art_veh.xls
8/10/12 ver. 2.1

Analysis of the Impact of Articulated Vehicles

INPUT:

Vehicle A {	Body 1:	Tractor A	m_1:	1,000.00	lb-s²/ft	I_1:	3,599.97	ft-lb-s²	θ_1:	0.00	deg	v_{1x}:	-72.18	ft/s	v_{3x}:	-72.18 ft/s
	Body 3:	Semitrailer A	m_3:	1,000.00	lb-s²/ft	I_3:	1,000.00	ft-lb-s²	θ_3:	0.00	deg	v_{1y}:	0.00	ft/s	v_{3y}:	0.00 ft/s
Vehicle B {	Body 2:	Tractor B	m_2:	1,300.00	lb-s²/ft	I_2:	5,000.01	ft-lb-s²	θ_2:	0.00	deg	v_{2x}:	50.00	ft/s	v_{4x}:	50.00 ft/s
	Body 4:	Semitrailer B	m_4:	1,000.00	lb-s²/ft	I_4:	15,000.02	ft-lb-s²	θ_4:	0.00	deg	v_{2y}:	0.00	ft/s	v_{4y}:	0.00 ft/s

32.17405	RUN impactAV	d_1:	1.00	ft	d_{1R}:	0.00	ft	ϕ_1:	0.00	deg	ϕ_{1R}:	0.00	deg	ω_1: 0.0 °/s
1.466666667		d_{3C}:	1.00	ft	d_{3R}:	0.00	ft	ϕ_{3C}:	0.00	deg	ϕ_{3R}:	0.00	deg	ω_3: 0.0 °/s
	Unit Conversion	d_2:	1.00	ft	d_{2Q}:	9.91	ft	ϕ_2:	0.00	deg	ϕ_{2Q}:	0.00	deg	ω_2: 0.0 °/s
US		d_{4C}:	1.00	ft	d_{4Q}:	20.01	ft	ϕ_{4C}:	0.00	deg	ϕ_{4Q}:	0.00	deg	ω_4: 0.0 °/s

If a velocity constraint for rigid body 3 and/or 4 exists, enter the angles (α_3, α_4). Otherwise, enter "none" (lowercase w/o "").

α_3:	none	deg
α_4:	none	deg

If known, enter the external impulse for Vehicles A and B (R and Q, respectively). Otherwise type "unknown" (lowercase w/o "").

R_x:	unknown	lb-s	Γ	0.00	deg
R_y:	unknown	lb-s	e	0.00	
Q_x:	unknown	lb-s	μ	100.00	% μ_0
Q_y:	unknown	lb-s	e'	-1	e' = -1 means that the moment impulse is zero

OUTPUT:

Initial Velocities:	v_{1x}:	-72.18	ft/s	v_{1y}:	0.00	ft/s	ω_1:	0.00	°/s	v_1:	72.18	ft/s	49.21	mph
	v_{3x}:	-72.18	ft/s	v_{3y}:	0.00	ft/s	ω_3:	0.00	°/s	v_3:	72.18	ft/s	49.21	mph
	v_{2x}:	50.00	ft/s	v_{2y}:	0.00	ft/s	ω_2:	0.00	°/s	v_2:	50.00	ft/s	34.09	mph
	v_{4x}:	50.00	ft/s	v_{4y}:	0.00	ft/s	ω_4:	0.00	°/s	v_4:	50.00	ft/s	34.09	mph
Final Velocities:	V_{1x}:	-6.83	ft/s	V_{1y}:	0.00	ft/s	Ω_1:	0.00	°/s	V_1:	6.83	ft/s	4.65	mph
	V_{3x}:	-6.83	ft/s	V_{3y}:	0.00	ft/s	Ω_3:	0.00	°/s	V_3:	6.83	ft/s	4.65	mph
	V_{2x}:	-6.83	ft/s	V_{2y}:	0.00	ft/s	Ω_2:	0.00	°/s	V_2:	6.83	ft/s	4.65	mph
	V_{4x}:	-6.83	ft/s	V_{4y}:	0.00	ft/s	Ω_4:	0.00	°/s	V_4:	6.83	ft/s	4.65	mph
Impulse Values:	R_x:	-65,351.3	lb-s	R_y:	0.0	lb-s	R:	65,351.3	lb-s	ΔV_1:	65.35	ft/s	44.56	mph
	P_x:	130,702.6	lb-s	P_y:	0.0	lb-s	P:	130,702.6	lb-s	ΔV_3:	65.35	ft/s	44.56	mph
	P_N:	130,702.6	lb-s	P_T:	0.0	lb-s	M:	0.0	ft-lb-s	ΔV_2:	56.83	ft/s	38.75	mph
	Q_x:	-56,827.2	lb-s	Q_y:	0.0	lb-s	Q:	56,827.2	lb-s	ΔV_4:	56.83	ft/s	38.75	mph

Energy Values:

Initial energy of Veh A	T_{IA}:	5,209,732.6	ft-lb	μ :	0.000 No Sliding at Separation	$PDOF_1$	0.0	deg
Final energy of Veh A	T_{FA}:	46,610.6	ft-lb	μ_0:	0.000	$PDOF_2$	0.0	deg
Initial energy of Veh B	T_{IB}:	2,875,000.0	ft-lb	e:	0.00			
Final energy of Veh B	T_{FB}:	53,602.2	ft-lb	e':	-1.00			

Initial System Kinetic Energy:	8,084,732.6	ft-lb
Final System Kinetic Energy:	100,212.9	ft-lb
System Energy Loss:	7,984,519.8	ft-lb
Percent System Energy Loss:	98.8	%