TASKING MEMORANDUM

JTF Cormorant OPLAN for NEO

Summary

Joint Task Force Cormorant is planning a contingency operations plan (OPLAN) for a noncombatant evacuation operation (NEO) in the event that the situation in the area of operations (AO) deteriorates to the point where US citizens need to safely be removed from the country.

This operation is complicated; we need assistance with several of the supporting calculations.

Resources

- October 1998 report and briefing on Operation Eagle Claw
  The report and briefing slides investigate the attempted hostage rescue in Iran in 1980, with a focus on the role of probability in mission planning. It will give you background in the kinds of calculations you'll need to do for this tasking.

Objective

Prepare and submit a report in which you successfully:

- Compute the probability that a given helicopter will complete the mission.
- Compute the number of helicopters necessary to assure a 95% chance of mission success for the aviation package.
- Determine the distribution of the payload.
- Determine minimum safe distances for the employment of munitions to avoid collateral civilian casualties.
- Develop an intelligence indicator for an enemy network attack.
- Assign probabilities to the enemy courses of action, based on that intelligence indicator.
- Make a recommendation as to which friendly course of action has the minimum expected casualties.
- Model network demand to support the mission and determine if sufficient resources exist to meet it.
- Provide written support with appropriate graphics for your recommendations.

Initial data

The Marine Expeditionary Unit (MEU) assigned to the JTF has 12 CH-46 helicopters. Each can carry 25 passengers. According to current OSD data, each has an availability of 74%. That means that on any given day, there is a 74% chance that the aircraft is mission capable.

The time between helicopter failures requiring a mission abort is estimated to be 25 flying hours. These failure times follow an exponential distribution.

We expect that 100 passengers will need to be flown out by helicopter. Passenger weight is normally distributed with a mean of 185 pounds and a standard deviation of 30 pounds.

Requirements: Task One

1. Determine and graph the distribution of the number of available helicopters.

2. Find the mean number of available helicopters.

3. Find the approximate 5th percentile of helicopters available on any given day. What does this number mean in the context of this mission?

4. Each helicopter has a planned mission length of 2.5 hours. Find the probability that a helicopter fails requiring a mission abort in this time period. Does it matter how many hours it has been since the last breakdown?

5. The number of non-combatants to be rescued in a given sortie is estimated at 100. How many helicopters should be sent to be 95% sure that enough complete the mission?

6. You plan on 25 passengers per helicopter. Find and graph the distribution of total passenger weight per helicopter. Find the 95th percentile of total passenger weight.

7. Do you have sufficient helicopters for this mission requirement? Why or why not?

8. Assume the number of non-combatants to be evacuated follows a Poisson distribution with mean 100. Construct a Monte Carlo simulation using Excel that samples the number of passengers, samples the number of helicopters available, sends all the helicopters available on the mission, samples

the number that abort, and decides if the mission had sufficient helicopters to complete the mission. Run the simulating 500 times and determine the percentage of times the mission can be completed.

Additional Data
We plan to employ precision munitions to support the NEO. Please note the following features of the planned munitions:

- These munitions have a range error with mean zero and standard deviation of 25 meters, and the range error is normally distributed.
- The munitions have a bursting radius of 35 meters.
- Prior planning data has indicated that if one lands within 35 meters of a friendly person, that person is assumed to become a casualty. If the round lands more than 35 meters away, the person is assumed to be non-injured.
- Current rules of engagement call for no rounds to be aimed at a point closer than 125 meters from friendly personnel.
- We plan to fire as many as 150 rounds in support of the mission.

There is intense interest in avoiding fratricide. Please calculate some worst-case probabilities.

Requirements: Task Two

1. What is the chance that a round injures a friendly person, given that it is fired at an aim point exactly 125 meters from a friendly person?
2. If you fired 150 rounds, each exactly 125 meters away from a friendly position, what is the chance that no friendlies were injured?
3. In your professional opinion, is the minimum safe distance of 125 meters adequate? Why or why not?

Course of Action Data
There are three scenarios under consideration that would trigger the NEO. We call them A, B, and C.

- **A** involves a coup attempt.
- **B** involves hostilities commencing against a neighboring US ally.
- **C** involves internal terrorism directed against US nationals.

We have tentatively assigned each of these “trigger” scenarios the following probabilities.

P(A) = .3
P(B) = .2
P(C) = .5

We believe that a network attack (N) against the JTF might be part of the scenarios. Based on preliminary analysis, the chance of a network attack depends on the scenario. We have the following probabilities:

P(N|A)=.3
P(N|B)=.9
P(N|C)=.1

We have two friendly courses of action, I and II. The following table depicts expected friendly losses for each course of action and scenario.

	A	B	C
I	30	150	25
II	40	100	30

We use failed log-in attempts on our non-classified PAO server as an (unclassified) intensity indicator of the likelihood of attacks on the secure systems. The time between failed log-in episodes (one episode might include several attempts by the same user until he is locked out) is well modeled by the exponential distribution with a mean of forty minutes.

Total message traffic for the JTF in KB each hour during the NEO operations is projected to follow the lognormal distribution with mu = 12 and sigma = 2.

Requirements: Task Three

1. Devise a rule based on failed log-in episodes that would indicate that we are experiencing a network attack. The rule should have a false alarm rate of only 1%.

2. Given that your rule has indicated a network attack, revise the probabilities for the different scenarios.

3. Using those revised probabilities, calculate the expected number of casualties for COA I and II.

4. Using the revised probabilities, draw the CDF for the number of casualties under COA I and II on the same graph paper.

5. Which COA do you recommend? Why? Justify your decision in writing.