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CSCD 350 Task 1 Supporting Document

Part A: Addressing Elements

1. **Aircraft, bomber** – defensive bomber aircraft used in the United States Air Force
    a. Source – [@www.boeing.com/defense/b-1b-bomber/]
    b. Category – noun
    c. Data – static aircraft chassis, dynamic bombing weaponry
    d. Control – Flight controls, weapons manipulation
    e. Behavior – Pilot flies the aircraft and controls the weaponry accordingly.
    f. Role – input – pilot directly influences the actions of the aircraft and its weapons.
    g. Pattern – behavioral – aircraft has specific set of behaviors that need to be defined and manipulated by a user.
    h. Concern – Controller – user input influences the behaviors and overall use of the aircraft.
    i. Difficulty – easy – much technological research has gone into aircraft manipulation programming already, as seen in transportation flights.
    j. Risk – moderate – malfunctions from something with heavy weaponry could lead to destructive failures.
    k. Confidence – low, minimal to no research on the subject before-hand
    l. Presentation – plane with a bomb icon to represent general visualization and specify role.

2. **Aircraft, fighter** – fighter aircraft used primarily for strong aerial/ground attacks or defenses in the United States Air Force
    a. Source – [@www.military.com/equipment/f-15e-strike-eagle]
    b. Category - noun
    c. Data – static aircraft chassis, dynamic bombing weaponry low-profile, maneuverable design frame (static)
    d. Control – flight controls, weapons manipulation
    e. Behavior – pilot controls aircraft and weaponry, digital navigation and radar system
    f. Role – input – pilot influences actions of the aircraft and its weapons
    g. Pattern – behavioral – aircraft has specific set of behaviors that need to be defined.
    h. Concern – controller – pilot input influences behavior of aircraft and weapons
    i. Difficulty – easy – like the bomber, aircraft programming exists currently and has been heavily leveraged.
    j. Risk – moderate – similar risk to destructive failures with something with heavy weapons, and naturally puts pilot at risk.
    k. Confidence – moderate – feeds off information about the bomber, and knowledge gained by word of mouth.
    l. Presentation – plane with a missile icon to represent the aircraft as being distinct in functionality from the bomber.

3. **Battleship** – armored warship with heavy artillery capabilities used to gain sea control.
   a. Source – [@military.wikia.org/wiki/Battleship]
   b. Category – noun
   c. Data – ship chassis, defensive armored shell (static), heavy gun battery (dynamic), masts (removed, static)
   d. Control – ship maneuvering, various weapons control
   e. Behavior – captain steers ship, deck department with various responsibilities, engineers for maintenance
   f. Role – input – overall crew influences the actions and behavior of the ship.
   g. Pattern – behavioral – defined set of behaviors and possible actions, controlled by captain/crew.
   h. Concern – controller – ship is manipulated by input and does nothing without human intervention.
   i. Difficulty – moderate – some elements would be easily controlled programmatically, such as the navigation system and radar, but others like the usage of weapons would likely need human intervention.
   j. Risk – moderate – like the aircrafts, something with large weaponry capabilities could have dangerous and destructive failures.
   k. Confidence – moderate – minor prior hobbyist research and basic knowledge
   l. Presentation – basic ship diagram with missile/torpedo indication

4. **Bomb, dumb** – large, unguided bombs (hence the name dumb) commonly dropped by aircraft.
   a. Source – [@www.globalsecurity.org/military/systems/munitions/gp.htm]
   b. Category – noun
   c. Data – various design patterns based on utility purpose, generally round, skinny frame with tail wings for aerodynamics. (static)
   d. Control – no control over bomb itself, except for release timing
   e. Behavior – free-falls to general target location.
   f. Role – output – bomb causes devastating blast and fragmentation with little to no manipulation needed.
   g. Pattern – structural – the primary defining element is the structure of the bomb, which determines its flight behavior, etc. based on its purpose.
   h. Concern – view – biggest impact is seen in the post-use effect of the bomb.
   i. Difficulty – Hard – the purpose of the bomb is specifically meant to be uncontrolled, so programmatically manipulating it would be very hard and potentially a waste of time and resources.
   j. Risk – high – bombs of any kind are very destructive, so the creation of such needs to be done with heavy care.
   k. Confidence – moderate – relatively basic concept
   l. Presentation – bomb pattern with no indicator of control

