```xml
<?xml version="1.0" encoding="UTF-8"?>
<AVCL version="3.0" vehicleName="RescueDrone" vehicleType="UAV" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="../../schemas/AVCL.3.0.xsd">
    <!-- vehicleType="USV" is also possible -->
    <head>
        <meta name="title" content="PiratesSeizingMerchantDefense.xml"/>
        <meta name="description" content="AVCL mission to overtake pirate small-boat gang attempting to capture threatened merchant ship,
        provide warning and counterattack if escalation of hostilities is warranted."/>
        <meta name="created" content="27 December 2019"/>
        <meta name="modified" content="16 February 2020"/>
        <meta name="creator" content="Don Brutzman"/>
        <meta name="reference" content="https://wiki.nps.edu/display/NOW/Ethical+Control+of+Unmanned+Systems"/>
        <meta name="reference" content="https://gitlab.nps.edu/Savage/EthicalControl/raw/master/missions/PiratesSeizingMerchantDefense.png"/>
        <meta name="generator" content="Altova XMLSpy, https://www.altova.com"/>
        <meta name="generator" content="Apache NetBeans, https://netbeans.apache.org"/>
        <meta name="generator" content="NPS Autonomous Unmanned Vehicle (AUV) Workbench, https://savage.nps.edu/AuvWorkbench"/>
        <meta name="identifier"
            content="https://gitlab.nps.edu/Savage/EthicalControl/tree/master/missions/avcl/PiratesSeizingMerchantDefense.xml"/>
        <meta name="license" content="../license.html"/>
    </head>
    <body>
        <MissionPreparation>
            <UnitsOfMeasure distance="meters" angle="degrees" mass="kilograms" time="seconds"/>
            <AgendaMission>
                <LaunchPosition id="LaunchPosition" description="Ship position when robot is launched">
                    <LatitudeLongitude latitude="0" longitude="0"/>
                </LaunchPosition>
                <RecoveryPosition id="RecoveryPosition" description="Ship position when ready to recover robot">
                    <LatitudeLongitude latitude="0" longitude="0"/>
                </RecoveryPosition>
                <GoalList>
                    <!--*Initiation Phase* to commence operations-->
                    <Goal id="PSMD11.0" title="Deploy, Launch" description="Commit to robot support" phase="Launch" nextOnSuccess="PSMD12.0"
                    nextOnFailure="PSMD99.0" nextOnException="PSMD99.0">
                        <Rendezvous description="">
                            <TargetVehicleID value="100" description="Launching ship"/>
                            <TargetVehicleID value="101" description="This robot"/>
                            <!--
                            <TargetVehicleID value="102" description="Recovery Ship"/>
                            <TargetVehicleID value="103" description="Merchant Ship"/>
                            -->
                        </Rendezvous>
                        <OperatingArea id="AssignedOpArea">
                            <Point>
                                <LatitudeLongitude latitude="36.62" longitude="121.506"/>
                                <!--36°36'11"N 121°53'37"W-->
                            </Point>
                        </OperatingArea>
                        <Duration value="300"/>
                        <ReportingCriteria value="onCommence"/>
                        <ReportingCriteria value="periodic"/>
                        <ReportingCriteria value="statusChanged"/>
                        <ReportingCriteria value="onComplete"/>
                    </Goal>
```

```xml
<!--*Approach Phase* to overtake pirate small-boat gang attempting to capture threatened merchant ship-->
<Goal id="PSMD12.0" title="Transit to hostile area" description="Proceed to estimated position" phase="Transit"
nextOnSuccess="PSMD13.0" nextOnFailure="PSMD99.0" nextOnException="PSMD99.0">
    <Search datumType="point" requiredPD="0.5">
       <Target name="Merchant Ship" id="MerchantShip" description="Fleeing or stationary"/>
    </Search>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="6000"/>
</Goal>
<!-- Group 13 Locate Merchant has common objective, exception -->
