PAR ALIGNMENT PROCEDURES AND SAFETY LIMITS

PAR Alignment Photographs

Each facility equipped with PAR shall have radar alignment photographs readily available to the radar final controller to facilitate radar performance checks. Radar alignment photographs shall be provided for each runway to which PAR approaches are established, and shall clearly display centerline and touchdown reflectors or bracket reflectors where applicable. It is recommended that multiple sets of alignment photographs (for each PAR runway) be available in the Radar Room to allow more than one controller at a time to make use of them. Photographs shall also be posted at the PAR site for technician use. Photographs shall be reviewed annually and updated when variables such as construction and change in vegetation cause a change in "radar picture."

PAR Alignment Verification Procedures (AN/FPN-63 (V))

> **Note -** These alignment verification procedures shall be accomplished on both PAR channels at the start of each watch, and on the channel in use at the start of each PAR session and whenever the PAR runway is changed. Notify maintenance personnel immediately if any of the following checks cannot be accomplished or alignment cannot be verified.

Controller PAR alignment verification procedures involve a number of elements. The controller procedures delineated below assume that the technician has previously conducted maintenance alignments.

1. To facilitate locating reflectors, controllers should adjust azimuth antenna servo (elevation range marks) down and elevation antenna servo (azimuth range marks) on centerline to obtain maximum signal return from the reflectors. MTI video selection will eliminate ground clutter and reduce errors in properly identifying the correct radar return. Adjust the IF GAIN control to create the smallest possible usable reflector targets. PAR alignment photographs, shall be used to assist the controller in ascertaining reflector location.

2. Controllers must then locate the:

   a. Touchdown Reflector on the elevation scan, and

   b. Touchdown and Centerline Reflectors on the azimuth scan.

3. Controllers should turn OFF the cursor and range marks by adjusting the CURSOR INTENSITY and RANGE MARK controls on the Indicator Processor-Power Supply Front Panel Controls (beneath the controller's shelf/writing surface).

4. Controllers should perform the following to check radar antenna alignment accuracy. This check is similar to verifying a permanent echo is at the correct bearing on a surveillance radar system. This test verifies accuracy of the radar and shall be accomplished on each PAR indicator.

a. Using the ANGLE VOLTAGE TD-OPERATE-6 NMI Switch on the Indicator Power Supply Front Panel Controls (beneath the controller's shelf/writing surface), select the TD (up) position. The controller should observe a sweep trace on both azimuth and elevation displays.

b. Using the ANGLE VOLTAGE TD-OPERATE-6 NMI Switch, select the OPERATE (center) position. The controller should observe and verify that the sweep trace left on the screen bisects the touchdown reflector on both the azimuth and elevation displays. Toggling the ANGLE VOLTAGE TD-OPERATE-6 NMI switch from TD to OPERATE several times may be necessary.

5. Controllers should turn ON the cursor and range marks by adjusting the CURSOR INTENSITY and RANGE MARK controls on the Indicator Processor-Power Supply Front Panel Controls.

6. Controllers should perform the following to check cursor alignment accuracy. This check ensures the aircraft will land on the runway centerline at the approved touchdown point and shall be accomplished on each PAR indicator.

a. On the azimuth display, the controller should observe the Touchdown Range Mark is coincident with the Touchdown Reflector. Servo left or right if necessary to verify alignment.

b. On the elevation display, the controller should observe both the Glidepath Cursor and Lower Safe Limit Cursor emanating from the center of (bisecting) the Touchdown Reflector.

c. On the azimuth display, the controller should observe the Courseline Cursor bisecting the Centerline Reflector (or half way between the two Bracketing Reflectors, if they are used instead of a Centerline Reflector).

d. On both the azimuth and elevation display servo the range mark wedges so the five NMI range mark (the intensified range mark) is over the Glidepath Cursor on elevation and the Centerline Cursor on azimuth.

e. Using the ANGLE VOLTAGE TD-OPERATE-6 NMI Switch, select the 6 NMI (down) position. The controller should observe the cursor (an intensified one inch line on the sweep trace) is coincident with the 5-mile range mark (an intensified dot on the sweep trace) on both the azimuth and elevation displays.