5. **Bomb, smart** – bomb launched with the ability to be guided.
   a. Source – [@en.wikipedia.org/wiki/Precision-guided_munition]

b. Category - noun
c. Data – similar slimmed rounded body as the dumb bomb, with similar wing setup for aerodynamics (all static)
d. Control – Variety of control options depending on the situation, from radio-controlled to laser-controlled to satellite or radar-controlled. Needs further specification.
e. Behavior – Controlled by specified method by pilot to achieve correct landing location and flight path.
f. Role – input – while the smart bomb's overall goal is to cause destruction, what distinguishes the smart bomb is the way it behaves and the input it receives to get it to its destination.
g. Pattern – behavioral – contrasted to the dumb bomb, the smart bomb has a significant job of behaving properly according to its control method to fulfill its purpose.
h. Concern – controller – biggest impact seen by the pilot's ability to properly control the bomb and get it to its destination.
i. Difficulty – easy – these bombs are designed specifically to be controlled programmatically, and the tech exists to allow that to happen, and can and should be implemented.
j. Risk – high – like the dumb bomb, failures can be very costly and destructive.
k. Confidence – moderate – I have seen similar concepts to smart bombs in many games/movies/etc.
l. Presentation – bomb pattern with control indication (satellite dish, radio, etc.)

6. **Countermeasure** – mechanism for deterring lock-on missiles.
   a. Source – [@www.globalsecurity.org/military/systems/aircraft/systems/ircm.htm]
   b. Category - noun
   c. Data – various shell designs, infrared radiation generator (static)
   d. Control – infrared radiation generator generates a heat source hotter than the aircraft's engines.
   e. Behavior – the heat generated by the infrared generator confuses IR seeking missiles to deter them from their intended target.
   f. Role – processing – the countermeasure is built to hinder the pathing process of the enemy missiles.
   g. Pattern – behavioral – the behavior of the countermeasure affects the behavior of the enemy missiles, and that behavior is key to the countermeasure fulfilling its purpose properly.
   h. Concern – controller – the purpose of the countermeasure is manipulation, although in this case there is no manual action required by the user (pilot)
   i. Difficulty – easy – IR has become a very common technology in various computer systems and would be relatively easy to implement in this product.
   j. Risk – high – failure to deter incoming missiles could be fatal.
   k. Confidence – moderate – I have worked with IR technology in the past and have a general understand of how it works.
   l. Presentation – square shell with missile icon and arrow, representing deterrence.

7. **Depth charge** – large explosive projectile launched underwater.
   a. Source – [@www.19fortyfive.com/2020/11/modernized-depth-charges-a-true-submarine-killer/]
   b. Category - noun
   c. Data – metallic barrels, filled with high-explosives (static)
   d. Control – Fast-sinking explosives used to take out enemy submarines by on-the-water ships.
   e. Behavior – coordination between person at the sonar and crew dropping the charge at the stern to determine the best launch time to target a moving submarine.
   f. Role – output – the explosion from depth charges is extremely deadly, and a carefully placed charge can easily take out a submarine.
   g. Pattern – structural – the thin bodies packed with explosives are key to the effectiveness of not only the impact of a depth charge, but also getting it to hit its target reliably.
   h. Concern – model – once a depth charge is launched, it is up to the design of the charge to hopefully make it to its destination.
   i. Difficulty – hard – depth charges themselves have no potential manipulation after launch, however it is important that the sonar is both accurate and taken advantage of to give it its full potential.
   j. Risk – high – the explosives in a depth charge are extremely powerful, and failures can have very destructive effects.
   k. Confidence – low – mixed information about design and usage from research
   l. Presentation – a sort of bomb indication, down arrow for direction, water drop icon for place usage.

