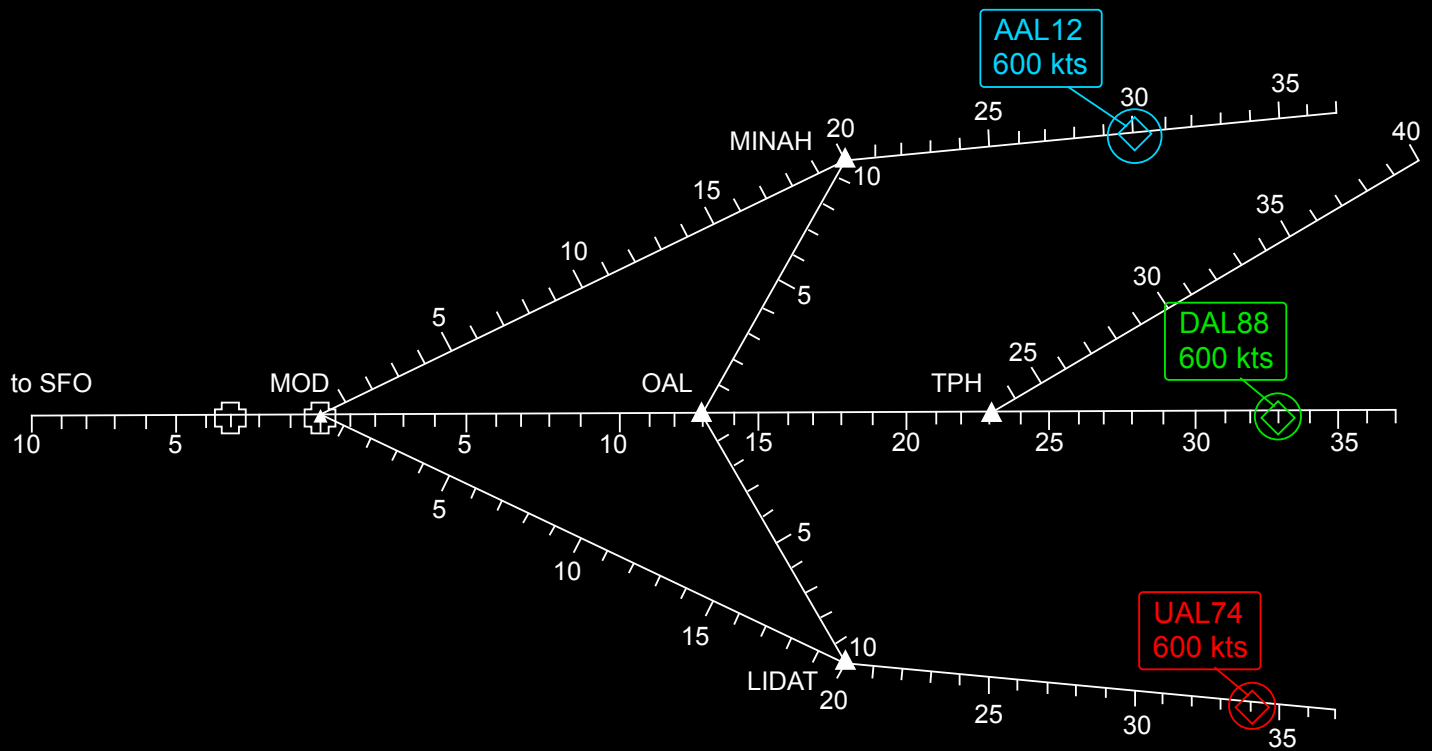




LineUp with Math

Math-Based Decisions in Air Traffic Control

STUDENT WORKBOOK C

Resolving Air Traffic Conflicts by Changing Route

- * 3 planes, each at the same speed
- * Worksheets for simulator problems 3-1, 3-2

