inertia are assumed to be parallel and perpendicular to the steering axis equations of motion. Other than this, these equations are equivalent to those in Sharp's 1971 paper, which when simplified correctly formed **a** subset of the equations presented in Chapter III of this thesis.

Weir and Zellner, 1978

Weir and Zellner later published the results of Weir's dissertation derivation in Motorcycle Dynamics and Rider Control (SP-428, 1978), but mistakenly thinking Weir's earlier derivation was wrong, they deleted a necessary term without comment. The term needing correction can be found on page 8 in the matrix equation (1), where the second row fourth column terms of the matrix should read,

$$\frac{L_{\ddot{\delta}}}{I_{xx}} s^2 + L_{\dot{\delta}} s + L_{\delta}$$

There are also some typos in equation (1) and we note the third row fourth column term should read,

$$N_{\ddot{\delta}} s^2 + N_{\dot{\delta}} s + N_{\delta}$$

and finally the fourth row fourth column term should read,

$$T_{\ddot{\delta}} s^2 + T_{\dot{\delta}} s + T_{\delta}$$

Because of these typographical errors we recommend using Weir's dissertation for any comparison of equations or results.

Incidentally, when corrected Weir and Zellner's matrix can be written to be symmetric **except** for the antisymmetric gyroscopic terms, but his notation does not make this evident.

Gobas, 1978

Using a technique which he calls the Boltzman Hamel method, in 1978 Gobas presented a linearized set of equations very similar in form to Neĭmark and Fufaev [1967]. Gobas' equations, (1.4) in his paper, incorporate the forward acceleration of the bicycle, $\dot{V}$. Setting V terms to zero and comparing, we think the lean equation may be correct, but in the steer equation the coefficient to the χ_r term seems to be in disagreement with the equations in our Chapter III. The variable b is not defined in the paper but we suspect that it is equivalent to our ν.

Gobas refers to Neĭmark and Fufaev, but does not compare equations.

Adiele, 1979

In his 1979 Master's thesis Adiele, who was focusing on design optimization and performance evaluation of two-wheeled vehicles, derived nonlinear equations of motion for the Basic bicycle with tire side slip using Kane's method of generalized active and inertia forces.

His equations, representing lateral motion, lean, steer, and yaw (in that order) are present in matrix form on pages 22-24 of his thesis. His variable V is our $\dot{X}_r$, λ is our χ_r, θ is our ψ, and r is our θ_r. Because his equations resembled Sharp's [1971] four equations, we expanded Adiele's matrix, linearized his equations for small values of λ and θ, and compared them to the equations in Sharp's [1971] Appendix I.

The results show that Adiele's equations are in error, missing several terms