DMP2 Sample Exercises

1. Grounded Tanker 35 NM Offshore

During the hours of darkness, an oil tanker runs aground and releases an unknown quantity of oil. Skimming resources are enroute to the scene and since the oil is determined to be dispersable, a Beechcraft King Air 90A is mobilized and is standing by. Dispersant application approval consultations have been initiated. At first light, an overflight reveals a slick extending about a mile from the vessel. The release at the tanker is controlled and an estimated 2500 bbl of product (after evaporation and natural dispersion) remains on the water. Dispersant application is approved by the FOSC and the Beechcraft is ordered to fly. The staging airfield is about 60 NM from the spill area which is 35 NM offshore. The Beechcraft is loaded with fuel and dispersant at the staging airfield and has about 9 hours remaining in the day to operate. The latest overflight estimate of the slick size is about 2.5 NM long and about a half mile wide with about 75 % coverage. A spotter aircraft is in place. Spraying is in both directions and the Beechcraft will be loading dispersant and fuel simultaneously. Answer the following questions using the DMP2:

- What is the nominal optimum dosage for this slick at a DOR of 1:20?
- Using the default configuration for the Beechcraft, what is the computed pump rate to achieve the desired dosage?
- Approximately how much oil could be treated with dispersant?

An alternate staging airport 48 NM from the spill location has been located that has a runway length of 4,600 feet.

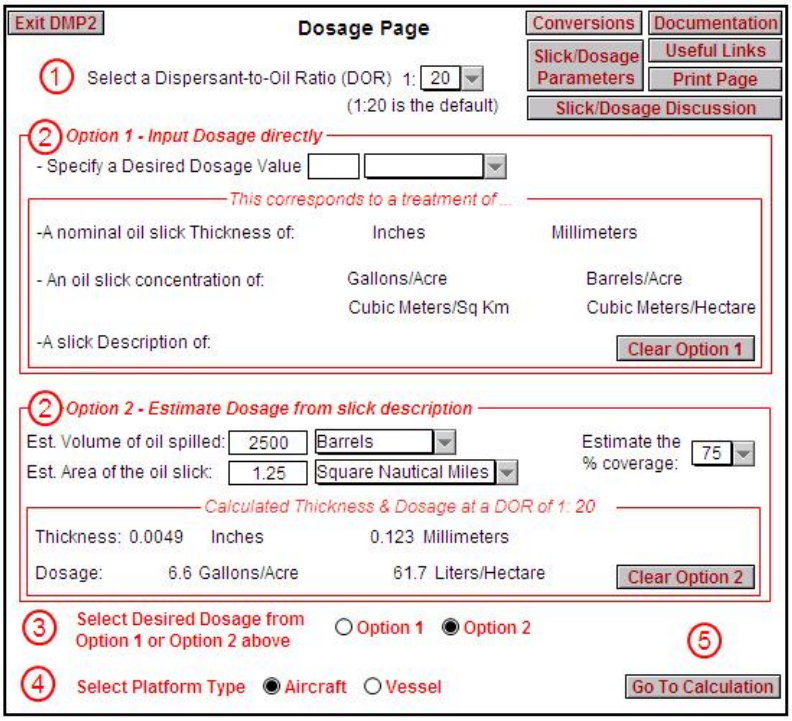
- Can the Beechcraft operate from this alternate staging airport?
- If so, about how much oil could be treated in the 9 hours available from this alternate staging airport?

It is determined that with this oil and dispersant combination, a more effective DOR is 1:10.

