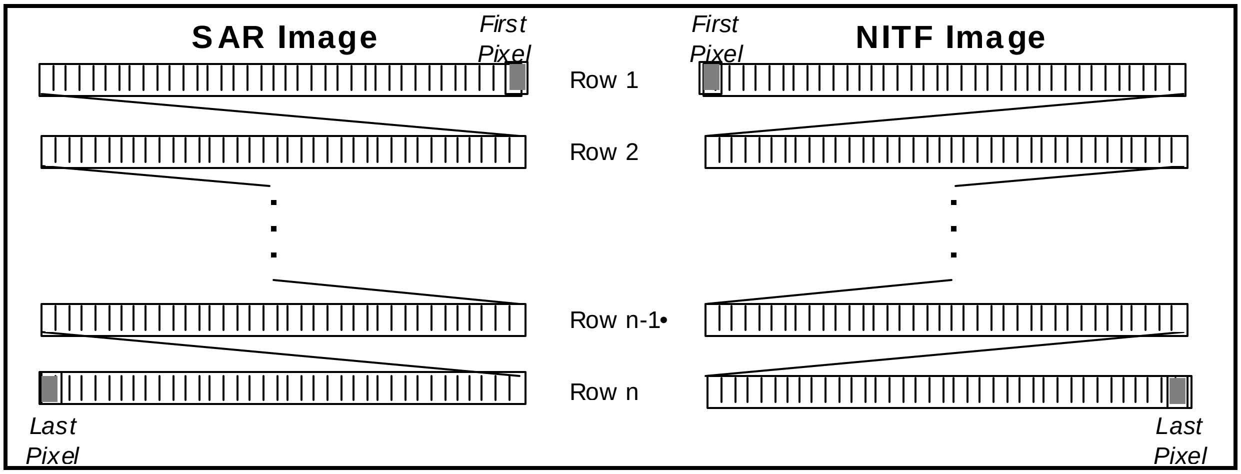

FIGURE 8-5. HISTORIC SAR COLLECTION RELATIONSHIP WITH THE NITF COORDINATE SYSTEM

8.2.4 Rational projection Model

The geometric sensor model describing the precise relationship between image coordinates and ground coordinates is known as a Rigorous Projection Model. A Rigorous Projection Model expresses the mapping of the image space coordinates of rows and columns (r,c) onto the object space reference surface geodetic coordinates (j, l, h).

RPC00 supports a common approximation to the Rigorous Projection Models. The approximation used by RPC00 is a set of rational polynomials exp ressing the normalized row and column values, (r_n, c_n), as a function of normalized geodetic latitude, longitude, and height, (P, L, H), given a set of normalized polynomial coefficients (LINE_NUM_COEF_n, LINE_DEN_COEF_n, SAMP_NUM_COEF_n, SAMP_DEN_COEF_n). Normalized values, rather than actual values are used in order to minimize introduction of errors during the calculations. The transformation between row and column values (r,c), and normalized row and column values (r_n, c_n), and between the geodetic latitude, longitude, and height (j, l, h), and normalized geodetic latitude, longitude, and height (P, L, H), is defined by a set of normalizing translations (offsets) and scales that ensure all values are contained in the range -1 to +1.

P = (Latitude	- LAT_OFF)	÷ LAT_SCALE
L = (Longitude	- LONG_OFF)	÷ LONG_SCALE
H = (Height	- HEIGHT_OFF)	÷ HEIGHT_SCALE
r_n = (Row	- LINE_OFF)	÷ LINE_SCALE
c_n = (Column	- SAMP_OFF)	÷ SAMP_SCALE

The rational function polynomial equations are defined as:

$$r_n = \frac{\sum_{i=1}^{20} LINE\_NUM\_COEF_i \cdot \rho_i(P,L,H)}{\sum_{i=1}^{20} LINE\_DEN\_COEF_i \cdot \rho_i(P,L,H)} \quad \text{and} \quad c_n = \frac{\sum_{i=1}^{20} SAMP\_NUM\_COEF_i \cdot \rho_i(P,L,H)}{\sum_{i=1}^{20} SAMP\_DEN\_COEF_i \cdot \rho_i(P,L,H)}$$

