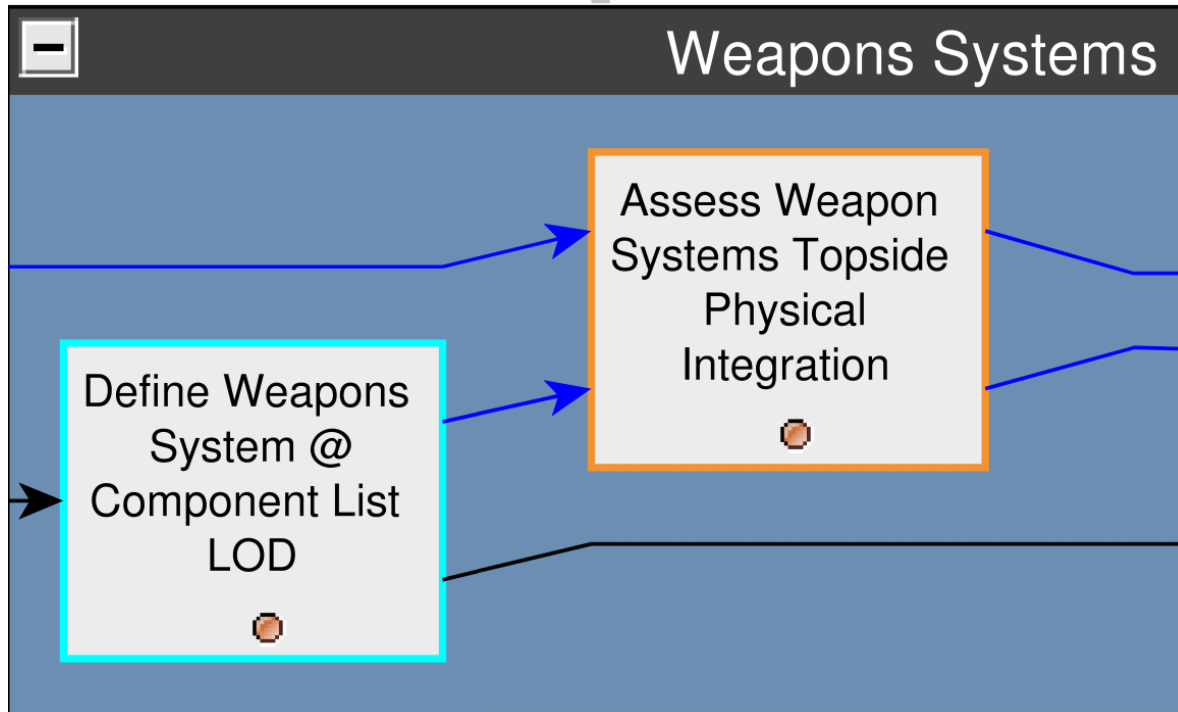
Inputs

Activities

Outputs



Mission Systems Activity Group: Weapons Systems



This picture shows the activities involved with the Weapon Systems Activity Group. The next page shows the input and output activities.

The Weapon Systems group focuses on the weapons and their integration into the design.

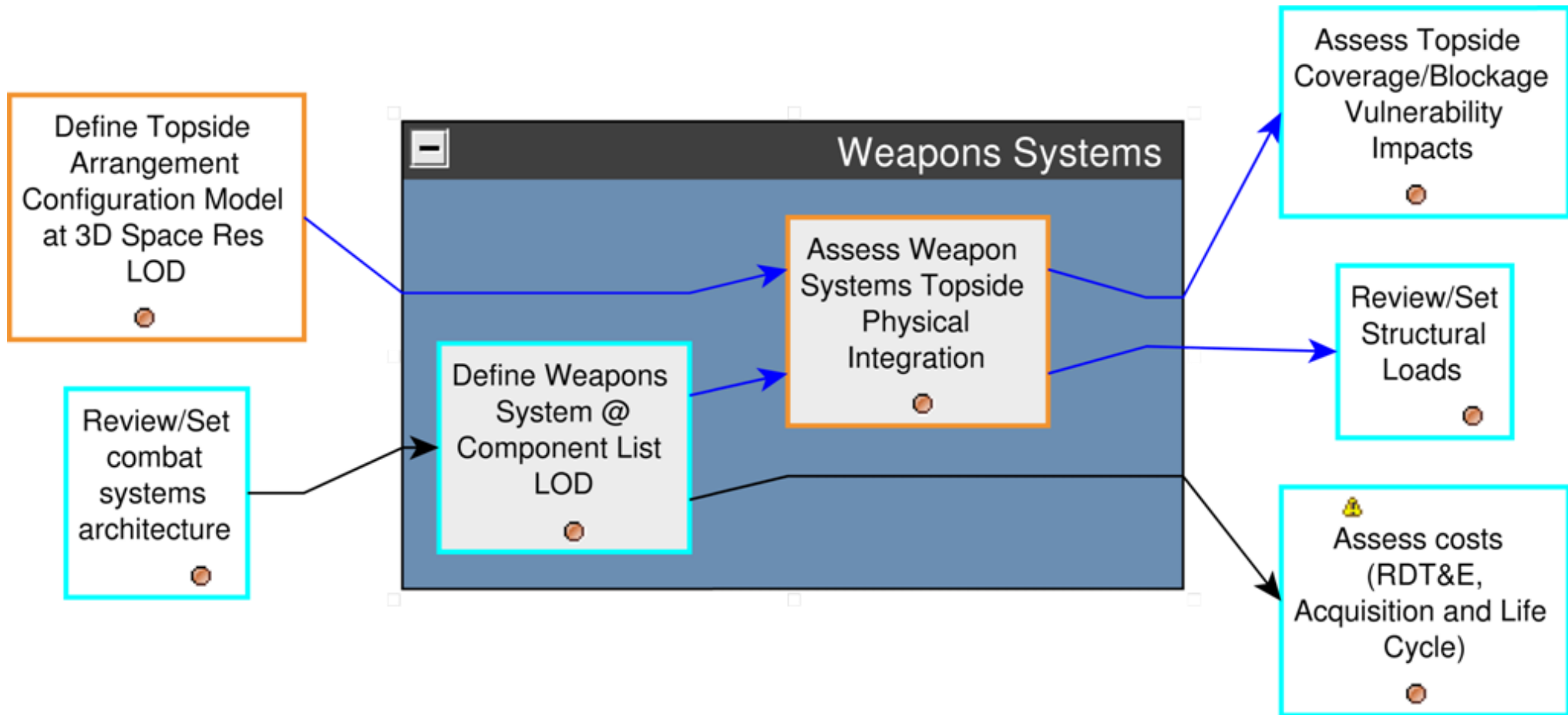
Descriptions of the activities are in Section C.

Mission Systems Activity Group: Weapons Systems

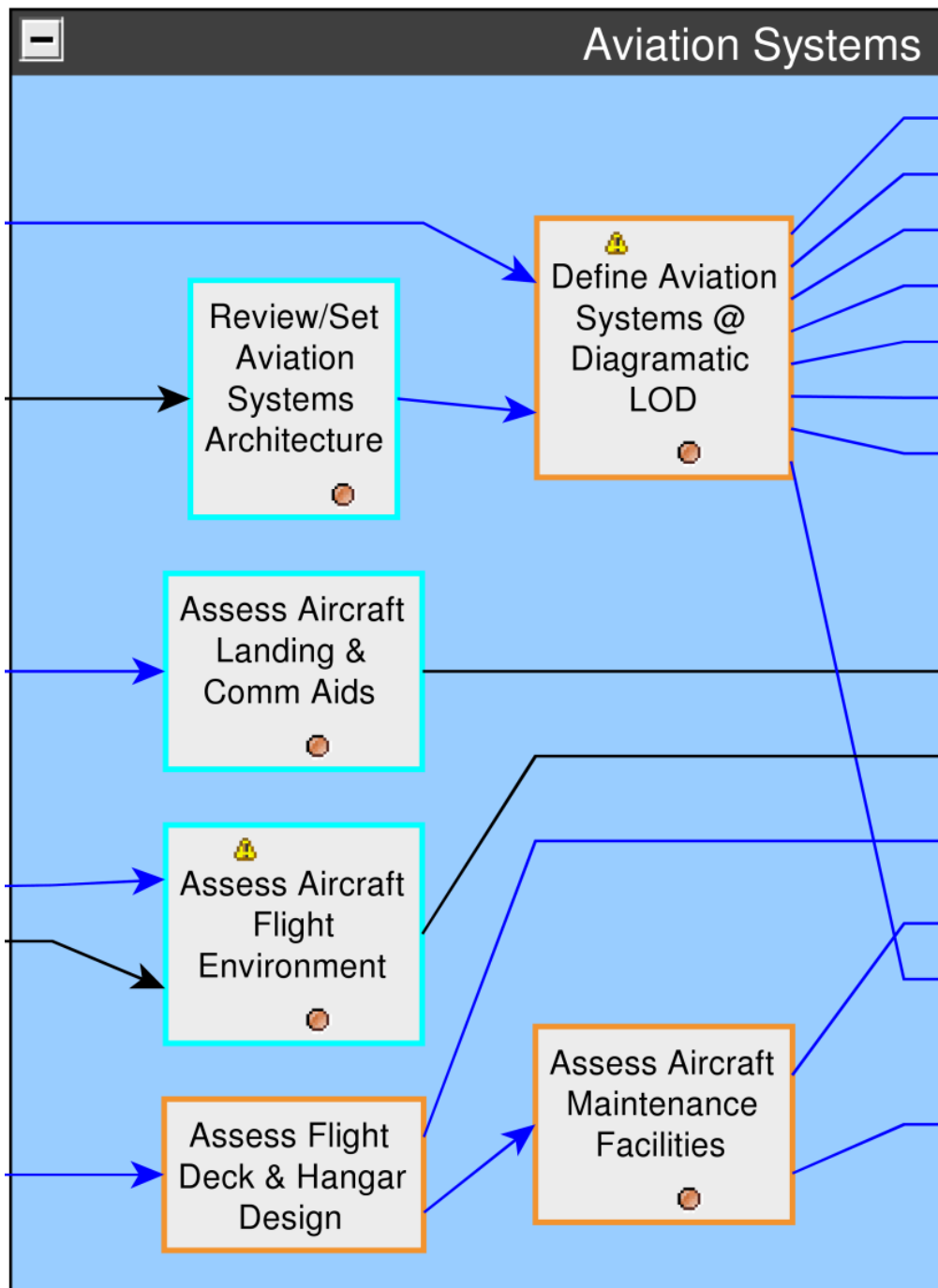
Inputs

Activities

Outputs



Mission Systems Activity Group: Aviation Systems



This picture shows the activities involved with the Aviation Systems Activity Group. The next page shows the input and output activities.

This group focuses on the ability of the design to launch & recover and maintain aerial vehicles such as helicopters and Unmanned Aerial Vehicles (UAVs)

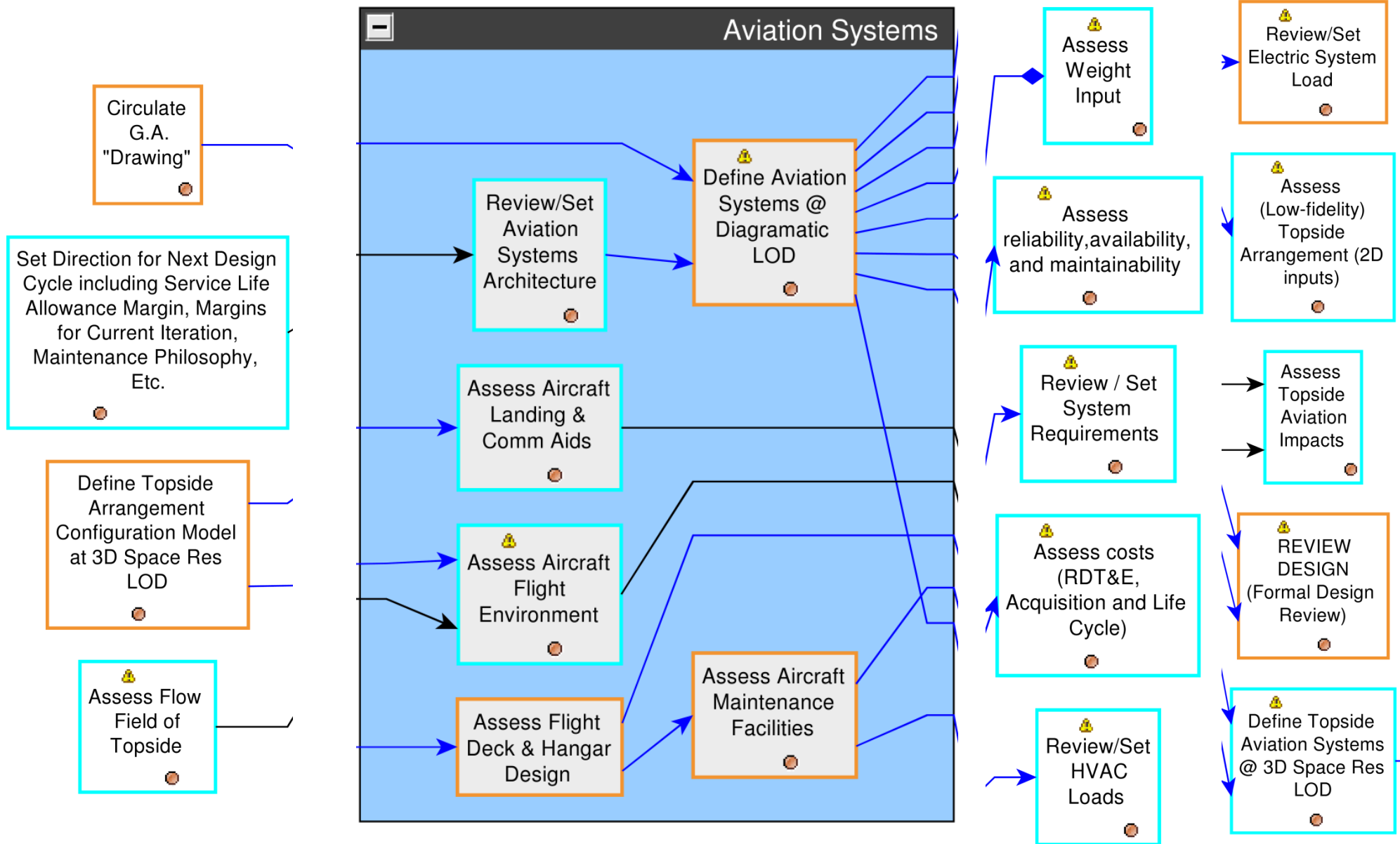
Descriptions of the activities are in Section C.

Mission Systems Activity Group: Aviation Systems

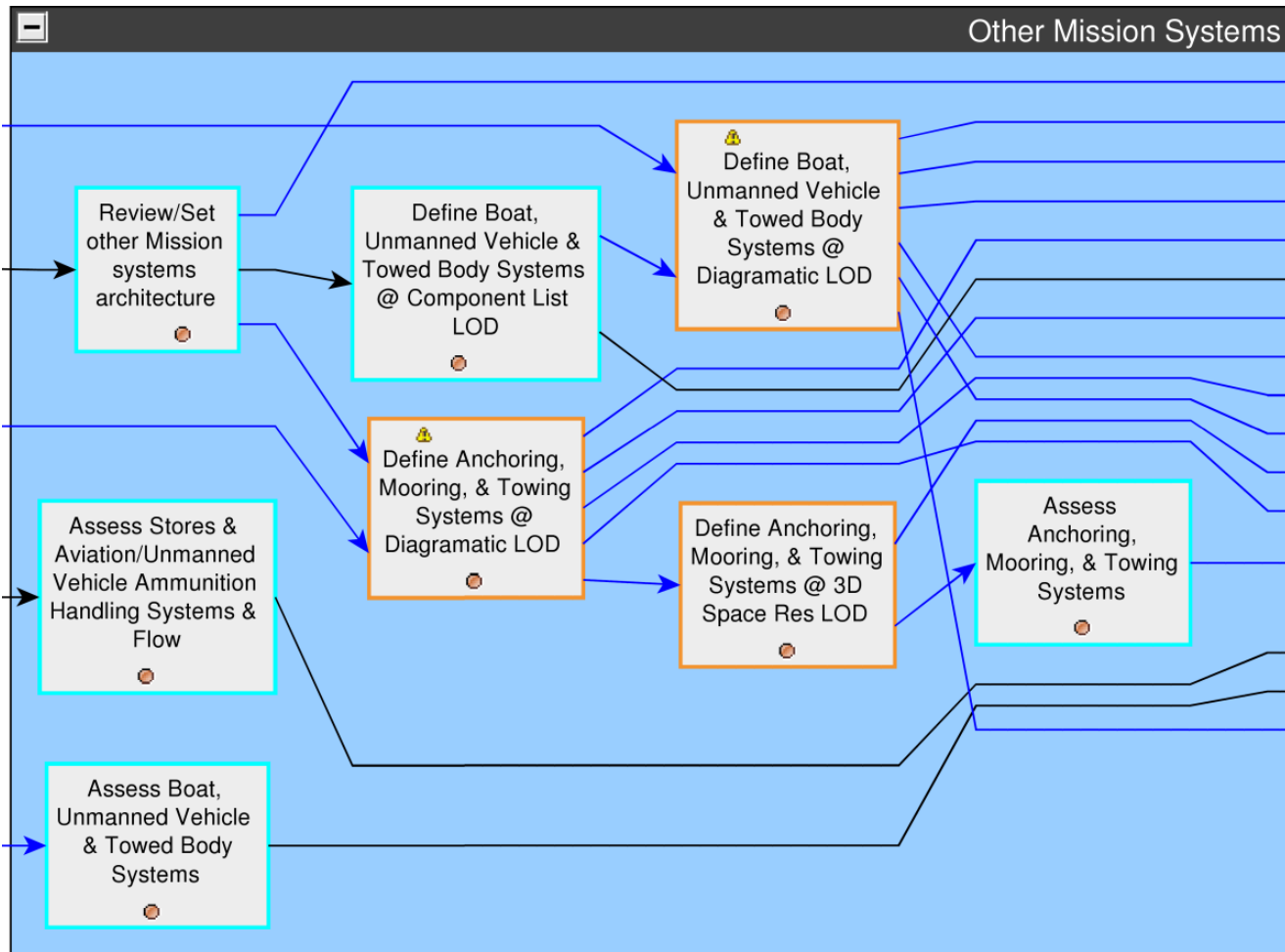
Inputs

Activities

Outputs



Mission Systems Activity Group: Other Mission Systems



This picture shows the activities involved with the Other Mission Systems Activity Group. The next page shows the input and output activities.

