

Estimated Dispersant System Potential (EDSP) Calculator User Manual



The ERSP, EBSP, and EDSP Calculators are intended as planning tools for estimating the potential of different oil spill response systems to mitigate (recover, burn or disperse) discharged oil relative to one another. These planning tools are NOT intended to be used as models for calculating system performance during an actual oil spill, which is affected by many factors such as the distribution of oil on the water surface, oil weathering, and other ambient on-scene conditions which are not included in these Calculators.

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1. Introduction

Dispersants are fluid chemicals that bond to oil molecules and separate them from water molecules, thus breaking up the oil. The result is tiny oil droplets that can biodegrade and disperse more quickly than a mass of oil.

The Estimated Dispersant System Potential (EDSP) Calculator developed in this project is Revision 1 of the Dispersant Mission Planner 2 (DMP2). The basic dispersant application algorithms remain the same. The programming environment used for the DMP2 is no longer supported. A document highlighting the major differences between the DMP2 and the EDSP Calculator can be found at www.genwest.com/genwest_publications.

The Calculator accounts for the performance of an aircraft or vessel dispersant application system as it sprays dispersant on an oil slick. The Calculator generates an “Estimated Dispersant System Potential” (EDSP) value for two Operating Periods following the discharge of an oil spill. The Calculator takes into account the time necessary to mobilize the system and the time needed to cascade the system from its home base to the incident staging site, if necessary. There is separate logic for aircraft platforms and vessel platforms that determines what is displayed for the two operating periods.

The EDSP Calculator is an HTML file, **EDSP-160225.html**, which runs in the following web browser versions:

PC (Win-XP, Win-7 and Win-8 environments)

- IE - 9, 10, 11 or greater
- Chrome 38 or greater
- Firefox 31 or greater
- Safari 5.1 or greater

Mac (OS 10.6 and greater)

- Safari 8.0 or greater
- Chrome 38 or greater
- Firefox 35 or greater

You can download the EDSP Calculator from the BSEE website. The “build” or version date of the calculator appears after the calculator name in the format – yymmdd.html (see Figure 7). This date stamp can verify that you are working with the latest version of the calculator.

This User’s Guide provides guidance to the user on the various data inputs that must be entered into the EDSP Calculator regarding the dispersant application configuration being evaluated, and further explains the Calculator results.

The EDSP Calculator was developed by Genwest Systems, Inc. under GSA Contract GS-00F-0002W, BSEE Order No. E12-PD-00012 in consultation with BSEE and the United States Coast Guard.

1a. The EDSP Calculator's Purpose and Intended Use

The EDSP Calculator is primarily a planning tool for estimating the potential for dispersant application on spilled oil by defined dispersant application systems. It estimates the potential of a single system and does not address the total potential or number of systems that would be necessary for a plan. You can use the Calculator to evaluate the potential of a dispersant application system for different spill planning situations

- **Estimated Dispersant System Potential (EDSP)**, a regulatory measure of a dispersant system's potential ability to treat oil.
- **Effective Daily Application Capacity (EDAC)**, a regulatory measure of how much dispersant can be applied by a dispersant application platform that is used in conjunction with U.S. Coast Guard regulated oil spill response plans. The EDAC assumptions and scenario can be found in Section 2b.
- **Operational spill planning**, where users are not constrained to EDAC values and assumptions.

To use the Calculator, you enter information about an aircraft or vessel dispersant application system, such as its swath, on-board dispersant storage capacity, and pump rates, and you describe the circumstances of its operation, such as cascading information and transit distance to the oil spill area and speed (see *Section Three, EDSP Calculator Inputs*). The Calculator then estimates the amount of dispersants that can be applied and the amount of oil that the system could treat during each of the first two days after a spill occurs (see *Section Four, EDSP Calculator Outputs*). These estimates of the oil treated are termed the “Estimated Dispersant System Potential” (EDSP) for the given dispersant application system configuration. The use of the calculator tool in both spill modes is further demonstrated and explained in *Section Five, Using the EDSP Calculator*.

The EDSP Calculator was developed with the intent of reinforcing incentives for creating and acquiring more effective dispersant application systems, and in addition, evaluating the potential of a dispersant application system to meet various regulatory planning requirements. Experimentation with the Calculator is helpful in understanding the effects of different configurations on a system's treatment potential, and may provide incentives for developing more effective dispersant application systems.

1b. Dispersant Application System Components

The EDSP Calculator was designed as a planning tool for estimating the potential of aircraft and vessel dispersant application systems. The major components of a dispersant application system include a dispersant storage tank, a pump system to move liquid dispersant from the storage tank to the distribution system, a power source, spray arms, and nozzles. Figure 1 below identifies the major components of a dispersant application system:

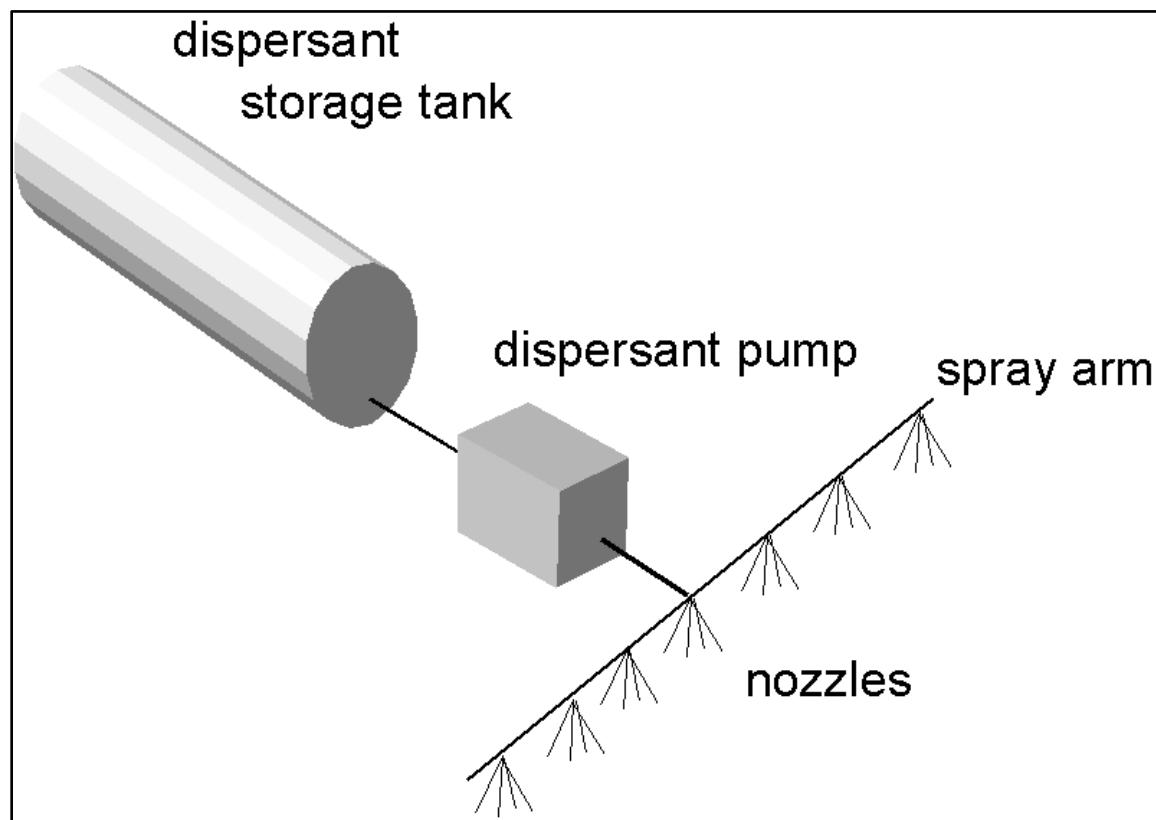


Figure 1. Dispersant Application System Components.

Below are short descriptions of the various components of a dispersant application system:

Delivery platform aircraft or vessel – This is the supporting platform for all the components of a dispersant application system including the following: dispersant tanks, dispersant pumps, delivery piping and manifolds, spray arms, and nozzles.

Onboard dispersant storage – Includes tankage built into or carried on the delivery platform to hold the dispersant. A payload is defined as a complete fill of the tank.

Pump – The pump transfers the dispersant from the tank through piping and manifolds to nozzles on the spray arms. The pump rate and nozzle configurations are adjusted to

deliver the dispersant at the desired dosage. Check the platform spray chart to insure that it can deliver the desired dosage and calculated pump rate.

Spotter aircraft - While not shown in Figure 1, spotter aircraft can be considered to be part of the “system” for dispersant application. Aerial delivery platforms necessarily fly low and at these altitudes oil slicks are difficult to see. The spotter aircraft assists in spill detection, tracking, alignment of the dispersant platform with the oil slick, and application-determination of “spray on” and “spray off.”

The following are photographs of some dispersant application platforms:



Figure 2. DC-4



Figure 3. C-130 Hercules



Figure 4. Helicopter with Dispersant Spray Bucket



Figure 5. Large Dispersant Vessel



Figure 6. Small Dispersant Vessel

2. Assumptions and Limitations as a Planning Tool

The EDSP Calculator was developed to provide a distribution-rate, system-based estimate of daily dispersant application. The calculator accommodates a broad range of dispersant system configurations and addresses response activities including the accessing, spraying, and treatment of oil. The Calculator also accounts for the transiting of a dispersant application system to and from a staging area for reloading of dispersant and fuel. The goal was to provide a computer tool that could facilitate the calculation of a “Planning Standard”, not a “Performance Measure”.

The ERSP, EBSP, and EDSP Calculators are intended as planning tools for estimating the potential of different oil spill response systems to mitigate (recover, burn or disperse) discharged oil relative to one another. These planning tools are NOT intended to be used as models for calculating system performance during an actual oil spill, which is affected by many factors such as the distribution of oil on the water surface, oil weathering, and other ambient on scene conditions which are not included in these Calculators.

The following is a list of assumptions and limitations inherent to the design of the EDSP Calculator, that are readily acknowledged as conditions accepted in order to keep the Calculator a simple and easy to use planning tool:

2a. General Assumptions

- **Ambient Conditions:** Estimates made by the Calculator assume that conditions are generally conducive to effective dispersant application operations. Its output is designed to serve as a guide for planning the deployment of dispersant application systems and estimating their delivery potential.
- **System Downtime:** No downtime due to maintenance or repair is considered.
- **Oil and dispersant types:** The Calculator does not differentiate outputs based on the type of oil or product being treated nor the type of dispersant being used. The Calculator assumes that the oil in question for the scenario, spray system, and dispersant being used is dispersible commensurate with expected efficiency and effectiveness ranges.
- **Success of Dispersion:** The EDSP Calculator does not provide information relating to the ultimate success of chemical dispersion of oil, but rather only the estimated potential volume of oil treated.
- **Oil Thickness on the Water:** For the purposes of planning and comparing spray systems, the Calculator does not assume any specific oil slick thickness will be encountered, however, an oil slick thickness of 0.004 inches (0.094 mm) is equivalent to the thickness of oil that would be treated by spraying dispersant at a dosage rate of 5 gallons per acre with a dispersant to oil ratio of 1:20.
- **Dosage:** The Dispersant Aircraft Capability Forms (see Figure 24) do not contain explicit dosage capability values or ranges. Every aircraft platform in the EDSP database can deliver the regulatory dosage of 5 gallons of dispersant for each acre sprayed. Other dosage values used in the EDSP may not be actually achievable and should be verified with the platform operator before use.
- **The Use of Default and Alternate Values:** The Calculator, and its default values for many of the key inputs, is intended to be “conservative” in nature. In some cases, a dispersant application system’s tested performance will be able to exceed the default values for specific inputs. Plan holders or OSROs may submit requests for the use of alternate values in the Calculator to the appropriate regulatory agency. The regulatory agencies will consider each request based on the merits of the documentation provided. Operators should expect that the use of approved alternate values may be subject to validation efforts by regulators with plan holders and OSROs being required to satisfactorily demonstrate the practical viability of these values during equipment verification visits and PREP equipment deployment exercises.
- **Incident Briefing:** All dispersant application platforms will hold an incident briefing for 45 minutes prior to departing the staging site to commence the first spray sortie. Normally this briefing will only occur in Operating Period1 (OP1), however, for a platform that cascades into the scenario and arrives for its first sortie in a subsequent OP that initial briefing will occur in the OP that contains the first operational spraying sortie.
- **Check-in Time:** Check-in time of 10 minutes with spotter aircraft occurs at the beginning of each sortie for aircraft platforms.

- **Side Overlap and Gaps:** Spray passes will not be precise in the real world. There will be side overlap and gaps in the spray pattern between passes in some cases, as application platforms will strive to only spray areas containing oil, which usually will not be continuous and uniform in nature on the water's surface. No side overlap or gaps are assumed in the Calculator.
- **Resupply On Scene:** When “Resupply On Scene” is set to “Yes” for vessel-based application systems, dispersants will be resupplied onsite at the spill location to the platform and application system, either when the payload of dispersant is completely applied during spraying operations, or when the operating period is completed, whichever occurs first.
- **Resupply at the Staging Site:** When “Resupply On Scene” is set to “No” (which is the default setting) for vessel-based spray application systems, the vessel will resupply its dispersant payload at the staging site. This will require the spraying vessel to transit between the spill site and the staging site, similar to aircraft operations, whenever more dispersant payload is needed. When “Resupply On Scene” is set to “No”, if a vessel has less than one half of its dispersant payload left onboard when the OP ends, the platform will immediately transit back to the staging area to resupply. However, if the vessel has more than one half of its payload remaining onboard at the end of the OP, the platform will stay at the spill site between operating periods and will commence spraying the remainder of the payload at the beginning of the next operating period.
- **Loading in between Operating Periods:** At the end of each Operating Period it is assumed that aircraft-based spray systems will reload dispersant and fuel before the next Operating Period begins.

2b. Additional EDAC assumptions and scenario:

- “Platform” inputs are reset and locked to default values
- The Dispersant-to-Oil Ratio (DOR) is 1:20.
- Five gallons of dispersant will be applied to each acre (46.8 liters/hectare).
- The pass length for the oil slick to be treated is 4 nautical miles (7.4 km) long in the direction of spraying.
- Aircraft platforms have 12 hours of time available for Operating Period 2 dispersant operations, not including the last transit back to the primary dispersant staging site.
- Cascading of aircraft and vessels from out-of-area requires entries for the platform/dispersant mobilization time, cascade distance, and platform dispersant payload status (loaded or empty). Cascading reduces the Operating Period resulting in the use of Adjusted Operating Period 1 for EDSP calculations.
- Aircraft platforms will be allowed to apply dispersants in both directions.
- Spotter aircraft are assumed on-scene waiting for dispersant spray platforms.

- Aircraft platforms will be allowed to refuel and load dispersants at the same time except for USAF Reserve C-130 H.
- Transit distance for vessel response plans is measured from the primary dispersant staging site (or closest dispersant staging site for plans with multiple staging sites) to the furthest spill site 50 NM off shore within a Captain of the Port (COTP) zone.
- Transit distance for facility response plans is measured from the primary dispersant staging site to the facility.
- Weather: Visibility greater than 3 statute miles (4.83 kilometers)* Ceiling greater than 1000 feet (304.8 meters)* No wind (0 mph) No precipitation Mild temperatures 40-80 degrees F (4.4 – 26.7 degrees Celsius) *Visible Flight Rule (VFR) conditions are required at the spill site for aircraft to apply dispersants and are assumed for all flight operations, including cascading from home base to staging airports and for transit to and from the spill site. VFR flight requires 30 minutes of fuel reserve on the aircraft.

3. EDSP Calculator Inputs

This section provides a general description, and in many cases, amplifying guidance, for each of the input fields and the variables that a user must enter into the Calculator. The graphic below is an illustration of the input screen that a user will see and use to enter their dispersant system information into the Calculator.

The screenshot displays the EDSP Calculator input screen. At the top right, it says "Estimated Dispersant System Potential (EDSP) Calculator v-160225" and "DMP2 Revision 1". Below this is a note about the calculators being planning tools for estimating oil spill response potential, not models for actual spills.

Name of Simulation: [Input field]

Platform: [Input field] [New](#)

Type: Aircraft Vessel

Mobilization/Cascading:

- Mobilization Time [hrs]:** [Input field] 0
- Distance to Staging Site:** [Input field] nm
- Cascade with Payload:** Yes No

Scenario:

- Operating Period [hrs]:** [Input field] 12
- One-way Transit Distance:** [Input field] nm
- Staging to/from spill:** Simultaneous Separate

Dispersant Spraying Operations:

- Dispersant to Oil Ratio (DOR):** 1:20
- Dosage:** 5 gal/acre
- Average Spray Pass Length:** [Input field] 4 nm
- Pass Type:** Bidirectional Unidirectional

Effective Daily Application Capacity (EDAC):

- Set EDAC:** Yes No

Calculate

Figure 7. EDSP Calculator Input Screen

- **Name of Simulation:** Entry field for the name or other form of identifier for the dispersant application system (up to 48 characters).

