



## Math-Based Decisions in Air Traffic Control

### Student Workbook B

- Resolving Air Traffic Conflicts by **Changing Route**
  - **2 planes**, each at the same speed.
  - Worksheets for Simulator problems 2-1, 2-2, 2-3.



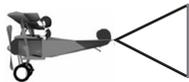
Simulator at: <https://atcsim.nasa.gov/simulator/sim2/sector33.html>



American 12, cleared  
direct MINAH to  
Modesto.

Investigator: \_\_\_\_\_

An Airspace Systems  
Program Product

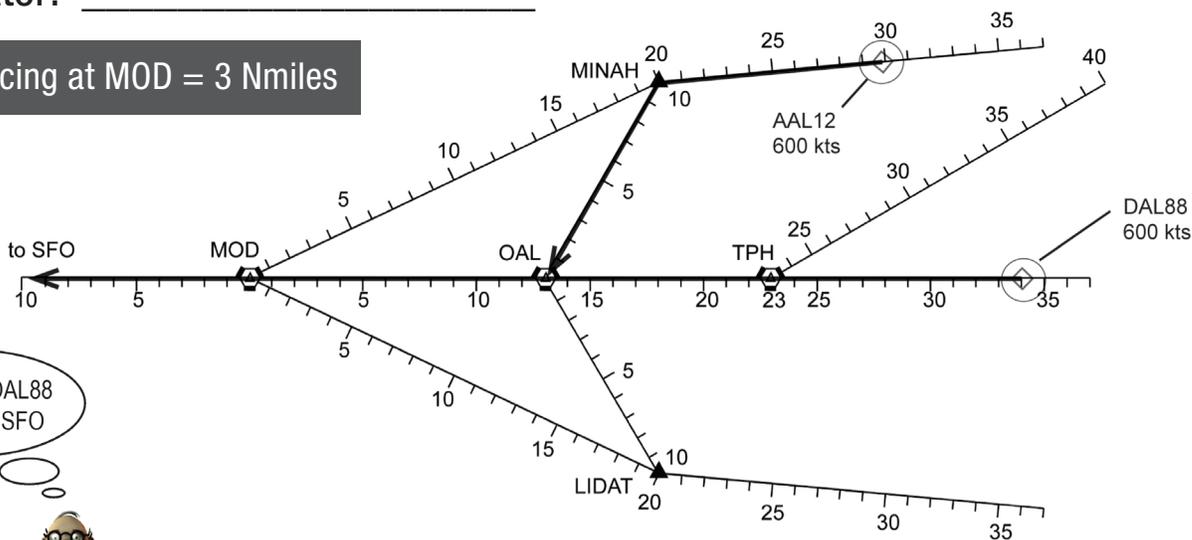


# Problem 2-1



Investigator: \_\_\_\_\_

Ideal Spacing at MOD = 3 Nmiles



## Understand the Situation

- 1 The plane speeds are:  Same  Different
- 2 The plane routes intersected first at:

## Predict Aircraft Positions

- 3 Which plane is closer to OAL? (This plane has a "headstart".)  "Headstart" =  nautical miles
- 4 Which plane will arrive first at OAL?  Spacing =  nautical miles
- 5 When that plane arrives at OAL, the spacing will be  the same as  different from the "headstart".

## Check Separation

- 6 Will the spacing at OAL be at least minimum separation of 2 nautical miles?  Yes  No
- 7 How much extra spacing is needed to have the ideal spacing of 3 nautical miles?  nautical miles
- 8 What could the controller do to achieve at least ideal spacing?