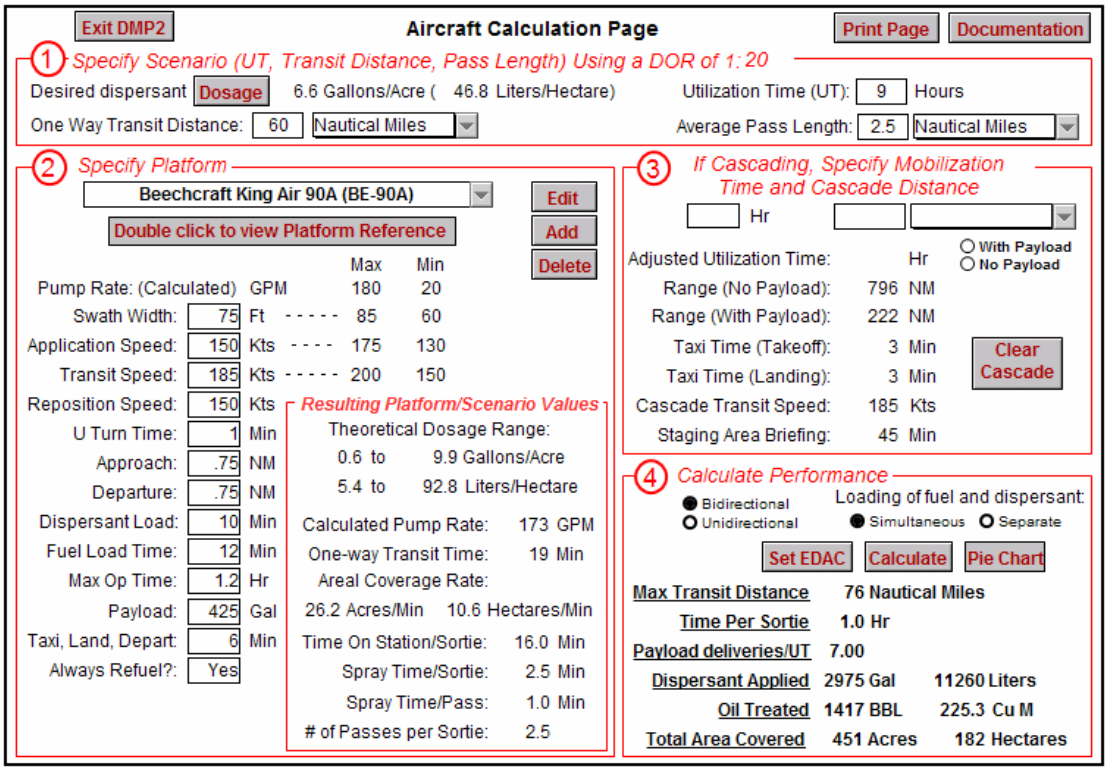
- What is the new nominal optimum dosage?
- What is the calculated pump rate for the Beechcraft to achieve this dosage?
- Can the Beechcraft deliver the calculated pump rate?

Discussion

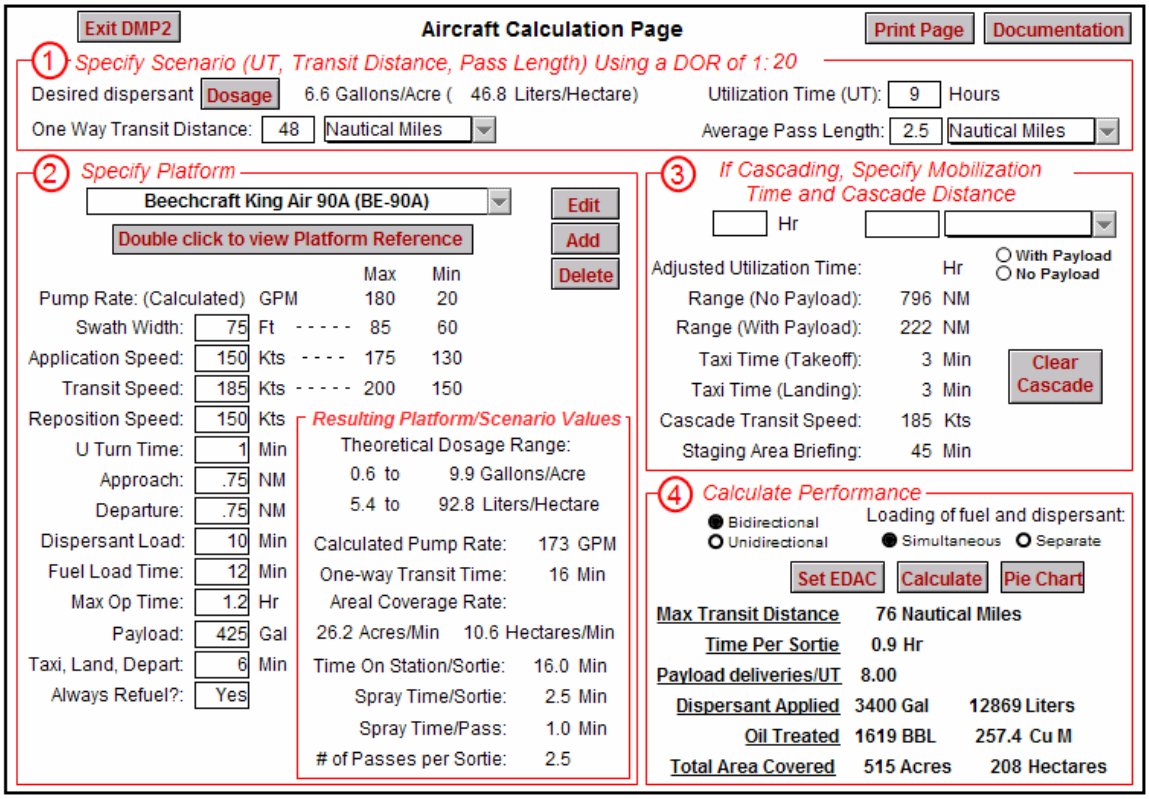
Use Option 2 on the Dosage Page. Entering the estimated volume of 2500 barrels, the estimated area of 1.25 square nautical miles (2.5 NM long x .5 NM wide), and the estimated coverage of 75%, the nominal dosage to treat this slick is 6.6 gallons of dispersant for each acre of slick (61.7 liters per hectare).