- **Simulation Details:** Enter configuration details including the type of platform, skimmer, pump, and boom being used and other key information to identify this simulation.

The EDSP Calculator inputs have been grouped into five overall categories: Mobilization/Cascading, Scenario, Dispersant Spraying Operations, Effective Daily Application Capacity (EDAC), and Platforms

3a. Mobilization/Cascading Inputs

The screenshot shows the 'Mobilization/Cascading' input screen. It includes a text input field for 'Mobilization Time [hrs]' with up and down arrows, a text input field for 'Distance to Staging Site' with up and down arrows and a unit dropdown set to 'nm', and a radio button group for 'Transit with Payload' where 'No' is selected.

Figure 8. Mobilization/Cascading Input Screen

- **Mobilization Time:** As resources are ordered at the onset of an oil spill response, each individual dispersant platform and/or dispersant stockpile will need a time period for activation and mobilization. Enter the time necessary for activation and mobilization to include all activity necessary to get the resource moving. Use the greater of the platform mobilization time or the dispersant stockpile mobilization time for use in the EDSP unless the platform will be cascading with payload. If the platform is cascading with payload, use the mobilization time for the spray platform. Mobilization Time should be based on:
 - Dispersant stockpiles must be available onsite or already loaded onboard the spray platform before it can depart for its first dispersant spraying sortie. For situations where a platform is cascading to a staging site without payload, mobilization times for dispersant stockpiles should be calculated based on the distance from the stockpile location to the selected dispersant operations staging site using applicable transit routes and speeds. For situations where a spray platform is departing from its home base to conduct sortie operations, if dispersants are not already

onsite, stockpile mobilization times must be calculated from the dispersant storage location to the spray platform's home base. The default transit speed for moving dispersant stockpiles to staging sites is 35 mph over land or 100 kts when moving stockpiles by air.

- Dispersant oil spill removal organizations should use the time specified in their contract for activation and mobilization of dispersant spraying platforms, or the time listed in other documentation that has been deemed acceptable by the appropriate regulatory agency.
- For situations where activation and mobilization times for spray platforms are not specified in a contract, the following table should be used for estimating activation and mobilization time:

Platform Activation and Mobilization Time (In Hours)		
Spraying Platform Status	Response Personnel Availability	
	24 hour On Site	Recall
Owned/Dedicated	1	2
Contracted/Dedicated	1.5	2.5
Owned/Non-dedicated	2.5	3.5
Contracted/Non-dedicated	3	4
<p><i>Dedicated means used solely for the purposes of spill response and dispersant spraying operations.</i></p> <p><i>Contracted/Owned refers to the relationship between the organization providing the dispersant spraying service and the spraying platform.</i></p> <p><i>Response availability applies to the full complement of personnel that would be required to mobilize and operate the spray platform.</i></p>		

Figure 9. Platform Activation and Mobilization Time

- **Distance to Staging Site:** If cascading from out of area or from a home base to a dispersant operations staging site (the staging site is where the aircraft will return for loading dispersants and fuel between sorties), the user enters a cascade distance, and specifies the distance units. The cascading calculation for all platforms includes a 45 minute briefing period (platforms are assumed to be loading fuel and dispersants as necessary during the 45 minute briefing period). Enter a numerical value here for the distance if the platform will be cascading from out-of-area to the incident staging site. The default distance unit is nm (nautical mile). Kilometers (km) or statute miles (mi) can be selected via a drop down list.

- **Transit with Payload:** If cascading from out of area or from a home base to a staging site, the user enters a cascade distance and specifies if cascading occurs with payload or with no payload. Most aerial platforms have a different Cascade Transit Speed and Maximum Range depending on whether the platform is cascading with or without a dispersant payload. With a selection of Yes, the Calculator will use the range and speed values in the database for cascading with a payload.

3b. Scenario Inputs

The screenshot shows the 'Scenario' input screen. It includes fields for 'Operating Period [hrs]' (set to 12), 'One-way Transit Distance' (set to nm), and 'Dispersant/Fuel Load' (set to Simultaneous). A note below the distance field states 'Staging to/from spill'.

Figure 10. Scenario Input Screen

- **Operating Period [hrs]:** The Operating Period, which should not be confused with an operational period for an Incident Action Plan, is the length of time (in hours) each day where conditions allow a dispersant application system to conduct spraying operations. The first Operating Period begins coincident with the starting time for the mobilization of the spraying platform and lasts for twelve hours (unless an alternate OP length is approved for the scenario being evaluated). The second OP will start at the twenty-four mark and ends at the thirty-six hour mark (see diagram below).

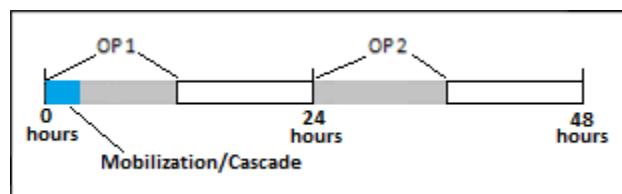


Figure 11. Operating Period

The default Operating Period (OP) is 12 hours. The OP will be reduced by Mobilization Time and any necessary cascade transit time. Alternative values for the length of the Operating Period may be requested, for example, when a plan is for an area and season that has extended hours of daylight. Requests for an extension of the Operating Period would be evaluated on a case-by-case basis by the appropriate regulatory agency.

- **One-way Transit Distance (Staging area to/from spill):** The staging area is the location where platforms will reload fuel (as necessary) and dispersant at the conclusion of each sortie. The one-way transit distance is the distance from the staging area to the spill location. The transit distance used for EDAC calculations for vessel response plan is measured from the primary dispersant staging site to the spill location furthest away within the boundaries of the Captain of the Port (COTP) zone that could occur 50 nm offshore. For more detailed information on estimating one way transit distances for use in EDAC calculations, see Section 3d of this user manual, “EDAC Inputs”.
- **Dispersant/Fuel Load:** Dispersants and fuel can be loaded separately (sequentially) or at the same time (simultaneous). If Simultaneous is selected, the greater of the fuel load time and the dispersant load time will be used by the Calculator.

3c. Dispersant Spraying Operations Inputs

The screenshot shows a software interface titled "Dispersant Spraying Operations". It includes the following input fields:

- Dispersant to Oil Ratio (DOR):** Set to 1:20.
- Dosage:** Set to 5 gal/acre.
- Average Spray Pass Length:** A numeric input field containing the value 4, with a unit selector dropdown set to "nm".
- Pass Type:** A radio button group where the "Bidirectional" option is selected.

Figure 12. Dispersant Spraying Operations Input Screen

- **Dispersant to Oil Ratio (DOR):** The volume of oil that one volume of dispersant will treat is expressed by the DOR. For example, a DOR of 1:20 means that one volume of dispersant will potentially treat 20 volumes of oil. The DOR can be changed by clicking on the Edit button located at the upper right of the Dispersant Spraying Operations Group. Currently the default DOR is 1:20.

Note: In the future, BSEE-regulated users may be asked to enter the DOR based upon the information available in the order of precedence:

- The minimum DOR that meets EPA-effectiveness thresholds, based upon an oil characterization and dispersibility test of the oil handled at your facility and the dispersant that you have stockpiled and ensured available in your OSRP.
- If oil characterization and dispersibility test information are not available, enter the manufacturer recommended DOR (if given as specific single value); if the manufacturer does not provide a specific DOR, but instead provides a recommended overall range, then use 1:20. This information may be found in the National Contingency Plan Product Schedule maintained by EPA at: <http://www.epa.gov/sites/production/files/2013-08/documents/schedule.pdf>.

Note: The following information is currently provided by manufacturers regarding their dispersants and recommended DORs:

Corexit EC9500A: A dispersant to oil ratio of **1:50 to 1:10** is recommended.

Finasol OSR 52: A dispersant to oil ration of **1:5 to 1:50** is recommended, according to the nature of the oil, its state of weathering, temperature, thickness of the slick, and other circumstances of the spill.

Accell Clean DWD: A dispersant to oil ratio of **1:10** is recommended.

The rate varies depending on the type of oil, degree of weathering, temperature, and thickness of slick.

Dispersit SPC 1000: A dispersant to oil ratio ranging from **1:50 to 1:10** is recommended. These rates will be dependent on the type of oil, degree of weathering, temperature and extent of oil slick.

- **Dosage:** Dosage is the volume of dispersant that is applied to the specified area. The default is 5 gallons of dispersant applied to every acre sprayed.

The default DOR and dosage values can be changed using the Edit button (see Figure 11) at the upper right hand corner of the Dispersant Spraying Operations Input Screen. When the Edit button is selected, the Dosage/DOR pop-up edit screen is displayed as illustrated below in Figure 13.

Dosage

(Dispersant to Oil Ratio) DOR: 1: 20

Input Dosage Directly

Desired Dosage: 5 Gallon/Acre

Oil Slick Thickness: 0.004 inches 0.094 millimeters

Oil Slick: 100 Gal/Acre 2.4 Bbl/Acre

Concentration: 94 Cubic Meter/Square Kilometer

Estimate Dosage From Slick Description

Est. Volume Oil Spill: Gallons

Est. Area of Slick: Acres

Est. % Coverage: %

Ok

Figure 13. Dosage/DOR Edit Popup Screen

- **Average Spray Pass Length:** This is the average length of the oil slick that is parallel to the spray path of a platform. The default Average Spray Pass Length is 4 nautical miles.
- **Pass Type:** The Pass Type can be Bidirectional or Unidirectional. Bidirectional means the aircraft platform sprays in both directions over the oil slick. Unidirectional is sometimes called “Race Track” mode in which an aircraft platform sprays in one direction only (usually upwind) over the oil slick. On the return leg, the aircraft transits over the oil slick without spraying. Figure 14 illustrates aircraft bidirectional spraying and Figure 15 illustrates aircraft unidirectional spraying

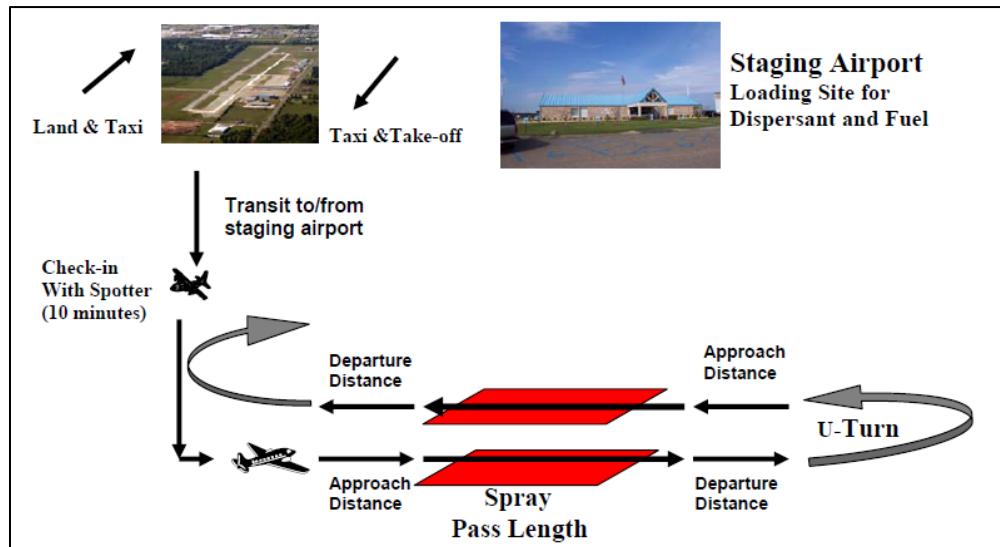


Figure 14. Bidirectional Spraying

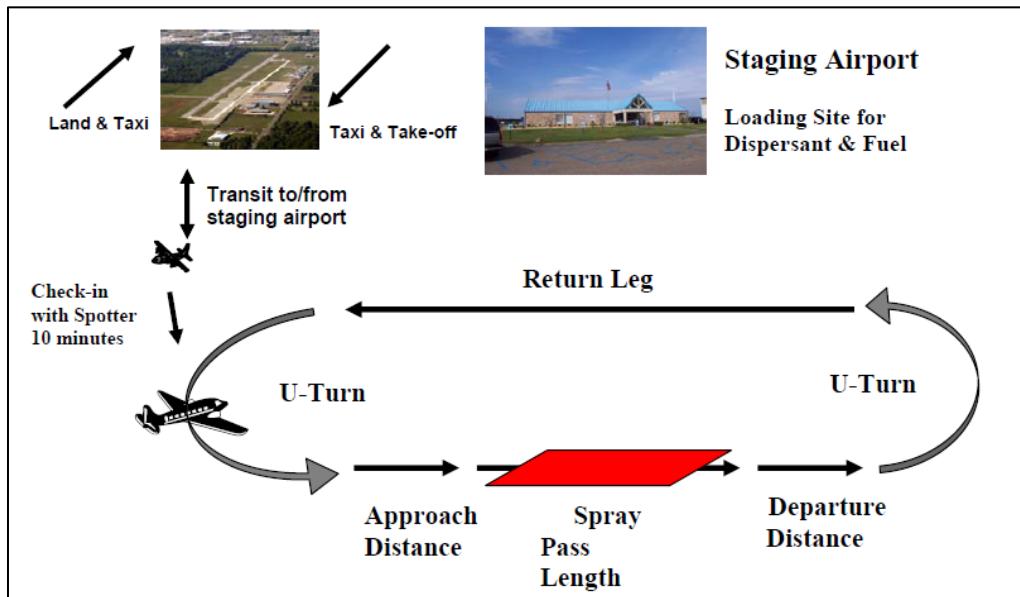


Figure 15. Unidirectional Spraying

3d. Effective Daily Application Capacity (EDAC) Input

The requirements for certain Coast Guard-regulated oil spill response plans have regulatory thresholds for the ability to apply dispersants during the initial days of a spill. These regulatory thresholds are called “Effective Daily Application Capacity” (EDAC). This EDSP Calculator was designed to provide both EDSP and EDAC outputs when necessary through the use of an EDAC radio toggle button. Selecting the “Yes” radio button ensures certain regulatory assumptions about inputs are maintained and provides computed EDAC values as outputs.

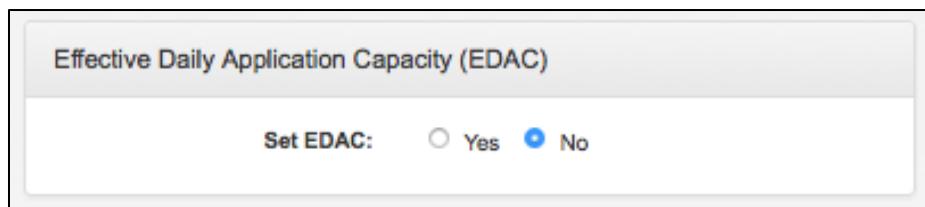


Figure 16. EDAC Selection Screen

While the default setting for the EDAC button is “No”, the EDSP Calculator will adjust certain calculator inputs for calculating EDAC when the EDAC “Yes” button is selected. Selecting “Yes” will reset and lock the following input values necessary for calculating EDAC:

Scenario Inputs

- Operating Period will be reset and locked at 12 hours.
- Dispersant/Fuel Loading will be set to simultaneous.

Spraying Inputs

- Average Pass Length will be reset and locked at 4 nautical miles.
- Pass Type will be set to Bidirectional.
- DOR will be reset and locked at 1:20.
- Dosage will be reset and locked at 5 gallons per acre.

Platform Inputs

- Default values for the selected dispersant application platform will be reloaded and locked. No edits to these values will be permitted, and the cursor will lock when placed over any of the platform input fields.

Figure 17. Locked EDAC Values

Calculating One Way Transit Distance for EDAC

When calculating one way transit distances for Facility Response Plans (FRPs), the distance from the staging site to the facility should be used.