PAR Tolerances

Precision approach radar shall meet the tolerances set forth in the U.S. Standard Flight Inspection Manual for an unrestricted classification.

Azimuth course alignment (at threshold) will not exceed 30 feet referenced to runway centerline.

Azimuth course alignment (along track)will not exceed 30 feet or 0.6 percent of the aircraft to PAR antenna distance, referenced to runway centerline. 0.6 percent exceeds 30 feet at aircraft to PAR distances greater than 5,055 feet (0.83 NM).

Glide path alignment (angle) will not exceed 0.1 degree of published angle during commissioning flight inspection, and not exceed 0.2 degree of published angle during periodic flight inspection. The allowable periodic deviation of 0.2 degree is applied to the published (desired) angle and not the angle found during the commissioning inspection.

Lower safe limit alignment (angle) will provide clearance from all obstacles from glide slope intercept to runway threshold. The lower safe limit angle is normally 0.5 degree less than the glide path angle.

Range accuracy will not exceed ±2 percent of the true range.

Usable distance of azimuth and elevation will be a minimum of (not be less than) 7.5 NM from touchdown.

Coverage of those PARs which have coverage capabilities beyond 10 NM should be checked at the minimum vectoring altitude to the coverage capabilities of the radar.

More detailed information can be found in the U.S. Standard Flight Inspection Manual.

PAR Target Interpretation and Glide Path Standards

To obtain maximum signal return from aircraft targets, controllers shall adjust the azimuth antenna servo (elevation range marks) on the elevation target, and the elevation antenna servo (azimuth range marks) on the azimuth target. To facilitate accurate and precise aircraft target relationship to elevation (glide path and lower safe limit) and azimuth (course) cursors, controllers shall adjust the IF GAIN control to create the smallest possible usable target.

WARNING

Using exaggerated/blooming targets will result in the issuance of erroneous glide path and course information.

The radar final controller shall issue precise glide path information for the pilot to establish and maintain a proper rate of descent. The controller shall mentally divide the elevation target into quarters to advise the pilot of any deviation from glide path. As depicted in Figure 7-1, the following describes the relationship between the glide path information relayed to the pilot and the corresponding aircraft target position with respect to the PAR glide path cursor:

1. On glide path — the elevation target is bisected by the glide path cursor.

2. Slightly above glide path — the lower-middle quarter of the elevation target is intersected by the glide path cursor.

3. Slightly below glide path — the upper-middle quarter of the elevation target is intersected by the glide path cursor.

4. Above glide path — the lower-most quarter of the elevation target is intersected by the glide path cursor.

5. Below glide path — the upper-most quarter of the elevation target is intersected by the glide path cursor.

6. Well above glide path — the elevation target is completely above (doesn't touch) the glide path cursor.

7. Well below glide path — the elevation target is completely below (doesn't touch) the glide path cursor.

Safety Limits Exceeded

Per FAAO JO 7110.65, prior to an aircraft passing decision height, whenever the completion of a safe approach is questionable because safety limits are exceeded or radical target deviations are observed, the controller shall instruct the aircraft if runway environment not in sight, to execute a missed approach if previously given; or climb to or maintain a specified altitude and fly a specified course.

If, at any time, the final controller observes a radical descent deviation, “LOW ALTITUDE ALERT. CHECK YOUR ALTITUDE IMMEDIATELY” shall be transmitted to the pilot.