<Goal id="PSMD13.0" title="Locate Merchant" description="Use best search pattern, then follow moving ship and boats"
phase="Transit" nextOnSuccess="PSMD13.1" nextOnFailure="PSMD21.0" nextOnException="PSMD99.0">
    <Rendezvous description="">
       <TargetVehicleID value="101" description="This robot"/>
       <TargetVehicleID value="102" description="Lifeboat"/>
    </Rendezvous>
    <OperatingArea refid="AssignedOpArea"/>
</Goal>
<Goal id="PSMD13.1" title="Report position" description="Alerts updated" phase="Transit" nextOnSuccess="PSMD13.2"
nextOnFailure="PSMD13.2" nextOnException="PSMD99.0">
    <MonitorTransmissions title="Send initial position report"/>
    <OperatingArea refid="AssignedOpArea"/>
</Goal>
<Goal id="PSMD13.2" title="Mark with Beacon" description="Monitor wind effects and ocean current" phase="Transit"
nextOnSuccess="PSMD14.0" nextOnFailure="PSMD21.0" nextOnException="PSMD99.0">
    <MarkTarget description="TODO ensure beacon/pinger in water">
       <Marker type="dyeMarker"/>
       <Target name="Merchant Ship Contact" id="MerchantShipContact"/>
    </MarkTarget>
    <OperatingArea refid="AssignedOpArea"/>
</Goal>
<!-- Group 14 Track Merchant has common objective and exception, includes loops-->
<Goal id="PSMD14.0" title="Track Merchant" description="Monitor and communicate" phase="Track" nextOnSuccess="PSMD14.1"
nextOnFailure="PSMD14.1" nextOnException="PSMD99.0">
    <Search datumType="point" requiredPD="0.5" description="Track Merchant"/>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="6000"/>
</Goal>
<Goal id="PSMD14.1" title="Maintain proximity" description="Beyond range of small arms" phase="Track"
nextOnSuccess="PSMD14.2" nextOnException="PSMD99.0">
    <Rendezvous description="Safe standoff distance">
       <TargetVehicleID value="101" description="This robot"/>
       <TargetVehicleID value="102" description="Lifeboat"/>
    </Rendezvous>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="6000"/>
</Goal>
<Goal id="PSMD14.2" title="Periodic reports" description="Situation reports, changing status" phase="Track"
nextOnSuccess="PSMD14.3" nextOnException="PSMD99.0">
    <MonitorTransmissions xsi:type="monitorTransmissionsElementType" description="Track sailor in water"/>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="6000"/>
</Goal>
```

```xml
<Goal id="PSMD14.3" title="Continue until further orders" description="Repeat until conditions change" phase="Track"
nextOnSuccess="PSMD14.9" nextOnFailure="PSMD21.0" nextOnException="PSMD99.0">
    <Patrol description="Perform any periodic requirements">
        <!--TODO should be agendaGoalType allowing OperatingArea-->
    </Patrol>
</Goal>
<Goal id="PSMD14.9" title="Check posture changed?" description="Task update received?" phase="Track"
nextOnSuccess="PSMD30.0" nextOnFailure="PSMD14.0" nextOnException="PSMD99.0">
    <MonitorTransmissions xsi:type="monitorTransmissionsElementType" description="Track sailor in water"/>
    <!--Branch point: note possible human override checked prior to looping.-->
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="6000"/>
</Goal>
<!-- Group 21 Request Guidance? and Group 22 Low Fuel have common objective, exception-->
<Goal id="PSMD21.0" title="Request Guidance?" description="Need updated position" phase="Transit" nextOnSuccess="PSMD12.0"
nextOnFailure="PSMD99.0" nextOnException="PSMD99.0">
    <MonitorTransmissions title="Request Guidance" description="Active transmission allowed, subject to EMCON"/>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="6000"/>
</Goal>
<Goal id="PSMD22.0" title="Low Fuel" description="Make best effort possible" phase="Mission Finish"
nextOnSuccess="PSMD22.1" nextOnException="PSMD99.0">
    <Reposition title="Prepare to finish"/>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="6000"/>
</Goal>
<Goal id="PSMD22.1" title="Remain with Merchant?" description="Choices: land on boat, attach to boat, or adrift nearby"
phase="Mission Finish" nextOnSuccess="PSMD22.2" nextOnException="PSMD99.0">
    <Rendezvous title="Attach, Land or Adrift" description="as close as advisable">
        <TargetVehicleID value="101" description="This robot"/>
        <TargetVehicleID value="102" description="Lifeboat"/>