8. **Fuze, depth** – munition activation that activates specifically based on distance going down.
   a. Source – [@www.inert-ord.net/usa03a/usa6/mk230/index.html]
   b. Category - noun
   c. Data – wind vane (dynamic)
   d. Control – rotating wind vane used for determining depth and when to trigger munition.
   e. Behavior – attached to munitions used for attacking underwater vessels such as submarines.
   f. Role – input – relies on depth determination from the vane attached to the tail in order to function properly.
   g. Pattern – structural – attached to a munition.
   h. Concern – controller – manipulates the activation of the munition.
   i. Difficulty – moderate – activation determined by rotation of the vane, can be programmed, might be better to do with hardware alone for physical accuracy.
   j. Risk – high – malfunctions and duds can cause the fuze to activate early and cause destruction.
   k. Confidence – low – no knowledge of the subject.
   l. Presentation – blast icon, arrow pointing down (depth)

9. **Fuze, distance** – munition activation that activates based on distance from source.
   a. Source – [@military.wikia.org/wiki/Artillery_fuze#Distance_measuring_fuzes]

b. Category - noun
c. Data – detonation mechanism (dynamic)
d. Control – detonates munitions based on distance travelled.
e. Behavior – determined distanced based on velocity of the munition and counting revolutions.
f. Role – input – the fuze relied on detecting distance as accurately as possible using things like the muzzle velocity and needs accurate input to function properly.
g. Pattern – structural – the structural design of mechanism for the fuze is key to it operating correctly and accurately.
h. Concern – controller – main functionality comes from its role in manipulating the munition it is attached to.
i. Difficulty – moderate – the only programming needed would be the mechanism.
j. Risk – low – allegedly safer than other fuze types due to the independence of the mechanism not needing any outside influence.
k. Confidence – low – not much knowledge on the subject
l. Presentation – blast icon, arrow pointing to the side (distance)

10. **Fuze, proximity** – munition activation that activates based on distance from target.
    a. Source – [@airandspace.si.edu/collection-objects/fuze-proximity-cutaway/nasm_A19940233000]
    b. Category - noun
    c. Data – dynamic detonation mechanism, often contains a radio transmitter.
    d. Control – detonates whatever munition it is attached to when it reaches whatever object or surface it was programmed to.
    e. Behavior – detonation is autonomously controlled programmatically, whether that is proximity to the ground, an enemy vessel, or other surface.
    f. Role – input – this fuze is very input-centered, as it is waiting to detect some surface or object to activate.
    g. Pattern – behavioral – the proximity fuze's effectiveness is centered on whether it activates when it is supposed to. Failing to do so could lead to an unsuccessful assault on something.
    h. Concern – controller – the munition the fuze is attached to is designed to be completely or partially reliant on the fuze going off, so the fuze has full manipulation over the munition it is attached to.
    i. Difficulty – easy – the proximity fuze uses basic technology forms, such as radio, and is sometimes designed with delay switches to increase the chance of being more precise with how close the munition is to its target.
    j. Risk – moderate – the fuze itself poses little to no threat in designing but testing it on live munitions could prove itself to be dangerous.
    k. Confidence – high – proximity fuzes are one of the more basic forms of fuzes and easy to grasp.
    l. Presentation – blast icon, arrow pointing towards line (surface proximity)

11. **Fuze, timed** – munition activation that activates based on time since launch.

a. Source – [@www.civilwarartillery.com/fuzes/default.htm]
b. Category - noun
c. Data – dynamic detonation mechanism, radio transmitter
d. Control – detonates munition it is attached to after a variable amount of time.
e. Behavior – deployer of munition with fuze sets the time to detonate via the radio transmitter located inside the fuze.
f. Role – input – much like the other fuze versions, the timed fuze takes input from the radio transmitter for its activation timing and serves as an "input" for the munition it is attached to.
g. Pattern – behavioral – fuze's function is centered around its timing and activation of the munition it is attached to.
h. Concern – controller – like the other fuzes, it manipulates the activation of the munition.
i. Difficulty – easy – the timing mechanism in this fuze is very basic using a radio controller that can be manipulated and activated from the host.
j. Risk – moderate – biggest risk comes in testing the fuze on live munitions.
k. Confidence – high – timed fuzes also have an obvious use in context of where and when they are used.
l. Presentation – blast icon, clock