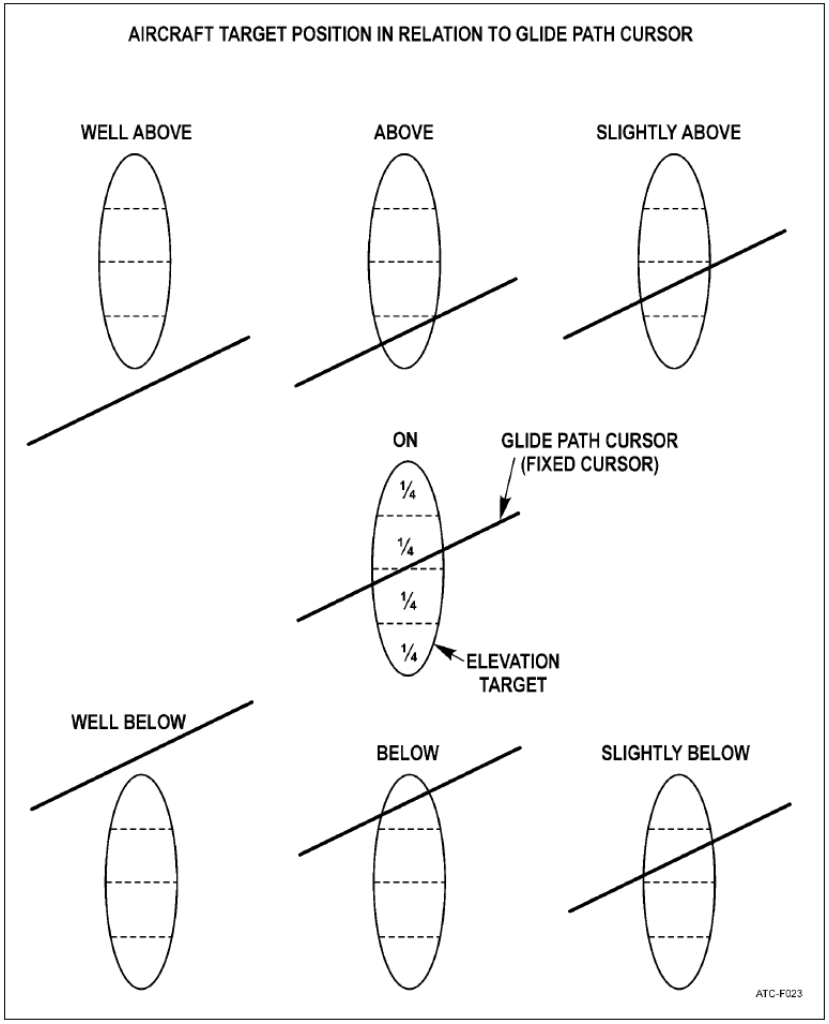


Figure 7-1. Glidepath Information

“TOO LOW FOR SAFE APPROACH” shall be defined as: If, after final descent, the aircraft target is well below glide path (not touching the glide path cursor) and touches the lower safe limit cursor. Due to the convergence of the glide path and lower safe limit cursors,

“TOO LOW FOR SAFE APPROACH” shall be further defined as: If, at one mile, the aircraft target is not touching and below the glide path cursor.

“TOO HIGH FOR SAFE APPROACH” is defined as: If, at one mile, the aircraft target is not touching and above the glide path cursor.

