Humber Tunnel Authority*

The Humber Tunnel Authority (HTA) has recently completed a tunnel which links the city of Hull with the expanding North Lincolnshire towns of Immingham and Grimsby. Because of rising costs, the original plan to build two two-lane tunnels, one for each direction, was changed to a single tunnel with one lane for each direction.

At the moment there is little traffic congestion, but it is expected that in the next decade work and settlement patterns will change. This will inevitably lead to serious traffic hold-ups at both ends of the tunnel during the morning and evening rush hours.

The Traffic Manager of the HTA has decided to prescribe a recommended speed and separation distance for congested traffic conditions in order to alleviate the expected delays. What recommendations would you advise him to make if he wants to achieve the best possible traffic flow?

The total distance a car takes to stop is made up of *reaction distance* (the distance covered between the time the driver perceives a hazard and begins to brake) and *braking distance* (the distance covered while the driver applies the brakes). Both of these components of stopping distance differ from driver to driver. Data is given below on the reaction and braking distances for ten drivers. These data were determined under experimental conditions that closely mimic real driving conditions.

		Individual								
Reaction Distance (ft)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
MPH										
30	27.37	30.89	33.09	29.97	31.07	30.47	29.33	30.66	32.75	30.22
50	48.73	50.28	52.25	50.13	50.43	53.58	54.32	51.05	51.99	48.66
70	69.14	68.16	70.71	72.34	69.06	68.79	69.77	69.38	71.09	72.35
Braking Distance (ft)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
MPH										
30	40.50	37.97	51.02	45.06	48.88	54.60	45.67	39.34	47.06	45.82
50	115.15	128.75	122.72	130.06	121.38	121.99	128.02	124.32	129.09	127.84
70	255.08	248.04	240.80	248.25	248.12	241.07	245.52	237.92	247.16	240.82

* This case was developed for classroom use by Associate Professor Stephen G. Powell of the Amos Tuck School of Business Administration, Dartmouth College. Source: D.J.G. James and J.J. McDonald, *Case Studies in Mathematical Modelling*, Wiley, NY, 1981.