When calculating EDAC for Vessel Response Plans (VRPs), dispersant spraying capabilities should cover the entire Captain of the Port (COTP) Zone out to a distance 50 nautical miles from shore. For a spraying platform that will only use a single primary staging site, the one way transit distance will be the longest distance possible that can be measured from the staging site to the farthest point in the COTP zone that is 50 miles offshore. Figure 17 below illustrates how to calculate the one way transit distance in such cases:

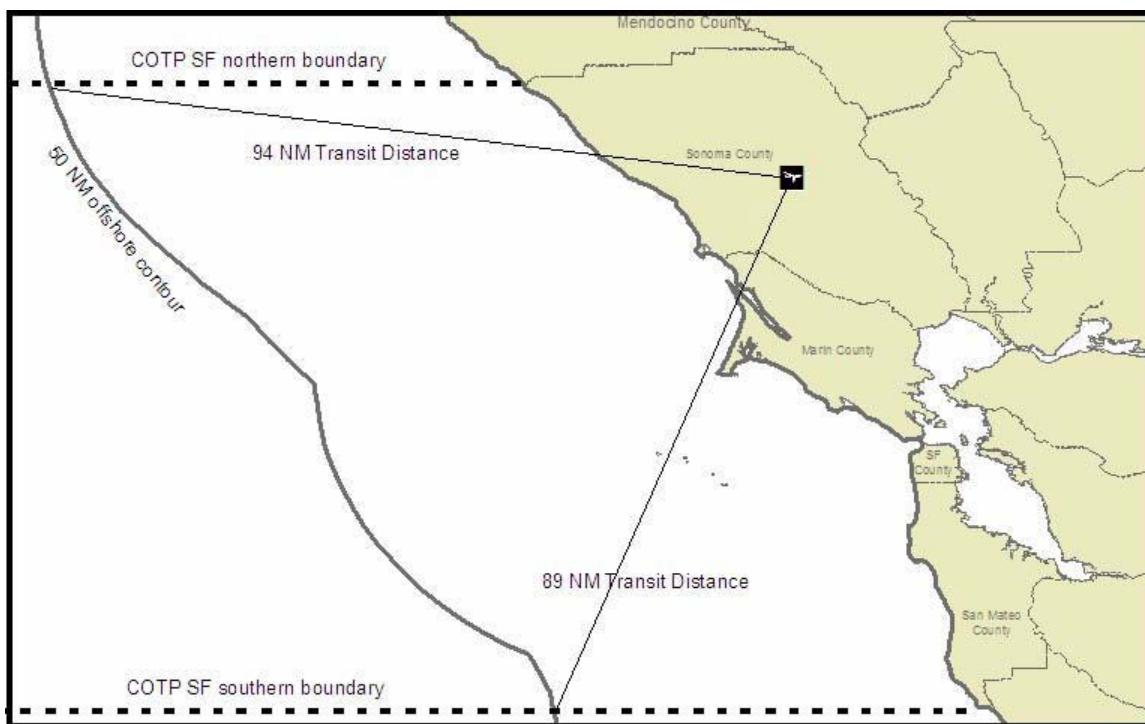


Figure 18. Example of EDAC Transit Distance Using a Single Staging Site.

The illustration above demonstrates how to determine the EDAC one-way transit distance (when calculating dispersant spraying coverage for a VRP) using the example of COTP San Francisco and the Sonoma County Airport as a single primary dispersant staging point. The distance from the staging point to the furthest extent of the 50 NM off shore contour is measured as 94 nautical miles.

Multiple dispersant staging sites may be specified in a VRP. The COTP zone could be subdivided into areas that would be covered by each staging site. Using the COTP San Francisco as an example, the Mendocino County Airport and the Half Moon Bay Airport could be used as multiple staging sites. If the Mendocino County Airport was the only staging site specified in the plan, the EDAC Transit Distance would be 124 NM. The EDAC Transit Distance for Half Moon Bay would be 131 NM if it were the only staging site specified in the plan. However, if both airports were specified as staging sites in the plan, the COTP zone could be divided into two areas by a line equidistant from the two airports. The diagram shows the San Francisco COTP zone with a dispersant staging site at the Mendocino County Airport for the northern area of the COTP zone with a EDAC Transit Distance of 85 nautical miles and a dispersant staging site at the Half Moon Bay Airport for the southern area of the COTP zone with a EDAC Transit Distance of 72 nautical miles.

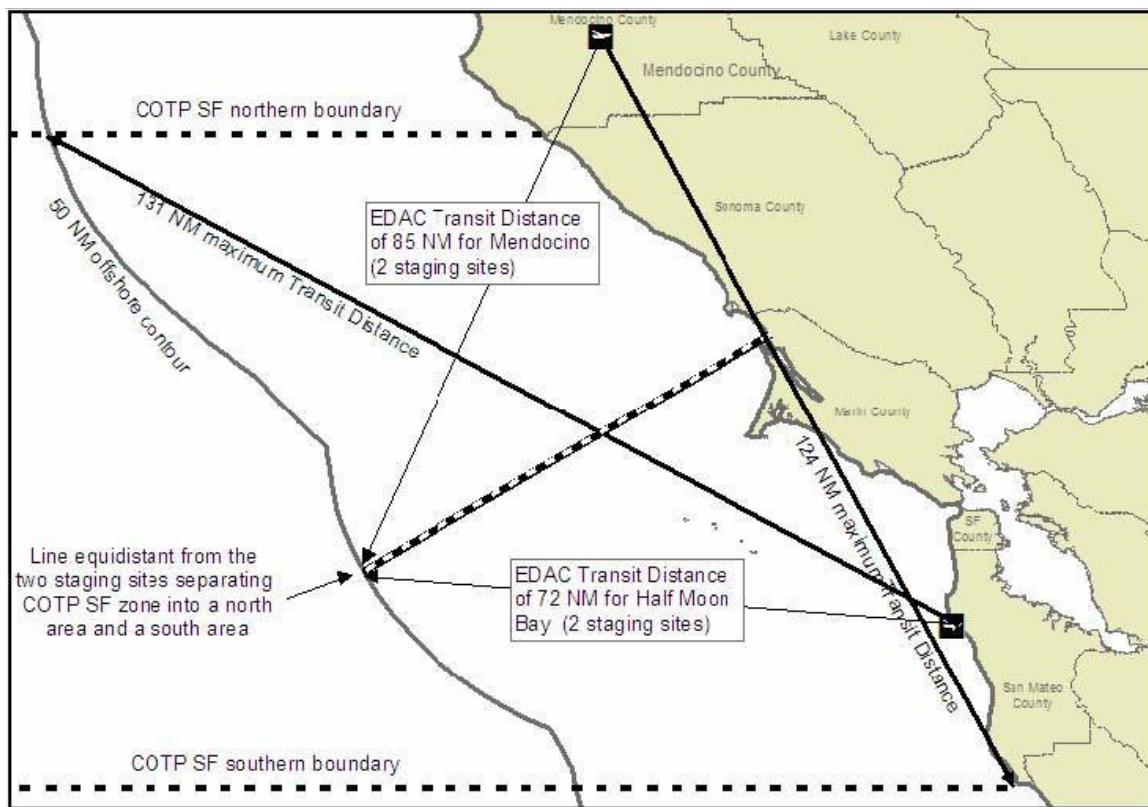


Figure 19. Example of EDAC Transit Distance for Multiple Staging Sites.

3e. Platform Inputs

The EDSP Calculator contains an internal database of spray platforms and their operational characteristics, such as transit speeds, dispersant payloads, etc. These platforms have been tested and vetted regarding their operational characteristics, and the listed default values for these platform operational inputs are already accepted and approved for use by BSEE and the USCG in the EDSP Calculator.

The EDSP Calculator also allows users to either 1) create new platforms based on the characteristics of the spray platform and system not currently listed in the database, or change any of the existing default values listed for a platform in the database in order to more accurately represent the capabilities of a platform and spray system that has been modified. When submitting any EDSP/EDAC calculations to BSEE or the USCG, users should clearly identify any platform input values that have been modified from the existing default values, and to show documentation demonstrating the validity of the alternate values that have been proposed for use in the calculator. Users must obtain approval from the appropriate regulatory agencies for the use of new platforms or any alternative input values to be used in conjunction with any existing platforms in the EDSP Calculator.

Platform Type (Aircraft or Vessel):

In the EDSP, you must choose between an aircraft or vessel-based spray system as illustrated in the figure below. Once you select a type, such as “Aircraft” shown below, a drop down menu appears that will allow you to select a specific type of platform. This selection will determine the format of the inputs the Calculator will display, as the input fields for aircraft and vessels are different.

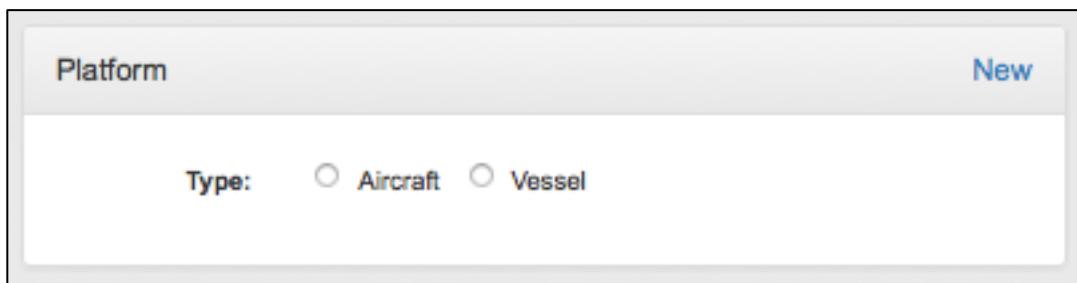


Figure 20. Platform Input Screen.

Aircraft Selection

To select an aircraft platform, click on the “Select Aircraft” drop down menu, and then select a specific aircraft from the Calculator’s database of existing spraying platforms.

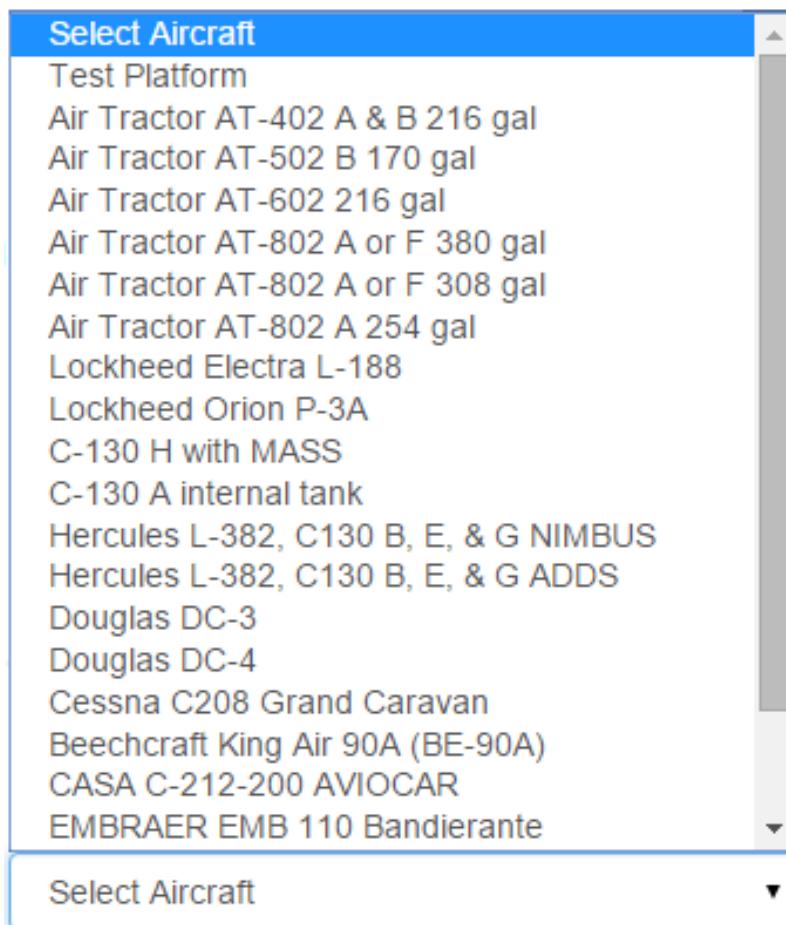


Figure 21. Existing Aircraft Platforms.

Aircraft Platform Input Screen

Once an aircraft platform has been selected from the platform dropdown menu, the default calculator input values (and associated ranges) are displayed in two groups: *mobilization/staging* and *sortie operations*.

The screenshot shows the Aircraft Platform Input Screen with several input fields and dropdown menus. A red box highlights the 'Platform - Mobilization/Staging' and 'Platform - Sortie Operations' sections.

Mobilization/Cascading:

- Mobilization Time [hrs]: 2
- Distance to Staging Site: [] nm ▾
- Cascade with Payload: Yes No

Scenario:

- Operating Period [hrs]: 12
- One-way Transit Distance: [] nm ▾
- Staging to/from spill
- Dispersant/Fuel Load: Simultaneous Separate

Dispersant Spraying Operations:

- Dispersant to Oil Ratio (DOR): 1:20
- Dosage: 5 gal/acre
- Average Spray Pass Length: 4 nm ▾
- Pass Type: Bidirectional Unidirectional

Effective Daily Application Capacity (EDAC):

- Set EDAC: Yes No

Platform - Mobilization/Staging:

PDF Reference	Min	Value Applied	Max
Taxi + Take Off/Landing [min]:	15	min	
Cascade Transit Speed [kts]:	130	130	130
Max Range No Payload [nm]:	1066	nm	
Max Range With Payload [nm]:	806	nm	
Payload [gal]:	1200	gal	
Dispersant Load [min]:	15	min	
Fuel Load Time [min]:	13	min	

Platform - Sortie Operations:

Transit Speed [kts]:	130	130	130
Application Speed [kts]:	120	130	160
Approach [nm]:	1	nm	
Pump Rate [gpm]:	40	Calculated	600
Swath Width [ft]:	70	120	120
Departure [nm]:	1	nm	
Reposition Speed [kts]:	130	kts	
U Turn Time [min]:	1	min	
Max Sortie Time [hr]:	6.2	hr	

Buttons:

- Calculate

Figure 22. Aircraft Platform Input Screen.

Aircraft Mobilization/Staging Input Fields:

Platform - Mobilization/Staging

	Min	Value Applied	Max
Taxi + Take Off/Landing [min]:	3	min	
Cascade Transit Speed [kts]:	122	122	140
Max Range No Payload [nm]:	488	nm	
Max Range With Payload [nm]:	512	nm	
Payload [gal]:	400	gal	
Dispersant Load [min]:	8	min	
Fuel Load Time [min]:	5	min	

Figure 23. Aircraft Platform – Mobilization/Staging Input Group

When selecting a specific aircraft platform, default input values (or ranges of values) are provided for the following platform parameters:

- Taxi + Take Off/Landing [min]: The time in minutes for the selected aircraft platform to taxi prior to take off and to taxi after landing.
- Cascade Transit Speed [kts]: The speed at which the aircraft transits while cascading from out of area. For most platforms, this speed will vary depending on whether the cascade is with or without a dispersant payload. Three values are displayed; the minimum Cascade Transit Speed, The value used for calculations, and the maximum Cascade Transit Speed.
- Max Range No Payload [nm]: This is the maximum range this platform has with maximum fuel load and no dispersant payload.

- Max Range With Payload [nm]: The maximum range for this platform with full dispersant payload and maximum takeoff weight.
- Payload [gal]: The maximum volume of dispersant the selected platform can carry.
- Dispersant Load [min]: The time necessary for a complete dispersant load.
- Fuel Load [min]: The time necessary to load fuel onboard the platform.

Aircraft Sortie Operations Input Fields:

Platform - Sortie Operations

Transit Speed [kts]:	185	185	220
Application Speed [kts]:	130	140	160
Approach [nm]:	0.5	nm	
Pump Rate [gpm]:	15	Calculated	260
Swath Width [ft]:	50	65	90
Departure [nm]:	0.3	nm	
Reposition Speed [kts]:	185	kts	
U Turn Time [min]:	1	min	
Max Sortie Time [hr]:	2.4	hr	

Figure 24. Aircraft Platform - Sortie Operations Group.

- Transit Speed [kts]: Three values are displayed; the minimum Transit Speed, the value used for calculations, and the maximum Transit Speed.
- Application Speed [kts]: Application speeds (averaged between passes) are assumed to be over-the-ground. It is acknowledged that all aircraft have a range

of acceptable air speeds for safe operations; however, when the effects of wind are considered the resulting ground speeds may vary considerably. Wind speed variation is not taken into account in the EDSP Calculator.

- Approach [nm]: The Approach is the distance over which the aircraft aligns on course for the next spray pass and descends to spray altitude at Reposition Speed prior to commencing dispersant spraying. See Figures 12 and 13, Race Track and Bi-directional Application Diagrams.
- Pump Rate [gpm]: The calculated Pump Rate necessary to deliver the required dosage. The EDSP checks to insure that the calculated pump rate is between the maximum and minimum pump rates and assumes that the selected platform can deliver the calculated pump rate. Note: check the spray chart for the selected aircraft to insure that it can deliver necessary pump rate and dosage.
- Swath Width [ft]: The length measured perpendicular to the dispersant application track between the points at which delivery on the oil slick drops below 90% of the designed dosage (ASTM Standard F 1413-07 (2013)).
- Departure [nm]: The distance the aircraft continues on course and at Reposition Speed before commencing a U Turn. See Race Track and Bi-directional Application Diagrams.
- Reposition Speed [kts]: The speed at which the aircraft performs Approaches, Departures, and Return Legs.
- U Turn Time [min]: The time necessary for the aircraft to make a 180 degree turn after a Departure and before the Approach for the next spray pass.
- Max Sortie Time [hr]: The maximum flight time the aircraft can achieve assuming no wind, VFR fuel reserve, and with a full dispersant load.

Aircraft PDF References

Clicking on the blue PDF Reference button will display the Dispersant Aircraft Capability Forms for the aircraft platform that has been selected. These forms contain detailed information regarding the aircraft performance parameters as well as information about the sources of the data. The data in the form column labeled “U.S. Regulatory Calculation Values” were used to populate the DMP2/EDSP Calculator database for the aircraft platform default input values. These default values are used by the Calculator’s algorithms to calculate EDSP and EDAC.