This group focuses on systems critical performing the ship's mission but are not weapons (ie. towing systems).

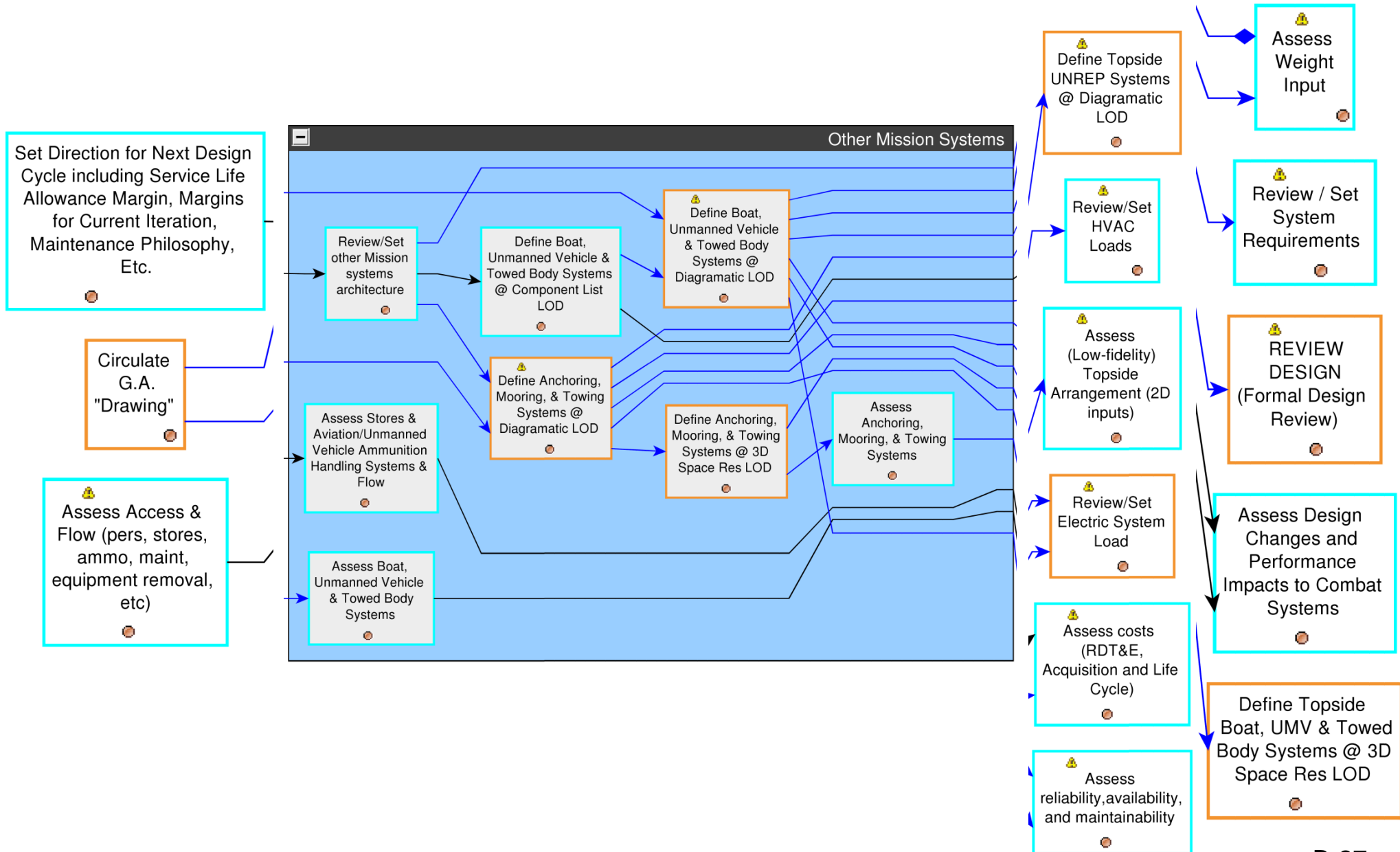
Descriptions of the activities are in Section C.

Mission Systems Activity Group: Other Mission Systems

Inputs

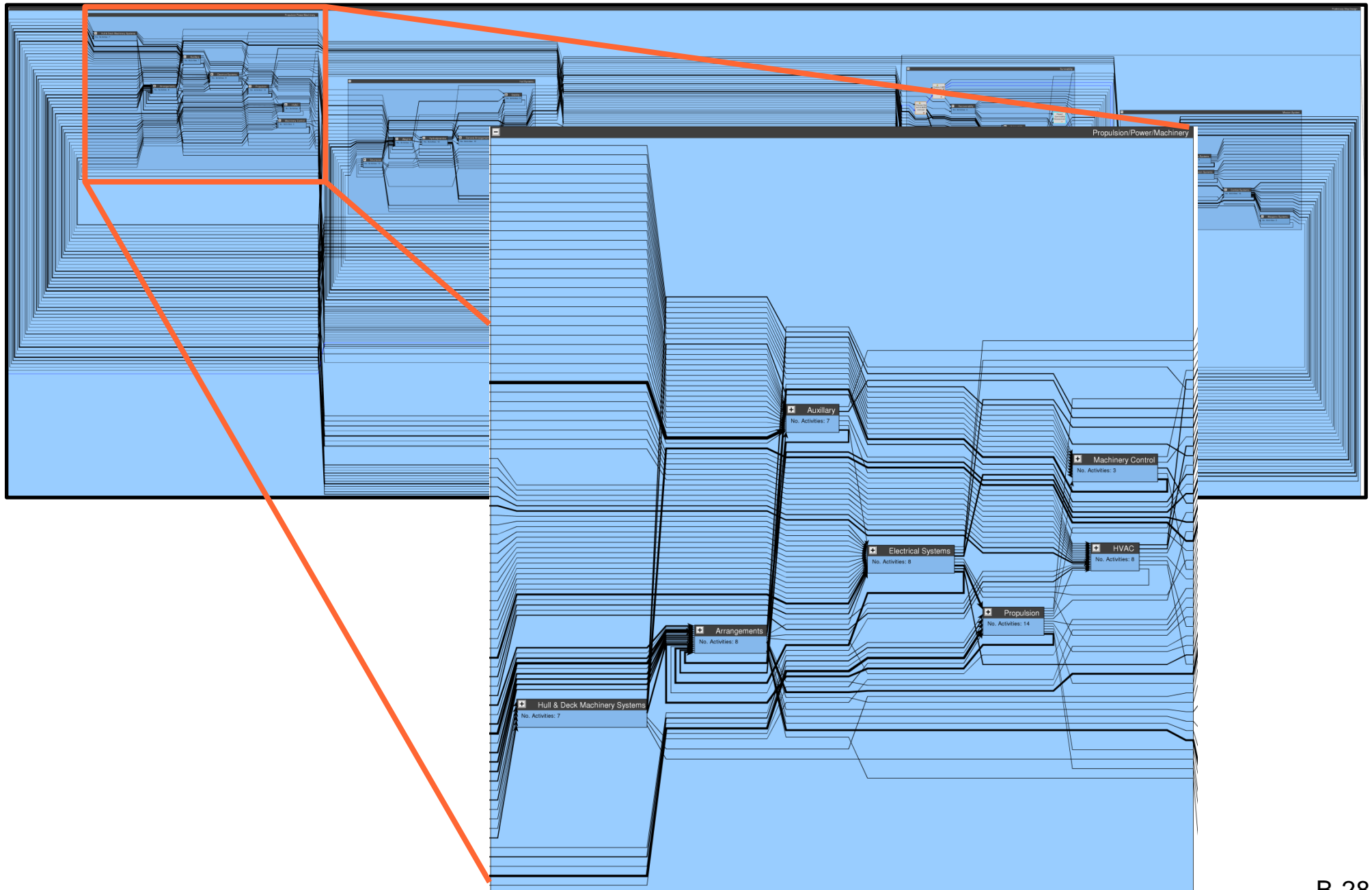
Activities

Outputs

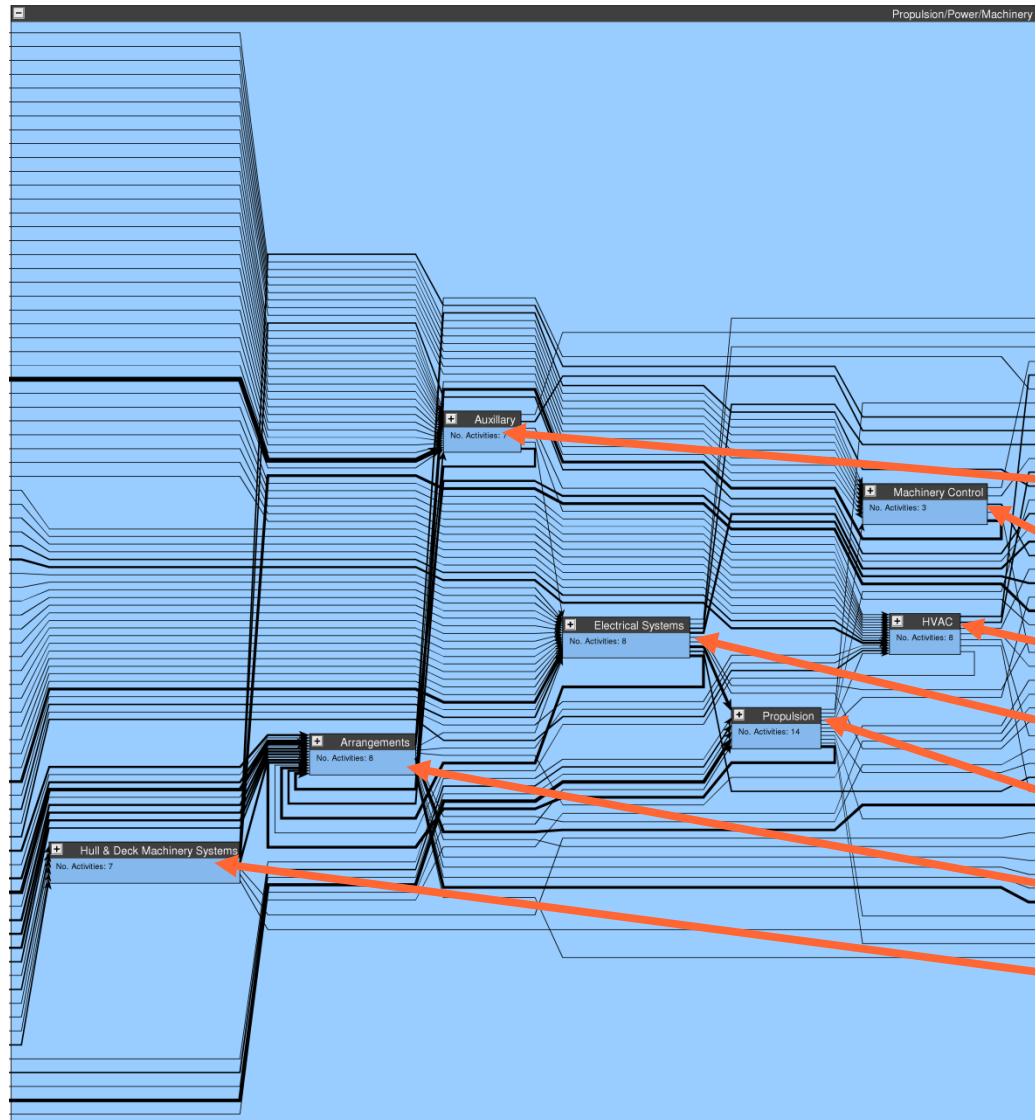


Propulsion/Power/Machinery Design Area

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



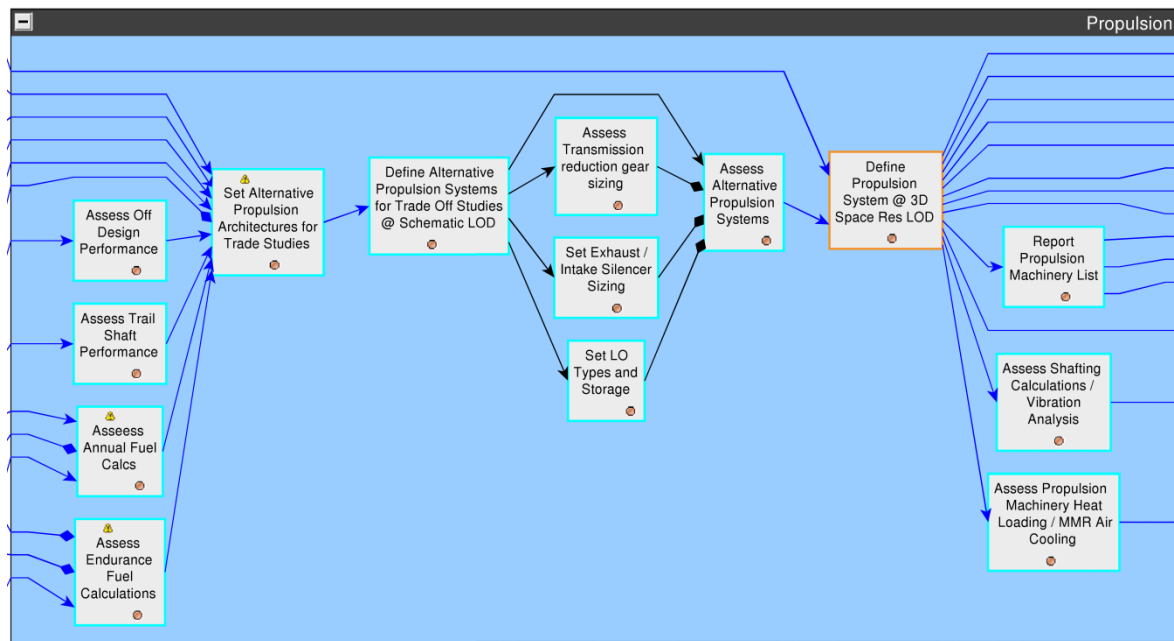
This picture shows the activity groups involved with the Propulsion/Power/Machinery (PPM) Design Area. The next page shows the input and out put activities that link PPM Activity Groups.

This group focuses on the activities needed to ensure the ship “moves”.

The key Activity Groups are:

1. **Auxiliary Systems** (Page B-34)
2. **Machinery Control** (Page B-38)
3. **HVAC** (Page B-40)
4. **Electrical Systems** (Page B-32)
5. **Propulsion** (Page B-30)
6. **Machinery Arrangements** (Page B-42)
7. **Hull & Deck Machinery Systems** (Page B-36)

Propulsion/Power/Machinery Activity Group: Propulsion



This picture shows the activities involved with the Propulsion Activity Group. The next page shows the input and output activities.

This group focuses on the necessary requirements to propel the design and the engine-propulsor connection.