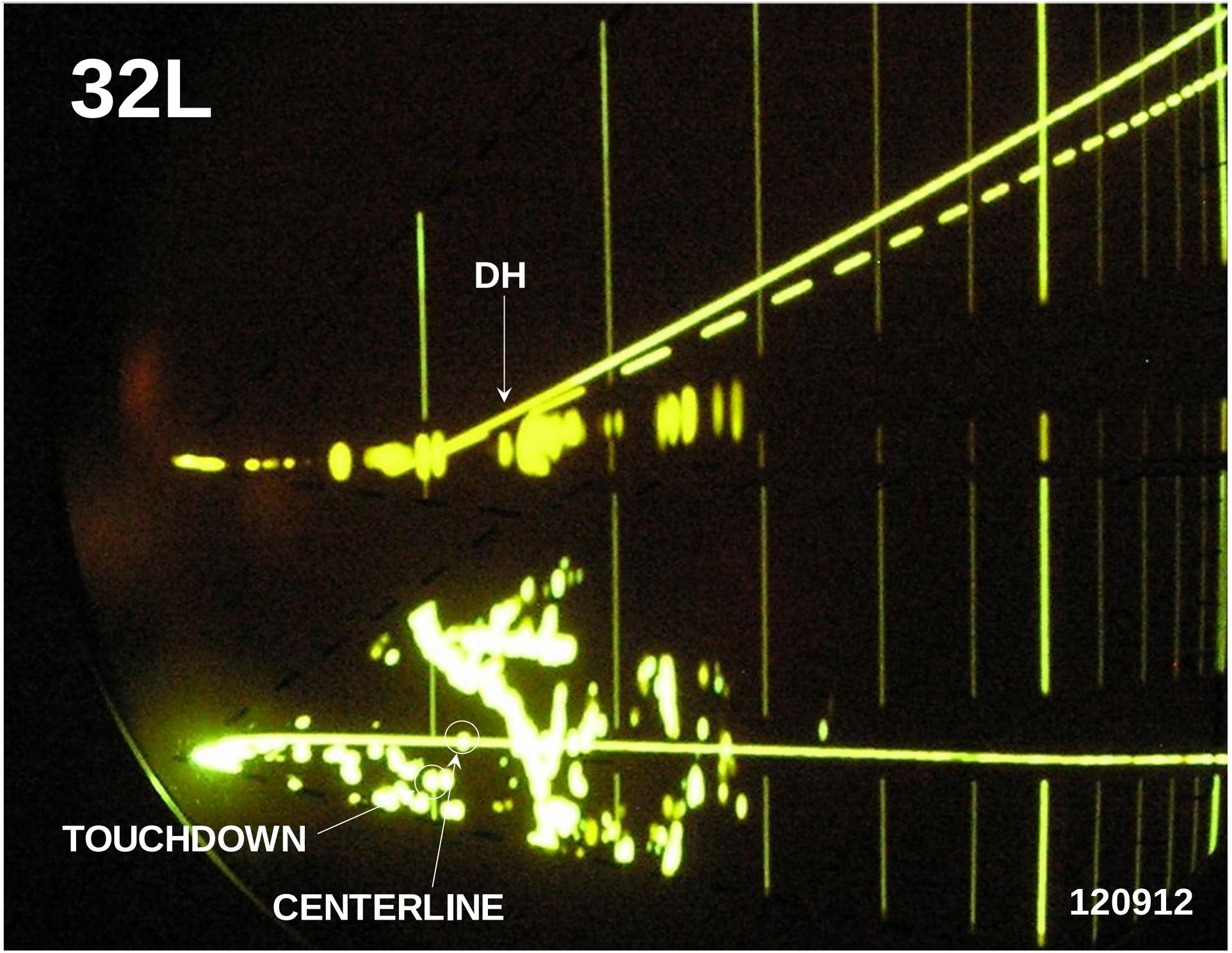
“TOO FAR RIGHT FOR SAFE APPROACH” is defined as: If, at one mile, the aircraft target is not touching and right of the centerline cursor.