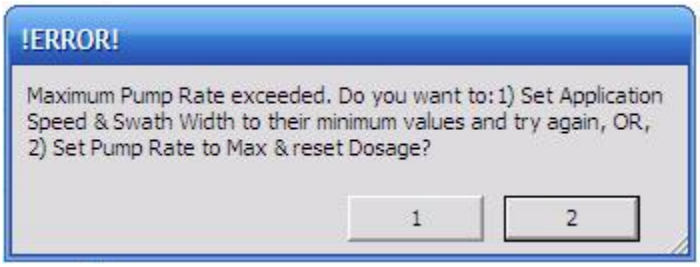
On the Aircraft Calculation Page, 1) enter the 60 NM Transit Distance, the 9 hour UT, the 2.5 NM Average Pass Length, and 2) select the Beechcraft KingAir 90A. The Calculated Pump Rate is 173 gallons per minute. Click on the Calculate button to obtain an estimate of the Oil Treated as 1417 barrels (225.3 cubic meters).



To determine if the Beechcraft can operate from the 4,600 foot runway, double click on the button for the Platform Reference. You will probably want to set the zoom factor to at least 100% to make this pdf document readable. Scroll towards the bottom of the document to find details on runway limitations for this platform. The minimum runway length is 4,200 feet. Assume the other critera fall within the acceptable bounds for this exercise.



Go back to the Dosage Page to set the DOR to 1:10 and navigate back to the Aircraft Calculation Page. Note that the Platform data will need to be reset by selecting the Beechcraft King Air again. With the new DOR, the calculated pump rate to achieve the new Dosage of 13.2 gallons per acre is 345 gallons per minute. Clicking the Calculate button brings up the following error window as the maximum pump rate for this platform is 180 gallons per minute. The two choices now are to set the Application Speed and Swath Width to their minimum values and try again (button 1), or, set the Pump Rate to its maximum and reset the Dosage to what can be achieved with the maximum pump rate (button 2).



Clicking on button 2 sets the Dosage to 6.8 gallons per acre and calculates the Oil Treated as an estimated 810 barrels. Note that the calculated pump rate is 178 gpm and not the expected 180 gpm due to rounding in the calculations.

2. Blowout in the Gulf of Mexico

Company X is a member of both CGA and MSRC. While overhauling the subsea blowout preventers on a platform, the crew experiences a problem which causes the uncontrolled discharge from the well of approximately 1,000 bbls of crude oil per hour. The location of the platform is: 27° 16' 56.8" N, 088° 19' 38" W.

The spill occurs at 0600 on 1 March 2007.

Both MSRC and CGA assets are activated as follows:

0700 MSRC C130 Coolidge Municipal Airport mobilization - 4 hours
0700 MSRC King Air Stennis International Airport mobilization - 4 hours
0700 CGA DC4 Houma Airport mobilization - 2 hours
0700 CGA DC3 Houma Airport mobilization - 6 hours

The MSRC C130 aircraft will fly to Stennis Airport fully loaded with 3250 gallons of dispersant.