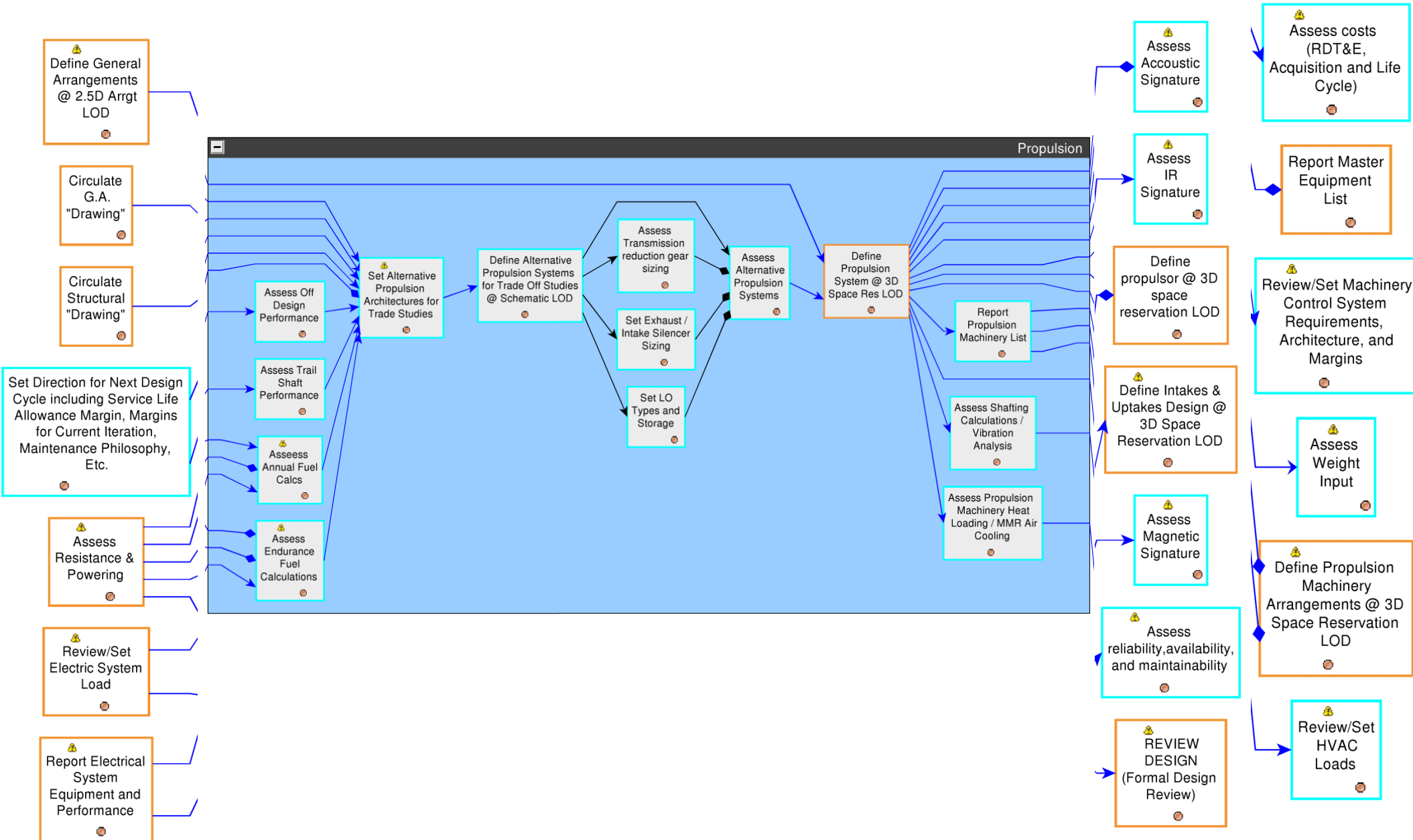
Descriptions of the activities are in Section C.

Propulsion/Power/Machinery Activity Group: Propulsion

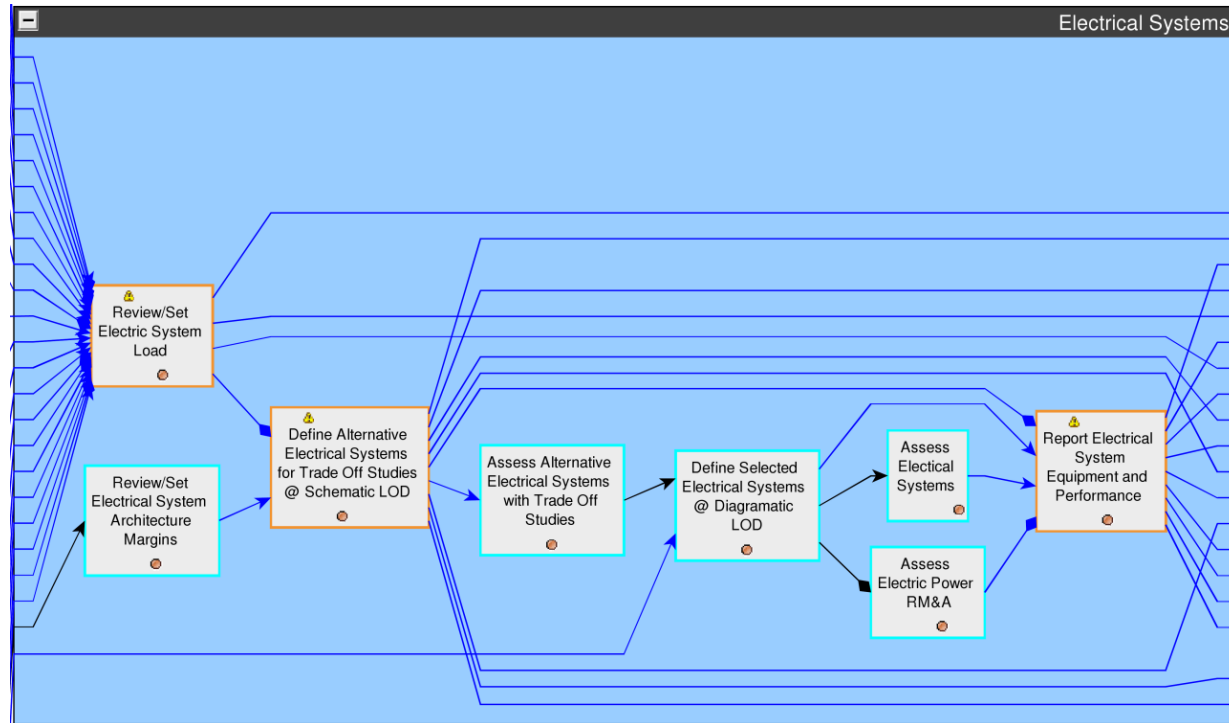
Inputs

Activities

Outputs



Propulsion/Power/Machinery Activity Group: Electrical Systems



This picture shows the activities involved with the Electrical Systems Activity Group. The next page shows the input and output activities.

The Electrical Systems ensures the design generates and supplies the electricity the ship needs.

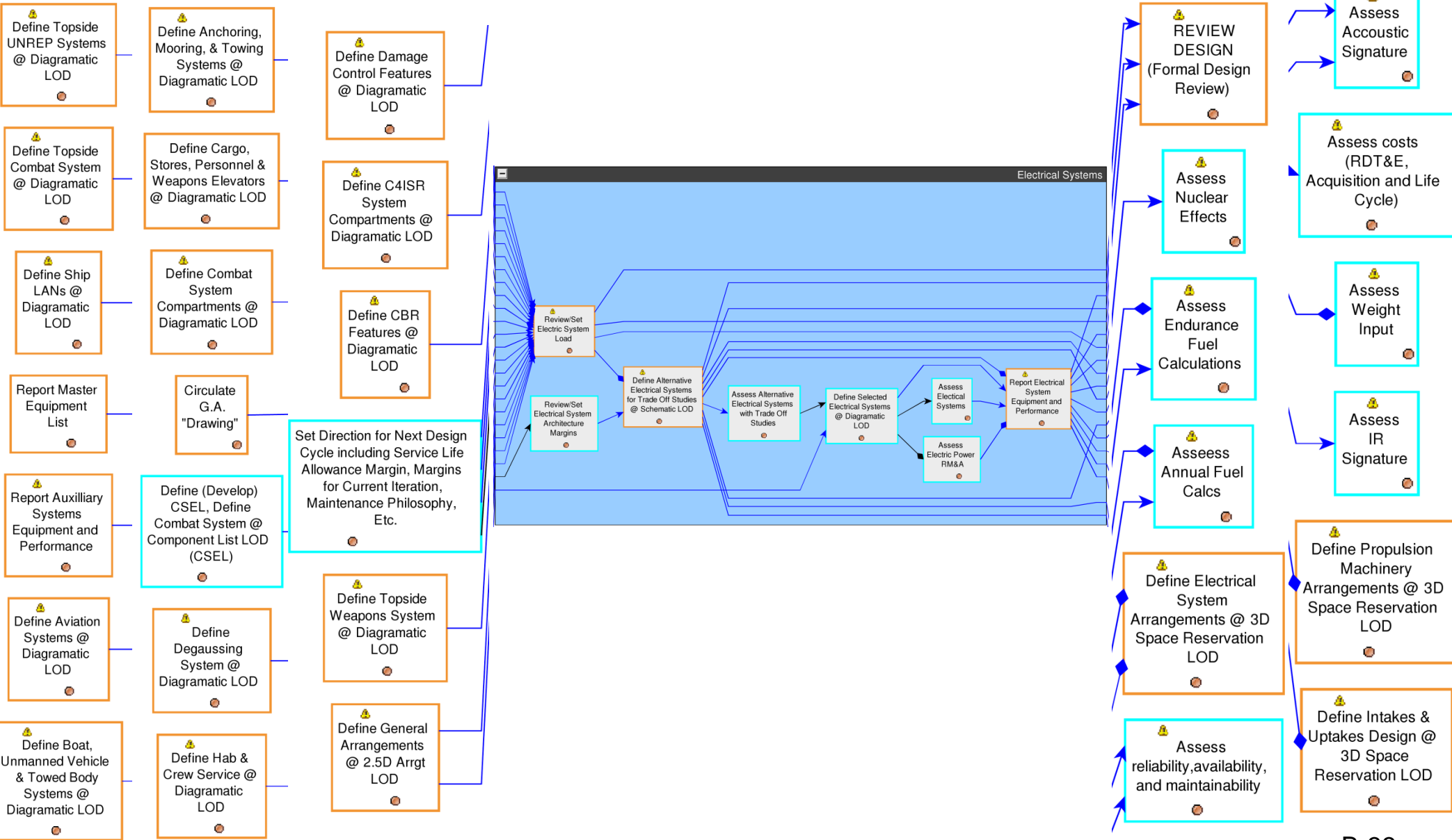
Descriptions of the activities are in Section C.

Propulsion/Power/Machinery Activity Group: Electrical Systems

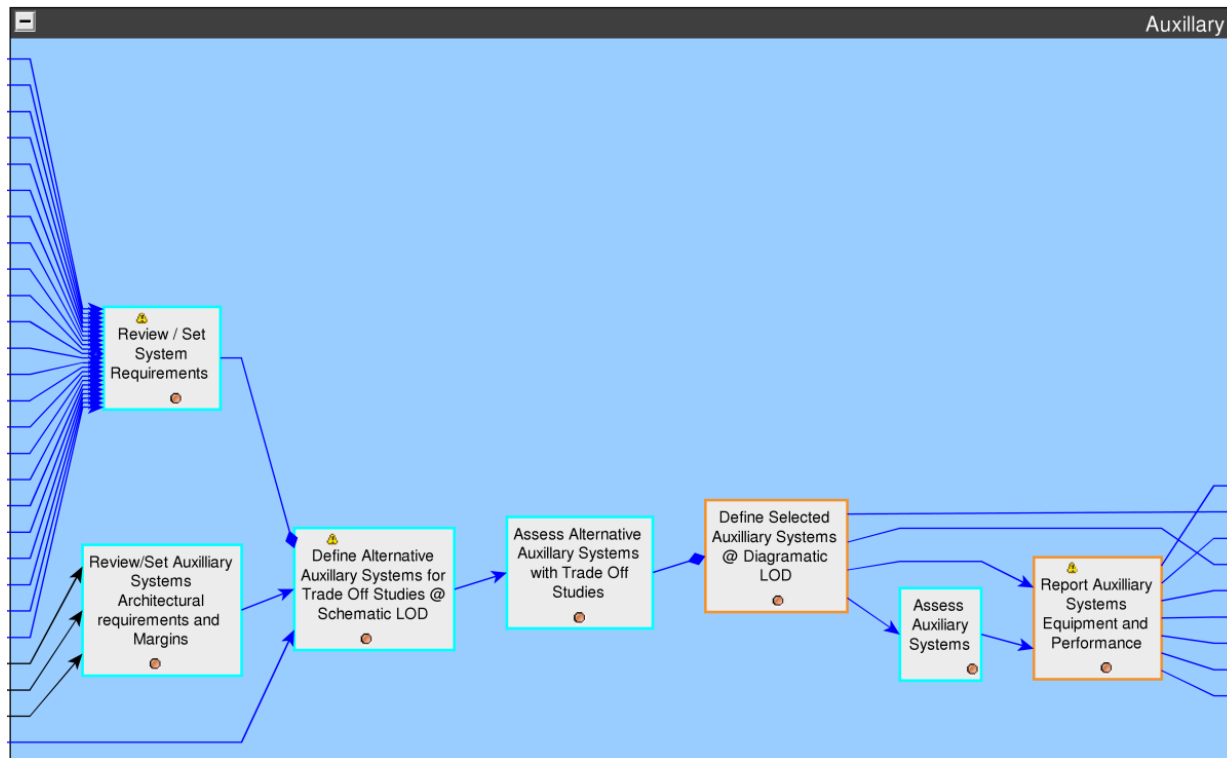
Inputs

Activities

Outputs



Propulsion/Power/Machinery Activity Group: Auxiliary



This picture shows the activities involved with the Auxiliary Systems Activity Group. The next page shows the input and output activities.

This group focuses on the design's machinery systems outside propulsion and electrical (such as firefighting systems).

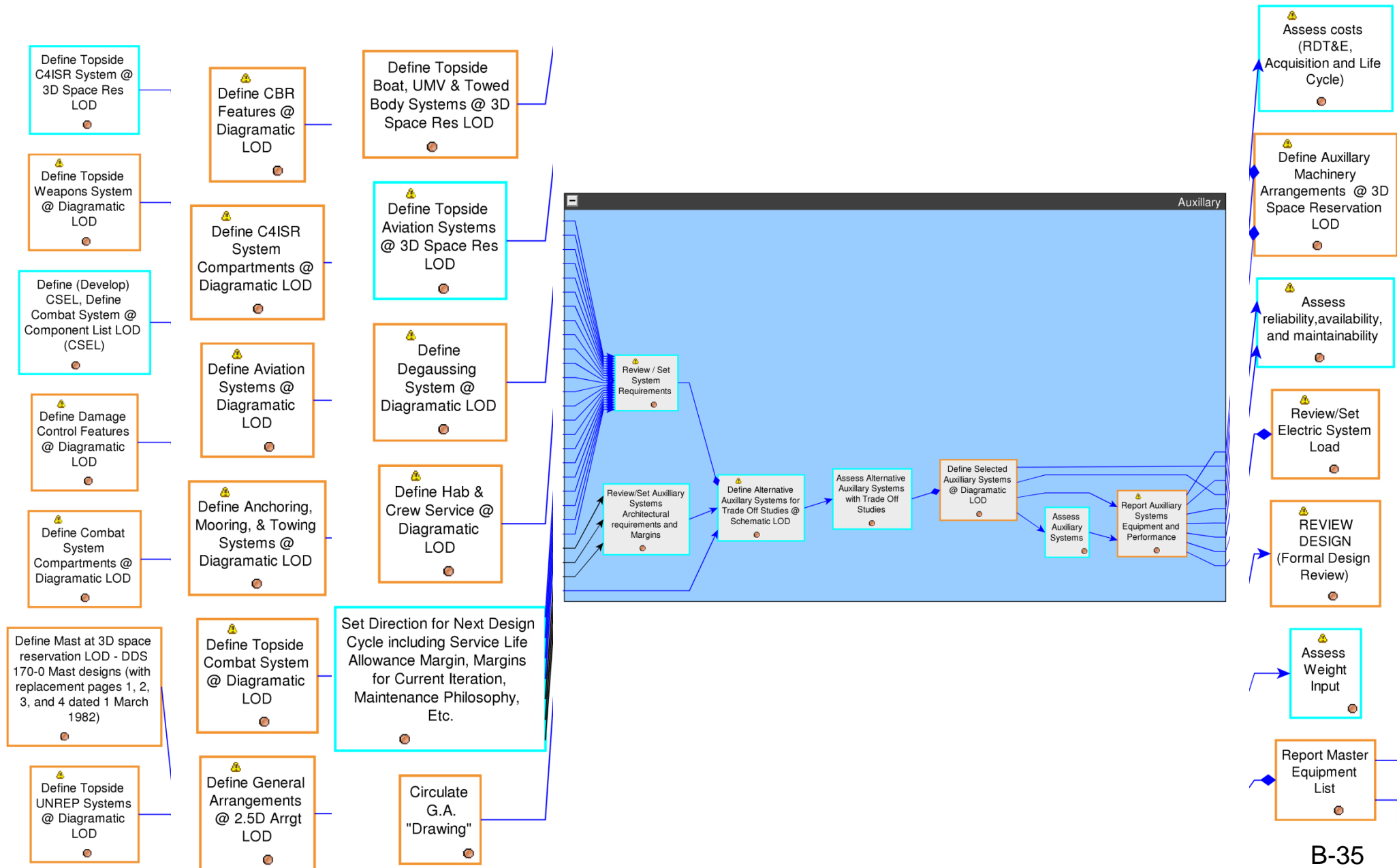
The descriptions of the activities can be found in Section C.