12. **Main battery gun** – primary set of weaponry on a vessel
    a. Source – [@en.wikipedia.org/wiki/Main_battery]
    b. Category - noun
    c. Data – gun/group of guns (dynamic, moving), rotating base for aiming (dynamic)
    d. Control – main group of rotating weapons on a warship to fight against enemy warships.
    e. Behavior – dynamic turreted groups of guns controlled at the weapons control stations of a warship.
    f. Role – output – the main effectiveness in the main battery is the output of the guns themselves, to have the highest effect on enemy ships as possible.
    g. Pattern – structural – the placement and mechanical functionality of the battery are very important in their effectiveness.
    h. Concern – model – manipulated by the crew to be used wherever it needs to be used.
    i. Difficulty – moderate – a large part of its control is mechanically oriented, but that mechanical motion does still need programmatical manipulation.
    j. Risk – high – malfunction of high-powered weaponry can be very dangerous.
    k. Confidence – low – I know little about warship guns other than research done.
    l. Presentation – top-down view of a circular base with several turret barrels coming out of it.

13. **Maneuver, defensive** – repositioning to gain a position more protected from an enemy.
    a. Source – [@www.flightsimbooks.com/f15strikeeagle/05_04_Defensive_Maneuvers.php]
    b. Category - verb
    c. Data – versatile movement (dynamic), disengagement capabilities (dynamic)

d. Control – disengage from enemy aircraft, maneuver around enemy aircraft, allow defensive repositioning.
e. Behavior – implement various repositioning strategies to gain a better defensive position against an enemy plane, etc. to avoid dangerous situations.
f. Role – input – the pilot will need to be able to act on these maneuvers to get out of dangerous situations against enemy aircraft.
g. Pattern – behavioral – maneuvers are entirely action-based, both for the pilot and aircraft.
h. Concern – view – the main purpose of a defensive maneuver is to get to a position where you have clear sight of the enemy to attack and avoid being attacked.
i. Difficulty – moderate – aircraft need to be given the capabilities to swiftly and efficiently perform the necessary maneuvers.
j. Risk – high – performing these wrong or being unable to perform these correctly can be fatal.
k. Confidence – low – not much know about the subject.
l. Presentation – figure-8 arrow with a D for defensive

14. **Maneuver, evasive** – repositioning to avoid a certain situation.
    a. Source – [@en.wikipedia.org/wiki/Basic_fighter_maneuvers]
    b. Category - verb
    c. Data – versatile movement (dynamic)
    d. Control – evade enemies and enemy attacks in an aircraft.
    e. Behavior – apply various maneuver techniques when targeted by enemy attacks in order to disengage from a situation or gain advantage on the enemy.
    f. Role – processing – evasion is all about reacting to environmental conditions and situations.
    g. Pattern – behavioral – actions taken by a pilot.
    h. Concern – view – influenced by the actions of the enemy and other conditions around you.
    i. Difficulty – moderate – aircraft needs high maneuvering capabilities to be able to get out of targeted situations.
    j. Risk – high – being unable to evade enemy attacks can be fatal.
    k. Confidence – low – not much knowledge about the subject.
    l. Presentation – figure-8 arrow with an E for evasive

15. **Maneuver, offensive** – repositioning to gain an attacking advantage on an enemy.
    a. Source – [@http://www.combataircraft.com/en/Tactics/Air-To-Air/Offensive-Split/]
    b. Category – verb
    c. Data – versatile movement, engaging capabilities (dynamic, constant changing)
    d. Control – strategically engage with enemy aircraft, allow for advantageous positioning behind enemies.
    e. Behavior – pilots control their aircraft using various strategies to allow for an attack on an enemy aircraft, for example closing a gap or getting behind them.

    f.   Role – input – relies on the pilot's ability to maneuver in such a way that they can attack the enemy.

    g.   Pattern – behavioral – like the other maneuvers, relies on the pilot's actions.

    h.   Concern – view – main purpose of an offensive maneuver is in positioning and advantageous view, having view of an enemy when the enemy has no view of you.