The MSRC aircraft will operate from Stennis International Airport.
The CGA aircraft will operate from Houma Airport.

- How much dispersant can each aircraft apply to the slick on Day1? On Day 2?
- How much dispersant will be needed to keep the aircraft fully operational for an estimated 4 day period the spill will last before being shut in?

Discussion of Day 1
Start with the CGA DC-4 staging from Houma. The distance from Houma is about 212 NM to the spill site (I used Google Earth, your result may vary somewhat depending on which tool/method you use). No wind speed or direction has been specified. If the slick is moving offshore at this distance from land, there may be no net environmental benefit to disperse this oil slick. Again with no weather specified, assume VFR conditions and optimal wind to mix the dispersant with the oil.

With notification at 0700, start taxi at 0900, and sunset at about 1800 the Utilization Time (UT) for the DC-4 is about 9 hours for day 1. Transit Time to the spill is about 85 min using DMP2. "Theoretical" dosage for the DC-4 ranges from .7 to 28.7 gallons per acre. What should be used for a Dosage? What about the Average Pass Length? Start out with 5 gallons per acre, Pass Lengths of 2, 3, and 5 NM. Using the same Pass Lengths increase the dosage to 10 gallons per acre, and finally 20 gallons per acre. The results

using the DMP2 are in the following table showing variation in platform performance with different pass lengths and dosages.

DC-4 Day 1	Dosage	Calc Pump Rate	Pass Lgth	Time per Sortie	Passes	Payloads	Disp used	Oil Treated	Area Cov
UT=9 Hr	5 gpa	262 gpm	2 NM	3.9 hr	9.6	2	4000 gal	1905 bbl	800 acres
Transit - 85 min	5 gpa	262 gpm	3 NM	3.8 hr	6.4	2	4000 gal	1905 bbl	800 acres
	5 gpa	262 gpm	5 NM	3.7 hr	3.8	2	4000 gal	1905 bbl	800 acres
	10 gpa	523 gpm	2 NM	3.7 hr	4.8	2	4000 gal	1905 bbl	400 acres
	10 gpa	523 gpm	3 NM	3.7 hr	3.2	2	4000 gal	1905 bbl	400 acres
	10 gpa	523 gpm	5 NM	3.6 hr	1.9	2	4000 gal	1905 bbl	400 acres
	11.4 gpa*	597 gpm	2 NM	3.7 hr	4.2	2	4000 gal	1905 bbl	351 acres
	11.4 gpa*	597 gpm	3 NM	3.6 hr	2.8	2	4000 gal	1905 bbl	351 acres
	11.4 gpa*	597 gpm	5 NM	3.6 hr	1.7	2	4000 gal	1905 bbl	351 acres

*The Calculated Pump Rate at a Dosage of 20 gpa is 1047 gpm which exceeds the Max Pump Rate of 600 gpm. DMP2 can 1), Recalculate the Pump Rate at Min Swath and Min App Speed OR 2), Recalculate Dosage at default Swath and App Speed. Option 2 yields a Dosage of 11.4 gpa.

DC-4 from Houma on Day 1: Note that because of the distance offshore, the maximum number of sorties is 2 regardless of the specified Dosages or Pass Lengths. This points out the importance of the spotter aircraft and dispersant effectiveness monitoring. With unspecified wind and current the configuration of the slick is unknown. The dispersant should be applied to the freshest oil possible (thickest) which may indicate higher Dosages. Whatever Dosage (i.e. Pump Rate) is applied on the first sortie, the spotter aircraft/effectiveness monitoring can possibly provide information for changes to the dosage on the second sortie. Another option to explore is Unidirectional or "Race Track" spraying. The above data were derived using Bidirectional spraying, i.e., spraying in both directions. Unidirectional spraying still allows for 2 sorties and gives the DC-4 flight crew, the spotter plane, and the monitoring program more time to evaluate effectiveness. The bottom line for the DC-4 from Houma on day 1 is: 2 Payloads or 4000 gallons applied to the spill to treat about 1900 bbl of oil. Depending upon the accuracy of the release estimate of 1000 bbl/hour, at the end of daylight (1800), about 12,000 bbl of crude is released and the DC-4 could treat about 15% of it at a DOR of 1:20.