Propulsion/Power/Machinery Activity Group: Auxiliary

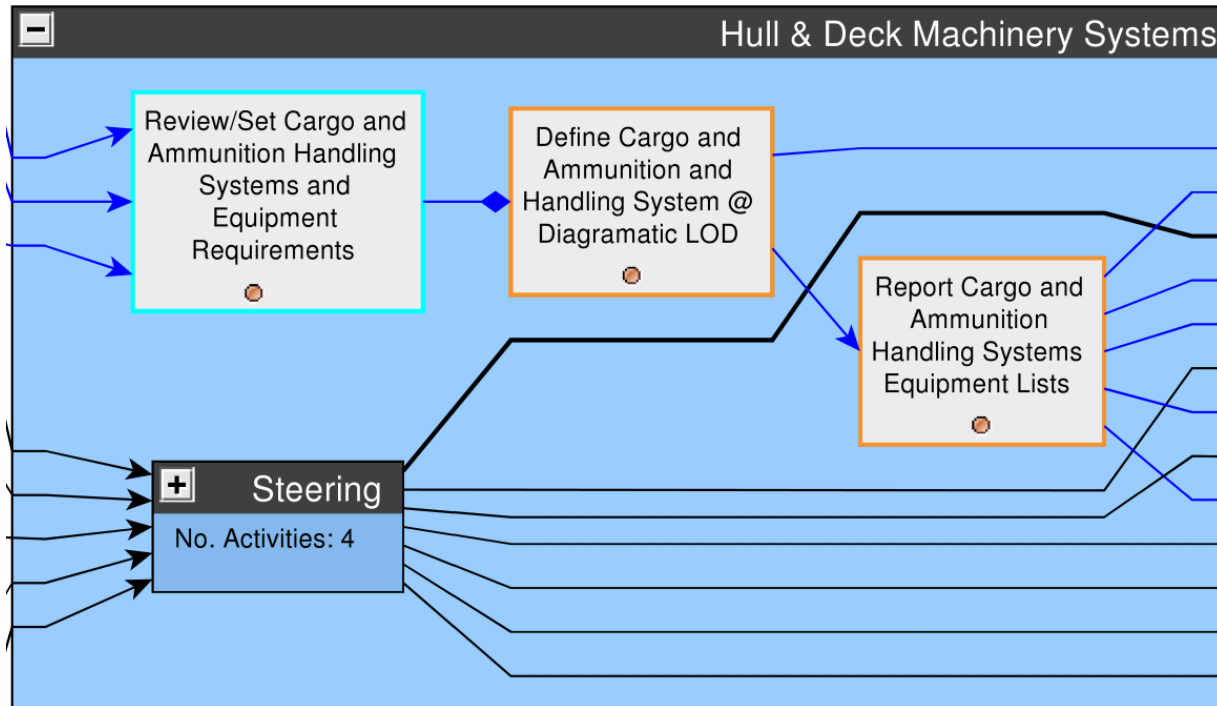
Inputs

Activities

Outputs



Propulsion/Power/Machinery Activity Group: Hull & Deck Machinery Systems



This picture shows the activities involved with the Hull & Deck Machinery Systems Activity Group. The next page shows the input and output activities.

This group focuses on machinery systems located on the weather decks (such as cargo cranes).

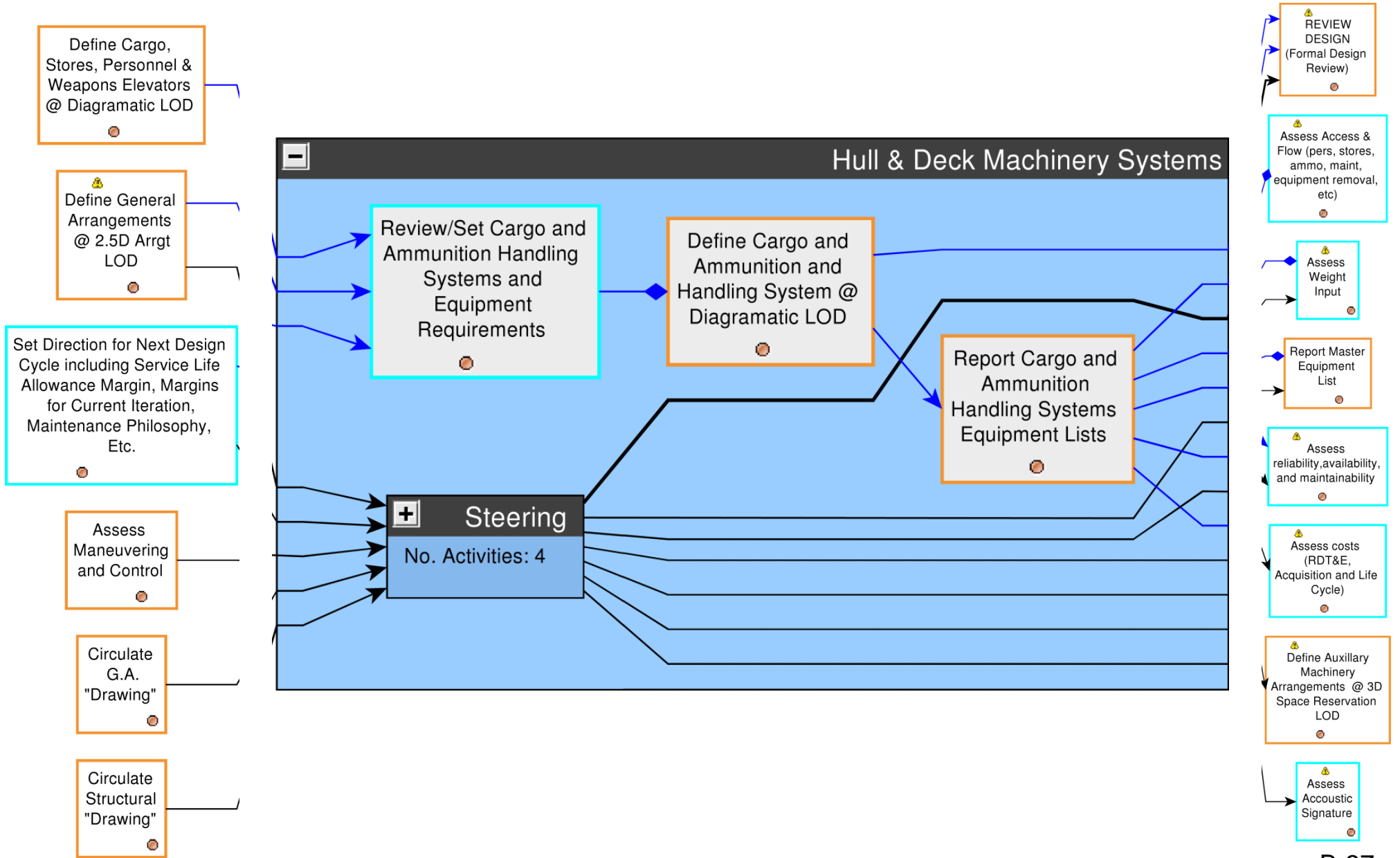
Descriptions of the activities are in Section C.

Propulsion/Power/Machinery Activity Group: Hull & Deck Machinery Systems

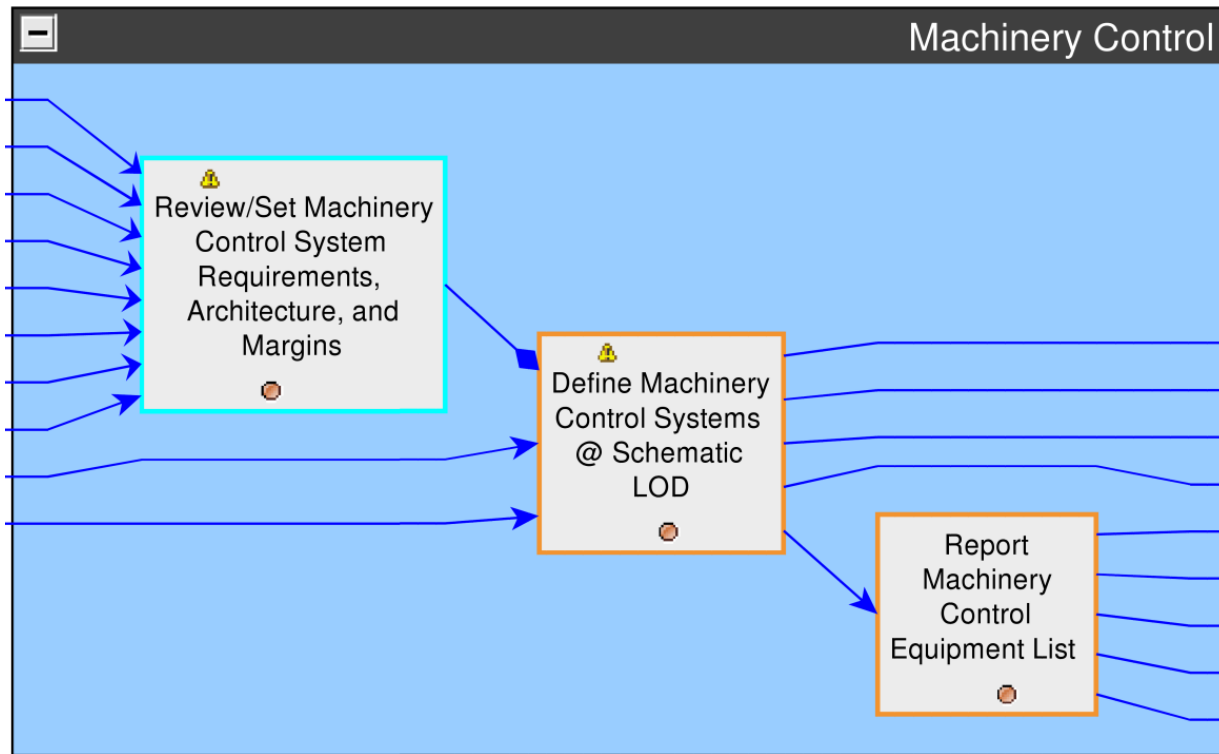
Inputs

Activities

Outputs



Propulsion/Power/Machinery Activity Group: Machinery Control

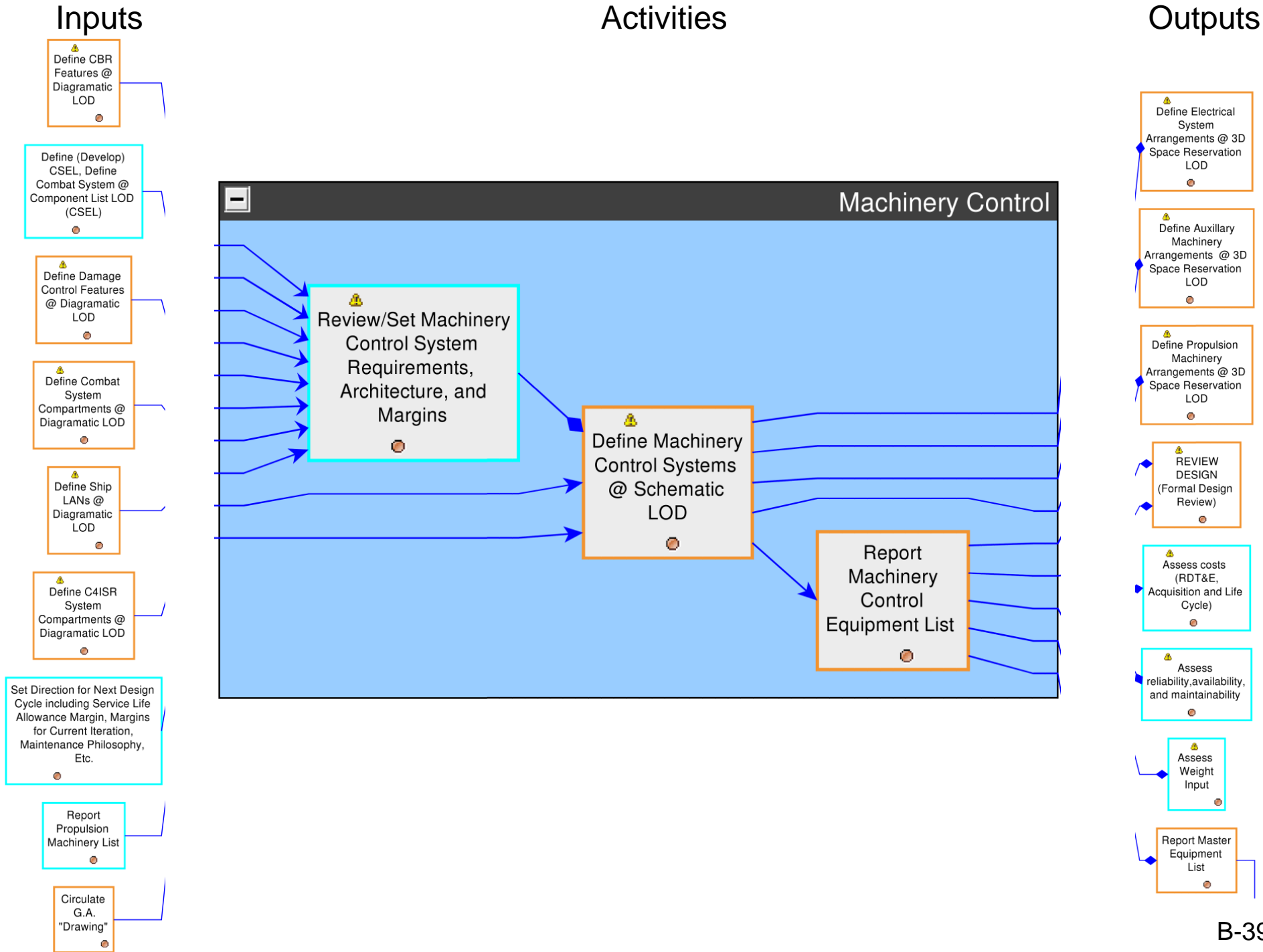


This picture shows the activities involved with the Machinery Control Activity Group. The next page shows the input and output activities.

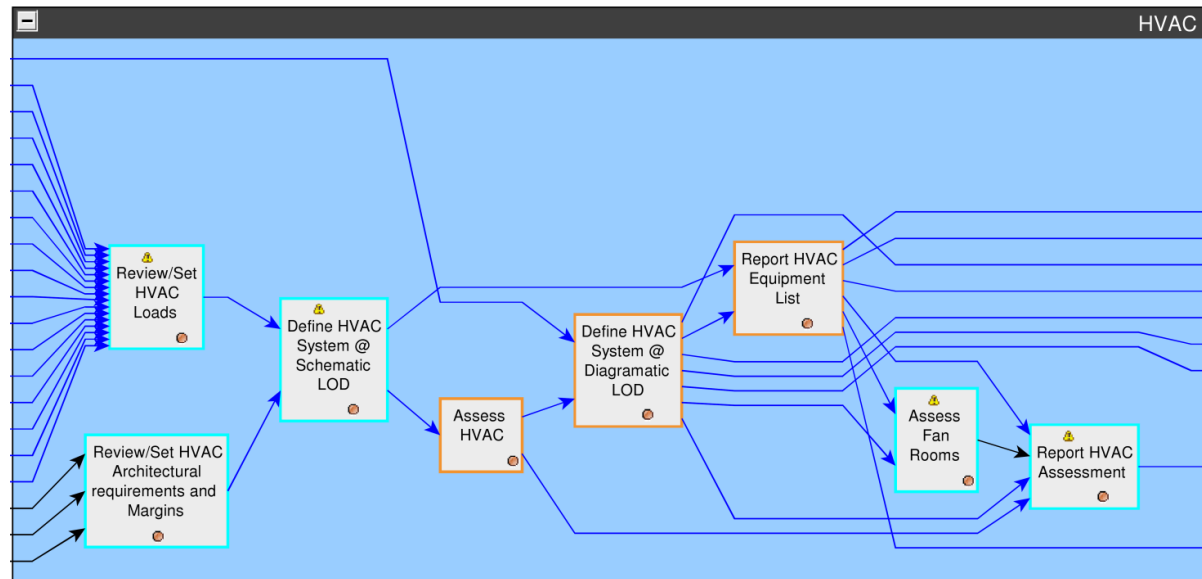
This group focuses on the controls used to run the design's machinery.