    </Rendezvous>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="6000"/>
</Goal>
<Goal id="PSMD22.2" title="Beacon?" description="While power remains" phase="Mission Finish" nextOnSuccess="PSMD99.0"
nextOnFailure="PSMD99.0" nextOnException="PSMD99.0">
    <MarkTarget description="TODO ensure beacon/pinger in water">
        <Marker type="dyeMarker"/>
        <Target name="Lifeboat last known location" id="LifeboatLastKnownLocation"/>
    </MarkTarget>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="6000"/>
</Goal>
<!-- *Warning Phase* to warn pirate small-boat gang to stand down and move away, otherwise lethal force imminent-->
<Goal id="PSMD30.0" title="Warning Phase" description="Close interaction with pirates, merchant ship" phase="Warning"
nextOnSuccess="PSMD31.0" nextOnException="PSMD99.0"/>
<Goal id="PSMD31.0" title="Confirm Mission Authorities" description="Check constraints and defensive responses"
phase="Warning" nextOnSuccess="PSMD32.0" nextOnException="PSMD99.0">
    <MonitorTransmissions description="Contact operational commander"/>
</Goal>
```

```xml
<!-- Group 32 IFFNU has common objective, exception-->
<Goal id="PSMD32.0" title="IFFNU" description="Identify Friend Foe Neutral Unknown" phase="Classify"
nextOnSuccess="PSMD32.1" nextOnFailure="PSMD32.1" nextOnException="PSMD99.0">
    <SampleEnvironment description="Check local conditions and all entities in operational area"/>
</Goal>
<Goal id="PSMD32.1" title="Photograph all close contacts" description="Pass within range of small arms" phase="Classify"
nextOnSuccess="PSMD32.2" nextOnException="PSMD99.0">
    <MarkTarget description="Record EM signals, take photos for classification">
        <Marker type="photograph"/>
        <Marker type="emScan"/>
        <Target name="Pirate Boat 1" id="PirateBoat1"/>
        <Target name="Pirate Boat 2" id="PirateBoat2"/>
        <Target name="Pirate Boat 3" id="PirateBoat3"/>
        <!-- possibly more pirates -->
        <Target name="Merchant Ship" refid="MerchantShip"/>
        <!-- possibly merchant ship life raft(s) -->
    </MarkTarget>
</Goal>
<Goal id="PSMD32.2" title="Classify, send contact reports" description="Based on target behavior or signal/image match"
phase="Classify" nextOnSuccess="PSMD32.3" nextOnException="PSMD99.0">
    <!--Does Classify computation require a separate  standoff task?-->
    <MonitorTransmissions description="Contact operational commander"/>
</Goal>
<Goal id="PSMD32.3" title="Confirm IFFNU classifications" description="Requires approval by human commander before
proceeding further" phase="Classify" nextOnSuccess="PSMD33.0" nextOnFailure="PSMD14.0" nextOnException="PSMD99.0">
    <MonitorTransmissions description="Contact operational commander"/>
</Goal>
<!-- Group 33 Commence Warnings? decision tree has common objective, exception-->
<Goal id="PSMD33.0" title="Commence Warnings" description="May provoke pirate response" phase="Engagement"
nextOnSuccess="PSMD33.1" nextOnFailure="PSMD14.0" nextOnException="PSMD99.0">
    <MonitorTransmissions description="Contact operational commander"/>
</Goal>
<Goal id="PSMD33.1" title="Notify Merchant" description="Keep crew informed, even if they cannot transmit"
phase="Engagement" nextOnSuccess="PSMD34.0" nextOnFailure="PSMD14.0" nextOnException="PSMD99.0">
    <MonitorTransmissions description="Contact operational commander"/>
</Goal>
<!-- Group 34 Send Warning Messages has common objective, exception-->
<Goal id="PSMD34.0" title="Send Warning Messages" description="Communicate to pirates, all parties" phase="Warning"
nextOnSuccess="PSMD34.1" nextOnFailure="PSMD34.1" nextOnException="PSMD99.0">
    <MonitorTransmissions description="Contact pirates"/>
</Goal>
<Goal id="PSMD34.1" title="Send multiple message paths" description="Loudspeaker, flashing light, siren, drop smoke,
bridge-bridge radio" phase="Warning" nextOnSuccess="PSMD34.2" nextOnException="PSMD99.0">
    <MonitorTransmissions description="Contact pirates"/>
</Goal>
<Goal id="PSMD34.2" title="Maintain proximity" description="Just outside range of small arms" phase="Warning"
nextOnSuccess="PSMD34.3" nextOnException="PSMD99.0">
    <Rendezvous description="Safe standoff distance">