DC-3 from Houma (Transit distance - 212 nautical miles): Start taxi at 1300 gives a UT of about 3 hours, enough for just one sortie on Day 1. Transit Time is 98 minutes, calculated Pump Rate for 5 gallons per acre is 209 gpm, calculated Pump Rate for 10

gallons per acre is 419 gpm. A dosage of 20 gallons per acre requires a Pump Rate of 837 gpm for the default Swath and Application Speed which is over the Max Pump Rate of 600 gpm. Resetting the Pump Rate to its Max with the default Swath and Application speed yields a dosage of 14.3 gallons per acre. The DC-4 discussion above regarding various dosages also applies to the DC-3. The DC-3 is able to make only one sortie on Day 1 applying 1200 gallons of dispersant to treat about 570 bbl of oil at a DOR of 1:20. Area covered is about 240 acres at 5 gallons per acre, about 120 acres at 10 gallons per acre, and about 84 acres at 14.3 gallons per acre.

C130A with internal tank from Coolidge: Note that all times are for the spill site in Louisiana (Central Time Zone). The C130A will cascade from Coolidge Municipal Airport to Stennis International Airport, a distance of 1131 NM (www.airnav.com, Microsoft Streets & Trips, and Google Earth are helpful tools). The C130A has a range with payload of 1400 NM so can make the cascade trip from home base to the staging airfield in one hop. Start taxi time is 1100 (0700 + 4) giving an adjusted UT of 2 hours on Day 1 (DMP2 Cascading assumes a 45 minute briefing at the staging site which also allows the C130A to refuel). The adjusted UT of 2 hours for the C130A will allow for 1 sortie on Day 1 with various possible dosages as discussed above. The Payload of 3250 gallons of dispersant will treat somewhat less than 1550 bbl of oil at a DOR of 1:20.

King Air from Stennis International: The spill site is beyond the range of the King Air in its normal configuration. However, Other Comments # 17 in the Beechcraft King Air 90A (BE-90A) Platform Reference specifies that the aircraft can carry a payload of 1955 lbs of dispersant with a maximum fuel load of 370 gallons and retain the same range and speeds as for no payload. Assuming a dispersant weight of 8.5 lbs/gallon gives a volume of 230 gallons. Start taxi time is 1100 which indicates a UT of about 7 hours. At a dosage of 5 gpa the King Air can deliver 2 payloads (460 gallons) within the UT. At the default Application Speed and Swath the maximum dosage is 6.8 gallons per acre and the total payloads within the UT remains 2.

Day 1 Summary. With 4 aircraft applying dispersant on the spill, there may be significant air control issues. One solution could be to stagger the arrival of the aircraft so that only one is on station at a time. Another possible solution is to fly race track patterns with 2 aircraft on station at a time – one spraying upwind while the other repositions on the opposite side of the race track pattern.
Dispersant used on Day 1:
C130A – 3250 gallons from Coolidge
King Air – 460 gallons from Stennis
DC-4 - 4000 gallons from Houma
DC-3 - 1200 gallons from Houma
Total 8910 gallons

For Day 2 and subsequent days, sunrise is at about 0630 and sunset is at about 1800. Each platform can have a different UT depending on the transit distance to the spill site and their respective transit speeds. Each could take off at a different time to check in with spotter aircraft at the spill site at sunrise. The following results assume the spill area

is of sufficient size so that each aircraft can operate independently on a separate section of the spill. Assume a pass length of 3 NM, a dosage of 5 gallons per acre, and bi-directional application. Working backwards from sunrise, subtract the taxi, takeoff time (Taxi, Land, Depart/2) and the transit time for each aircraft for the start of UT (start taxi time).