Descriptions of the activities are in Section C.

Propulsion/Power/Machinery Activity Group: Machinery Control



Propulsion/Power/Machinery Activity Group: HVAC



This picture shows the activities involved with the Heating, Ventilation and Air Conditioning (HVAC) Activity Group. The next page shows the input and output activities.

This group ensures all the different compartments have the necessary temperature control and ventilation and are habitable for the crew.

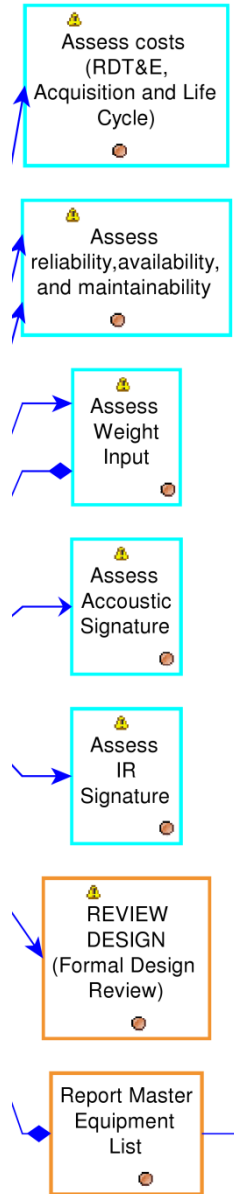
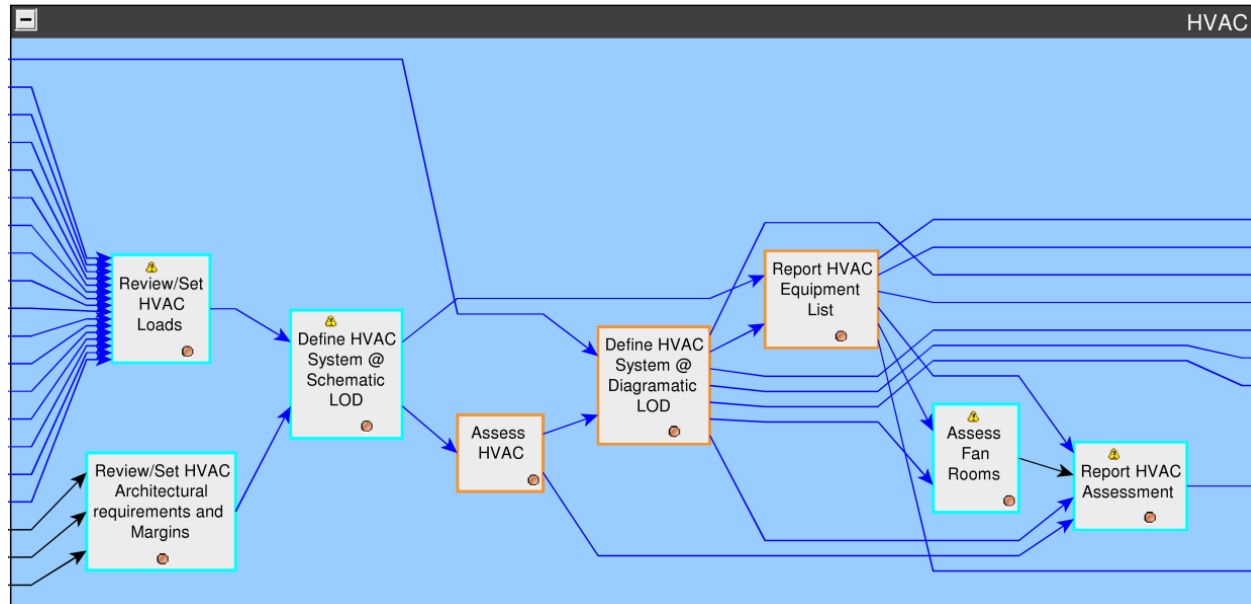
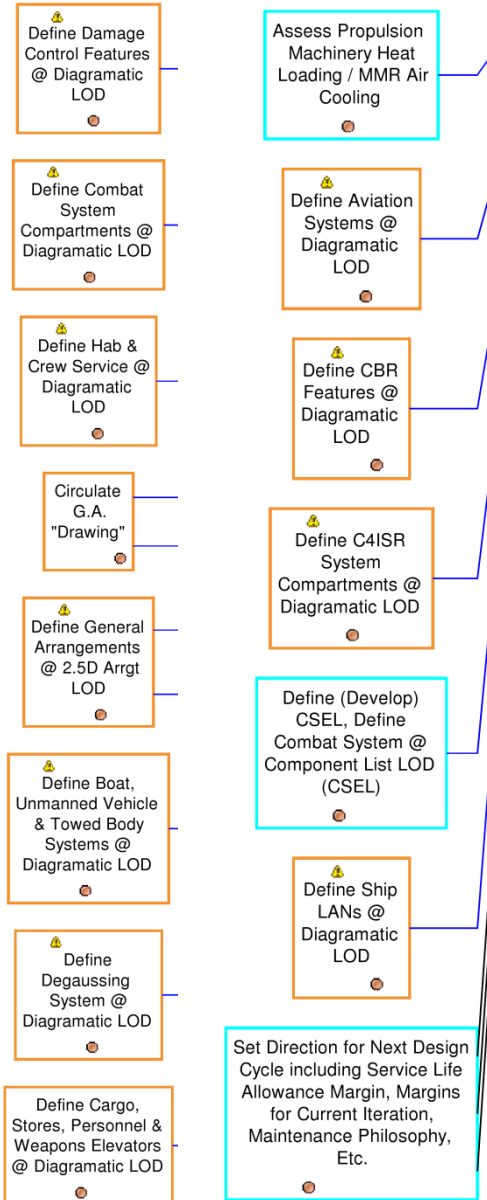
Descriptions of the activities are in Section C.

Propulsion/Power/Machinery Activity Group: HVAC

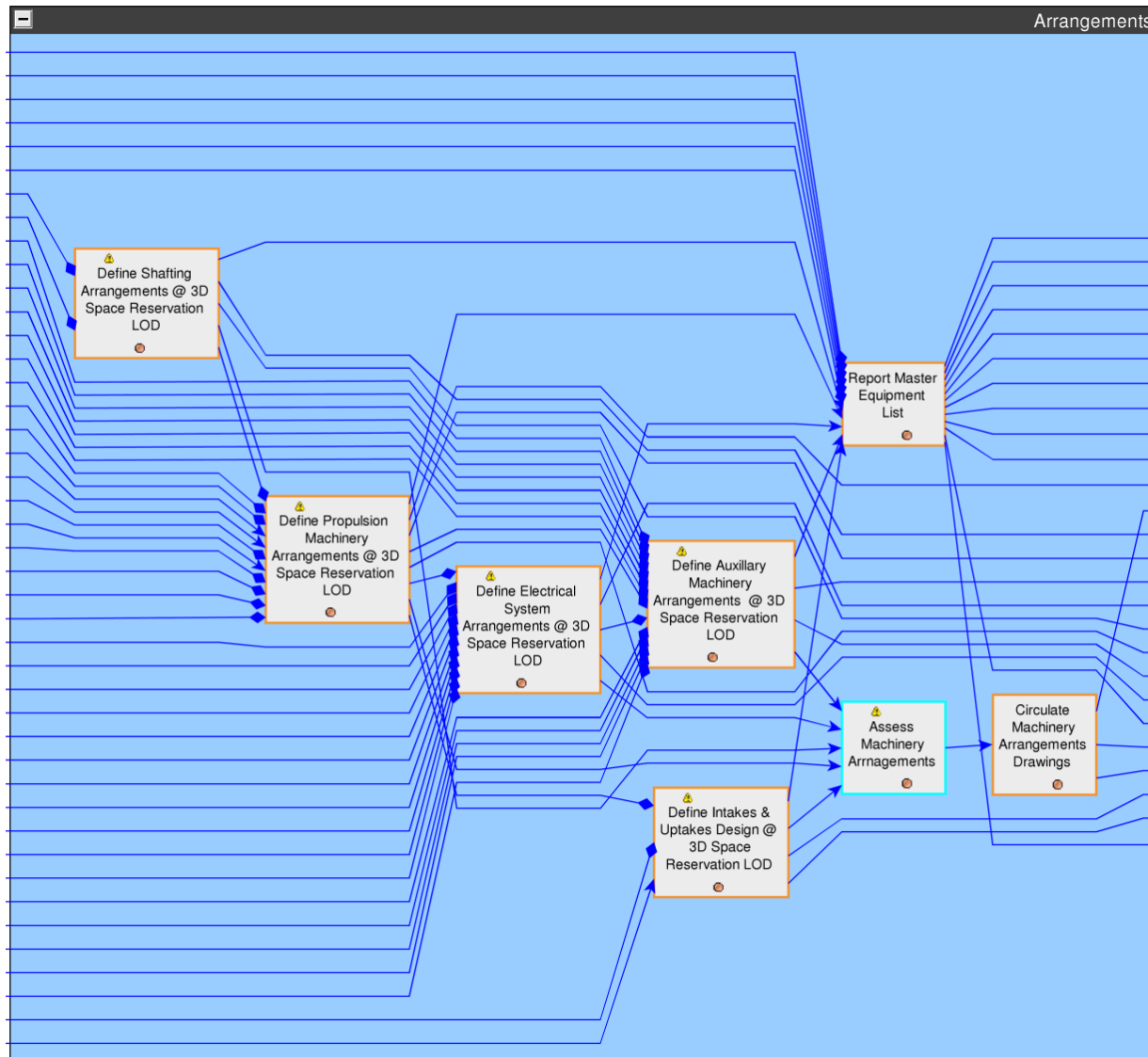
Inputs

Activities

Outputs



Propulsion /Power/Machinery Activity Group: Arrangements



This picture shows the activities involved with the Arrangements Activity Group. The next page shows the input and output activities.

This group focuses on the space allocation for machinery.

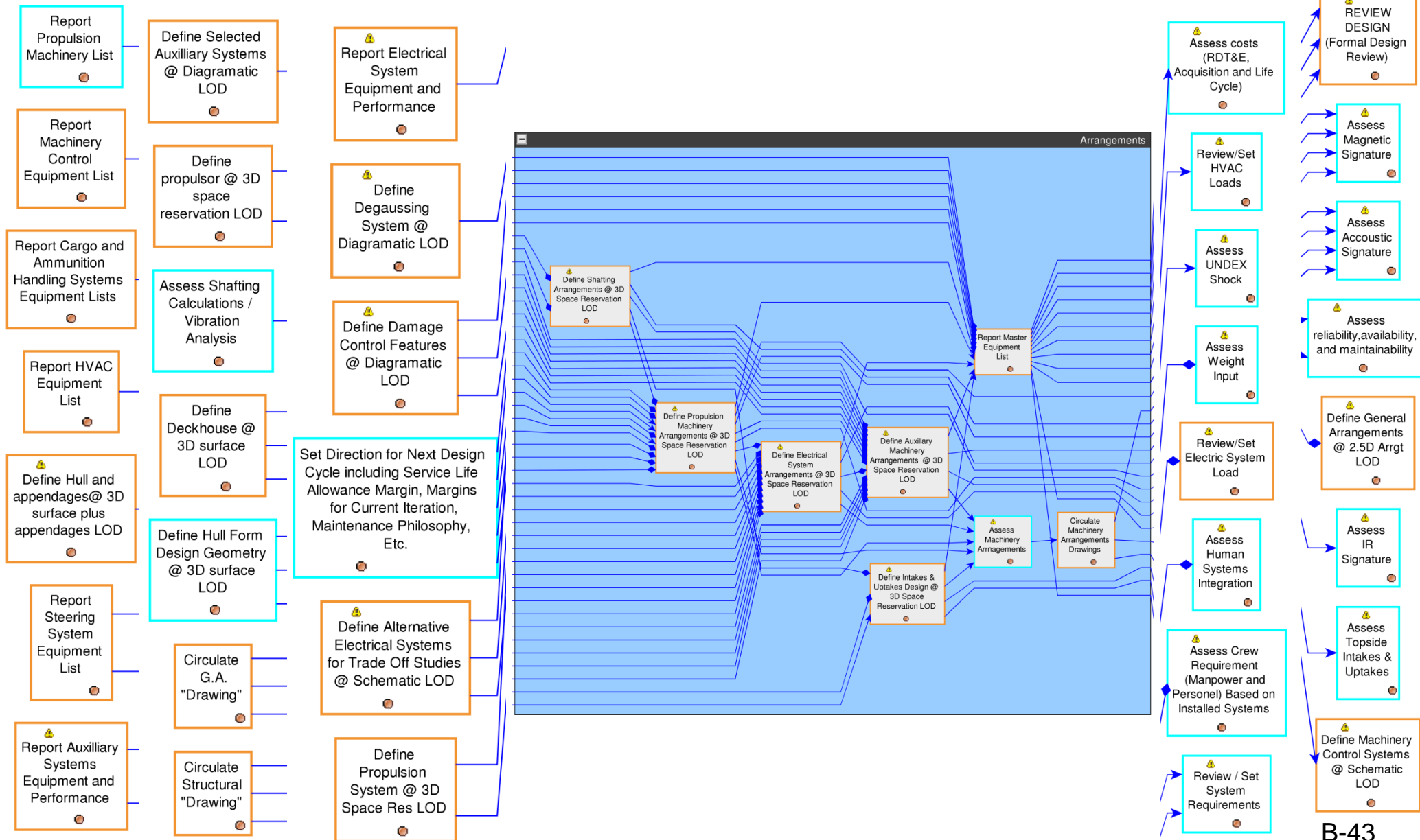
Descriptions of the activities are in Section C.