    i.   Difficulty – moderate – like other maneuvers, aircraft needs to be able to move efficiently and swiftly.

    j.   Risk – moderate – performing maneuvers incorrectly can be dangerous but will sometimes just lead to missed opportunities to attack.

    k.   Confidence – low – little known about subject.

    l.   Presentation – figure-8 arrow with an O for offensive

16. **Missile** – long, thin, guided explosive projectile.

    a.   Source – [@en.wikipedia.org/wiki/Missile]

    b.   Category - noun

    c.   Data – thin long shell (static), jet engine/rocket motor (dynamic)

    d.   Control – self-propelled by rocket motor, guided by guidance system.

    e.   Behavior – launched by aircraft/ships/on ground to attack an enemy vessel, whether that be ship, tank, aircraft, satellite, etc.

    f.   Role – output – goal is to cause destruction to enemy vessels.

    g.   Pattern – behavioral – relies on guidance system to hit its target.

    h.   Concern – model – the missile itself is manipulated by the guidance system to reach its destination.

    i.   Difficulty – moderate – guidance system needs to be programmed correctly and accurately for the missiles to perform best.

    j.   Risk – high – involves explosives.

    k.   Confidence – moderate – basic concept to grasp.

    l.   Presentation – simple missile diagram

17. **Sensor fusion** – combining sensor readings.

    a.   Source – [@www.aptiv.com/en/insights/article/what-is-sensor-fusion]

    b.   Category - verb

    c.   Data – algorithms (static), various sensors being used (radar, cameras, etc.) (dynamic)

    d.   Control – combines data from various radars, cameras, and other sensors according to set algorithms.

    e.   Behavior – used to create a more accurate model of the environment surrounding an object or vehicle.

    f.   Role – processing – receives input and generates output, but more importantly is how it processes the data it receives based on the specified algorithms.

    g.   Pattern – creational – accuracy of the environmental view it creates is important.

    h.   Concern – model – creates a model of a vehicle.

    i.   Difficulty – moderate – difficulty depends on the sensors used, number of sensors, vehicle analyzed, etc.

      j.   Risk – moderate – depending on the situation, sensors failing could be very impactful, but in others nothing more than an inconvenience.

      k.   Confidence – low – nothing known about the subject before.

      l.   Presentation – three camera icons with arrows pointing from them towards the center.

18. **Sensor, acoustic** – measures sound waves
    a. Source – [@realtechsupport.org/UB/MRII/docs/sensing/Acoustic%20Sensors.pdf]
    b. Category - noun
    c. Data – algorithm for detecting and processing sound waves (static), shell and physical hardware of sensor (static)
    d. Control – takes input of acoustic waveforms and converts it to frequency components.
    e. Behavior – used by the military to detect incoming artillery and other object sources.
    f. Role – input – taking in acoustic waveforms; processing – algorithm for processing the waveforms.
    g. Pattern – creational – takes basic waveforms and creates a frequency chart out of it.
    h. Concern – view – gives users a readable form for incoming acoustics.
    i. Difficulty – hard – incoming data needs to be converted in an accurate and precise manner, to account for many sources of input.
    j. Risk – high – failure in the system can result in incoming attacks not detected.
    k. Confidence – low – no knowledge on sensors before
    l. Presentation – speaker with arrow pointing in.

19. **Sensor, active** – measures various readings from a specific object
    a. Source – [@www.nasa.gov/directorates/heo/scan/communications/outreach/funfacts/txt_passive_active.html]
    b. Category - noun
    c. Data – radar sensor (static), sensor shell (static)
    d. Control – measure echoed radar information from whatever object it is monitoring.
    e. Behavior – used to create relative mappings of various objects and information near or affecting whatever it is monitoring.
    f. Role – input – takes in echoed information; processing – processes echoed information into relative maps about surroundings; output – creates map of surroundings from information.
    g. Pattern – creational – creates relative maps of surroundings.
    h. Concern – view – maps give users important information in a 3D space.
    i. Difficulty – hard – output maps need to be accurate to give the best information possible, and processing needs to be precise as well.
    j. Risk – low – other than inconvenience of information, not much risk is relevant here.
    k. Confidence – low – no knowledge on these sensors before
    l. Presentation – Radar icon with an A for active

