FORD EDR STABILITY CONTROL DATA CALCULATION TEMPLATE (CAN ALSO BE U

For use in conjunction with article by Sgt. John Bruno and Richard R. (Rick) Ruth, P.E.

INSTRUCTIONS

1. Check to see if your CSV data file has the same column headings/order and spacing as the templat

2. If yes, **copy the complete data table (precrash speed columns A-E for -5.0 to 0 to A13, and stabili**

3. If no, copy the individual columns and paste one column at a time below

It is not necesary to copy the roll angle or roll rate column (usually last)

PRE-CRASH DATA -5 TO 0 SEC [2 SAMPLES/SEC] (FIRST RECORD)				
Times (sec)	Speed, vehicle indicated MPH	Accelerator pedal, % full	Service brake, on/off	Engine RPM
-5				
-4.5				
-4				
-3.5				
-3				
-2.5				
-2				
-1.5				
-1				
-0.5				
0				

4. Type the l

PRE-CRASH DATA -5 TO 0 SEC [10 SAMPLES/SEC] (FIRST RECORD)				
Times (sec)	Steering Wheel Angle (degrees)	Stability Control Lateral Acceleration (g)	Stability Control Longitudinal Acceleration (g)	Stability Control Yaw Rate (deg/sec)
-5				
-4.9				
-4.8				
-4.7				
-4.6				
-4.5				
-4.4				
-4.3				
-4.2				
-4.1				
-4				
-3.9				
-3.8				
-3.7				
-3.6				

Error accumu

5. For maxim

Type the tim

6. Type the t

7. Type the t

-3.5
-3.4
-3.3
-3.2
-3.1
-3
-2.9
-2.8
-2.7
-2.6
-2.5
-2.4
-2.3
-2.2
-2.1
-2
-1.9
-1.8
-1.7
-1.6
-1.5
-1.4
-1.3
-1.2
-1.1
-1
-0.9
-0.8
-0.7
-0.6
-0.5
-0.4
-0.3
-0.2
-0.1
0

END OF DATA TABLE

CALCULATE SPEED AT IMPACT FROM LAST *STABLE* PRE-CRASH SPEED AND STABILITY CONTROL LO

time	$v_{fps\ start}$	**(from above) Longitudinal g's**	t	$ft/sec^2/g$	$V_{fps\ end}$	$V_{mph\ end}$
-5		0	0.1	32.2		
-4.9		0	0.1	32.2		
-4.8		0	0.1	32.2		

-4.7	0	0.1	32.2
-4.6	0	0.1	32.2
-4.5	0	0.1	32.2
-4.4	0	0.1	32.2
-4.3	0	0.1	32.2
-4.2	0	0.1	32.2
-4.1	0	0.1	32.2
-4	0	0.1	32.2
-3.9	0	0.1	32.2
-3.8	0	0.1	32.2
-3.7	0	0.1	32.2
-3.6	0	0.1	32.2
-3.5	0	0.1	32.2
-3.4	0	0.1	32.2
-3.3	0	0.1	32.2
-3.2	0	0.1	32.2
-3.1	0	0.1	32.2
-3	0	0.1	32.2
-2.9	0	0.1	32.2
-2.8	0	0.1	32.2
-2.7	0	0.1	32.2
-2.6	0	0.1	32.2
-2.5	0	0.1	32.2
-2.4	0	0.1	32.2
-2.3	0	0.1	32.2
-2.2	0	0.1	32.2
-2.1	0	0.1	32.2
-2	0	0.1	32.2
-1.9	0	0.1	32.2
-1.8	0	0.1	32.2
-1.7	0	0.1	32.2
-1.6	0	0.1	32.2
-1.5	0	0.1	32.2
-1.4	0	0.1	32.2
-1.3	0	0.1	32.2
-1.2	0	0.1	32.2
-1.1	0	0.1	32.2
-1	0	0.1	32.2
-0.9	0	0.1	32.2
-0.8	0	0.1	32.2
-0.7	0	0.1	32.2
-0.6	0	0.1	32.2
-0.5	0	0.1	32.2
-0.4	0	0.1	32.2
-0.3	0	0.1	32.2
-0.2	0	0.1	32.2

-0.1	0	0.1	32.2		
0	0	0.1	32.2	#VALUE!	
0.1	0.000	0.1	32.2	#VALUE!	