Propulsion/Power/Machinery Activity Group: Arrangements

Inputs

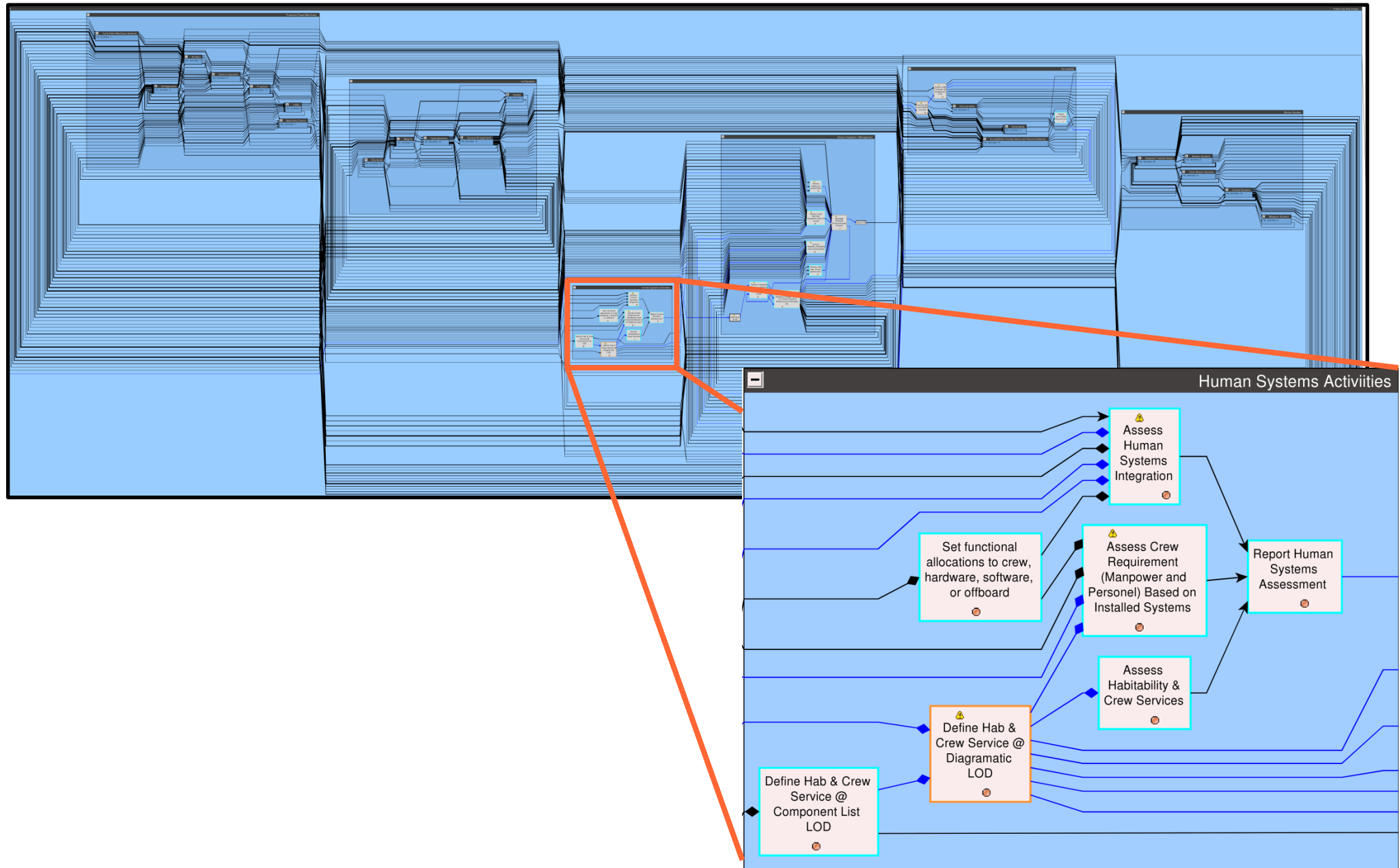
Activities

Outputs

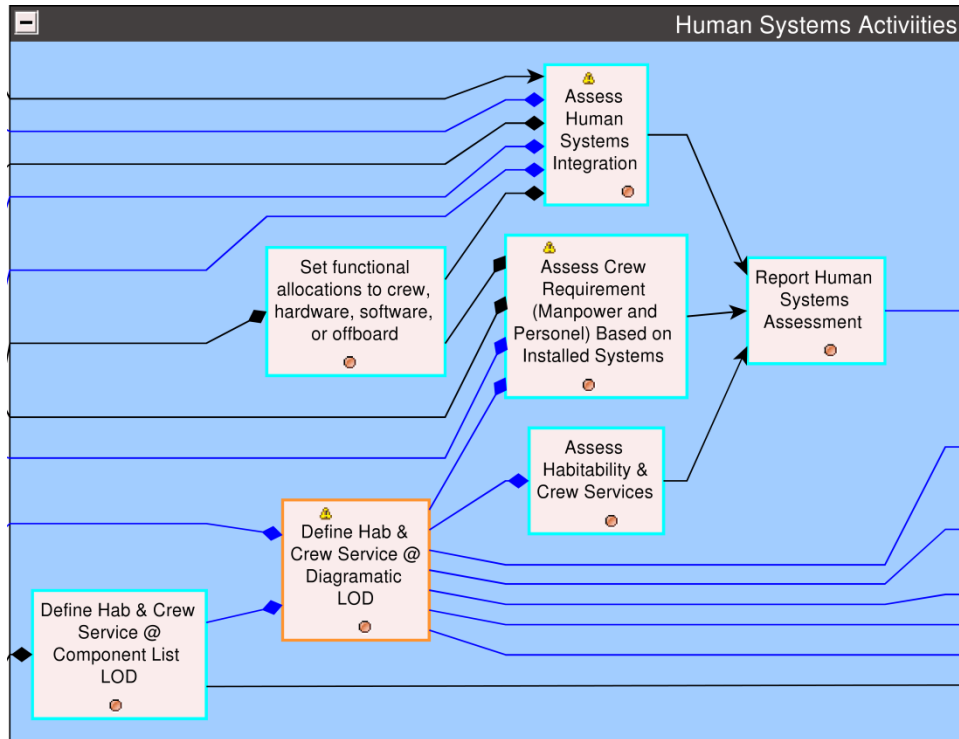


Human Systems Design Area

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



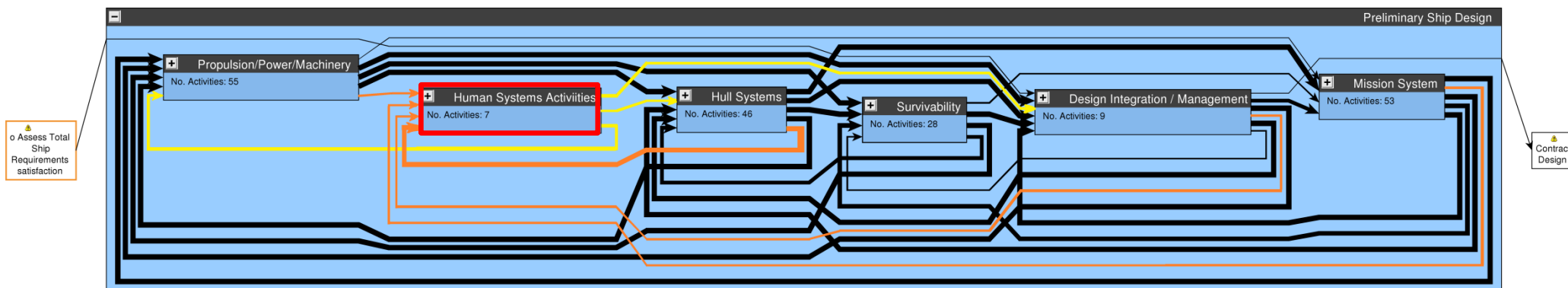
Human Systems Activities



The picture to the left shows the activities involved with the Human Systems Design Area. The next page shows the input and output activities that link to Human Systems Activities.

This group focuses on the human factors needed to operate, maintain and fight the ship.

While there are no Activity Groups or iterations shown Human Systems Activities. When taken as part of the whole, iterations can be seen with the other Design Areas (see picture below).



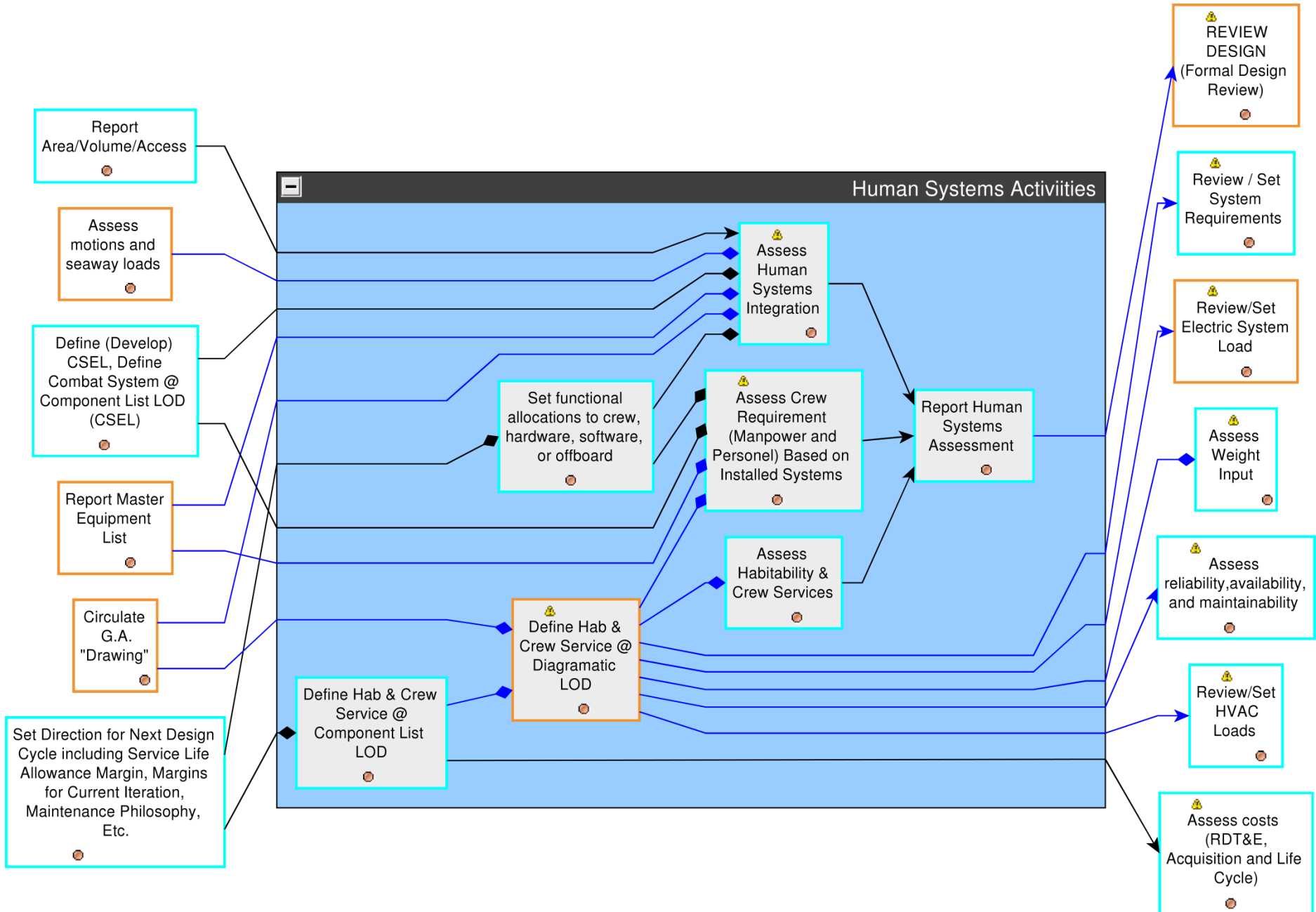
Legend: Yellow – Output of Human Systems
Orange – Input of Human Systems