        <TargetVehicleID value="101" description="This robot"/>
        <TargetVehicleID value="102" description="Merchant Ship"/>
    </Rendezvous>
    <OperatingArea refid="AssignedOpArea"/>
</Goal>
```

```xml
<Goal id="PSMD34.3" title="Periodic reports" description="Situation reports, changing status" phase="Warning"
nextOnSuccess="PSMD34.4" nextOnException="PSMD99.0">
    <MonitorTransmissions xsi:type="monitorTransmissionsElementType" description="Track sailor in water"/>
    <Duration value="6000"/>
</Goal>
<Goal id="PSMD34.4" title="Continue until further orders" description="First repeat for all designated pirates"
phase="Warning" nextOnSuccess="PSMD35.0" nextOnFailure="PSMD14.0" nextOnException="PSMD99.0">
    <Patrol description="Perform any periodic requirements">
        <!--TODO should be agendaGoalType allowing OperatingArea-->
    </Patrol>
</Goal>
<!-- Group 35 Observe pirate response has common objective, exception-->
<Goal id="PSMD35.0" title="Observe pirate response" description="Monitor and report back to own ship" phase="Hostilities
Imminent" nextOnSuccess="PSMD35.1" nextOnFailure="PSMD35.1" nextOnException="PSMD99.0">
    <Patrol description="Perform any periodic requirements">
        <!--TODO should be agendaGoalType allowing OperatingArea-->
    </Patrol>
    <OperatingArea refid="AssignedOpArea"/>
</Goal>
<Goal id="PSMD35.1" title="Pirates retreat?" description="Stay with merchant, report if response changes"
phase="Hostilities Imminent" nextOnSuccess="PSMD14.0" nextOnFailure="PSMD35.2" nextOnException="PSMD99.0">
    <MonitorTransmissions description="Contact pirates"/>
</Goal>
<Goal id="PSMD35.2" title="Pirates attack?" description="Stay with merchant, counterattack if response changes"
phase="Hostilities Imminent" nextOnSuccess="PSMD40.0" nextOnFailure="PSMD35.3" nextOnException="PSMD99.0">
    <MonitorTransmissions description="Contact pirates"/>
</Goal>
<Goal id="PSMD35.3" title="Maintain proximity" description="Just outside range of small arms" phase="Hostilities Imminent"
nextOnSuccess="PSMD35.4" nextOnException="PSMD99.0">
    <Rendezvous description="Safe standoff distance">
        <TargetVehicleID value="101" description="This robot"/>
        <TargetVehicleID value="102" description="Merchant Ship"/>
    </Rendezvous>
    <OperatingArea refid="AssignedOpArea"/>
</Goal>
<Goal id="PSMD35.4" title="Periodic reports" description="Situation reports, changing status - note ship may have EMCON
radio silence" phase="Hostilities Imminent" nextOnSuccess="PSMD35.5" nextOnException="PSMD99.0">
    <MonitorTransmissions xsi:type="monitorTransmissionsElementType" description="Track sailor in water"/>
    <Duration value="6000"/>
</Goal>
<Goal id="PSMD35.5" title="Continue until further orders" description="Repeat until conditions change" phase="Hostilities
Imminent" nextOnSuccess="PSMD36.0" nextOnException="PSMD99.0">
    <Patrol description="Perform any periodic requirements">
        <!--TODO should be agendaGoalType allowing OperatingArea-->
    </Patrol>
    <OperatingArea refid="AssignedOpArea"/>
</Goal>
<Goal id="PSMD36.0" title="Check posture changed?" description="Task update received" phase="Hostilities Imminent"
nextOnSuccess="PSMD37.0" nextOnFailure="PSMD35.0" nextOnException="PSMD14.0">
    <MonitorTransmissions xsi:type="monitorTransmissionsElementType" description="Track sailor in water"/>
    <Duration value="6000"/>
</Goal>
```

```xml
<Goal id="PSMD37.0" title="Fire Warning Shot" description="Warning shots remain an available option for human commanders.
Lethal force is authorized." phase="Hostilities Imminent" nextOnSuccess="PSMD31.0" nextOnFailure="PSMD31.0"
nextOnException="PSMD99.0">
    <Attack title="Attack pirate boats" description="Use of Lethal Force is authorized"/>
</Goal>
<!-- *Interdiction Phase* Counterattack to force pirate small-boat gang withdrawal from threatened merchant ship-->
<Goal id="PSMD40.0" title="Attack" description="Close interaction with pirates, merchant ship" phase="Counter Attack"
nextOnSuccess="PSMD41.0" nextOnFailure="PSMD41.0" nextOnException="PSMD99.0"/>
<Goal id="PSMD41.0" title="Attack Pirate Boats in priority order" description="Rapidly engage, shoot to disable or kill.