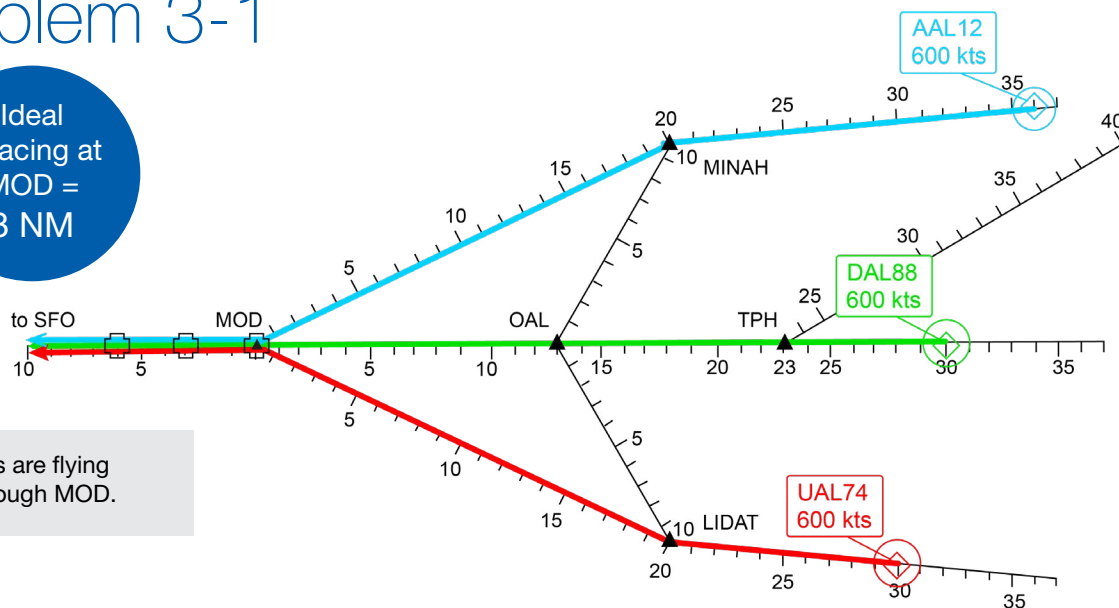
Simulator at: <https://atcsim.nasa.gov/simulator/sim2/sector33.html>

WORKSHEET #1

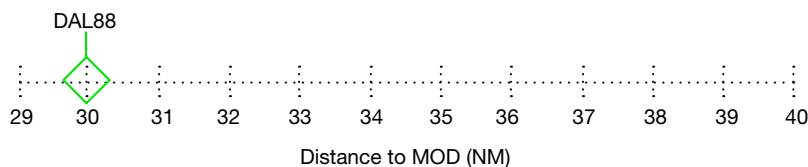
Problem 3-1

Ideal
Spacing at
MOD =
3 NM

All 3 planes are flying
to SFO through MOD.



- Use the diagram above to find each plane's travel distance to MOD. On the number line below, use a $\diamond$ to plot the travel distance to MOD for each plane. Label each plane.



- Fill in the table below using the number line above to analyze arrival order and spacing to MOD. Take note of any spacing less than minimum separation and extra spacing needed to get ideal spacing.

Arrival Order at MOD	1st	2nd	3rd
Plane Call Sign	_____	_____	_____
Projected Spacing at MOD	_____ NM	_____ NM	_____ NM
Ideal Spacing at MOD	☐ No ☐ Yes	☐ No ☐ Yes	
Needed Spacing at MOD	_____ NM	_____ NM	

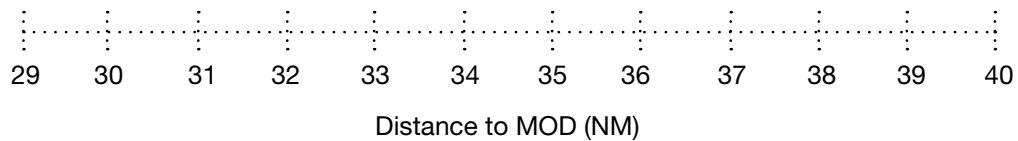
WORKSHEET #1 continued

Problem 3-1

3. What route changes are needed to solve any spacing problems?

Arrival Order	Plane	New Route (if needed)	New Distance to MOD	New Spacing at MOD
1st	_____	_____	_____ NM	_____ NM
2nd	_____	_____	_____ NM	_____ NM
3rd	_____	_____	_____ NM	_____ NM

4. To picture the
- NEW**
- arrival order and spacing, use a ◇ to plot the new distances to MOD for each plane on number the line below. Label each plane.