Human Systems Activities

Inputs

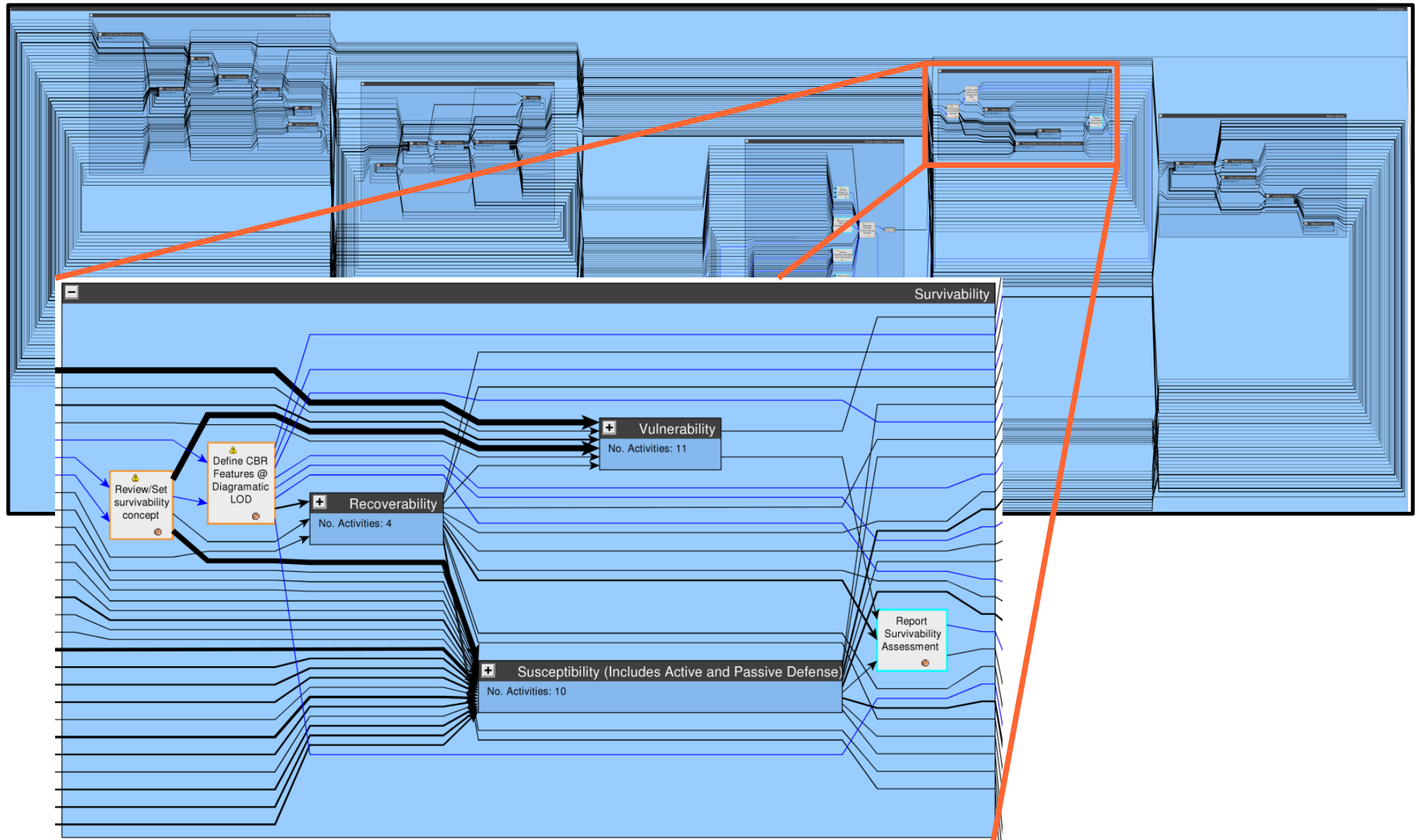
Activities

Outputs

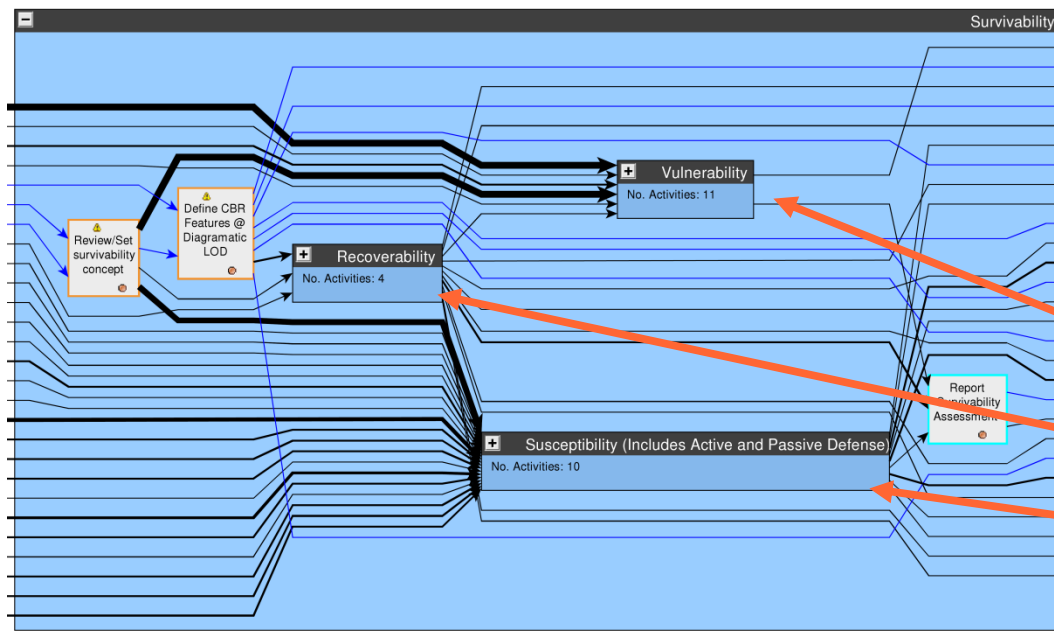


Survivability Design Area

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



Survivability Activity Groups



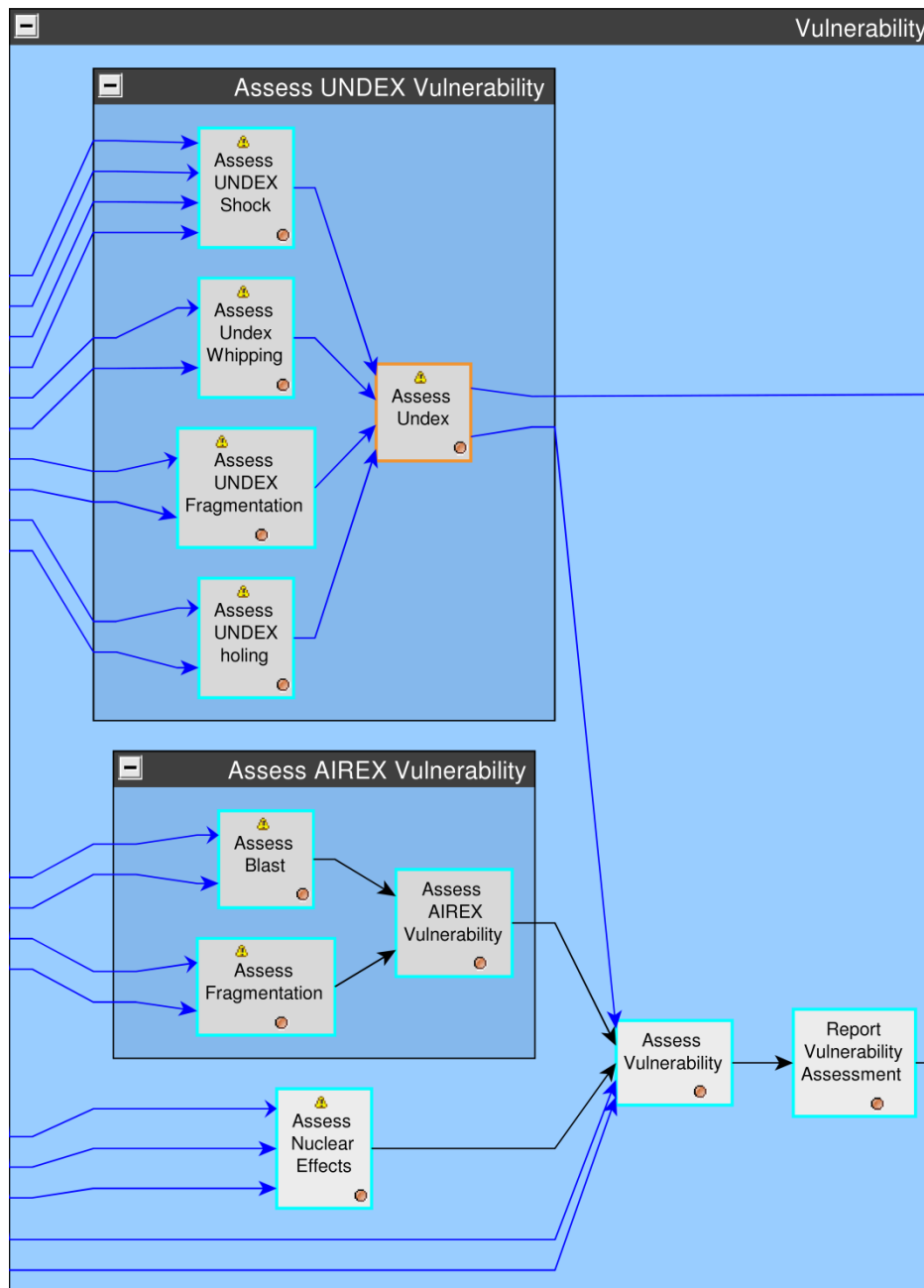
This picture shows the activity groups involved with the Survivability Design Area. The next page shows the input and output activities that links Survivability Activity Groups.

This group focuses on the activities needed to ensure the ship “survives”.

The key Activity Groups are:

1. **Vulnerability** (Page B-49)
2. **Recoverability** (Page B-51)
3. **Susceptibility** (Page B-53)

Survivability Activity Group: Vulnerability



This picture shows the activities involved with the Vulnerability Activity Group. The next page shows the input and output activities.

This group accesses the design's expected capability degradation due to damage.

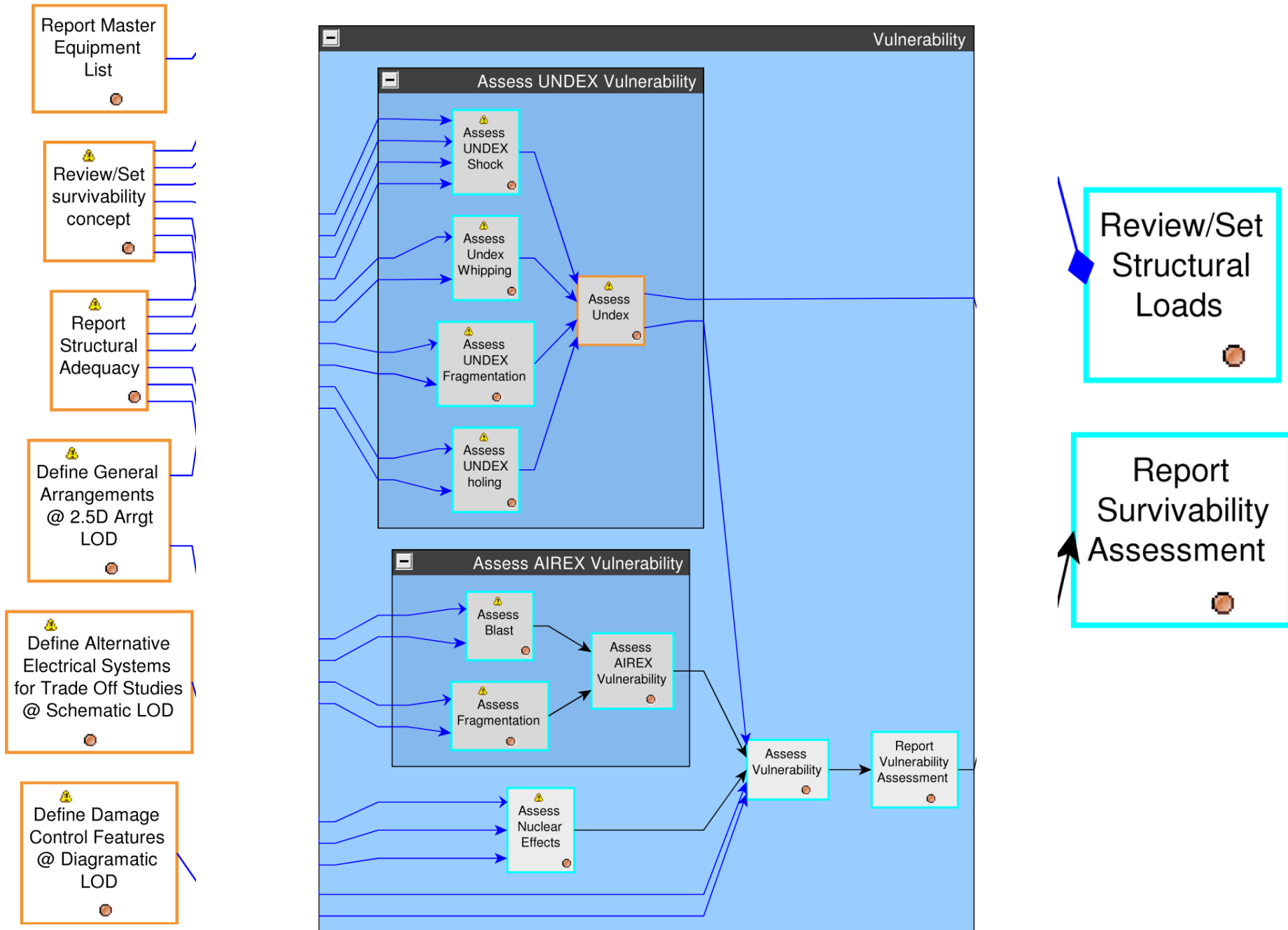
Descriptions of the activities are in Section C.

Survivability Activity Group: Vulnerability

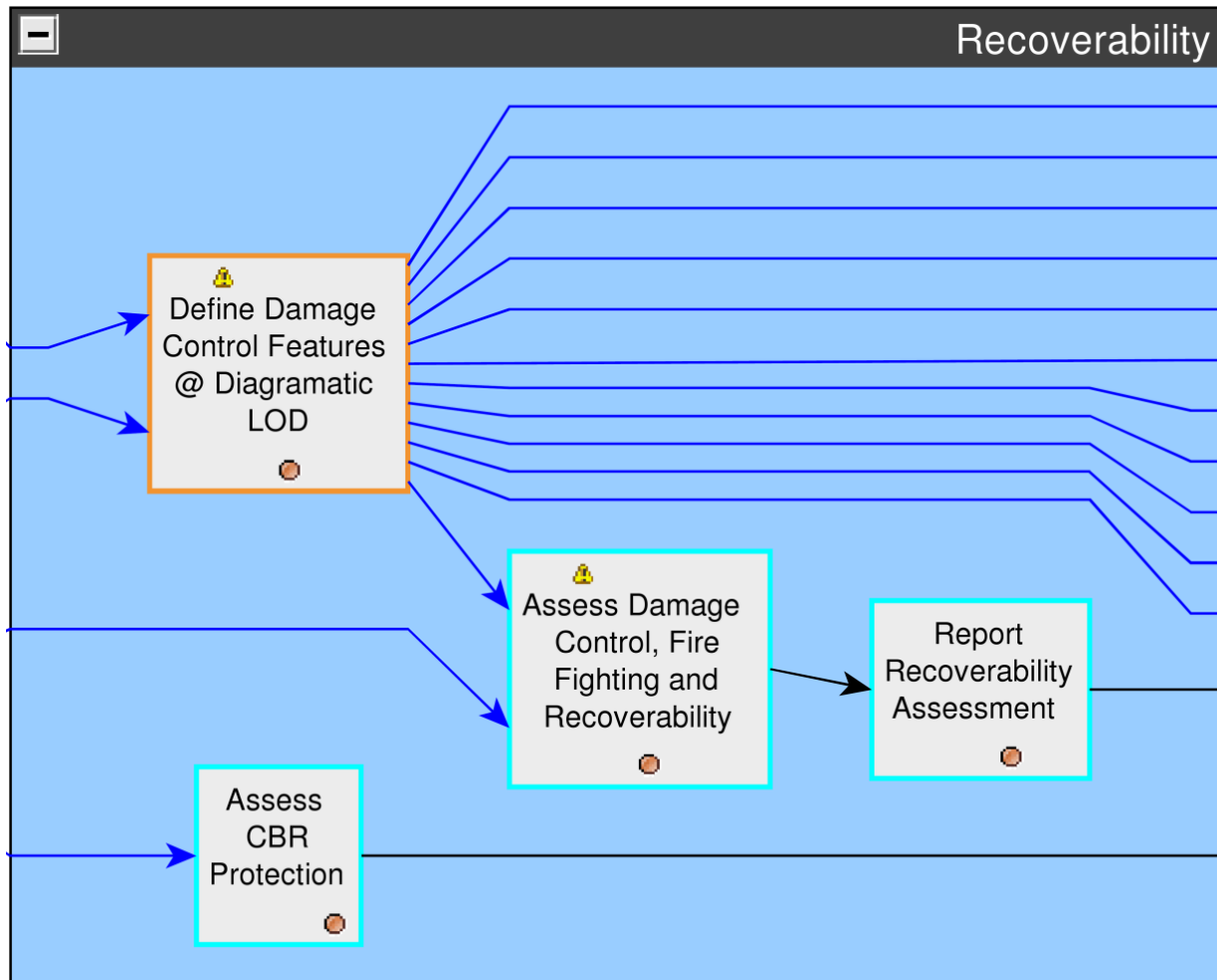
Inputs

Activities

Outputs



Survivability Activity Group: Recoverability



This picture shows the activities involved with the Recoverability Activity Group. The next page shows the input and output activities.

This group accesses the design's ability to prevent damage spread and to restore degraded capabilities.

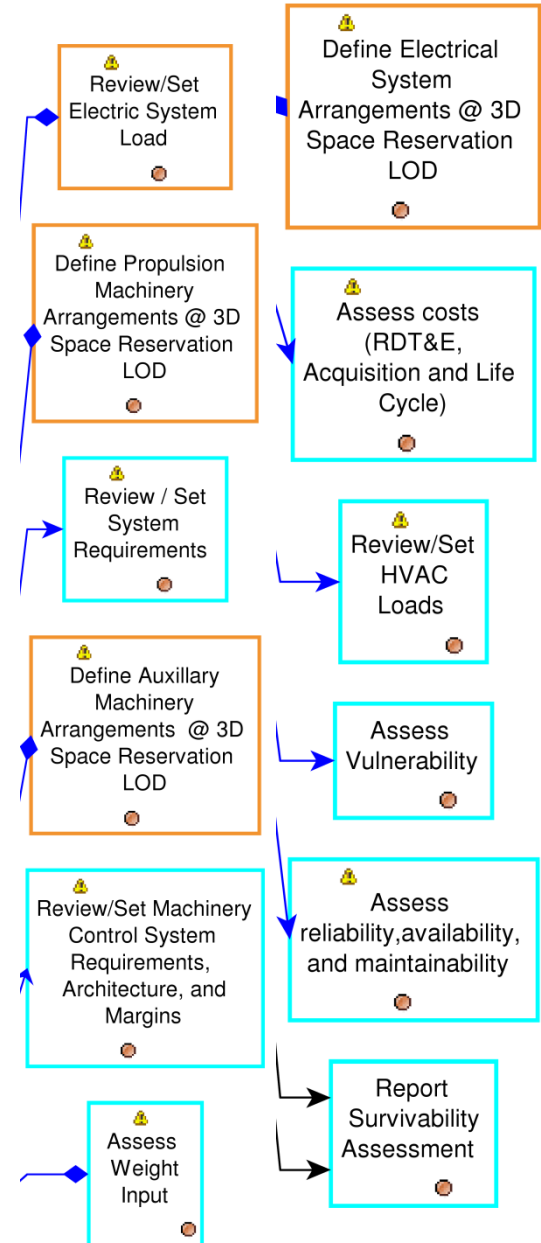
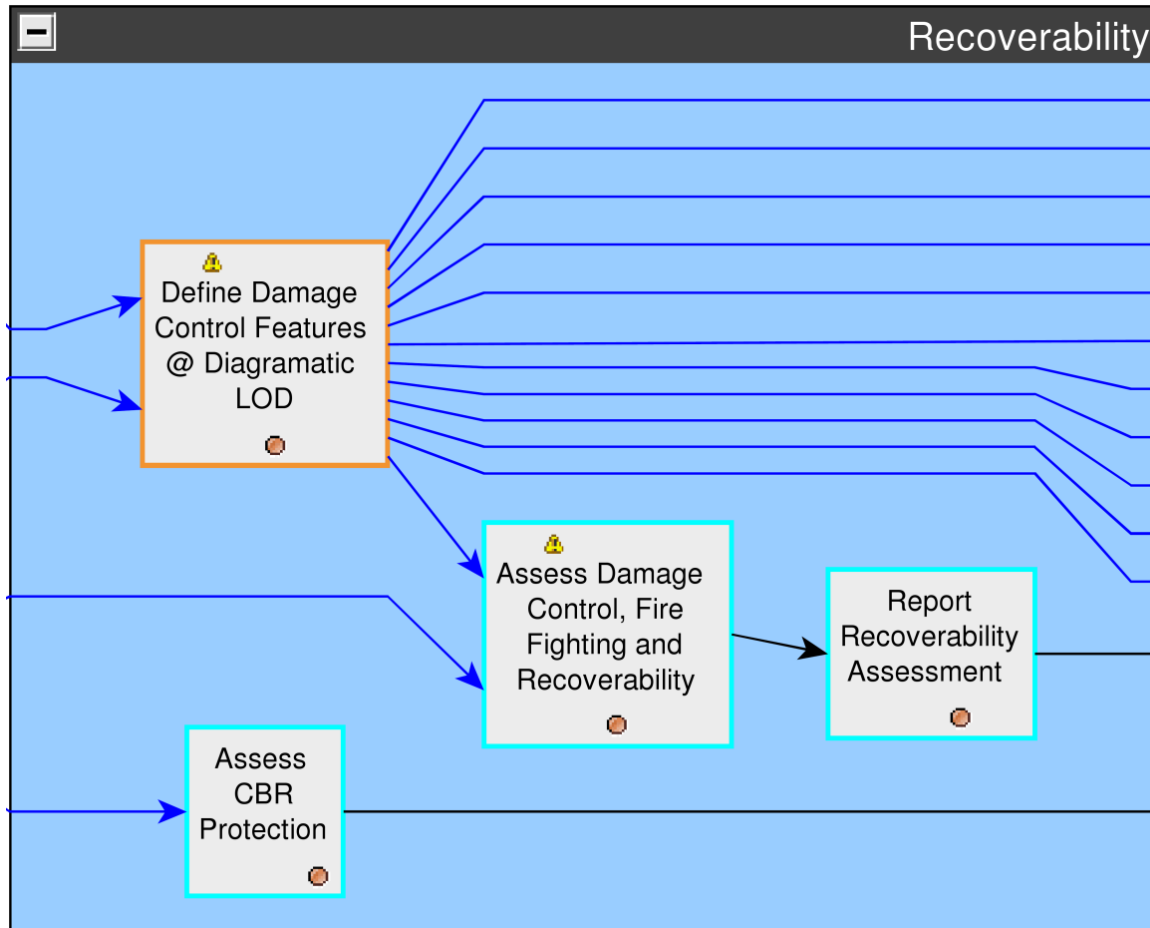
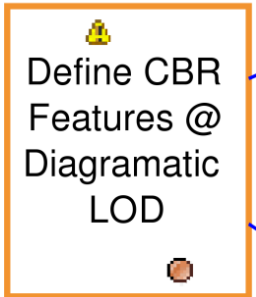
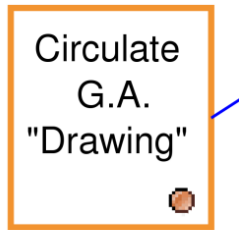
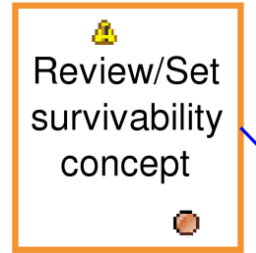
Descriptions of the activities are in Section C.

