

# ISSUE DOCUMENTATION – RTCA SC-186



Tracking Information (committee secretary only)	
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Short Title for Change Issue:	ADS-B/TCAS Symbol Directionality for CDTI
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Topic:	<input type="checkbox"/> ASA	<input type="checkbox"/> High-level	<input type="checkbox"/> ASAS	<input type="checkbox"/> STP	<input type="checkbox"/> ASSAP	<input checked="" type="checkbox"/> CDTI
Document Reference:				Originator Information:		
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Proposed Rationale for Consideration (originator should check all that apply):	
<input type="checkbox"/>	Item needed to coordinate with other documents
<input type="checkbox"/>	ASA MASPS
<input type="checkbox"/>	1090 MHz Link MOPS
<input type="checkbox"/>	UAT Link MOPS
<input type="checkbox"/>	TIS-B MASPS
<input type="checkbox"/>	Previously written CDTI MOPS
<input type="checkbox"/>	Other (include document title):
<input type="checkbox"/>	Item needed for harmonization with international requirements
<input type="checkbox"/>	Item identified during recent ADS-B development activities and operational evaluations
<input type="checkbox"/>	MOPS clarifications and correction item
<input type="checkbox"/>	Validation/modification of questioned MOPS requirement item
<input type="checkbox"/>	Military use provision item
<input checked="" type="checkbox"/>	New requirement item

Nature of Issue:	<input type="checkbox"/> Editorial	<input type="checkbox"/> Clarity	<input type="checkbox"/> Performance	<input checked="" type="checkbox"/> Functional
Issue Description:				
<b>CURRENT SITUATION:</b>				
TCAS symbols are currently non-directional, providing no track information for traffic aircraft. However, pilots can monitor the relative movement of TCAS symbols across the TCAS display in order to determine the general track of traffic aircraft.				
<b>ISSUE:</b>				
Given that track data is available through ASA systems, the <b>direction</b> of traffic aircraft could be indicated on TCAS symbols for targets that are tracked by both TCAS and ASA systems, and correlated. Directional information could be provided for all or a subset of TCAS symbology. Should the CDTI MOPS include requirements related to depicting traffic directionality when TCAS symbology is used to depict traffic position? If requirements are specified, which symbols are affected?				
<i>(Continued on next page.)</i>				

Issue Description (continued):

**The CDTI MOPS could:**

- A. Require directional information for all or a subset of TCAS symbols
- B. Disallow directional information for all or a subset of TCAS symbols
- C. Not specify requirements, thus allowing manufactures to decide whether to provide directional information
- D. Recommend a symbol set as a minimum (i.e., TCAS) while not specifically allowing or disallowing directionality

The following provides some considerations for providing directional information on TCAS traffic symbols. The considerations should be treated as only a starting point for future discussions and research.

**Possible Benefits of Directional Information on TCAS symbols**

- May improve visual acquisition of traffic out the window
- May improve pilot estimates of future traffic positions
- May improve pilot traffic awareness with regard to an evolving conflict or the overall traffic picture
- May improve pilot trust and reliance on TCAS alerting
- May help pilots discriminate between different traffic based on the additional directionality information

**Possible Costs of Directional Information on TCAS symbols**

- Directional symbology may confuse pilots (e.g., symbology may be complex or ambiguous)
- May add clutter to the display or interfere with the legibility of other information (e.g., TCAS data tags) on the traffic display.
- May be inaccurate/misleading
- May degrade pilot trust and reliance on TCAS alerting
- May delay pilot compliance with RA
- May result in pilot disregarding RA based on perceived traffic direction
- May result in unauthorized (e.g., horizontal) maneuvering
- If directionality information is not presented on all TCAS symbols, the discontinuity as symbols change (e.g., during RA) may confuse pilots.

**Possible reasons why directional information should not be standardized within the MOPS**

- Insufficient knowledge of the implications of directionality information
- May not be any appreciable safety/performance cost or benefit associated with directional information.
- May preclude better designs by manufacturers.
- One FAA approved system (under Supplemental Type Certification) with directional information is currently being used

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Issue Description (continued):

**Possible reasons why directional information should be standardized within the MOPS**

- Sufficient knowledge exists to establish appropriate minimum standards on directionality information
- May be an appreciable safety/performance, or cost/benefit associated with certain depictions of directional information.
- May be a safety benefit to provide consistency across different systems and manufacturers.

Originator's proposed resolution:

Consider the above considerations and determine whether or not the STP MOPS should standardize the treatment of directional information.

CDTI Subgroup Deliberations:

**November 2, 2004:** The paper was discussed at the CDTI subgroup meeting of November 2004. [See CDTI meeting notes 110204.doc for more detailed notes.]

The group **agreed** that directional symbology is useful for situational awareness. The ASA MASPS says that directional symbology *should* be used. Moving on, the group **agreed** that the directional symbol should continue during TCAS proximity alerts and traffic alerts. Since the pilot is required to follow the RA, and redirect their attention to the command guidance, there is no need for directional data during an RA. There is concern that pilots would disregard the RA or maneuver horizontally using this data.

Most of the group agreed that the directionality should be taken away during an RA, although others felt that more study is needed. Directional information may prove useful for situational awareness or target identification, although one would expect this to have been established previous to the issuance of an RA. The group could think of no particular benefit to maintaining the directional symbol as far as avoiding a collision. However, there was some concern about continuity of the display, and dropping directional information. The group reached no consensus on whether "shall not" or "should not" (use directional symbology) should be included in the document. The consensus was that the group make no recommendation about the use of directional symbols for targets generating TCAS RAs, but include definitive text discussing the issue in the ASAS MOPS.

The group **agreed** that velocity vectors should be eliminated during an RA.