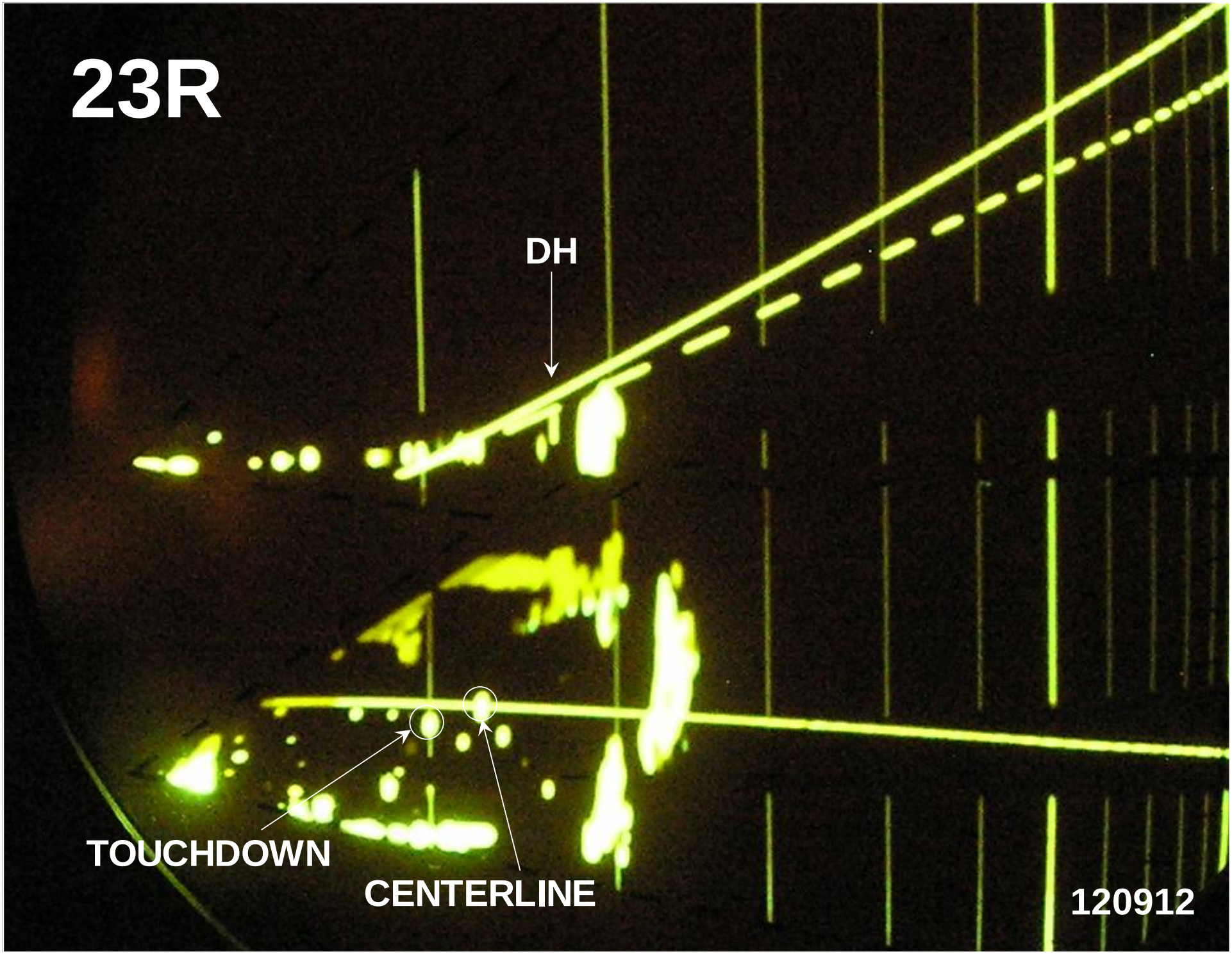
“TOO FAR LEFT FOR SAFE APPROACH” is defined as: If, at one mile, the aircraft target is not touching and left of the centerline cursor.