Survivability Activity Group: Recoverability

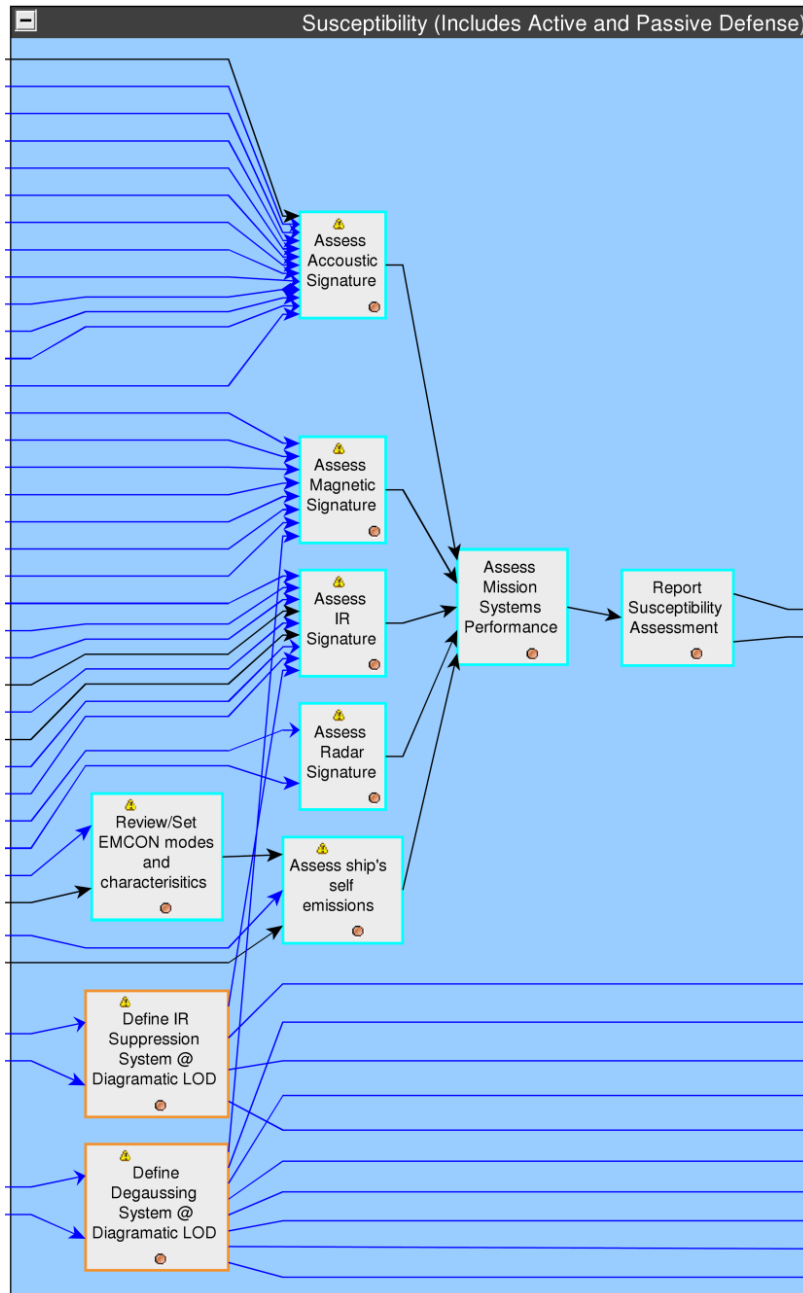
Inputs

Activities

Outputs



Survivability Activity Group: Susceptibility



This picture shows the activities involved with the Susceptibility Activity Group. The next page shows the input and output activities.

This group accesses the design's likelihood of being damaged by weapons or environmental threats.

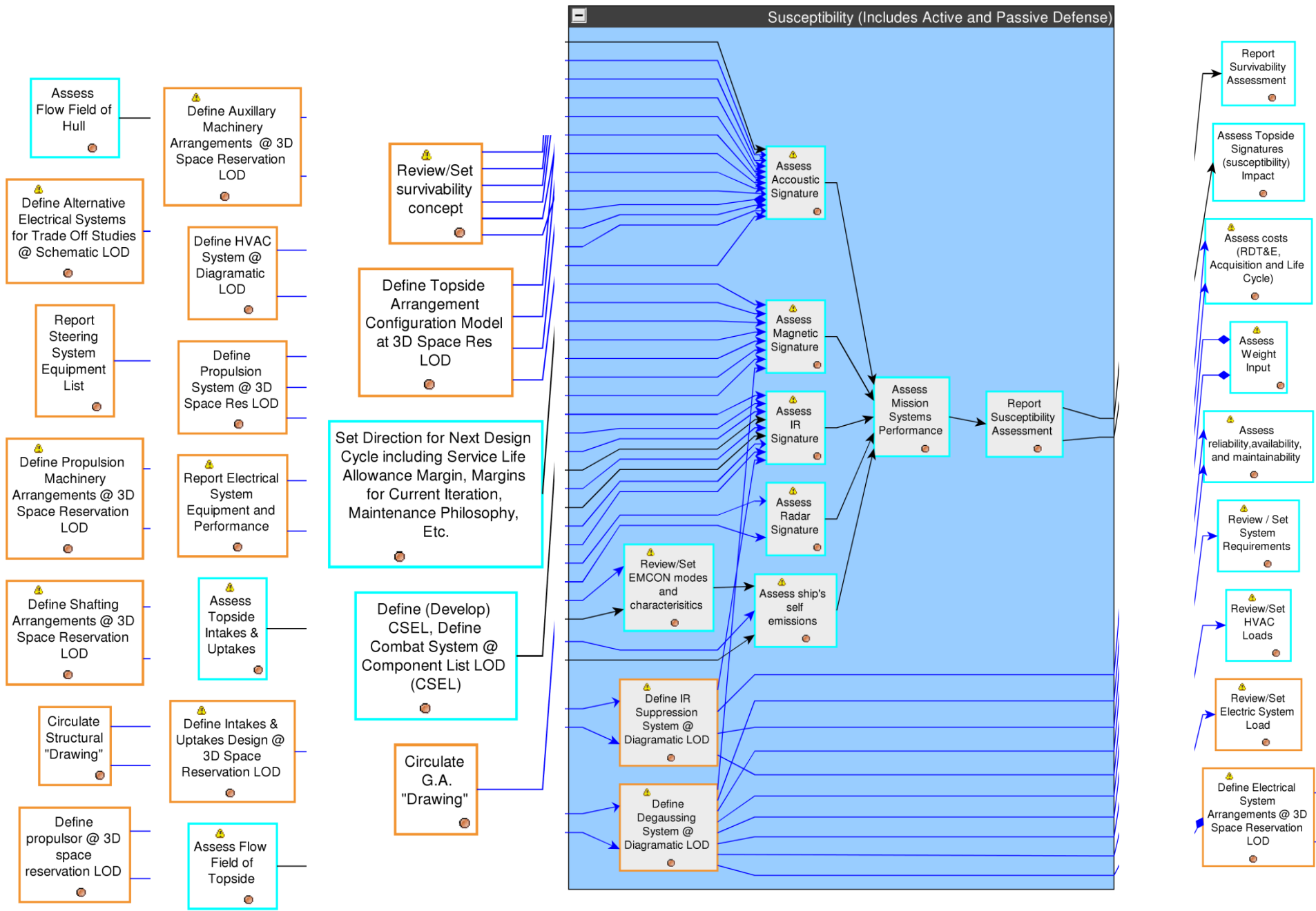
Descriptions of the activities are in Section C.

Survivability Activity Group: Susceptibility

Inputs

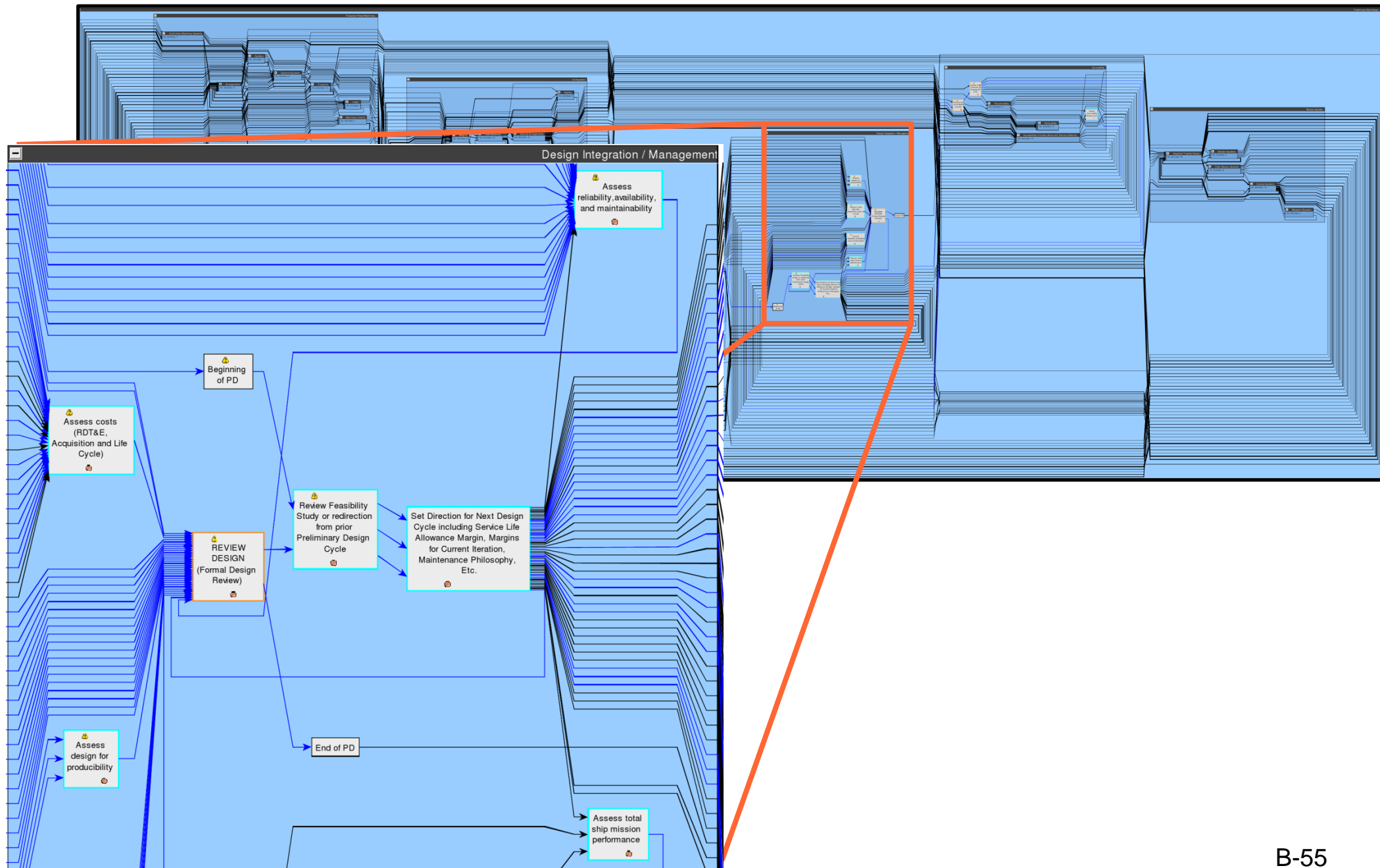
Activities

Outputs

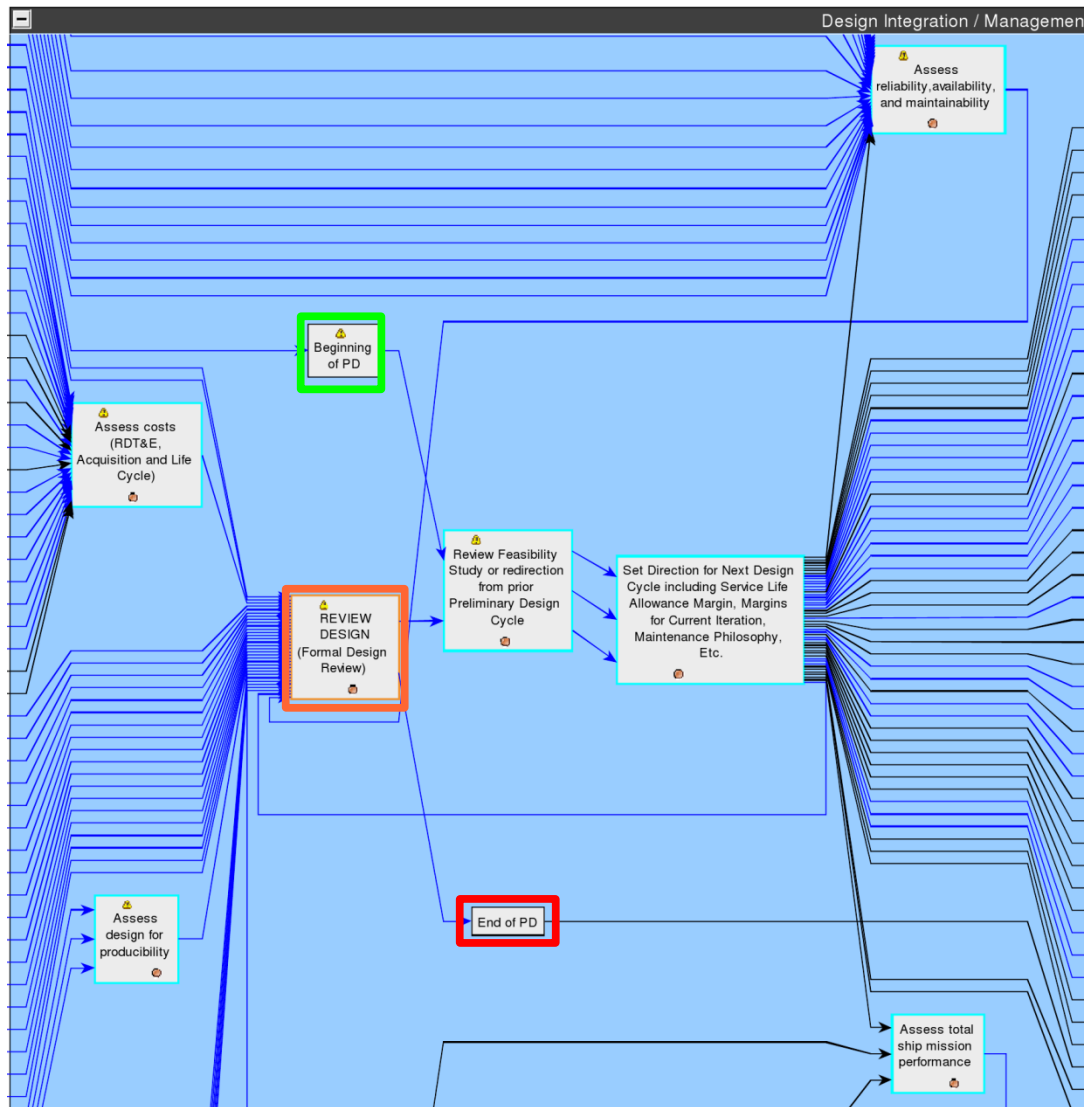


Design Integration & Management Design Area

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 page shows the input and out put activities that links Design Integration & Management Activity Groups.

This group focuses on the activities needed to “integrate” the ship.

The critical Activity in the Design Integration & Management Design Area is the “Formal Design Review”, shown in the orange box. All the information developed through the other Design Areas come together and the design is analyzed as a product.

Depending on the outcome of the Formal Design Review another iteration may begin with the “Begin Preliminary Design (PD)” Activity or continue to another Design Stage with the “End PD” activity; shown in the green and red boxes respectively.

Design Integration/ Management Activities

Inputs

Activities

Outputs