Platform	Taxi, Takeoff	Transit Time	Start Taxi Time	UT	Payloads	Gallons
DC-4	15 minutes	85 minutes	4:48 am	13.2 hr	3	6000
DC-3	15 minutes	98 minutes	4:35 am	13.5 hr	3	3600
C130A	15 minutes	45 minutes	5:28 am	12.6 hr	4	13000
King Air	3 minutes	72 minutes	5:13 am	12.8 hr	4	1400*

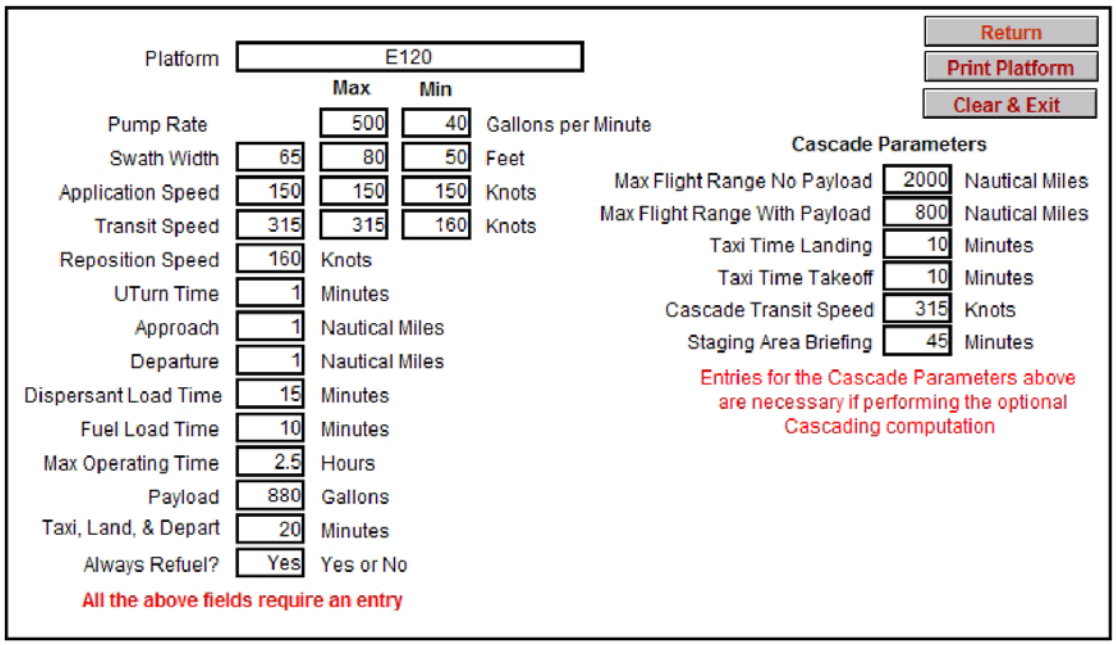
* See King Air Loading Chart - Payload of 350 gallons of Corexit 9500 at VFR Endurance of 2.86 hr (time per sortie of 2.8 hr)

The total dispersant delivered each day for Day 2 and beyond is 24000 gallons. The total dispersant needed to keep all the aircraft fully operational for a 4 day period is 80,910 gallons.

3. Add EDAC Platform

You are an OSRO and wish to add a platform to DMP2. The following platform data have been verified and have been approved by the Coast Guard:
Pump Rate Maximum – 500 gallons per minute
Pump Rate Minimum – 40 gallons per minute
Swath Width – 65 feet
Swath Width Maximum – 80 feet
Swath Width Minimum – 50 feet
Application Speed – 150 knots
Application Speed Maximum – 150 knots
Application Speed Minimum – 150 knots
Transit Speed – 315 knots
Transit Speed Maximum – 315 knots
Transit Speed Minimum – 160 knots
Reposition Speed – 160 knots
U-Turn Time – 1 minute
Approach – 1 nautical mile
Departure – 1 nautical mile
Dispersant Load – 15 minutes
Fuel Load Time – 10 minutes
Max Op Time – 2.5 hours
Payload – 880 gallons
Taxi, Land, Depart – 20 minutes
Always Refuel? – Yes
Simultaneous loading of fuel and dispersant allowed
Cascade Parameters:

Range (No Payload) – 2000 nautical miles
Range (With Payload) – 800 nautical miles
Taxi Time (Takeoff) – 10 minutes
Taxi Time (Landing) – 10 minutes
Cascade Transit Speed – 315 knots
Staging Area Briefing – 45 minutes



Name this platform "E120" and add to the DMP2. Calculate the EDAC for this platform within the COTP San Francisco zone using the Sonoma County Airport as the primary dispersant staging point. The EDAC is 3195 barrels.