The rational function polynomial equation numerators and denominators each are 20-term cubic polynomial functions of the form:

$$\sum_{i=1}^{20} C_i \cdot \rho_i(P, L, H) =$$

$$\begin{array}{llll}
C_1 & + C_6 \cdot L \cdot H & + C_{11} \cdot P \cdot L \cdot H & + C_{16} \cdot P^3 \\
+ C_2 \cdot L & + C_7 \cdot P \cdot H & + C_{12} \cdot L^3 & + C_{17} \cdot P \cdot H^2 \\
+ C_3 \cdot P & + C_8 \cdot L^2 & + C_{13} \cdot L \cdot P^2 & + C_{18} \cdot L^2 \cdot H \\
+ C_4 \cdot H & + C_9 \cdot P^2 & + C_{14} \cdot L \cdot H^2 & + C_{19} \cdot P^2 \cdot H \\
+ C_5 \cdot L \cdot P & + C_{10} \cdot H^2 & + C_{15} \cdot L^2 \cdot P & + C_{20} \cdot H^3
\end{array}$$

Note: The order of terms differs between different applications. This order is used with RPC00B and the Digital Point Positioning Data Base. RPC00A uses a different term order.

where coefficients $C_1 \cdots C_{20}$ represent the following sets of coefficients:
LINE_NUM_COEF_n, LINE_DEN_COEF_n, SAMP_NUM_COEF_n, SAMP_DEN_COEF_n

The image coordinates are in units of pixels. The ground coordinates are latitude and longitude in units of decimal degrees and the geodetic elevation in units of meters. The ground coordinates are referenced to WGS-84.

8.2.5 Stereo Projection Model

The two images comprising a Stereo Pair are referred to as the Left and Right images; the Beginning and Ending Asymmetry, Convergence, and Bisector Elevation angles define the geometry between the two images (figure 8-7). The Beginning and Ending angles are always measured from the first and last lines, respectively, of the Left image, but measurement locations in the Right image are dependent on the rotation required to align the imagery (figure 8-6). When the two images are collected in succession along a flight path, the fore (aft) image is the Left (Right) image.

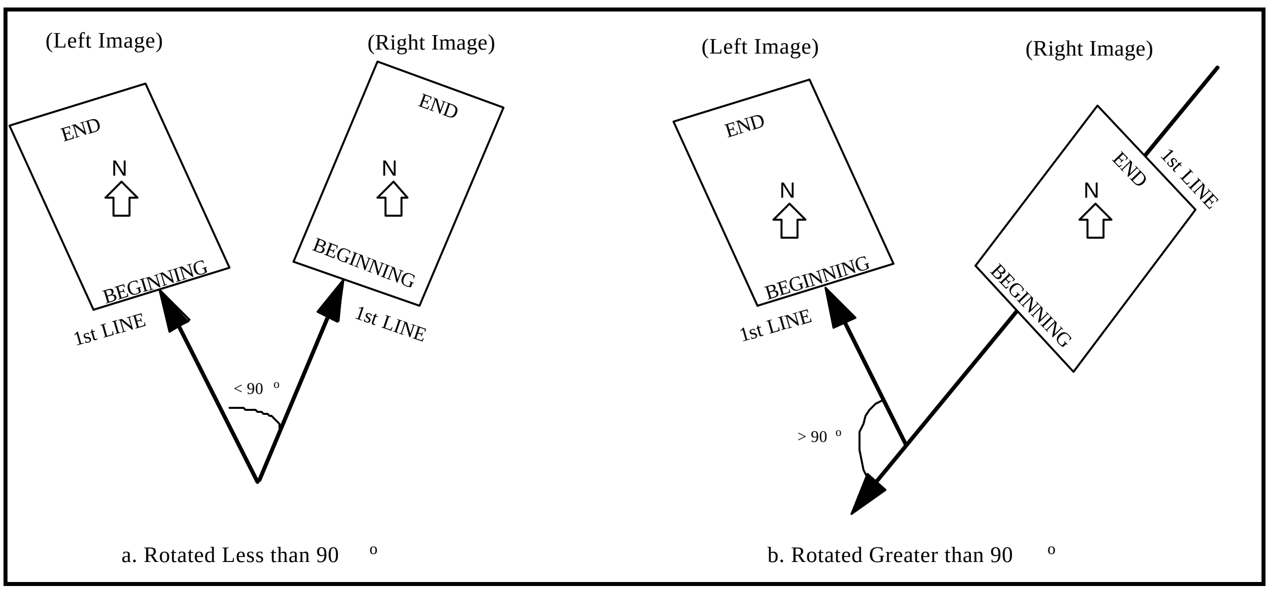

FIGURE 8-6. LOCATION OF BEGINNING/ENDING ANGLES