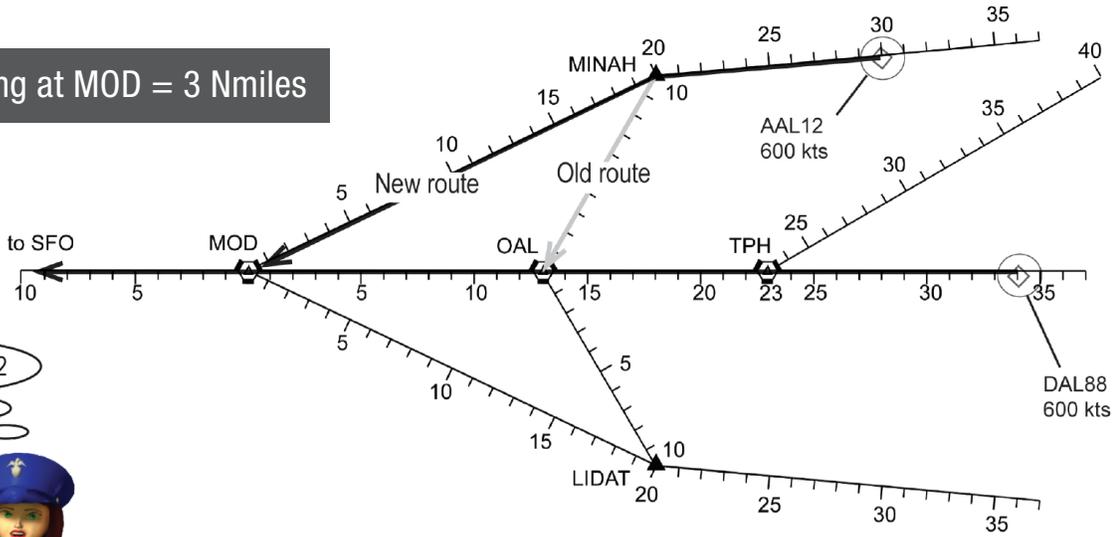
\_\_\_\_\_

\_\_\_\_\_

**Continue to Next Page**



**Ideal Spacing at MOD = 3 Nmiles**



**Fix the Conflict**

- One way to try to achieve the ideal spacing is to REROUTE AAL-12 directly from MINAH to MOD as shown above.

9 Circle the intersection where the new AAL12 route meets the DAL88 route.

**Predict New Positions**

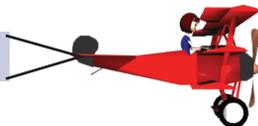
- 10 Which plane now has a "headstart"?   New "Headstart" =  nautical miles
- 11 Which plane will arrive first?   Spacing =  nautical miles

12 Why does the new route provide additional spacing?

**Check New Separation**

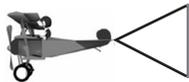
- 13 Is the new spacing at least the minimum of 2 nautical miles?  Yes  No If No, try again!
- 14 Does the new spacing equal the ideal spacing of 3 nautical miles?  Yes  No

Route changes don't always give Ideal Spacing!



End of Worksheet



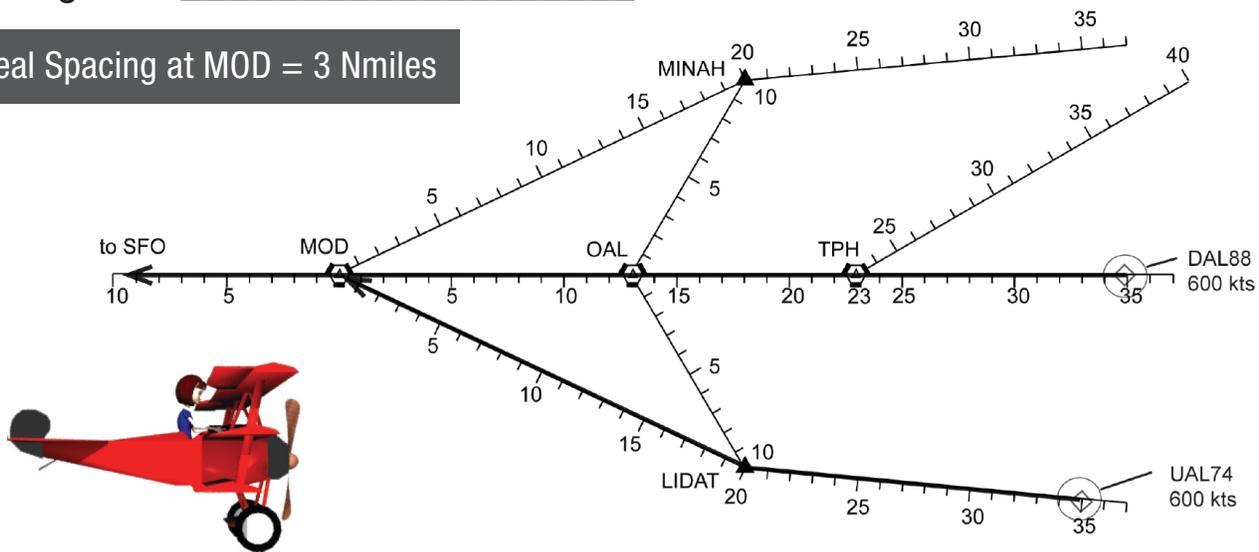


# Problem 2-2



Investigator: \_\_\_\_\_

Ideal Spacing at MOD = 3 Nmiles



1

Fill in the table to determine if the 2 planes have the ideal spacing where the routes meet.