Lethal force still authorized." phase="Counter Attack" nextOnSuccess="PSMD41.1" nextOnException="PSMD99.0">
    <Attack title="Attack pirate boats" description="Use of Lethal Force is authorized"/>
</Goal>
<Goal id="PSMD41.1" title="Pirates retreat?" description="Stay with merchant, report if response changes" phase="Counter
Attack" nextOnSuccess="PSMD14.0" nextOnFailure="PSMD41.2" nextOnException="PSMD99.0">
    <MonitorTransmissions description="Contact pirates"/>
</Goal>
<Goal id="PSMD41.2" title="Pirates attacking?" description="Stay with merchant, counterattack if response changes"
phase="Counter Attack" nextOnSuccess="PSMD41.3" nextOnException="PSMD42.0">
    <MonitorTransmissions description="Contact pirates"/>
</Goal>
<Goal id="PSMD41.3" title="Maintain proximity" description="Just outside range of small arms" phase="Counter Attack"
nextOnSuccess="PSMD41.4" nextOnException="PSMD99.0">
    <Rendezvous description="Safe standoff distance">
        <TargetVehicleID value="101" description="This robot"/>
        <TargetVehicleID value="102" description="Merchant Ship"/>
    </Rendezvous>
    <OperatingArea refid="AssignedOpArea"/>
</Goal>
<Goal id="PSMD41.4" title="Periodic reports" description="Situation reports, changing status - note ship may have EMCON
radio silence" phase="Counter Attack" nextOnSuccess="PSMD41.5" nextOnException="PSMD99.0">
    <MonitorTransmissions xsi:type="monitorTransmissionsElementType" description="Track sailor in water"/>
    <Duration value="6000"/>
</Goal>
<Goal id="PSMD41.5" title="Continue until further orders" description="Repeat until conditions change" phase="Counter
Attack" nextOnSuccess="PSMD36.0" nextOnException="PSMD99.0">
    <Patrol description="Perform any periodic requirements">
        <!--TODO should be agendaGoalType allowing OperatingArea-->
    </Patrol>
    <OperatingArea refid="AssignedOpArea"/>
</Goal>
<Goal id="PSMD42.0" title="Low or no ammunition: need to disengage?" description="Hold ammunition in reserve, or else fight
to the finish" phase="Counter Attack" nextOnSuccess="PSMD14.0" nextOnFailure="PSMD41.3" nextOnException="PSMD90.0">
    <MonitorTransmissions xsi:type="monitorTransmissionsElementType" description="Track sailor in water"/>
    <Duration value="6000"/>
</Goal>
<Goal id="PSMD43.0" title="Check for guidance, resume tracking or continue attacking?" description="Humans monitoring
attack can interrupt or override" phase="Counter Attack" nextOnSuccess="PSMD14.0" nextOnFailure="PSMD41.0"
nextOnException="PSMD90.0">
    <MonitorTransmissions xsi:type="monitorTransmissionsElementType" description="Track sailor in water"/>
    <Duration value="6000"/>
</Goal>
```

```xml
<!-- *Recovery Phase*-->
<Goal id="PSMD90.0" title="Check relieved by other asset" description="Continue tracking merchant unless further task
update recieved" phase="Mission Finish" nextOnSuccess="PSMD14.0" nextOnFailure="PSMD14.0" nextOnException="PSMD99.0">
    <MonitorTransmissions xsi:type="monitorTransmissionsElementType" description="Track sailor in water"/>
    <Duration value="6000"/>
</Goal>
<!--Group 99 has common objective: Global Default Exception and terminal states-->
<Goal id="PSMD99.0" title="Proceed to recovery" description="Mission complete, prepare for pickup" phase="Recover Robot"
nextOnSuccess="PSMD99.1" nextOnFailure="PSMD99.2" nextOnException="PSMD99.3">
    <Reposition description="Return to ship or other recovery point"/>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="6000"/>
</Goal>
<Goal id="PSMD99.1" title="Halt and prepare for recovery" description="Operations completed, final success state"
phase="Recover Robot">
    <Rendezvous description="Recovery by ship">
        <TargetVehicleID value="101" description="This robot"/>
        <TargetVehicleID value="102" description="Recovery Ship"/>
    </Rendezvous>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="0"/>
</Goal>
<Goal id="PSMD99.2" title="Halt and deploy recovery beacon" description="Unable to operate, final failure state"
phase="Recover Robot">
    <Rendezvous description="Recovery by ship">
        <TargetVehicleID value="101" description="This robot"/>
        <TargetVehicleID value="102" description="Recovery ship"/>
    </Rendezvous>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="0"/>
</Goal>
<Goal id="PSMD99.3" title="Halt and await further orders" description="Unplanned failure, final exception state"
phase="Recover Robot">
    <Rendezvous description="Recovery by ship">
        <TargetVehicleID value="101" description="This robot"/>
        <TargetVehicleID value="102" description="Recovery ship"/>
    </Rendezvous>
    <OperatingArea refid="AssignedOpArea"/>
    <Duration value="0"/>
</Goal>
            </GoalList>
        </AgendaMission>
      </MissionPreparation>
    </body>
</AVCL>
```