Fire Simulation Model Inputs

This report will go over the various inputs I am expecting the fire simulation model will use, and also where these inputs will come from, and the format they will be in.

Primary User-Entered Inputs:

These inputs will be the inputs that will be on the GUI for this fire simulation model. The user of this model will likely want to change these inputs frequently between runs of the simulation.

* Number of runs: This simulation simulates one day of a fire season. This number of runs input will determine how many times this day is simulated.
* Expected number of lightning fires: This input determines how many number lightning fires are expected to happen on this day. This value is then used to find the mean value used in the exponential distribution that will randomly calculate the times between fires during the simulation, therefore there will not necessarily be the same number of fires as was expected!!
* Expected number of human caused fires: The same as above. There is currently no difference between human and lightning caused fires except for recording their cause.
* Show Fire Attributes Checkbox: An option to show all the details about every single fire in the simulation, rather than to just show the final statistical results.
* Initial attack radius: A user entered value to determine the maximum distance an airtanker will fly to fight a fire. If no airtankers are within range of a fire it will not be fought.
* The locations of these points, if there are less values than points, the locations of the points will be determined randomly
* The number of points to keep track of in this simulation
* Maximum and minimum latitudes and longitudes for the simulation (controls where fires can start since their starting point is uniformly distributed in this area.

Region-Specific Inputs:

These are all inputs that will be read from a file. The user will only have to enter the location of this file into the GUI. Some of these files may never need to be changed by each individual user (even if they differ from other users, whereas others may be changed quite frequently).

* Location of a file with FBP weather data. Will search the header for column identifiers (month, day, FFMC, lat, long, etc...) to read in the data for use in the FBP calculations. This will require a rather specific file format however, and I am unsure of what to do in the case of missing data (ie. No FFMC in file). The user will likely want to change this file every day in order to use the current day’s (or some specific day’s) weather data in the fire simulation model. The fires will use the weather data from the location closest to their starting point for their ROS calculations (from the FBP).
* Location of a file that contains information about each of the airtanker bases in this region. It should contain the bases location, the number of airtankers and bird dogs at the base, and the type of aircraft that these airtankers and bird dogs are.

Simulation Inputs:

These are inputs files that the simulation uses which should likely not be tampered with by the user. They affect how the simulation runs, and should likely not be changed by the user unless they have a good reason to.

* File listing different types of aritankers and bird dogs and the stats to use for each of them. Right now this would only include their travel speed and speed when flying between a fire and lake to the fight the fire, but adding fuel capacity and consumption can also likely be added. Also potentially a water tank size for service time calculations would be helpful
* Potential file listing some constants (or I may just keep these in the source code instead so they can’t be tampered with). I think saving all of our probability distribution values in here would be good (ie. 80% chance fire is detected, mean 2 hour detection time, etc.)

Things I Need/Questions:

* How does the fire rate change over time of day for both lightning and human caused fires?
* Should I make the fires starting locations depend on other fires in any way (ie. Not allowing fires to start too close to one another), though I believe Kazi’s model does not do this
* When an airtanker finishes a fire should it:

1. Always return to its home base (like in Kazi’s model)
2. Go to the nearest base (which may or not be its home base)
3. Return to its home base if it is not requested to fight another fire, else go to next fire
4. Return to closest base if it is not requested to fight another fire, else go to next fire
5. Some other rules

* Kazi’s simulation assumes that the number of drops a fire requires is a uniform distribution, that he says may vary depending on the size and intensity of the fire, the value at risk (I don’t understand how?), and the capacity of the airtankers tanks, but I’m not sure if his model actually makes these factors affect the number of drops. I believe it does not.
* Kazi’s model estimates nearest lake distance based on a uniform distribution, if I do it the same, what should I use for the min and max values?
* Equation drop time is 2 \* (lake->fire dist) / airtanker speed + Const drop time. What should I use for this constant drop time? Will it come from the airtanker aircraft data file?
* My simulation model is currently set up such that the amount of time in a day fires spawn (say 1440 hours) and the amount of time airtankers fight fires for is equal. This means that once thesimulation ends, airtankers stop fighting fires (so fires that started right before the simulation end would be unlikely to be successfully fought). In Kazi’s model however, the fire generation time is for 14 hours, whereas the airtankers fight these fires until all of the fires were fought (regardless of how long this takes), should I set up my model to work in the same way? Or should I perhaps let the user specify some amount of time for both (ie. An amount of time fires will be generated for, and an amount of time that airtankers will fight for)

Assuming I make all of these changes, from what I understand of Kazi’s model from the document you sent me, I believe my simulation would be a slightly more complex of Kazi’s simulation model. I’m not sure if you think there would be any other changes necessary, or now that it is quite close to his model you would have more ideas for how I can further increase the complexity.