Platform - Mobilization/Staging

PDF Reference Min Value Applied Max

Taxi + Take Off/Landing [min]:	3	min	
Cascade Transit Speed [kts]:	122	122	140
Max Range No Payload [nm]:	488	nm	
Max Range With Payload [nm]:	512	nm	
Payload [gal]:	400	gal	
Dispersant Load [min]:	8	min	
Fuel Load Time [min]:	5	min	

Figure 25. PDF Reference Button

The following example (Figure 26A) shows the various data fields and forms within the Capability Form for the Beechcraft King Air (BE-90A).

DISPERSANT AIRCRAFT CAPABILITY FORM						
PLATFORM						
BEECHCRAFT KING AIR 90A (BE-90A)		<p>Operator: Dynamic Aviation, Inc. OSRO: Marine Spill Response Corp.</p>				
<small>Photo compliments of the Marine Spill Response Corporation</small>						
DATA SOURCE LEGEND						
1. (Black):	Indicates the data are based on documented field trials or is a fixed design value					
2. (Blue):	Indicates the data are based on limited field observations or operator's stated practice or stated value (little or no documentation)					
3. (Red):	Indicates the data are based on reasonable calculations or performance of comparable systems					
	Unit	U.S. Regulatory Calculation Values	Data Source 1-2-3	Range	Reference(s)	
AIRCRAFT PARAMETERS						
1	Swath Width	feet	75	1	60-85	Dynamic Aviation Group, Inc. spray test May 06
a.	Application (gallons per acre)	gpa	5	1	1-10	Dynamic Aviation Group, Inc. spray test May 06
b.	Altitude	feet	75	1	50-100	Dynamic Aviation Group, Inc. spray test May 06
c.	Application Speed	knots	150	1	130-175	Dynamic Aviation Group, Inc. spray test May 06
d.	Pump Rate (gallons per minute)	gpm	85	1	20-180	Dynamic Aviation Group, Inc. static spray test 12/06
e.	Boom Pressure (pounds/square inch)	psi	55	1	20-60	Dynamic Aviation Group, Inc. static spray test 12/06
2	Transit Speed at Altitude From Base to Staging Airport	knots feet	185 20,000	1	150-200 12- 20,000	Dynamic Aviation Group, Inc. field test Nov 06
3	Transit Speed at Altitude Staging Airport to/from spill	knots feet	185 1,500	1	150-200 1,500	Dynamic Aviation Group, Inc. field test Nov 06
1 Revised April 18, 2007						

Figure 26A. Dispersant Aircraft Capability Form for Beechcraft King Air

4	Dispersant Spraying Reposition Speed	knots	150	1	130-185	Dynamic Aviation Group, Inc. field test Nov 06
5	Time to Fully Load Dispersant Tank	min	10	1	10-20	Dynamic Aviation Group, Inc. timed exercise
6	Time to Fully Load Fuel Tanks	min	12	1	10-30	Dynamic Aviation Group, Inc. operator exercise
7	Load Dispersant & Fuel simultaneously (Yes/No)	—	YES	1	YES	Dynamic Aviation Group, Inc. operator See Other Comments below *5,*6
8	Time to Make U-turn (Turn 180 degrees)	min	1.00	1	1.0-3.0	Dynamic Aviation Group, Inc. operator measured exercise flight paths
9*	Dispersant Payload Maximum	gal	425	1	0-425	Dynamic Aviation Group, Inc. operator
10	Fuel with maximum dispersant payload	lbs	895	1	895	Dynamic Aviation Group, Inc. operator
11	Approach Distance for spraying	nm	.75	1	0.3-1.5	Dynamic Aviation Group, Inc. operator measured exercise paths Nov 06
12	Departure Distance for spraying	nm	.75	1	0.3-1.5	Dynamic Aviation Group, Inc. operator measured exercise paths Nov 06
13	Taxi Time Take-Off	min	3	2	3-15	Dynamic Aviation Group, Inc. operator
14	Taxi Time Landing	min	3	2	3-15	Dynamic Aviation Group, Inc. operator
15	On-site Check-In/Safety Time	min	10	2	5-15	Dynamic Aviation Group, Inc. operator
CASCADE PARAMETERS*						
16	Take-off with Maximum Payload and Maximum Take-off Weight (assume no wind and VFR fuel reserve)					
a.	Maximum Flight Time	hours	1.2	2	1.2	Dynamic Aviation Group, Inc. operator
b.	Maximum Flight Range	nm	222	2	192-240	Dynamic Aviation Group, Inc. operator
c.	Optimal Altitude	feet	20,000	2	20,000	Dynamic Aviation Group, Inc. operator
d.	True Air Speed	knots	185	2	160-200	Dynamic Aviation Group, Inc. operator
e.	Fuel Consumption	lbs/ hour	500	2	500-520	Dynamic Aviation Group, Inc. operator
17	Take-Off with Maximum Fuel and No Payload (assume no wind and VFR fuel reserve)					
a.	Maximum Flight Time	hours	4.3	2	4.3	Dynamic Aviation Group, Inc. operator
b.	Maximum Flight Range	nm	796	2	688-860	Dynamic Aviation Group, Inc. operator
c.	Optimal Altitude	feet	20,000	2	20,000	Dynamic Aviation Group, Inc. operator
d.	True Air Speed	knots	185	2	160-200	Dynamic Aviation Group, Inc. operator
e.	Fuel Consumption	lbs/ hour	500	2	500-520	Dynamic Aviation Group, Inc. operator
18	Staging area briefing	min	45	2	30-60	Exercise observation

Figure 26B. Dispersant Aircraft Capability Form for Beechcraft King Air

AIRPORT PARAMETERS						
19	Runway length - Minimum (For take-off at maximum gross weight assuming sea level, 90° F, no wind using a balanced field concept, i.e., go, no go speed)	feet	4,200	2	4,200	Dynamic Aviation Group, Inc. operator
20	Runway weight restrictions for maximum aircraft weight	lbs	11,220	1	11,220	Dynamic Aviation Group, Inc. operator. Aircraft maximum weight
OTHER COMMENTS						
5* 6*	The time to load dispersants and fuel are stand alone times independent of each other. If item 7 indicates that fuel and dispersants can be loaded simultaneously, then the longer of fuel or dispersant load time is used in the capability calculations. If item 7 indicates fuel and dispersants can NOT be loaded simultaneously, then the times are added together to calculate the aircraft's capability. To load simultaneously depends upon the airport, aircraft, and support crew. The loading times depend upon the loading system i.e., 5,000 tank truck, 55 gallon drums or other means and the pumping system used. The time shown in items 5 and 6 is for loading from a tank truck which is standing by ready to commence loading when the aircraft comes to a stop in the loading area, i.e. the fastest loading time possible.					
9*	Maximum payload depends upon the weight of the dispersant per gallon. The calculations provided are for the heaviest dispersant, Corexit 9527, weighing 8.5 lbs/gallon. For this aircraft the payload can be reduced from 425 gallons and the fuel increased to extend the range of the aircraft. A loading chart for the aircraft is provided to the template as an attachment.					
*	Cascade Parameters: The aircraft's calculated capability when cascading uses the same fuel loading and taxi times for dispersant operations as listed in items 6, 13 and 14.					
16 *	Calculations are based on empty weight plus crew of 6,768 pounds and gross take-off weight of 11,220 pounds and using Visual Flight Rules requiring a 30 minute fuel reserve. Payload, endurance and range depend upon the weight of the dispersant per gallon. The calculations provided are for the heaviest dispersant, Corexit 9527, weighing 8.5 lbs/gallon. Increased range may be obtained by increasing fuel and decreasing dispersant to the maximum fuel load for the aircraft of 2479 lbs. Flight hours for the aircraft can be estimated for planning purposes from the loading chart attached to this template, which also includes calculations for Corexit 9500. Pilots of the aircraft will determine payloads versus fuel loading based on the specific aircraft being used, the temperature, humidity, airport altitude, weather conditions enroute, etc.					
17 *	The aircraft with a maximum fuel load of 370 gallons (2479 lbs) can carry a payload of 1955 lbs of dispersant and retain the same range and speeds as for no payload.					

Figure 26C. Dispersant Aircraft Capability Form for Beechcraft King Air

BEECHCRAFT KING AIR (BE-90A)								
LOADING CHART								
Fuel Loaded before Engine Starts*		Dispersant			Aircraft Gross Weight At Takeoff	Endurance to Reserve		
Gallons	LBS	Corexit 9500 (7.5 #/g) Gallons	Corexit 9527 (8.5 #/g) Gallons	LBS	LBS	VFR 30 min reserve	IFR 45 min reserve	
370	2479	160	149	1264	10,456	4.32	4.07	
370	2479	170	158	1343	10,535	4.32	4.07	
370	2479	180	167	1422	10,614	4.32	4.07	
370	2479	190	177	1501	10,693	4.32	4.07	
370	2479	200	186	1580	10,772	4.32	4.07	
370	2479	210	195	1659	10,851	4.32	4.07	
370	2479	220	204	1738	10,930	4.32	4.07	
370	2479	230	214	1817	11,009	4.32	4.07	
370	2479	240	223	1896	11,088	4.32	4.07	
370	2479	250	232	1975	11,167	4.32	4.07	
370	2479	257	239	2028	11,220	4.32	4.07	
368	2453	260	242	2054	11,220	4.27	4.02	
354	2374	270	251	2133	11,220	4.11	3.85	
343	2295	280	260	2212	11,220	3.96	3.71	
331	2216	290	270	2291	11,220	3.80	3.55	
319	2137	300	279	2370	11,220	3.64	3.39	
307	2058	310	288	2449	11,220	3.49	3.24	
295	1979	320	297	2528	11,220	3.33	3.08	
284	1900	330	307	2607	11,220	3.17	2.92	
272	1821	340	316	2686	11,220	3.01	2.76	
260	1742	350	325	2765	11,220	2.86	2.61	
248	1663	360	335	2844	11,220	2.70	2.45	
236	1584	370	344	2923	11,220	2.54	2.29	
225	1505	380	353	3002	11,220	2.39	2.14	
213	1426	390	362	3081	11,220	2.23	1.98	
201	1347	400	372	3160	11,220	2.07	1.82	
189	1268	410	381	3239	11,220	1.92	1.67	
177	1189	420	390	3318	11,220	1.76	1.51	
172	1150	425	395	3358	11,220	1.68	1.43	
165	1108	----	400	3400	11,220	1.60	1.35	
153	1022	----	410	3485	11,220	1.43	1.18	
140	937	----	420	3570	11,220	1.26	1.01	
134	895	----	425	3613	11,220	1.17	.92	

* Estimated that aircraft will use 55 pounds of fuel for run-up to taking off so that at takeoff aircraft will have 55 pounds less fuel than shown here. At 6.7 pounds of fuel per gallon this equates to 8.2 gallons of fuel. The flight times are based on the aircraft using 502 lbs of fuel per hour of the fuel available at takeoff.

Figure 26D. Dispersant Aircraft Capability Form for Beechcraft King Air

Vessel Platform Inputs

Name of Simulation: [Input Field]

Simulation Details: [Input Field]

Mobilization/Cascading

- Mobilization Time [hrs]:** [Input Field] 2
- Distance to Staging Site:** [Input Field] nm [Dropdown]

Scenario

- Operating Period [hrs]:** [Input Field] 12
- One-way Transit Distance:** [Input Field] nm [Dropdown]
- Staging to/from spill**
- Dispersant/Fuel Load:** Simultaneous Separate

Dispersant Spraying Operations

- Dispersant to Oil Ratio (DOR):** 1:20
- Dosage:** 5 gal/acre
- Average Spray Pass Length:** [Input Field] 4 nm [Dropdown]
- Pass Type:** Discontinuous Continuous

Effective Daily Application Capacity (EDAC)

- Set EDAC:** Yes No

Platform

- Type:** Aircraft Vessel
- Vessel:** Typical Large Vessel [Dropdown]

Platform - Mobilization / Staging

	Min	Value Applied	Max
Cascade Transit Speed [kts]:	5	5	20
Max Range With Payload [nm]:	1000	nm	
Payload [gal]:	2000	gal	
Dispersant Load [min]:	20	min	
Fuel Load Time [min]:	40	min	

Platform - Sortie Operations

	Min	Value Applied	Max
Transit Speed [kts]:	5	5	20
Application Speed [kts]:	3	5	20
Pump Rate [gpm]:	3	Calculated	20
Swath Width [ft]:	20	65	100
U Turn Time [min]:	1	min	
Max Sortie Time [hr]:	36	hr	

Resupply On Scene: Yes No

Calculate

Figure 27. Vessel Platform Input.

Platform - Mobilization / Staging

	Min	Value Applied	Max
Cascade Transit Speed [kts]:	5	5	20
Max Range With Payload [nm]:	1000	▼	nm
Payload [gal]:	2000	▼	gal
Dispersant Load [min]:	20	▼	min
Fuel Load Time [min]:	40	▼	min

Figure 28. Vessel Platform – Mobilization/Staging Group.

Mobilization/Staging

Cascade Transit Speed: The speed at which the vessel transits while cascading from out of area. Three values are displayed: the minimum Cascade Transit Speed, the default value used for calculations, and the maximum allowable Cascade Transit Speed.

Max Range: This is the maximum range this vessel has with maximum fuel load

Dispersant Payload: The maximum volume of dispersant the selected vessel can carry.

Dispersant Load Time: The time necessary for a complete dispersant load.

Fuel Load Time: The time necessary for a complete fuel load.

Platform - Sortie Operations

Transit Speed [kts]:	5	5	<input type="button" value="▲"/>	<input type="button" value="▼"/>	20
Application Speed [kts]:	3	5	<input type="button" value="▲"/>	<input type="button" value="▼"/>	20
Pump Rate [gpm]:	3	Calculated	<input type="button" value="▲"/>	<input type="button" value="▼"/>	20
Swath Width [ft]:	20	65	<input type="button" value="▲"/>	<input type="button" value="▼"/>	100
U Turn Time [min]:	1	<input type="button" value="▲"/>	<input type="button" value="▼"/>	min	
Max Sortie Time [hr]:	36	<input type="button" value="▲"/>	<input type="button" value="▼"/>	hr	
Resupply On Scene:	<input type="radio"/> Yes	<input checked="" type="radio"/> No			

Figure 29. Vessel Platform - Sortie Operations.

Sortie Operations

Transit Speed: Three values are displayed; the minimum Transit Speed, the value used for calculations, and the maximum Transit Speed.

Application Speed: The vessel speed while spraying dispersant.

Pump Rate: The calculated Pump Rate necessary to deliver the required dosage. The EDSP checks to insure that the calculated pump rate is between the maximum and minimum pump rates and assumes that the selected platform can deliver the calculated pump rate.

Swath Width: The width of the dispersant spray onto the oil slick.

U Turn Time: The time necessary for the vessel to make a U-turn.

Max Sortie Time: The maximum time the vessel can operate, which is a function of the dispersant load, the onboard berthing and messing capacities, and the maximum range.

Resupply On Scene: The default setting is “No”. When “Resupply On Scene” is set to “No”, if a vessel has less than one half of its dispersant payload left onboard when the OP ends, the platform will immediately transit back to the staging area to resupply. However, if the vessel has more than one half of its payload remaining onboard at the end of the OP, the platform will stay at the spill site between operating periods and will commence spraying the remainder of the payload at the beginning of the next operating period. Figure 29 below shows a vessel timeline with Resupply On Scene set to “No.”

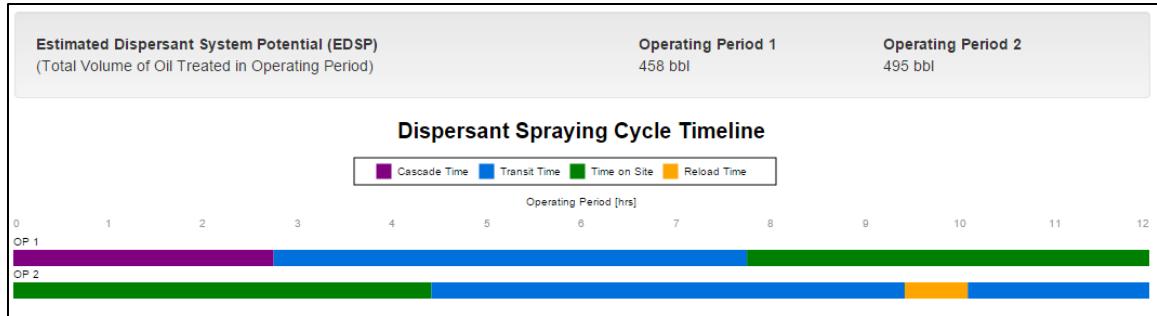


Figure 30. Vessel Timeline with Resupply On Scene set to “No.”

When “Yes” is selected the vessel will be resupplied with dispersant on-scene, either when the payload of dispersant is completely applied during spraying operations, or when the operating period is completed, whichever occurs first. Figure 30 shows the same vessel timeline with Resupply On Scene set to “Yes.”

