

## Technical Information

### “What are Radar Interference Problems”?

#### Appearance

Lots of steel bridges crossing inland waterways, cause in addition to the “normal” radar image even more, interfering and noisy signals. These interference echoes create so-called “ghost images”, which usually appear as dot rows perpendicular to the bridge axis or as long drawn-out extensive echoes with irregular structure.

In the case of strong clutter, the ghost images even appear beside the waterway and reach a length of 500 m and more behind the bridge. The radar clutter maximum in general appears at perpendicular angle of incidence and distance between radar and bridge of 200 to 300 m.

Navigating with radar, oncoming ships or anchored ships inside the clutter zone are difficult or not even detectable and distinguishable. The cluttered zone has to be crossed blind. Hence, in this area the danger of collision is especially high.

Another type of false signals is the the so-called “ghost images”. They appear mostly at low bridges over canals. These “ghost images” affect bridges or oncoming ships in the radar image.

#### Sources of Radar Interference Problems

Radar Interference Problems within the range of bridges are caused by multiple reflections of the radar beam either inside a bridge cavity or between bridge and reflecting objects in the bridge environment. Strong multiple reflections in between the bridge cavity appear under the following conditions:

- 1.) A large portion of radar energy enters the bridge cavity
- 2.) The energy is multiple reflected between the parallel surfaces of the bridge cavity
- 3.) The reflection loss (absorption) of these surfaces is low.

The last condition is only fulfilled at metallic surfaces; hence, only steel bridges can cause radar clutter. In contrast, concrete absorbs a considerable amount of radar energy with reflection losses of 8 to 10 dB. Therefore, concrete bridges don't cause radar interference problems.

#### Security of inland's waterway transportation

In order to guarantee the security of radar navigating inland's waterway transportation, the suppression of the radar interference problems is controlled by the statements from 24<sup>th</sup> of April 1969 (W7/4069/VA 69) and 14<sup>th</sup> of December 1994 (BW 25/BW 21/52.24.14-2/16 S 94) of the Federal Department of Transportation.

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