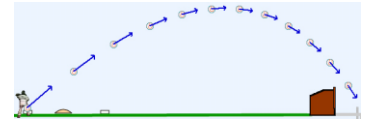


### 20.5.1 MG road-map: Projectile motion (2D)

A baseball (particle  $Q$ ) flies over Earth  $N$  (a Newtonian reference frame). Aerodynamic forces on the baseball are modeled as  $-b\vec{v}$  ( $\vec{v}$  is  $Q$ 's velocity in  $N$ ).

$\hat{n}_x$  is horizontally-right,  $\hat{n}_y$  is vertically-upward, and  $N_o$  is home-plate (point fixed in  $N$ ).



**MG road-map** for projectile motion  $x$  and  $y$  ( $\hat{n}_x, \hat{n}_y$  measures of  $Q$ 's position vector from  $N_o$ )

Variable	Translate/ Rotate	Direction (unit vector)	System $S$	FBD of $S$	About point	<b>MG road-map equation</b>
$x$	Translate	$\hat{n}_x$	$Q$	<b>Draw</b>	Not applicable	$\hat{n}_x \cdot (\vec{F}^Q) \stackrel{(20.1)}{=} m^Q N \vec{a}^Q$
$y$	Translate	$\hat{n}_y$	$Q$	<b>Draw</b>	Not applicable	$\hat{n}_y \cdot (\vec{F}^Q) \stackrel{(20.1)}{=} m^Q N \vec{a}^Q$
$x$	<b>Dot( Nx&gt;, Q.GetDynamics() )</b>					<b>MotionGenesis</b> command ©
$y$	<b>Dot( Ny&gt;, Q.GetDynamics() )</b>					<b>MotionGenesis</b> command ©



**Draw FBD**