Page 2 states:

> We can relate the body and inertial frame by a rotation matrix R which goes from the body frame to the inertial frame. This matrix is derived by using the ZYZ Euler angle conventions and successively "undoing" the yaw, pitch, and roll.
>
> $$R = \begin{bmatrix} c_\phi c_\psi - c_\theta s_\phi s_\psi & -c_\psi s_\phi - c_\phi c_\theta s_\psi & s_\theta s_\psi \\ c_\theta c_\psi s_\phi + c_\phi s_\psi & c_\phi c_\theta c_\psi - s_\phi s_\psi & -c_\psi s_\theta \\ s_\phi s_\theta & c_\phi s_\theta & c_\theta \end{bmatrix}$$
>
> For a given vector $\vec{v}$ in the body frame, the corresponding vector is given by $R\vec{v}$ in the inertial frame.

Unfortunately there is a mistake here. The rotation matrix as a function of roll, pitch, yaw angles is actually derived from rotating around 3 different axes e. g. XYZ (not rotating around 2 axes ZYZ). The final formula, if we make the following association:

Roll – φ – X-axis

Pitch – θ – Y-axis

Yaw – ψ – Z-axis

is given by

$$R = \begin{bmatrix} \cos\psi\cos\theta & \cos\psi\sin\varphi\sin\theta - \cos\varphi\sin\psi & \sin\varphi\sin\psi + \cos\varphi\cos\psi\sin\theta \\ \cos\theta\sin\psi & \cos\varphi\cos\psi + \sin\varphi\sin\psi\sin\theta & \cos\varphi\sin\psi\sin\theta - \cos\theta\sin\varphi \\ -\sin\theta & \cos\theta\sin\varphi & \cos\varphi\cos\theta \end{bmatrix}$$

This formula can be derived from elementary rotations around X,Y,Z axes. The derivations can be easily obtained with Matlab's symbolic toolbox:

```
syms phi theta psi;

Rx = [1         0           0;
       0  cos(phi)   -sin(phi); ...
       0  sin(phi)    cos(phi)];

Ry = [ cos(theta)  0  sin(theta);
                0  1           0; ...
      -sin(theta)  0  cos(theta)];

Rz = [cos(psi) -sin(psi) 0; ...
      sin(psi)  cos(psi) 0; ...
      0                0 1];
R = Rz*Ry*Rx
```

Also, see https://en.wikipedia.org/wiki/Rotation_matrix