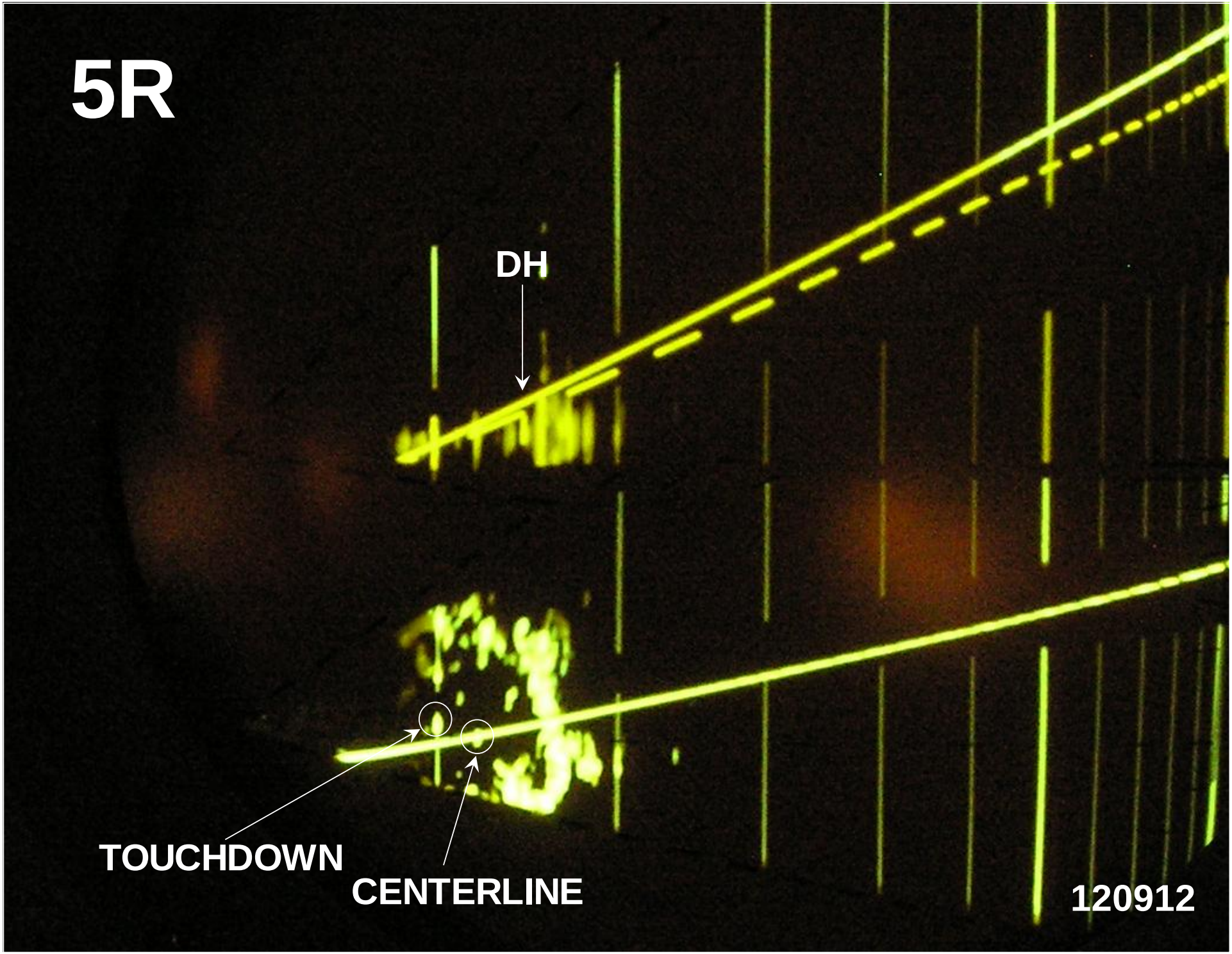
ATCFOs may, in the ATC Facility Manual, clearly state other local conditions defining “TOO HIGH FOR SAFE APPROACH”, “TOO FAR RIGHT FOR SAFE APPROACH”, and “TOO FAR LEFT FOR SAFE APPROACH” for PAR approaches conducted at their facilities considering such conditions as tower pattern altitudes, existence of parallel runways, etc.