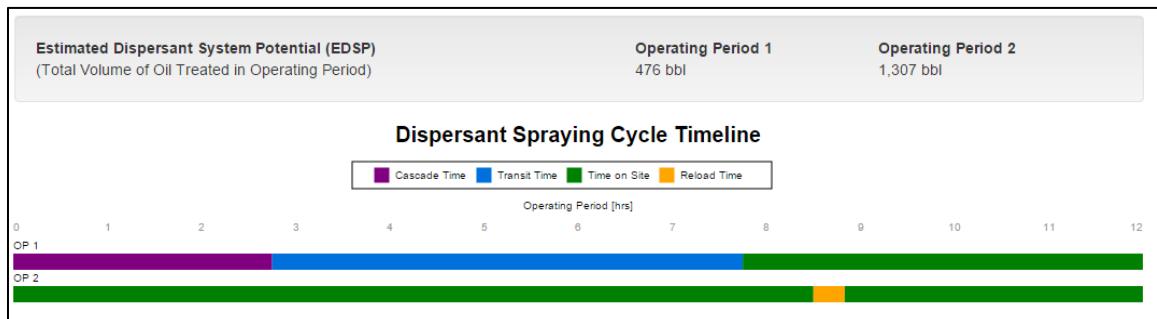


Figure 31. Vessel Timeline with Resupply On Scene set to “Yes.”

Changing Platform Values:

Values for the platform parameters can be changed (some values will have a minimum and maximum value that will bound the lower and upper limits of possible alternative values that may be entered). When this is done the box around the changed value will be outlined in orange to indicate a default value has changed. Below the Transit Speed [kts] and Departure [nm] have been changed and the box around those two values has turned orange to highlight that these values have been changed.

Platform - Sortie Operations

Transit Speed [kts]:	120	125	152
Application Speed [kts]:	104	135	135
Approach [nm]:	0.5	nm	
Pump Rate [gpm]:	15	Calculated	260
Swath Width [ft]:	45	70	75
Departure [nm]:	0.75	nm	
Reposition Speed [kts]:	140	kts	
U Turn Time [min]:	0.75	min	
Max Sortie Time [hr]:	3	hr	

Figure 32. Example of Platform Value Change

Creating Spray Application Platforms with Alternative Values for Inputs

Users can create customized platforms with alternative input values via two different methods:

- 1) Users may create a new customized platform completely from scratch by:
 - a. Clicking on “New” in the Platform Menu Box
 - b. Selecting “Aircraft” or “Vessel” in the “New Platform” Dialogue Box and clicking on “Save”
 - c. Entering in the platform name and its input values in the “New Platform” Menu and clicking on “Save”

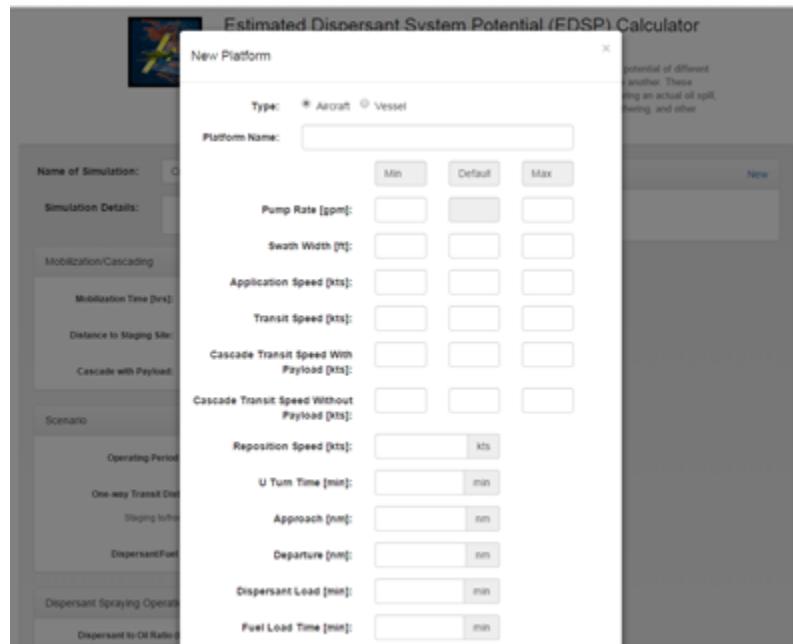


Figure 33. New Aircraft platform template.

- 2) Users may also modify one or more input parameters for an existing platform and save this configuration as a new platform by:
 - a. Modifying the existing input parameters with the desired alternative values and then clicking on “Save As” in the Platform Menu Box. In Figure 33 below, the payload was changed from 3250 to 4000 gallons.

The screenshot shows the 'Platform' tab of the EDSP Calculator. On the right, there's a 'Platform' section with a 'Type' dropdown set to 'Aircraft'. Below it, the 'Aircraft' dropdown is set to 'C-130 A internal tank'. On the left, under 'Simulation Details', it says 'C-130 with modified dispersant storage tank holding 4000 gallons'. In the center, there's a 'Platform - Mobilization/Staging' section where the 'Payload [gal]' field is highlighted with a red box and a red arrow pointing to it. The value '4000' is entered in this field.

Figure 34. Aircraft Payload Change

- Edit the Platform Name, confirm the alternative values are entered into the “Edit Platform” Menu, and then click on “Save”

This screenshot shows the 'Edit Platform' dialog box. The 'Platform Name' field contains the text 'Modified C-130 A internal tank with 4000 gal payload'. On the right side of the dialog, there's a 'Calculator' section with a 'Save As' button highlighted with a red box and a red arrow pointing to it. The dialog also contains various input fields for aircraft parameters like Pump Rate, Swath Width, Application Speed, etc., with their respective min, default, and max values.

Figure 35. Saving Aircraft Platform Change

Regardless of which method you use, once you have saved your platform with the alternative input values, it will now appear in your platform drop down menu/picklist for use in your locally maintained version of the EDSP Calculator.

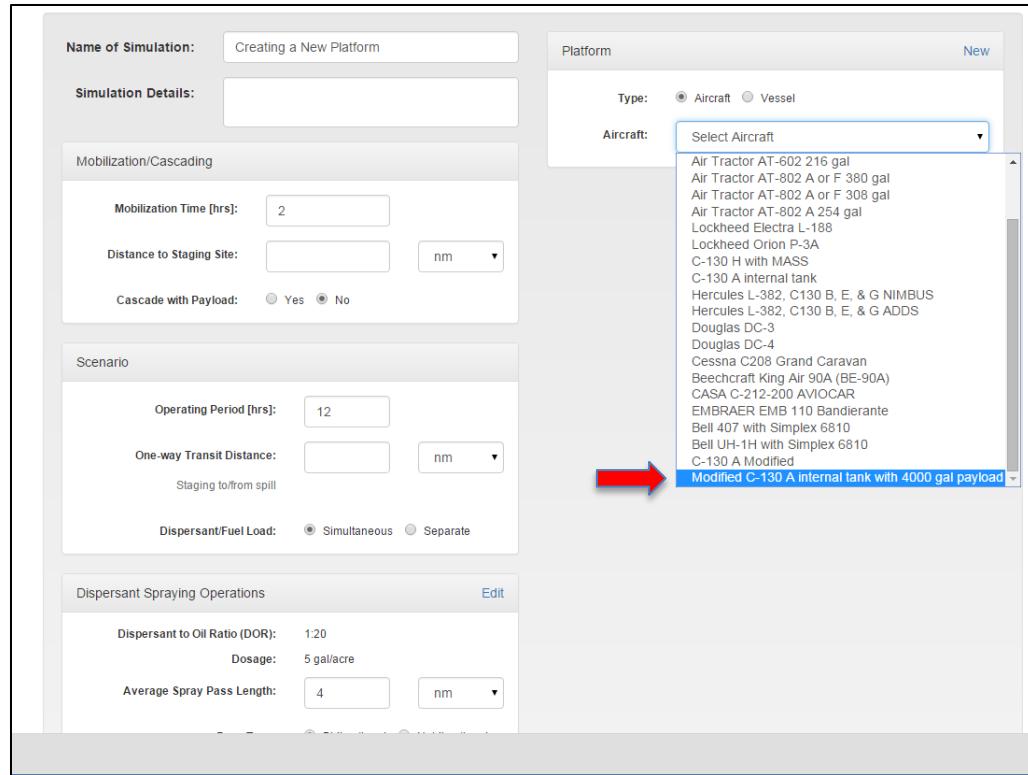


Figure 36. New Aircraft Platform Added to Selection List

Note: If you modify existing input values for a platform, and do not save those changes as a custom platform, whenever you change platform selections, all modified input values will be automatically reset to their default values.

4. EDSP Calculator Outputs

EDSP Calculator results are output in the form of both graphics and tabular data. The graphical data is presented in the form of summary data and a Dispersant Spraying Cycle Timeline during each Operating Period.

Estimated Dispersant System Potential (EDSP) (Total Volume of Oil Treated in Operating Period)	Operating Period 1 7,143 bbl	Operating Period 2 9,524 bbl
---	---------------------------------	---------------------------------

Figure 37. Summary Data.

The Dispersant Spraying Cycle Timeline depicts mobilization/cascading, transit, dispersant spraying and reloading periods for Operating Period 1 on an hourly timescale. Operating Period 2 depicts the first full day on scene.

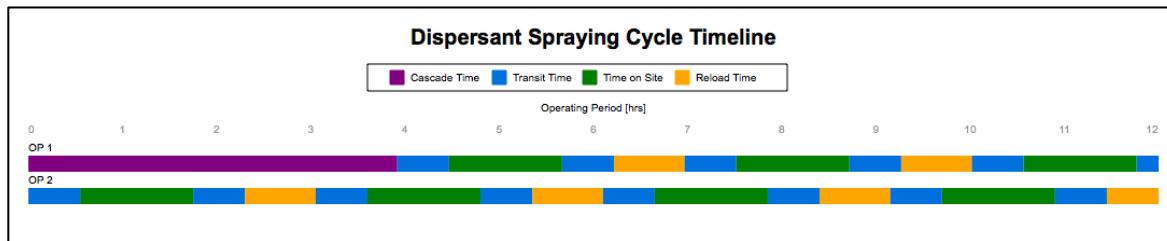


Figure 38. Dispersant Spraying Cycle Timeline.

The following figure shows the tabular data outputs, which present additional planning details relating to cascade time, and dispersant spraying related aspects of the system.

Results for Each Operating Period		OP 1	OP 2
Cascade Time		3.92 hrs	0 hrs
Time On Scene to Commence Spray Operations for OP 1 (Cascade Time + One Way Transit Time)		4.5 hrs	N/A
Adjusted OP Time		8.08 hrs	12 hrs
Payload Deliveries		3	4
Dispersant Applied		15000 gal	20000 gal
Total Area Coverage		2999 acres	3999 acres
Oil Treated (EDSP)		7143 bbl	9524 bbl
Results per Sortie for a Complete Payload Application		OP 1	OP 2
One-way Transit Time (Including Taxi + Takeoff/Landing for Aircraft)		33 min	
Calculated Pump Rate		253 gpm	
Spray Time/Pass		1.7 min	
# of Passes/Sortie		11.9	
Spray Time/Sortie		19.8 min	
Total Time/Sortie		138 min	
Areal Coverage Rate		50.6 acres/min	
Area Covered/Sortie		1000 acres	

Figure 39. EDSP Tabular Outputs.

4a. Results for Each Operating Period

Cascade Time:

This includes Notification/Mobilization time, travel time to staging site and a 45 minute briefing period for both aircraft and vessels.

Time On Scene to Commence Spray Operations for OP1 (Cascade Time + One Way Transit Time):

This is the time necessary for the platform to arrive on scene and ready to spray, only in OP1.

Adjusted OP Time:

For OP 1, this is the Operating Period time minus the Cascade time.

Payload Deliveries:

Total number of payload deliveries, including any partial payload deliveries completed by the end of the operating period.

Dispersant Applied:

Total number of gallons of dispersant applied in the operating period.

Total Area Coverage:

Total area sprayed in the operating period.

Oil Treated (EDSP):

Amount of oil assumed to be treated based on the dispersant to oil ratio.

4b. Results per Sortie for a Complete Payload Application

One-way Transit Time (including Taxi + Takeoff/Landing for Aircraft):

Amount of time needed to transit from the staging area to the spill site.

Calculated Pump Rate:

This is the pump rate necessary to achieve the desired dosage.

Spray Time/Pass:

Amount of time actually spraying on each pass over the oil slick.

of Passes/Sortie:

The number of passes over the oil slick necessary to apply one payload of dispersant.

Spray Time/Sortie:

The total amount of time actually spraying during each payload delivery.

Total Time/Sortie:

Includes spraying time, repositioning time, and transit time.

Areal Coverage Rate:

Number of acres covered for each minute of spraying time.

Area Covered/Sortie:

Total number of acres sprayed per payload.

4c. Aircraft Sortie Timeline Components

The following graphic illustrates all the components of an aircraft dispersant application operation that are included in the EDSP

EDSP Calculator Aircraft Timeline Components		
Timeline color legend		
	Cascade Time	
	Transit Time	
	Time on Site	
	Reload Time	
	Total sortie time	
	Timeline Component	Source
	Notification & Mobilization	Input
	Taxi & takeoff time	From platform data
	Cascade transit to staging time (includes any required fuel stops)	Calculated using Cascade Transit Speed
	Landing & taxi time	From platform data
	Initial orientation briefing, refueling & loading	45 min
	Taxi & takeoff time	From platform data
	Transit to operational area	Calculated using Transit Speed
O	On-site spotter briefing	10 min
n	Approach time (Pass 1)	Calculated using Reposition Speed
e	Spray time (Pass 1)	Calculated using Application Speed
	Departure time (Pass 1)	Calculated using Reposition Speed
	U-Turn time (Pass 1)	From platform data
S	Approach time (Pass 2)	Calculated using Reposition Speed
o	Spray time (Pass 2)	Calculated using Application Speed
r	Departure time (Pass 2)	Calculated using Reposition Speed
t	U-Turn time (Pass 2)	From platform data
i	<i>Repeat spray pass sequence...</i>	
e	Approach time (Last pass)	Calculated using Reposition Speed
	Spray time (Last pass)	Calculated using Application Speed
	Departure time (Last pass)	Calculated using Reposition Speed
	Transit to staging area	Calculated using Transit Speed
	Landing & taxi time	From platform data
N	Loading fuel & dispersant time (in parallel or serial)	From platform data
e	Taxi & takeoff time	From platform data
x	Transit to operational area	Calculated using Transit Speed
t	On-site spotter briefing	10 min
	Approach time (Pass 1)	Calculated using Reposition Speed
S	Spray time (Pass 1)	Calculated using Application Speed
o	Departure time (Pass 1)	Calculated using Reposition Speed
r	U-Turn time (Pass 1)	From platform data
t	Approach time (Pass 2)	Calculated using Reposition Speed
i	Spray time (Pass 2)	Calculated using Application Speed
e	Departure time (Pass 2)	Calculated using Reposition Speed
	U-Turn time (Pass 2)	From platform data
	<i>Repeat for other sorties to end of Operating Period...</i>	
		<i>Repeat...</i>

Figure 40. Aircraft Sortie Timeline Components

4c. Results when using the EDAC button

When the EDAC button is set to “Yes”, the Calculator estimates the volume of dispersants applied in the “Results for Each Operating Period” and labels this data as “Computed EDAC”.

EDSP Calculator User Manual (Mar 2016)

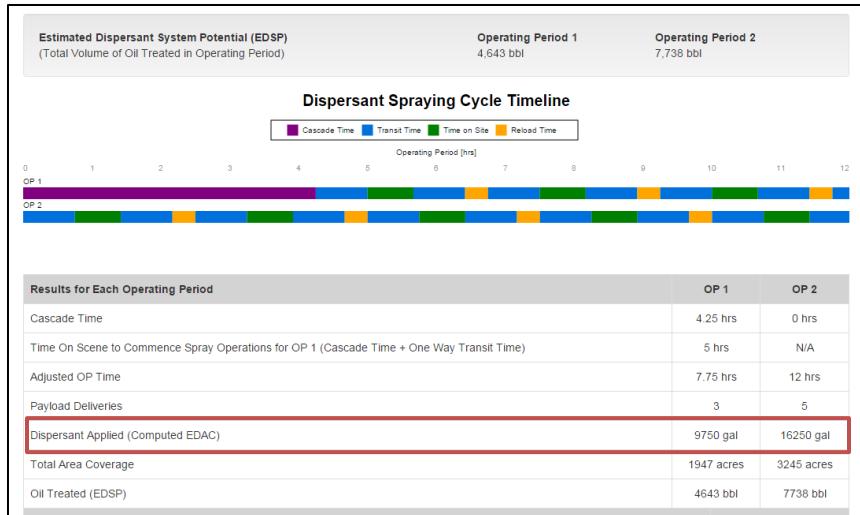


Figure 41. Example of EDAC Output

5. Using the EDSP Calculator

Starting the EDSP Calculator

You can access the EDSP Calculator by double-clicking on the EDSP-160225.html file (date portion of file name will change as new builds are available), which will open up the Calculator in your default web browser.