20. **Sensor, passive** – measures various readings in the environment

a. Source –
[@www.nasa.gov/directorates/heo/scan/communications/outreach/funfacts/txt_passive_active.html]
b. Category - noun
c. Data – microwave sensor (static), sensor shell (static)
d. Control – measures low power emissions from whatever is being monitored, such as radiation.
e. Behavior – used to gather various environmental information regarding an object (radiation, heat, etc.)
f. Role – input – purely for gathering environmental information.
g. Pattern – behavioral – relies on the input it receives and how accurately it gathers it.
h. Concern – model – manipulated by environmental conditions that determine what information it gathers.
i. Difficulty – moderate – involves precise gathering of information.
j. Risk – low – no large risk of failure, only inconvenience of information
k. Confidence – low – no knowledge on sensor before
l. Presentation – radar icon with a P for passive

21. **Sensor, radar** – pings with electromagnetic waves to detect nearby objects.
    a. Source – [www.elprocus.com/radar-basics-types-and-applications/]
    b. Category - noun
    c. Data – radio frequency detection (static), electromagnetic sensor (static)
    d. Control – transmits electromagnetic energy to objects such as ships and aircraft and receives echoes.
    e. Behavior – used to determine the distance from the radar sensor to the object. Also used to track, locate, and identify these objects.
    f. Role – input – gathers information about the detected objects.
    g. Pattern – behavioral – heavily relies on the sensor's ability to correctly translate received information into identifying objects and information about them.
    h. Concern – model – subject to the information it receives and converts that information into knowledge about objects it finds.
    i. Difficulty – hard – needs to be accurate and needs to account for a wide variety of findings.
    j. Risk – moderate – depending on the usage, if it is being used to discover and identify enemy threats, failure of the sensor could be dangerous.
    k. Confidence – moderate – some knowledge of radar technology
    l. Presentation – stereotypical icon of a radar circle with scanning segment

22. **Sensor, sonar** – pings using ultrasonic waves to detect nearby objects.
    a. Source – [@www.maxbotix.com/articles/how-ultrasonic-sensors-work.htm]
    b. Category - noun
    c. Data – sonar pinging device (dynamic)
    d. Control – sends out ultrasonic pulses and receives them back.

e. Behavior – measures the distance between the sensor and an object that reflects the ultrasonic pulses.
f. Role – input – gathers information about distance to objects.
g. Pattern – creational – can generate a mapping of various objects in the surrounding area.
h. Concern – view – creates a mapping for viewing of the user.
i. Difficulty – moderate – technology is relatively basic, but mappings and readings need to be precise.
j. Risk – moderate – can be used to gain passive knowledge, or to gain information about dangerous surroundings or incoming objects.
k. Confidence – moderate – some knowledge of ultrasonic and sonar systems
l. Presentation – curved waveforms going in a direction from a source.

23. **Sensor, thermal** – detects changes in temperature.
    a. Source – [@www.sciencedirect.com/topics/engineering/thermal-sensor]
    b. Category - noun
    c. Data – simple sensor for detecting thermal changes (static).
    d. Control – detects change in thermal/temperature setting by means of contact or non-contact.
    e. Behavior – used to detect change in temperature of the surrounding area using infrared (non-contact) or the thermals of a specific object (contact).
    f. Role – input – role is entirely based on thermal input.
    g. Pattern – behavioral – reliant on accurate readings of thermal changes.
    h. Concern – model – manipulated by the environment/object changing to get readings.
    i. Difficulty – easy – simple transferring of data, detecting thermal energy itself is very physical-based.
    j. Risk – moderate – if being used to detect things like overheating, a failure in the system can cause major damage and possible harm to individuals.
    k. Confidence – high – adequate knowledge of heat detection and how thermal energy works.
    l. Presentation – thermometer symbol