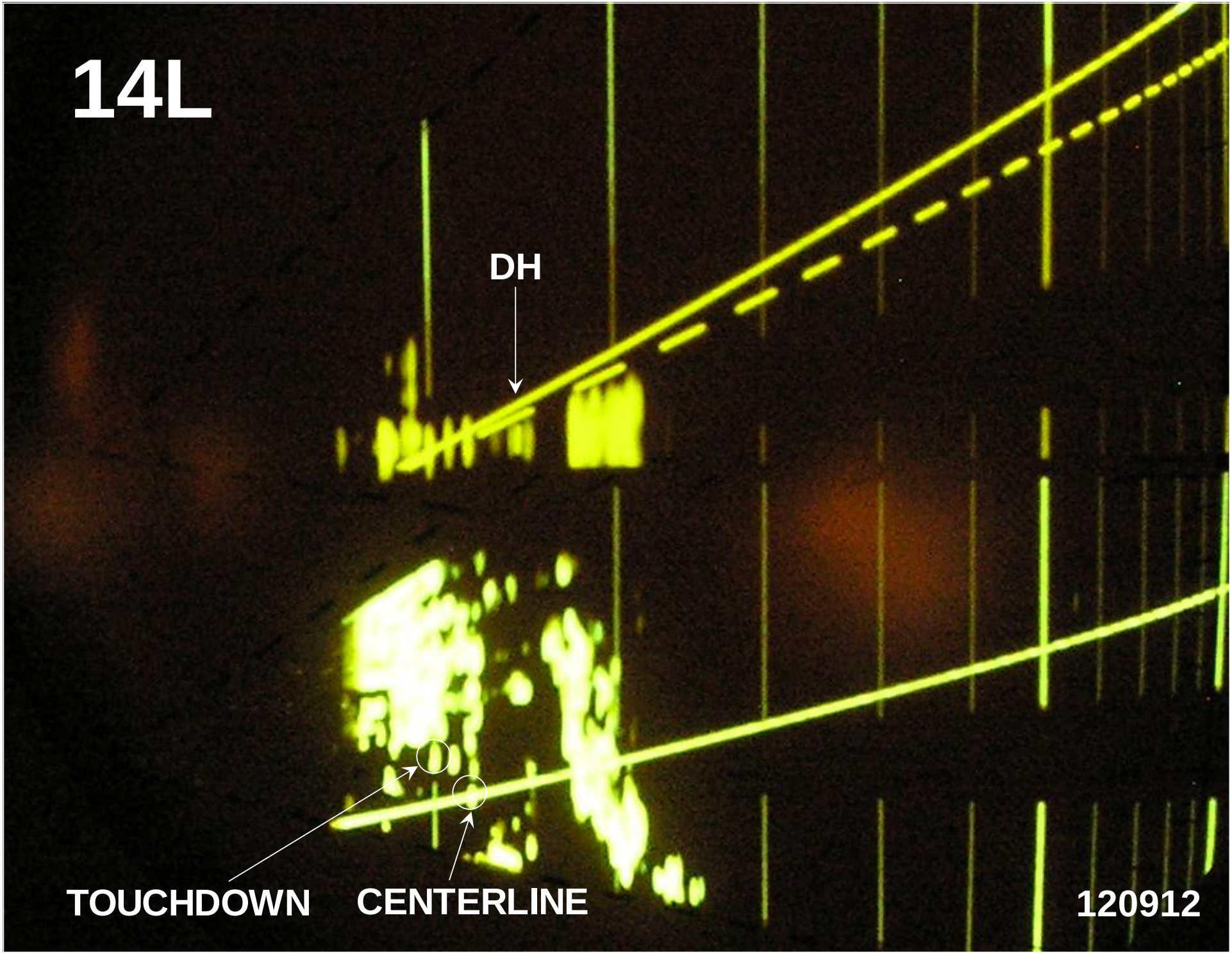
WARNING

If, after the pilot is instructed “DO NOT ACKNOWLEDGE FURTHER TRANSMISSIONS,” a missed approach is issued due to safety limits exceeded or radical target deviations observed, obtain a specific acknowledgement from the pilot.


32L
DH
TOUCHDOWN
CENTERLINE
120912


23R
DH
TOUCHDOWN
CENTERLINE
120912


5R
DH
TOUCHDOWN
CENTERLINE
120912


14L
DH
TOUCHDOWN
CENTERLINE
120912