5a. Calculating EDSP using an Aircraft

Entering input values

- In the **Name of Simulation** box, enter the identifier for this burn system configuration. This example uses “Spray 1”.
- The **Simulation Details** box can be used to enter descriptive information about the dispersant system configuration.

Mobilization/Cascading Group:

- The **Mobilization Time [hrs]** box auto fills with 2 hrs, but can be changed.
- Set **Distance to Staging Site** to 200 nm.
- The **Cascade with Payload** default is “No”, but can be changed.

Scenario Group:

- The **Operating Period** is auto set at 12 hrs, but can be changed.
- Enter 75 in the **One-way Transit Distance [nm]** box.
- Under **Dispersant/Fuel Load** select the “Simultaneous” radio button.

Platform Group:

- Select the Aircraft radio button.
- Select the Hercules L-382, C130 B, E, & G ADDS aircraft.

The Calculator input screen should now look like this:

EDSP Calculator User Manual (Mar 2016)

Name of Simulation: Spray 1

Platform

Type: Aircraft Vessel

Aircraft: Hercules L-382, C130 B, E, & G ADDS

Mobilization/Cascading

Mobilization Time [hrs]: 2

Distance to Staging Site: 200 nm

Cascade with Payload: Yes No

Scenario

Operating Period [hrs]: 12

One-way Transit Distance: 75 nm

Staging location: Spill

Dispersant/Fuel Load: Simultaneous Separate

Dispersion Spraying Operations

Dispersion to Oil Ratio (DOR): 1:20

Dosage: 5 gallons

Average Spray Pass Length: 4 nm

Pass Type: Bidirectional Unidirectional

Effective Daily Application Capacity (EDAC)

Set EDAC: Yes No

Platform - Mobilization/Staging

POF Reference

	Min	Value Applied	Max
Taxi + Take Off/Landing [min]	15	15	min
Cascade Transit Speed [kts]	275	300	300
Max Range No Payload [nm]	2700	2700	nm
Max Range With Payload [nm]	1200	1200	nm
Payload [gal]	5000	5000	gal
Dispensant Load [min]	45	45	min
Fuel Load Time [min]	30	30	min

Platform - Sortie Operations

Transit Speed [kts]	250	250	300
Application Speed [kts]	140	145	150
Approach [nm]	1	1	nm
Pump Rate [gpm]	51	Calculated	612
Swath Width [nm]	100	150	200
Departure [nm]	1	1	nm
Reposition Speed [kts]	150	150	kts
U Turn Time [min]	1.75	1.75	min
Max Sortie Time [hr]	4	4	hr

Calculate

Figure 42. EDSP Input Screen for Aircraft.

Click **Calculate**. The EDSP Outputs for this dispersant application system configuration will then be displayed.

EDSP Calculator User Manual (Mar 2016)

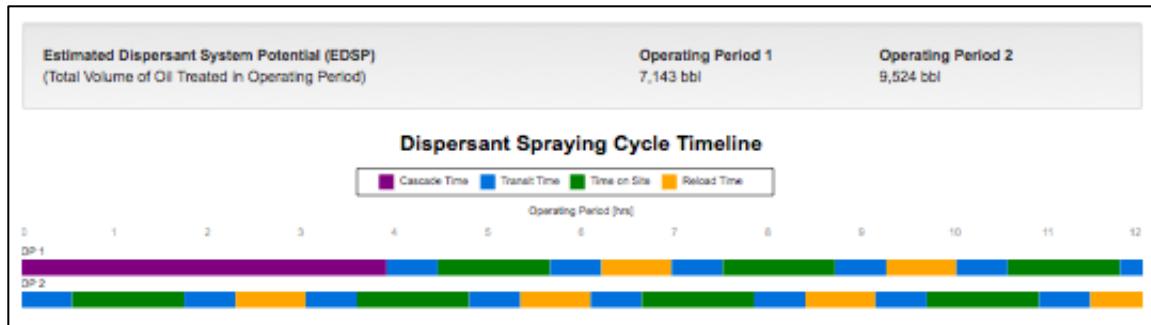


Figure 43. EDSP Timeline Outputs for Spray 1.

Results for Each Operating Period	OP 1	OP 2
Cascade Time	3.92 hrs	0 hrs
Time On Scene to Commence Spray Operations for OP 1 (Cascade Time + One Way Transit Time)	4.5 hrs	N/A
Adjusted OP Time	8.08 hrs	12 hrs
Payload Deliveries	3	4
Dispersant Applied	15000 gal	20000 gal
Total Area Coverage	2999 acres	3999 acres
Oil Treated (EDSP)	7143 bbl	9524 bbl
Results per Sortie for a Complete Payload Application		
One-way Transit Time (including Taxi + Takeoff/Landing for Aircraft)	33 min	
Calculated Pump Rate	253 gpm	
Spray Time/Pass	1.7 min	
# of Passes/Sortie	11.9	
Spray Time/Sortie	19.8 min	
Total Time/Sortie	138 min	
Areal Coverage Rate	50.6 acres/min	
Area Covered/Sortie	1000 acres	

Figure 44. EDSP Tabular Output for Spray 1.

For this dispersant spraying system configuration and scenario, the calculated EDSP value is 7143 barrels of oil for OP1 and 9524 barrels of oil for OP2. During the twelve hour Operating Period, you can expect this system, as configured, to deliver three payloads in OP1 and four in OP2.

5b. Variations in Aircraft Spray 1 Scenario

Changing Dispersant Spraying Options Inputs:

To change the Dispersant Spraying Options select the “Edit” link in the upper right hand corner to make the “Dosage” window pop up. The Dosage can be changed with Input Dosage Directly (default) or Estimate Dosage from Slick Description. If Estimate Dosage from Slick Description is selected, enter the estimate the volume of oil spilled, the estimated area covered by the oil slick, and the estimated percentage coverage of the slick. The resultant average thickness will be used with the DOR to calculate the necessary dosage to treat the oil slick.

The screenshot shows a modal dialog titled "Dosage". It contains two main sections: "Input Dosage Directly" (selected) and "Estimate Dosage From Slick Description".

- Input Dosage Directly:**
 - Desired Dosage: 5 Gallon/Acre
 - Oil Slick Thickness: 0.004 inches (0.094 millimeters)
 - Oil Slick Concentration: 100 Gal/Acre (2.4 Bbl/Acre, 94 Cubic Meter/Square Kilometer)
- Estimate Dosage From Slick Description:**
 - Est. Volume Oil Spill: [empty]
 - Est. Area of Slick: [empty]
 - Est. % Coverage: [empty]

At the bottom right is a green "Ok" button.

Figure 45. DOR/Dosage Edit.

Important Note. The Dispersant Aircraft Capability Forms do not contain explicit dosage capability values or ranges. Every aircraft platform in the EDSP database can deliver the regulatory dosage of 5 gallons of dispersant for each acre sprayed. Other dosage values used in the EDSP may not be actually achievable for a specific platform and should be verified with the platform operator before use.

There will be cases where the desired dosage is too low to be delivered by the specified platform. In that instance an Error box will be displayed, as seen below:

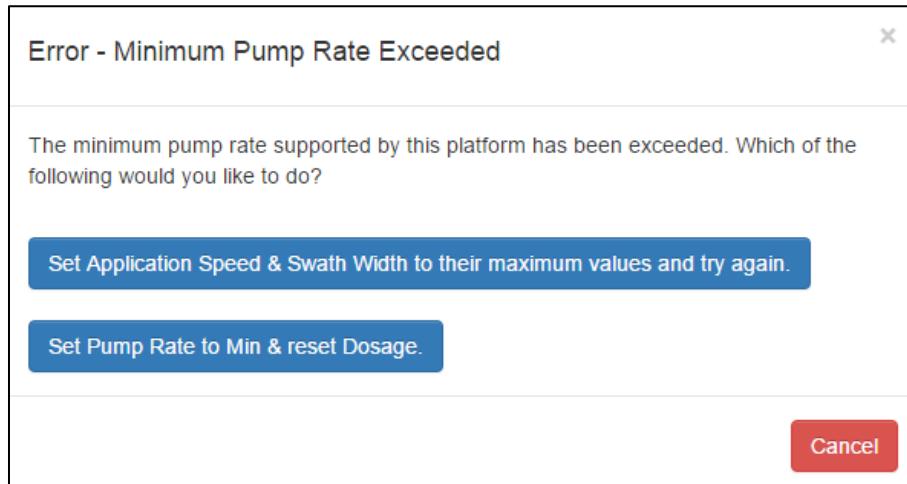


Figure 46. Minimum Pump Rate Error.

In this case the choices are, 1) Set the platform application speed and swath width to their maximum values and try again, or, 2) Set the platform's pump rate to its minimum value and the achievable dosage value will be set.

Likewise, when a dosage value is specified that is higher than the platform can deliver, the following error dialogue box will be displayed:

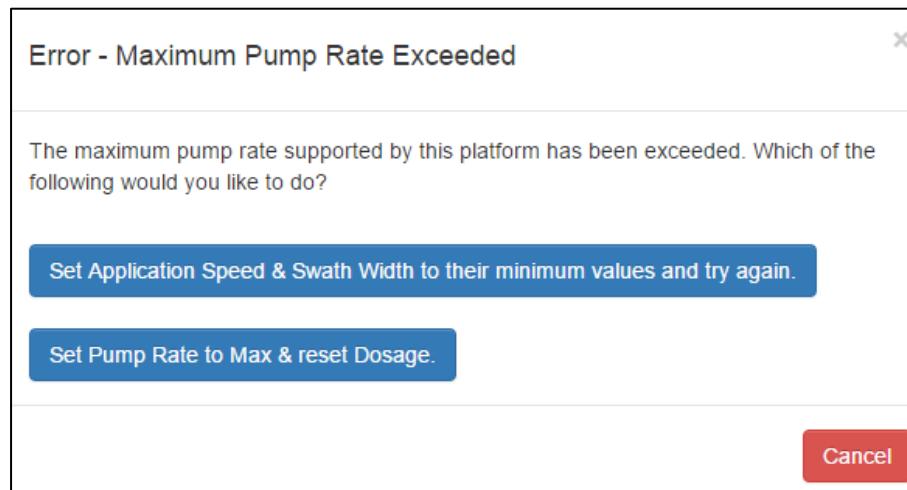


Figure 47. Maximum Pump Rate Error.

The choices are 1), to reset the Application Speed and Swath Width to their minimum values and try again, or 2) Set Pump Rate to its maximum value and the achievable Dosage will be calculated. Multiple spray passes from the platform over the oil slick may be necessary if the oil is too thick.

Cascade and Time On Scene Logic for Aircraft in the EDSP:

- **On Scene In-between OP1 and OP2:** If the Time On Scene to Conduct Spray Operations (TOSCO) of a dispersant aircraft will be greater than one full Operating Period but less than 24 hours, then Operating Period 1 will show solely as Cascade Time and OP2 will begin with a transit to the spill and spray operation.
- **On Scene during OP2:** If TOSCO is greater than 24 hours but less than (24 hours + OP hours), OP1 and OP2 will display actual cascade and transit times and OP2 will correctly show when the aircraft arrives on scene to commence spray operations.
- **On Scene After the end of OP2:** If TOSCO is greater than (24 hours + OP hours), then OP2 will begin with a transit (i.e. the aircraft platform arrives on scene after the end of OP 2).

The following Figures illustrate a scenario where a C-130 is mobilized and cascaded from Arizona to a staging site on the North Slope of Alaska to apply dispersants on a spill offshore in the Chukchi Sea. This is an example of an aircraft arriving on scene between OP1 and OP2.

The screenshot shows the EDSP Calculator software interface with the following configuration:

- Name of Simulation:** Deployment of C-130 to the Arctic
- Platform:**
 - Type: Aircraft
 - Aircraft: C-130 A internal tank
- Mobilization/Cascading:**
 - Mobilization Time [hrs]: 2
 - Distance to Staging Site: 3085 nm
 - Cascade with Payload: Yes
- Scenario:**
 - Operating Period [hrs]: 12
 - One-way Transit Distance: 80 nm
 - Staging to/from spill
 - Dispersant/Fuel Load: Simultaneous
- Dispersant Spraying Operations:**
 - Dispersant to Oil Ratio (DOR): 1:20
 - Dosage: 5 gallons/acre
 - Average Spray Pass Length: 4 nm
 - Pass Type: Bidirectional
- Effective Daily Application Capacity (EDAC):**
 - Set EDAC: No
- Platform - Mobilization/Staging:**
 - PDF Reference: Min Value Applied Max
 - Taxi + Take Off/Landing [min]: 15 min
 - Cascade Transit Speed [kts]: 250 298 370
 - Max Range No Payload [nm]: 2086 nm
 - Max Range With Payload [nm]: 1400 nm
 - Payload [gal]: 3250 gal
 - Dispersant Load [min]: 20 min
 - Fuel Load Time [min]: 20 min
- Platform - Sortie Operations:**
 - Sortie Speed [kts]: 230 298 298
 - Application Speed [kts]: 150 150 200
 - Approach [nm]: 1 nm
 - Pump Rate [gpm]: 60 Calculated 523
 - Swath Width [ft]: 100 150 150
 - Departure [nm]: 1 nm
 - Reposition Speed [kts]: 150 kts
 - U Turn Time [min]: 1.67 min
 - Max Sortie Time [hr]: 4.7 hr

Calculate button is located at the bottom center.

Figure 48. C-130 Arctic Cascade Scenario

EDSP Calculator User Manual (Mar 2016)

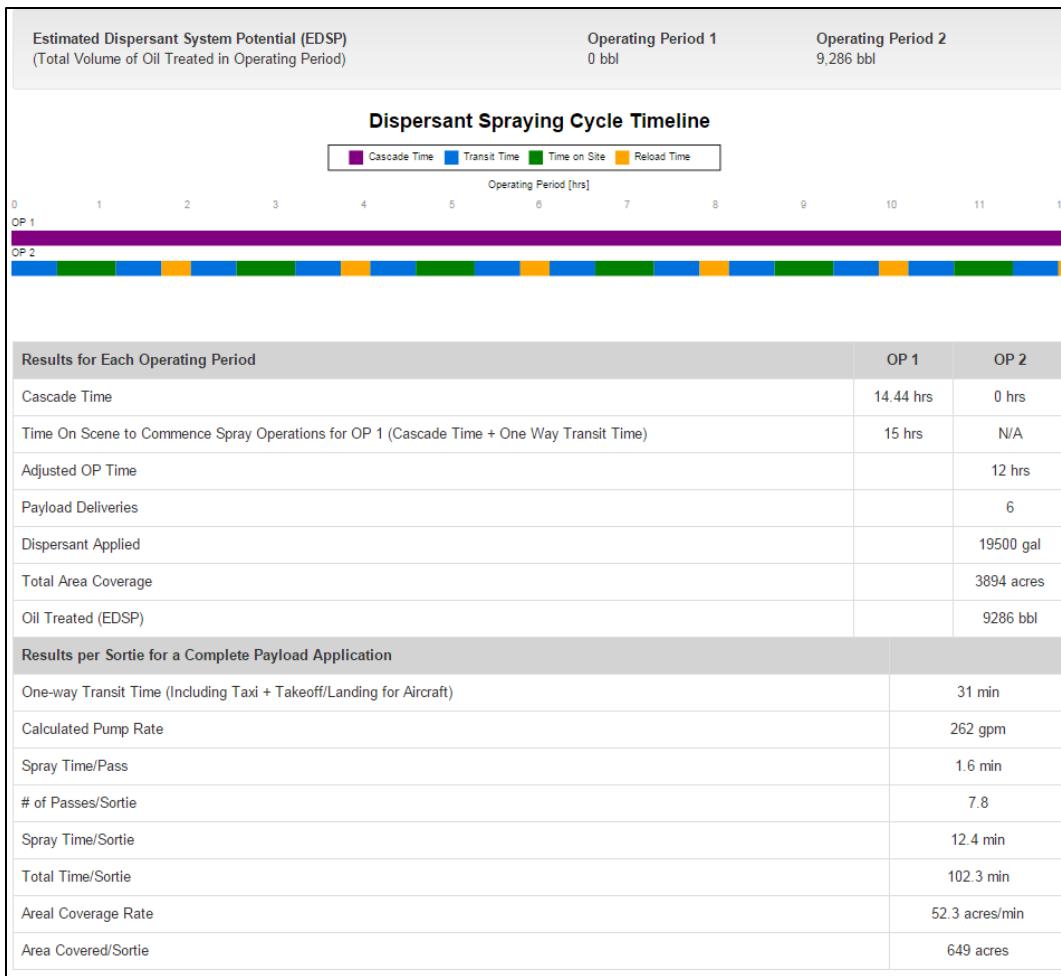


Figure 49. C-130 Arctic Cascade Scenario Results

The computed cascade time for this example as shown in the results table in the OP1 column is 14.4 hours. As a result, the timeline for OP 1 is made up entirely of Cascade Time. As the platform can be ready to begin spraying before the second OP begins (15 hours), the second OP begins with a transit to the spill site to begin spray operations. The platform is capable of delivering 6 payloads for a total of 19,500 gallons of dispersant applied (treating an estimated 9286 barrels of oil) during OP 2. These numbers reflect the EDAC/EDSP potential that the platform can achieve each day as the spill continues.