C136 is average of C133-C135

G135 in green is the MAXIMUM speed at impact **before** +/-4% speedo error are considered
G136 in purple is the MINIMUM speed at impact **before** +/4% speedo error is considered
4% of H20, the last stable speed value = #VALUE! Maximum speed at impac
Minimum speed at impact

CALCULATE LATERAL VELOCITY AND DISPLACEMENT FROM LATERAL ACCELERATION

$V_y = V_{y'} + g * t * 32.2$ **Dy = Dy' + (**

Time	Previous Sample Vy'	g	t	g	Cumulative Velocity Vy	Dy'
-5	0	0	0.1	32.2		0
-4.9		0	0.1	32.2		
-4.8		0	0.1	32.2		
-4.7		0	0.1	32.2		
-4.6		0	0.1	32.2		
-4.5		0	0.1	32.2		
-4.4		0	0.1	32.2		
-4.3		0	0.1	32.2		
-4.2		0	0.1	32.2		
-4.1		0	0.1	32.2		
-4		0	0.1	32.2		
-3.9		0	0.1	32.2		
-3.8		0	0.1	32.2		
-3.7		0	0.1	32.2		
-3.6		0	0.1	32.2		
-3.5		0	0.1	32.2		
-3.4		0	0.1	32.2		
-3.3		0	0.1	32.2		
-3.2		0	0.1	32.2		
-3.1		0	0.1	32.2		
-3		0	0.1	32.2		
-2.9		0	0.1	32.2		
-2.8		0	0.1	32.2		
-2.7		0	0.1	32.2		
-2.6		0	0.1	32.2		
-2.5		0	0.1	32.2		
-2.4		0	0.1	32.2		
-2.3		0	0.1	32.2		
-2.2		0	0.1	32.2		
-2.1		0	0.1	32.2		
-2		0	0.1	32.2		

-1.9		0	0.1	32.2		
-1.8		0	0.1	32.2		
-1.7		0	0.1	32.2		
-1.6		0	0.1	32.2		
-1.5		0	0.1	32.2		
-1.4		0	0.1	32.2		
-1.3		0	0.1	32.2		
-1.2		0	0.1	32.2		
-1.1		0	0.1	32.2		
-1		0	0.1	32.2		
-0.9		0	0.1	32.2		
-0.8		0	0.1	32.2		
-0.7		0	0.1	32.2		
-0.6		0	0.1	32.2		
-0.5		0	0.1	32.2		
-0.4		0	0.1	32.2		
-0.3		0	0.1	32.2		
-0.2		0	0.1	32.2		
-0.1		0	0.1	32.2		
0		0	0.1	32.2		
0.1		0.000	0.1	32.2		
Time	**Vy'**	**g**	**t**	**g**	**Vy**	**Dy'**

C200 is average of C197 to C199

CALCULATE LATERAL VELOCITY AND DISPLACEMENT FROM YAW RATE DATA

	$L = V_x * t$		Long. Dist	$C = C' + Y * t$		
	Long. Velocity	Time	this interval	previous	Yaw rate	time
Time	**Vx**	**t**	**L**	**C'**	**Y**	**t**
-5		0.1		0.000	0.000	0.1
-4.9		0.1			0.000	0.1
-4.8		0.1			0.000	0.1
-4.7		0.1			0.000	0.1
-4.6		0.1			0.000	0.1
-4.5		0.1			0.000	0.1
-4.4		0.1			0.000	0.1
-4.3		0.1			0.000	0.1
-4.2		0.1			0.000	0.1
-4.1		0.1			0.000	0.1
-4		0.1			0.000	0.1
-3.9		0.1			0.000	0.1
-3.8		0.1			0.000	0.1
-3.7		0.1			0.000	0.1
-3.6		0.1			0.000	0.1
-3.5		0.1			0.000	0.1
-3.4		0.1			0.000	0.1
-3.3		0.1			0.000	0.1