Where do the routes meet?	Headstart Nmiles	Spacing at MOD, Nmi	Is Spacing at MOD Ideal?	Additional spacing required for Ideal Spacing (3 Nmi)
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> Nmi

2

If the spacing is NOT at least ideal, enter the flight plan change you will use to get more spacing at MOD.

Plane:       Route change:       To:       To:

### CAUTION

**Be sure to mark out the old route and darken the new route.**

This is so you won't use the wrong route by mistake when you check your solution.

3

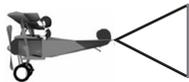
To check your new route, fill in the following table.

Where do the routes meet?	Lead Plane?	Headstart Nmiles	Spacing at OAL, Nmi	Is Spacing at MOD Ideal?
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

If Yes, Congratulations!    If No, try again!

End of Worksheet



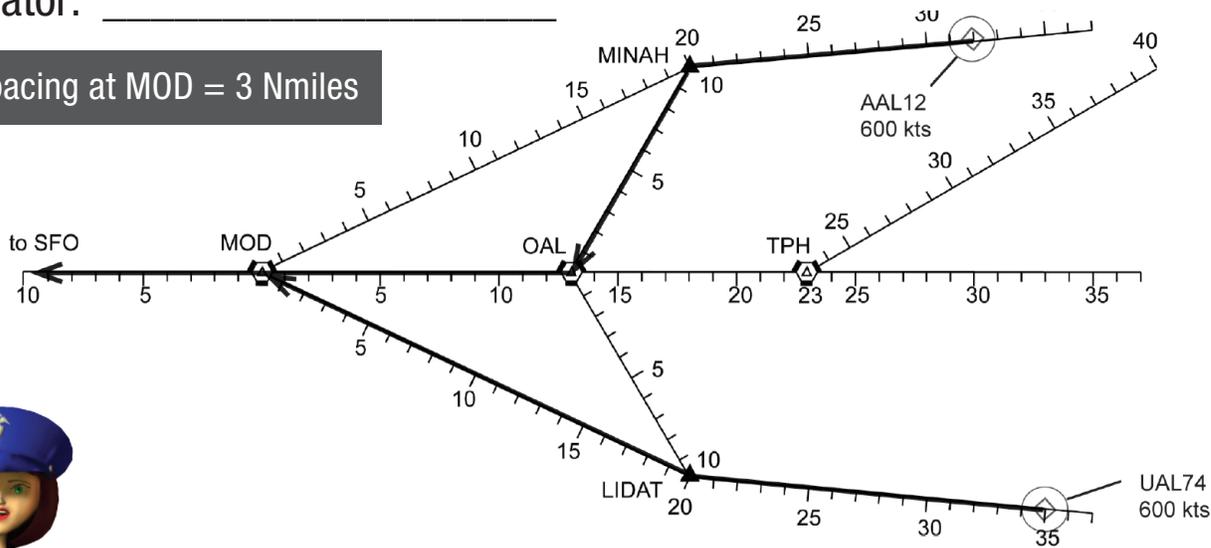


# Problem 2-3



Investigator: \_\_\_\_\_

Ideal Spacing at MOD = 3 Nmiles



1 What is the spacing at MOD?  nautical miles

2 Why? \_\_\_\_\_  
\_\_\_\_\_

3 Does the spacing equal the ideal?  Yes  No

4 If the spacing is NOT the ideal spacing, enter the flight plan change you will use to solve the problem.  
Plane: \_\_\_\_\_ New Route: \_\_\_\_\_

## CAUTION

**Be sure to mark out the old route and darken the new route.**

This is so you won't use the wrong route by mistake when you check your solution.

5 What is the new spacing at MOD?  nautical miles

6 Why? \_\_\_\_\_  
\_\_\_\_\_

7 Is the new spacing now ideal (3 nautical miles)?

Yes  No

If Yes, Congratulations!  
If No, try again!

End of Worksheet