EDSP Calculator User Manual (Mar 2016)

In the following example, a C-130 is cascaded in from an international location (5000 miles away) that also requires a 24 hour period for preparing the aircraft for mobilization. The following Figures demonstrate the cascading logic and Calculator outputs for a platform that would arrive on scene after the end of OP2.

Estimated Dispersant System Potential (EDSP) Calculator v-160226

DMF2 Revision 1

The ERSP, EBSP, and EDSP Calculators are intended as planning tools for estimating the potential of different oil spill response systems to mitigate (recover, burn or disperse) discharged oil relative to one another. These planning tools are NOT intended to be used as models for calculating system performance during an actual oil spill, which is affected by many factors such as the distribution of oil on the water surface, oil weathering, and other ambient onscene conditions which are not included in these Calculators.

Name of Simulation:	Platform	New Save As
Simulation Details:	Type: <input checked="" type="radio"/> Aircraft <input type="radio"/> Vessel	
Mobilization/Cascading	Aircraft: C-130 A internal tank	
Mobilization Time [hrs]: 24	Platform - Mobilization/Staging	
Distance to Staging Site: 5000 nm	PDF Reference Min Value Applied Max	
Cascade with Payload: <input type="radio"/> Yes <input checked="" type="radio"/> No	Taxi + Take Off/Landing [min]: 15 min	
Scenario	Cascade Transit Speed [kts]: 250 298 370	
Operating Period [hrs]: 12	Max Range No Payload [nm]: 2086 nm	
One-way Transit Distance: 120 nm	Max Range With Payload [nm]: 1400 nm	
Staging to/from spill	Payload [gal]: 3250 gal	
Dispersant/Fuel Load: <input checked="" type="radio"/> Simultaneous <input type="radio"/> Separate	Dispersant Load [min]: 20 min	
Dispersant Spraying Operations	Fuel Load Time [min]: 20 min	
Dispersant to Oil Ratio (DOR): 1:20	Platform - Sortie Operations	
Dosage: 5 gallons	Transit Speed [kts]: 230 298 298	
Average Spray Pass Length: 4 nm	Application Speed [kts]: 150 150 200	
Pass Type: <input checked="" type="radio"/> Bidirectional <input type="radio"/> Unidirectional	Approach [nm]: 1 nm	
Effective Daily Application Capacity (EDAC)	Pump Rate [gpm]: 60 Calculated 523	
Set EDAC: <input type="radio"/> Yes <input checked="" type="radio"/> No	Swath Width [ft]: 100 150 150	
	Departure [nm]: 1 nm	
	Reposition Speed [kts]: 150 kts	
	U Turn Time [min]: 1.67 min	
	Max Sortie Time [hr]: 4.7 hr	
Calculate		

Figure 50. International Cascade Scenario Results

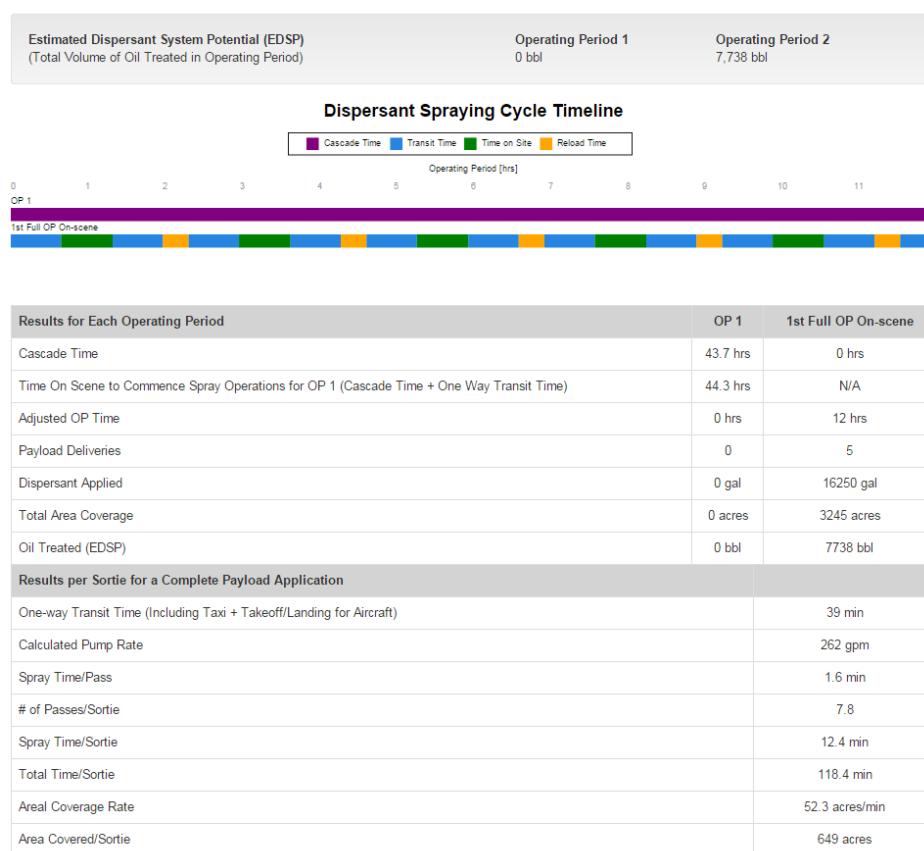


Figure 51. International Cascade Scenario Results

The computed cascade time for this example as shown in the results table in the OP1 column is 43.7 hours and the aircraft could be on scene as early as 44.3 hours. As a result, the timeline for OP 1 is made up entirely of Cascade Time. Notice the second bar in the timeline and the second column in the table are now labeled as "1st Full OP On Scene", and both reflect what the spray aircraft can achieve during a full operating period (where the platform begins the OP with a transit out to the spill site). As the platform could be on scene to begin spraying after 44.3 hours (and the third OP would begin at 48 hours), the second timeline bar and data column represent what the platform could provide during the third OP and each subsequent full OP afterwards. For this scenario, the platform is capable of delivering 5 payloads for a total of 16,250 gallons of dispersant applied (treating an estimated 7738 barrels of oil) during the third OP.

Changing Cascade Speed with Payload:

For some aircraft platforms the cascade speed will change based on whether or not they are cascading with a dispersant payload. For example, the Air Tractor AT-502 B 170 gal aircraft has a Cascade Transit Speed of 122 kts when it cascades with no payload. However, when a full payload of dispersant is added, the Cascade Transit Speed decreases to 120 kts. The calculator takes these variations into consideration in the calculation of cascade time

5c. Calculating EDSP using a Vessel

Entering input values

- In the **Name of Simulation** box, enter the identifier for this burn system configuration. This example uses “Spray 2”.
- The **Simulation Details** box can be used to enter descriptive information about the dispersant system configuration.

Mobilization/Cascading Group:

- The **Mobilization Time [hrs]** box auto fills with 2 hrs, but can be changed.
- Set **Distance to Staging Site** to 35 nm.

Scenario Group:

- The **Operating Period** is auto set at 12 hrs, but can be changed.
- Enter 15 in the **One-way Transit Distance [nm]** box.
- Under **Dispersant/Fuel Load** select the “Simultaneous” radio button.

Platform Group:

- Select the Vessel radio button.
- Select the Typical Large Vessel.
- Adjust any platform input values as necessary
- Select whether the vessel will be resupplied with dispersant on scene, or will have to transit back to the staging site to reload dispersants.

The Calculator input screen should now look like this:

EDSP Calculator User Manual (Mar 2016)

The screenshot shows the 'Vessel Input Screen' of the EDSP Calculator. The interface is divided into several sections:

- Name of Simulation:** Spry 2
- Platform:** Type: Vessel; Vessel: Typical Large Vessel
- Mobilization/Cascading:**
 - Mobilization Time [hrs]: 2
 - Distance to Staging Site: 35 nm
- Scenario:**
 - Operating Period [hrs]: 12
 - One-way Transit Distance: 15 nm
 - Staging (to/from spill)
 - Dispensant/Fuel Load: Simultaneous Separate
- Dispensant Spraying Operations:**
 - Dispensant to Oil Ratio (DOR): 1:20
 - Dosage: 5 gallons
 - Average Spray Pass Length: 4 nm
 - Pass Type: Discontinuous Continuous
- Effective Daily Application Capacity (EDAC):**
 - Set EDAC: Yes No
- Platform - Mobilization / Staging:**

	Min	Value Applied	Max
Cascade Transit Speed [kts]	5	5	20
Max Range With Payload [nm]	1000	1000	nm
Payload [gal]	2000	2000	gal
Dispensant Load [min]	20	20	min
Fuel Load Time [min]	40	40	min
- Platform - Sortie Operations:**

Transit Speed [kts]	5	5	20
Application Speed [kts]	3	5	20
Pump Rate (gpm)	3	Calculated	20
Swath Width [%]	20	65	100
U Turn Time [min]	1	1	min
Max Sortie Time [hr]	36	36	hr
Resupply On Scene:	<input type="radio"/> Yes <input checked="" type="radio"/> No		

Calculate button at the bottom.

Figure 52. Vessel Input Screen.

Click **Calculate**. The EDSP Outputs for this dispersant application system configuration and scenario will then be displayed.

EDSP Calculator User Manual (Mar 2016)

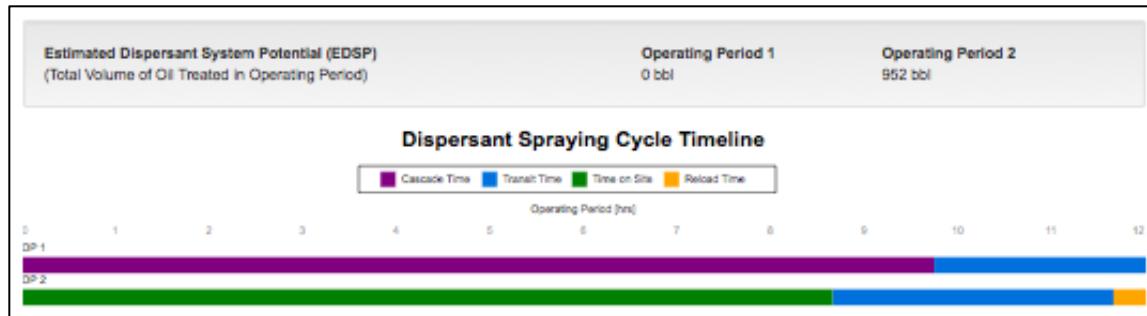


Figure 53. EDSP Graphical Outputs for Spray 2

Results for Each Operating Period		OP 1	OP 2
Cascade Time		9.75 hrs	0 hrs
Time On Scene to Commence Spray Operations for OP 1 (Cascade Time + One Way Transit Time)		12.8 hrs	N/A
Adjusted OP Time		2.25 hrs	12 hrs
Payload Deliveries		0	1
Dispersant Applied		0 gal	2000 gal
Total Area Coverage		0 acres	378 acres
Oil Treated (EDSP)		0 bbl	952 bbl
Results per Sortie for a Complete Payload Application			
One-way Transit Time (Including Taxi + Takeoff/Landing for Aircraft)		180 min	
Calculated Pump Rate		4 gpm	
Spray Time/Pass		48 min	
# of Passes/Sortie		10.4	
Spray Time/Sortie		500 min	
Total Time/Sortie		870 min	
Areal Coverage Rate		0.8 acres/min	
Area Covered/Sortie		378 acres	

Figure 54. EDSP Tabular Output for Spray 2

For this dispersant spraying system configuration, the calculated EDSP value is 0 barrels of oil for OP1 because the vessel speed did not allow a spraying period in OP1 and 952 barrels of oil for OP2. During the twelve hour Operating Period, you can expect this system, as configured, to deliver one payload in OP2.

5d. Variations in Vessel Spraying Scenarios

Business Rules for Reloading Dispersant Payloads on Vessels

When Resupply on Scene is set to “No”, a business rule is in effect that requires a vessel spray platform to return to the staging site when their payload is below 50% of their maximum capacity at the end of an OP. Unlike aircraft, and due to their slow transit speeds, vessels are allowed to reload their payload and transit/return to the spill site between OPs.

In the example Figure below, you can see from the tabular data in the OP1 column, that the vessel platform was able to spray 60% of their payload before OP1 ended.

Following the business rule, the vessel then returned to the staging site, reloaded dispersants, and returned to the spill site prior to the start of OP2 (as the one way transit time to and from the spill is only 2 hour each way and vessels are allowed to transit at night between Ops. As a result, the vessel begins OP2 on scene conducting spraying operations and is able to deliver a complete payload before returning back to the staging site.

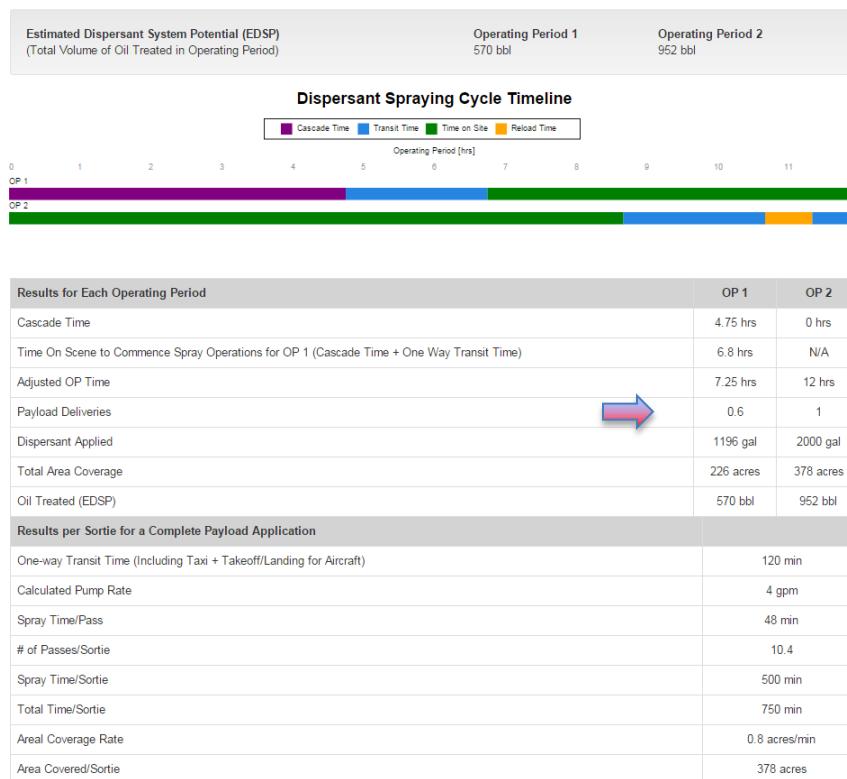


Figure 55. Business Rule for Reloading Dispersants on Vessels

EDSP Calculator User Manual (Mar 2016)

In the example below, you can see from the tabular data in the OP1 column, that the vessel platform was only able to spray 40% of their payload before OP1 ended due to an increased cascade time from the previous example. Following the business rule, the vessel now remains on scene between OPs and sprays the remaining portion of its payload when OP2 begins. When spraying the full payload is completed, the vessel returns to the staging site to reload dispersants and begin a new sortie.

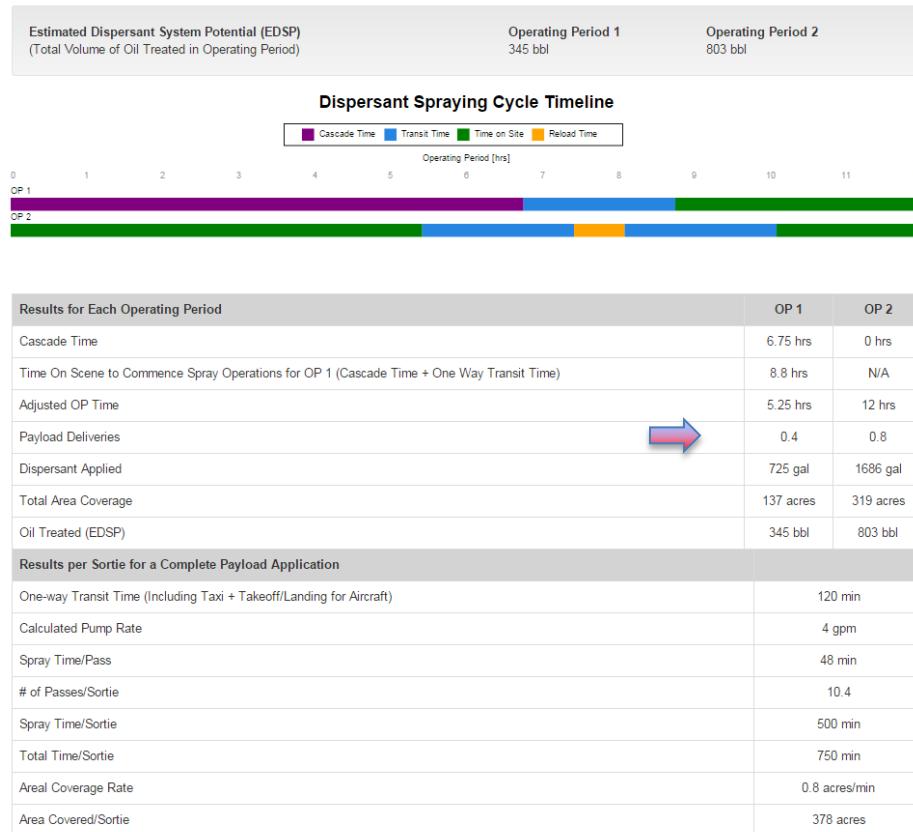


Figure 56. Business Rule for Reloading Dispersants on Vessels

When “Resupply On Scene” selection is “Yes”, the vessel platform will be refilled with dispersants whenever the vessel’s dispersant payload has been completely exhausted, and at the end of each OP. When Resupply On Scene selection is “Yes”, vessel platforms that conducted some spray operations during OP 1 will always start out OP 2 with a full payload of dispersants. Setting ‘Resupply On Scene’ to Yes negates the need for additional transits between the staging site and the spill for the purposes of reloading dispersants, and increases on scene time for applying dispersants. The Figure below illustrates the change in the same platform’s cycle timeline from the example above if Resupply On Scene is changed from “No” to “Yes”.