-3.2		0.1			0.000	0.1
-3.1		0.1			0.000	0.1
-3		0.1			0.000	0.1
-2.9		0.1			0.000	0.1
-2.8		0.1			0.000	0.1
-2.7		0.1			0.000	0.1
-2.6		0.1			0.000	0.1
-2.5		0.1			0.000	0.1
-2.4		0.1			0.000	0.1
-2.3		0.1			0.000	0.1
-2.2		0.1			0.000	0.1
-2.1		0.1			0.000	0.1
-2		0.1			0.000	0.1
-1.9		0.1			0.000	0.1
-1.8		0.1			0.000	0.1
-1.7		0.1			0.000	0.1
-1.6		0.1			0.000	0.1
-1.5		0.1			0.000	0.1
-1.4		0.1			0.000	0.1
-1.3		0.1			0.000	0.1
-1.2		0.1			0.000	0.1
-1.1		0.1			0.000	0.1
-1		0.1			0.000	0.1
-0.9		0.1			0.000	0.1
-0.8		0.1			0.000	0.1
-0.7		0.1			0.000	0.1
-0.6		0.1			0.000	0.1
-0.5		0.1			0.000	0.1
-0.4		0.1			0.000	0.1
-0.3		0.1			0.000	0.1
-0.2		0.1			0.000	0.1
-0.1		0.1			0.000	0.1
0	#VALUE!	0.1			0.000	0.1
0.1	#VALUE!	0.1			0.000	0.1
Time	**Vx**	**t**	**L**	**C'**	**Y**	**t**

F259 is the average of F256-F258

If lateral distance from both lateral acceleration and yaw rate is available, the calculated adjustme

(in other cases where only yaw rate is available, use this to estimate adjustment required)

Lateral distance moved at time 0 based on lateral acceleration =	
Lateral distance moved at time 0 based on yaw rate =	

CHANGE IN APPROACH ANGLE FROM LATERAL ACCELERATION

Arc Sine of lateral distance moved in last interval divided by distance moved longitudinally in last inte

Change in approach = asin((J199-J198)/H135)

Change in approach angle in degrees from lateral acceleration = #VALUE!

Change in approach angle in degrees from yaw rate =		
	#VALUE!	Assume later calculated pe

SUMMARY OF CALCULATIONS:	Time 0.0	Time +0.10
Speed at impact including 4% speedometer error =	#VALUE!	#VALUE!
Longitudinal distance moved during deceleration =		
Lateral distance moved based on lateral acceleration =		
Lateral distance moved based on yaw rate =		
Change in approach angle in degrees from lateral acceleration =	#VALUE!	#VALUE!
Change in approach angle in degrees from yaw rate =		

IMPORTANT NOTE:

Ford products with negative "-" lateral acceleration values indicates movement to the right.
Ford products with negative "-" yaw rate values indicates clockwise rotation.
All other manufactures are the opposite.
Check the CDR help file information for the specific cable for the specific module of ACM the above d

SED FOR CHYRSLER YAW DATA)

e below

ty control columns A-E and paste to A27

ast STABLE speed value into the box below

ulates over time so use as little time as needed

um accuracy find the last **stable** speed in the pre-crash data and the time when the longitudinal G's show a

e sample value just before **longitudinal acceleration** indicates braking. Ie. -1.2 seconds

ime sample value just before the **lateral acceleration** indicates the swerve begins. Ie. -0.8 seconds

ime sample value just before the **yaw rate** indicates the swerve began. Ie. -1.1 seconds

NGITUDINAL ACCELERATION

Distance this interval Vx*t	Min Distance to impact	Max Distance to impact	Distance from change in input

	0.0	
	Min	Max

t including 4% G135+D141 = #VALUE!

: including 4% G136 - D141 = #VALUE!

/y * t)

Vy	t	Dy (accel)
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	

	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
	0.1	
Vy	**t**	**Dy (accel)**

Cum Yaw Angle **C**	**Dy = Dy' + Sin C * L** Previous **Dy'**	Cum Yaw **C**	**Sin C**	Long. Dist this interval **L**	Cum Distance **Dy(yaw)**
	0.000				

C	Dy'	C	Sin C	L	Dy(yaw)

nt factor is = **#VALUE!**

erval

ral acceleration is more accurate than yaw rate -
ercentage adjustment factor for this case

lata was imaged from for verification of the data.

significant change