24. **Shell** – arcing projectile used by various weapon types.
    a. Source – [@hypertextbook.com/facts/2002/NickishaBerlus.shtml]
    b. Category - noun
    c. Data – various casing shapes and sizes, depending on weapon it is used for (static)
    d. Control – houses whatever material the projectile is made of, whether it is explosive or not.
    e. Behavior – launched by high-arching artillery weapons, such as mortars, howitzers, etc.
    f. Role – output – shells are designed to output damage.
    g. Pattern – structural – designed to fit well with the weapon it is created for and situations it is used for.
    h. Concern – model – controlled entirely by the weapon it is loaded in.
    i. Difficulty – hard – very static object, no programming required.

      j.   Risk – high – if the shell is explosive, failures can cause massive damage.

      k.   Confidence – moderate – basic concept, easy to grasp.

      l.   Presentation – bullet symbol.

25. **Submarine** – vessel for underwater and on-water transportation
    a. Source – [@www.britannica.com/technology/submarine-naval-vessel]
    b. Category - noun
    c. Data – long, rounded hull, sometimes coated with sound-absorbing material, engine propelled (dynamic)
    d. Control – transport underwater and on-water as well, making it distinct from typical warships. Can be used for just transportation or attacks.
    e. Behavior – Strategic submarines are used for a stealth element, as well as countering attacks sent at itself or allied vessels, and in general deter enemy attacks. Attack submarines are used for targeting and destroying either enemy submarines or enemy surface warships.
    f. Role – processing – strategic submarines, for actively dealing with enemy ships and attacks; output – attack submarines, for actively damage enemy ships.
    g. Pattern – structural – various designs for attack and strategic submarines depending on their purpose.
    h. Concern – controller – strategic submarines particularly are designed to gain control and manipulation over the area they reside in.
    i. Difficulty – moderate – many systems need to be implemented into a submarine in order to function well, from steering to sonar to possible weaponry.
    j. Risk – high – strategic submarines need to be precisely designed to avoid detection, as detection can give away the position of other allied vessels and cause further problems.
    k. Confidence – low – not much prior knowledge on the subject.
    l. Presentation – basic submarine model

26. **Torpedo** – projectile fired underwater to target enemy warships or submarines.
    a. Source – [@www.thedrive.com/the-war-zone/33018/modern-submarine-torpedo-attacks-are-nothing-like-what-you-see-in-the-movies]
    b. Category - noun
    c. Data – very long, very thin projectile frame, fuel- or electric-controlled propulsion (dynamic)
    d. Control – designed to breach the frame of warships and submarines.
    e. Behavior – launched by submarines and warships at high speeds, some with target-seeking capabilities.
    f. Role – output – primary role of the torpedo is the damage it can do to an enemy vessel.
    g. Pattern – behavioral – usage and effectiveness mostly determined the way it is launched and the target-seeking capabilities.
    h. Concern – model – purely manipulated by the vessel it is launched by, and any target-seeking capabilities it is given.

     i. Difficulty – moderate – target-seeking is something that is being actively countered by other forms of technology and needs to be aggressively programmed into weapons like torpedoes in order to be effective.

    j. Risk – moderate – electric torpedoes have less risk of handling, but thermal torpedoes are more dangerous to handle.

    k. Confidence – moderate – some knowledge prior, and basic concept to grasp.

    l. Presentation – model with long, thin frame, small tails on the back.

Part B: Grouping Elements

- Weaponry
  - Bomb, dumb
  - Bomb, smart
  - Main battery gun
  - Missile
  - Torpedo
  - Depth charge
  - Shell
- Munitions
  - Missile
  - Torpedo
  - Shell
  - Fuze, depth
  - Fuze, distance
  - Fuze, proximity
  - Fuze, timed
- Utility
  - Sensor, acoustic
  - Sensor, active
  - Sensor, passive
  - Sensor, radar
  - Sensor, sonar
  - Sensor, thermal
  - Countermeasure
- Vessel
  - Aircraft, bomber
  - Aircraft, fighter
  - Battleship
  - Submarine
- Action
  - Maneuver, defensive
  - Maneuver, offensive
  - Maneuver, evasive
  - Sensor fusion

Word count: 4496