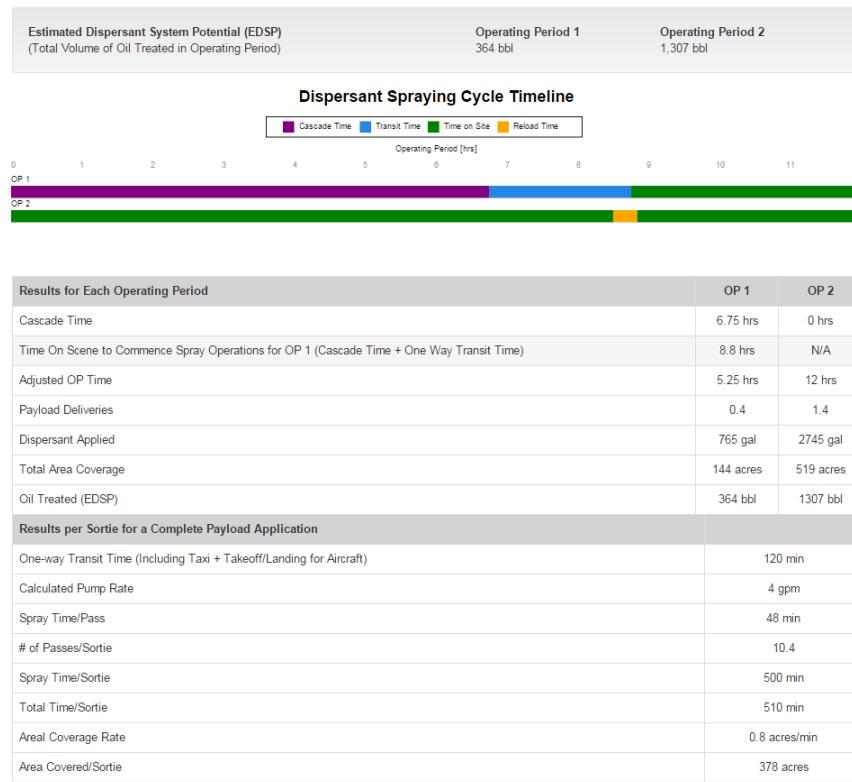


Figure 57. Resupply On Scene Set to “Yes”

Multi-Day Cascading of Vessels:

The EDSP output of two operating periods is well suited for aircraft. Cascading of aircraft from out-of-area can be accomplished in most situations in the first operating period so that the estimated dispersant application performance can be displayed for the second operating period. Compared with aircraft, however, vessels are very slow. In order for the EDSP to provide meaningful estimates for vessels, the following logic has been employed based on the Time On Scene to Commence Spray Operations (TOSCO).

Cascade and Time On Scene Logic for Vessels in the EDSP

- **On Scene During OP1:** If the TOSCO is less than the OP (i.e. the vessel arrives on scene and commences spray operations within OP-1) then show the operations for both OP-1 and OP-2 with the "business rule" (see above) coming into play if OP-1 ends with a partial spray.
- **On Scene In-between OP1 and OP2:** If the TOSCO is greater than OP time (past OP-1) but Less than 24 hours, (i.e. the vessel arrives on scene ready to spray after the end of OP-1 but before the start of OP-2) then the OP-1 timeline

reflects any actual Cascade and Transit that occurred during the first OP, and the second OP starts with a spray operation.

- **On Scene During OP2:** If the TOSCO is greater than OP time (arrives after OP-1) but Less than 24 + OP-hours, then the first and second operating periods reflect the actual Cascade and transit times, and the vessel arrives and starts spray operations during the second operating period.
- **On Scene After the end of OP2:** If TOSCO is greater than OP hours + 24 hours (multiday cascade), then the first operating period will begin with a spray operation. The labels for the timelines and the tabular data columns will be changed from “OP-1” and “OP-2” to “1st Full OP On Scene” and “2nd OP On Scene”. Since this scenario will lead to starting OP-1 with a spray operation, the other output fields in the first column headed “1st Full OP On Scene”, will appear as they normally would for an operating period starting with a spray operation.

In the example below, the vessel had a cascade time of 9.75 hours and a time on scene of 15.8 hours. Since the vessel arrived in between OP1 and OP2, the vessel timeline will start out with spraying operations at the beginning of OP2.

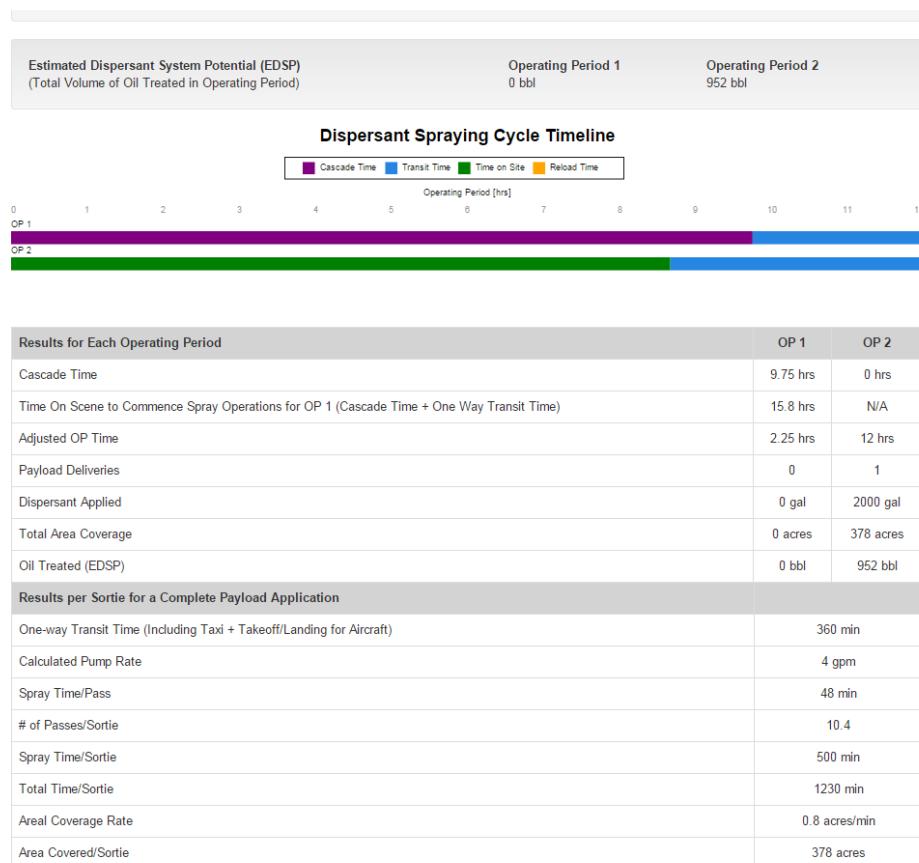


Figure 58. Vessel Arriving On Scene in between OP1 and OP2

The Figures below illustrate a vessel cascading over multiple OPs and arriving on scene after the end of OP2. In this case, a vessel of opportunity required 24 hours for mobilization before transiting 50 miles to the staging site to load dispersants. The cascade time was 34.75 hours, and the time on scene was 42.8 hours. Since the vessel arrived after the end of OP2, the outputs will show the first two full OPs where the vessel is on scene. In this case, that would be for OP3 and OP4, as OP3 starts at 48 hours.

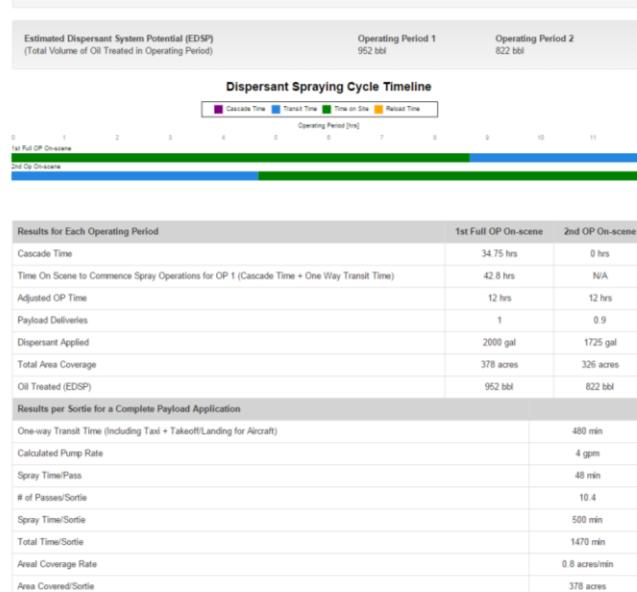


Figure 59. Vessel of Opportunity Arriving On Scene after OP2

If resupply on scene is then set to “Yes”, the outputs change as seen below. With resupply set to “Yes”, the output will repeat itself for each full OP.

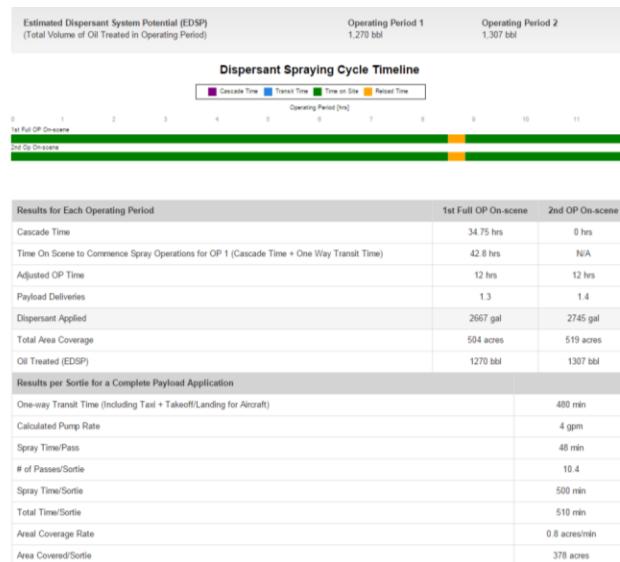


Figure 60. Vessel of Opportunity Arriving On Scene after OP2 with Resupply On Scene

6. Equations Used in Calculations

In the EDSP Calculator, the following variables and equations are used to estimate rates, times, areal coverage, and volumes.

Cascade Time

If the Cascade Distance to Staging Site is less than or equal to the Maximum Flight Range then the cascade can be done with one leg and,

Aircraft Cascade Time = Mobilization Time + (Taxi + Takeoff/Landing Time) + Distance to Staging Site/Cascade Transit Speed + (Taxi + Takeoff/Landing Time) + 45 minute briefing period.

The Cascade Transit Speed and Maximum Flight Range for aircraft will vary depending on whether the platform is cascading with or without a dispersant payload.

If the Cascade Distance is greater than the Maximum Flight Range then the cascade will require multiple legs. Each leg will require a Fuel Load Time.

Vessel Cascade Time = Mobilization Time + Distance to Staging Site/Cascade Transit Speed + 45 minute briefing period.

One-way Transit Time

Aircraft One-way Transit Time = (Taxi + Takeoff/Landing Time) + (One-way Transit Distance, staging to & from spill) /Transit Speed

Vessel One-way Transit Time = (One-way Transit Distance, staging to & from spill) /Transit Speed

Areal Coverage Rate

Areal Coverage Rate = Application Speed x Swath Width/430

Pump Rate

Pump Rate = Dosage x Areal Coverage Rate

Spray Time/Sortie

Spray Time/Sortie = Payload/Pump Rate

Spray Time/Pass

Spray Time/Pass = Average Spray Pass Length/Application Speed

of Passes/Sortie

of Passes/Sortie = (Spray Time/Sortie) / (Spray Time/Pass)

The integer part of this is the number of complete passes. The decimal part of this determines the extent of the last partial pass before the end of the sortie.

For Bidirectional Spraying:

Number of U Turns = INT(# of Passes/Sortie)

Number of Approaches + Departures = 2 x INT(# of Passes/Sortie) + 2

For Unidirectional Spraying:

Return Leg Distance = Approach + Average Spray Pass Length + Departure

Return Leg Time = Return Leg Distance / Reposition Speed

Number of U Turns = 2 x INT(# of Passes/Sortie)

Number of Approaches + Departures = 4 x INT(# of Passes/Sortie) + 2

Maximum Transit Distance

The Maximum Transit Distance is the maximum distance for a particular scenario and aircraft platform combination that the platform can reach, deliver a full payload, and return to the staging site within its Max Sortie Time.

Time On Station = 10 min check in time + Approaches/Departures + spray passes + U Turns.

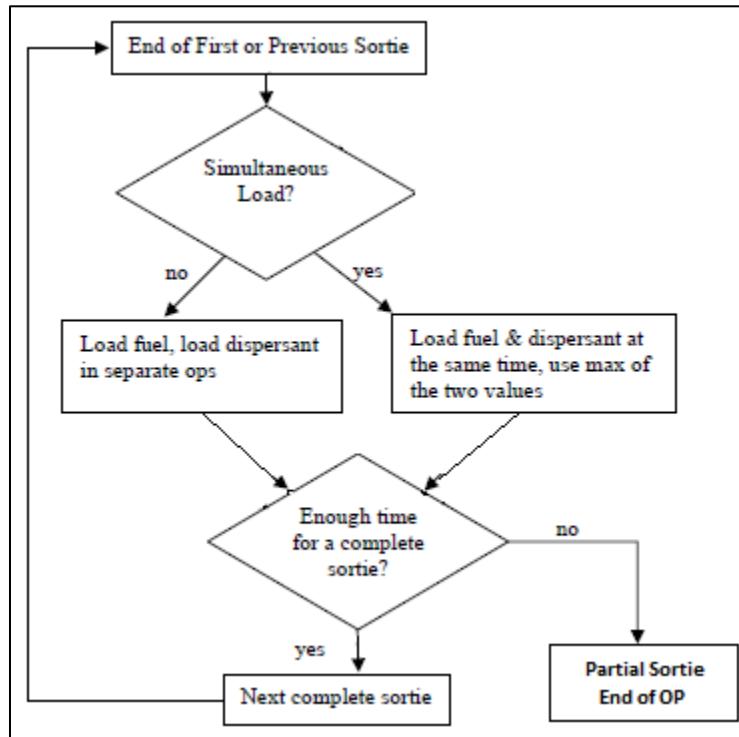
Total Time/Sortie = Time On Station + 2(One-Way Transit Time)

Maximum One-way Transit Time = (Max Sortie Time – Time On Station) / 2

Maximum Transit Distance = Maximum One-way Transit Time x Transit Speed

Payload Deliveries

The following logic is used to determine the Payload Deliveries in an OP (EDAC) and Oil Treated (EDSP):



Cycle Time = Total Time/Sortie + Resupply Time

Payload Deliveries = INT(Operating Period Time / Cycle Time)

Dispersant Applied = Payload Deliveries x Payload

This will be the number of complete payload deliveries in the operating period. Next add any partial sortie spray passes that can be accomplished in the remaining time in the operating period.

OP Time Remaining = Operating Period Time – (Payload Deliveries x Cycle Time) – Transit Time – Check in Time – Approach Time

If OP Time Remaining > 0

Then if OP Time Remaining > Spray Time/Pass

Dispersant Applied = Dispersant Applied + (Spray Time/Pass x Pump Rate)

OP Time Remaining = OP Time Remaining – Departure Time – U Turn Time – Approach Time (for bidirectional spraying)

OR

OP Time Remaining = OP Time Remaining – Departure Time – U Turn Time – Return Leg Time – U Turn Time (for unidirectional spraying)

End if

End if

Now add spray time for final partial pass

Dispersant Applied (EDAC) = Dispersant Applied + OP Time Remaining x Pump Rate

EDSP = Dispersant Applied x DOR/42

Total Spray Time in OP = Dispersant Applied / Pump Rate

Total Area Coverage = Areal Coverage Rate x Total Spray Time in OP