```
function drawVTOL(u)

    % process inputs to function
    z_v      = u(1);
    h        = u(2);
    theta    = u(3);
    z_t      = u(4);
    t        = u(5);

    % define persistent variables
    persistent VTOL_handle
    persistent target_handle

    L = 5;

    % first time function is called, initialize plot and persistent vars
    if t==0,
        figure(1), clf
        plot([0,L],[0,0],'k'); % plot track
        hold on
        VTOL_handle    = drawVehicle(z_v, h, theta, []);
        target_handle  = drawTarget(z_t, []);
        axis([-L/5, L+L/5, -L/5, L+L/5]);
        axis('square');


    % at every other time step, redraw base and rod
    else
        drawVehicle(z_v, h, theta, VTOL_handle);
        drawTarget(z_t, target_handle);
    end
end


%
%=======================================================================
% drawVTOL
% draw VTOL system
% return handle if 3rd argument is empty, otherwise use 3rd arg as handle
%=======================================================================
%
function handle = drawVehicle(z, h, theta, handle)

  x1 = 0.1;
  x2 = 0.3;
  x3 = 0.4;
  y1 = 0.05;
  y2 = 0.01;
  pts = [...
      x1, y1;...
      x1, 0;...
      x2, 0;...
      x2, y2;...
      x3, y2;...
      x3, -y2;...
      x2, -y2;...
      x2, 0;...
      x1, 0;...
      x1, -y1;...
      -x1, -y1;...
      -x1, 0;...
      -x2, 0;...
      -x2, -y2;...
```

```
      -x3, -y2;...
      -x3, y2;...
      -x2, y2;...
      -x2, 0;...
      -x1, 0;...
      -x1, y1;...
      x1, y1;...
      ];
  % rotate points (must do first)
  R = [cos(theta), sin(theta); -sin(theta), cos(theta)];
  pts = pts*R;
  % translate points
  pts = pts + repmat([z,h],size(pts,1),1);

  if isempty(handle),
    handle = fill(pts(:,1),pts(:,2),'b');
  else
    set(handle,'XData',pts(:,1),'YData',pts(:,2));
    drawnow
  end
end

%
%=========================================================================
% drawTarget
% draw the Target
% return handle if 3rd argument is empty, otherwise use 3rd arg as handle
%=========================================================================
%
function handle = drawTarget(z, handle)

  w = 0.1;
  h = 0.05;
  pts = [...
      w/2, h;...
      w/2, 0;...
      -w/2, 0;...
      -w/2, h;...
      w/2, h;...
      ];

    % translate points
  pts = pts + repmat([z,0],size(pts,1),1);

  if isempty(handle),
    handle = fill(pts(:,1), pts(:,2), 'r');
  else
    set(handle,'XData',pts(:,1),'YData',pts(:,2));
    drawnow
  end
end
```