5. With the new routes, do spacings meet at least minimum separation?

☐ No ☐ Yes

→ If Yes, Congratulations! If no, try again!

6. With the new routes, is spacing equal to ideal spacing?

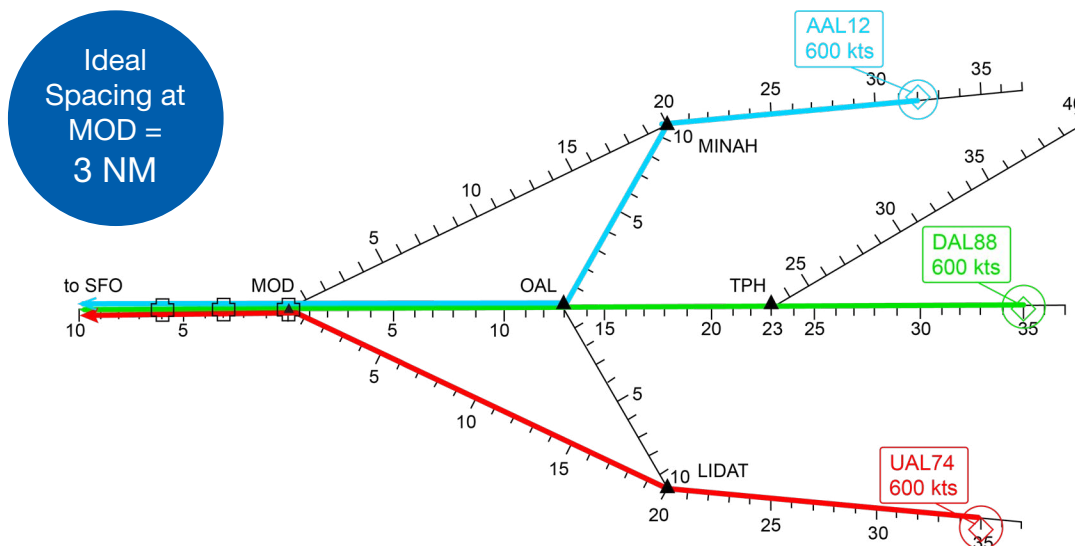
☐ No ☐ Yes

→ If Yes, Congratulations! If no, try again!

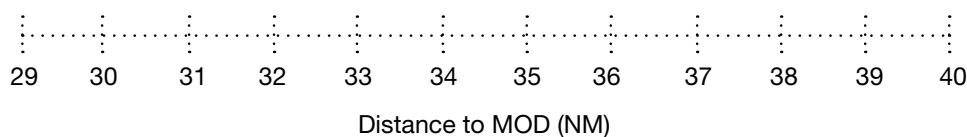
WORKSHEET #2

Problem 3-2

Information for each plane, including it's position, is shown on the sector display.



- Use the diagram above to find each plane's travel distance to MOD.
On the number line below, use a $\diamond$ to plot the travel distance to MOD for each plane.
Label each plane.



- Are all the spacings at least minimum separation? ☐ No ☐ Yes
- Which plane needs extra spacing to have ideal spacing? _____
- How much extra spacing is needed? _____ nautical miles
- On the diagram above, show the changes needed to reroute air traffic to achieve ideal spacing.
- ➔ **Mark out the old route and darken the new route change on the diagram.** Be sure to use the correct route when you check your solution with the ATC simulator.
- Using the number line in Question 1, plot a ☐ for the **NEW** distances to MOD and label each ☐ with the plane's call sign. Cross out the call sign at the starting distance.
- Are all spacings now ideal? ☐ No ☐ Yes
➔ If Yes, Congratulations! If no, try again!

National Aeronautics and Space Administration

NASA Headquarters

300 E. Street, SW
Washington, DC 20546

[nasa.gov](https://www.nasa.gov)