**DESCRIPTION OF EXPERIMENTAL STIMULI**

**Diagnostic information and rules of engagement used in TANDEM**

The diagnostic information available to make classification decisions is presented in Table S1. Each classification outcome (Type, Class, Intent) was informed by three pieces of diagnostic information whose values were uniquely associated with a single classification designation. For example, when making the Type classification, participants could identify a target as an Aircraft, Surface, or Submarine vessel. A target whose Speed was greater than 35 knots, Altitude/Depth greater than zero feet, and communication time between one and forty seconds was classified as an Air vessel; similarly, a Speed between 25 and 34 knots, an Altitude/Depth of zero feet, and a communication time between 41 and 80 seconds was indicative of a Surface contact. The same protocol was used to identify a contact’s Class and Intent. For the Class and Intent classification options, information pertaining to an “Unknown” designation could exist, but participants could not identify a contact as such. Consequently, these classifications each possessed only two possible outcomes (Class = Civilian or Military; Intent = Peaceful or Hostile). Once all three classification decisions were made, participants could make a final engagement decision for a contact based on the “rules of engagement” shown in Table S2. The rules indicated how a target should be prosecuted according to its Type, Class, and Intent. Thus, a target whose Type = Air, Class = Civilian, and Intent = Peaceful should have a final engagement decision = Warn, whereas a target that was a Submarine, Military, Hostile should have a final engagement decision of Mark. Both the diagnostic information and rules of engagement were available to participants in the operations manual.

**Derivation of heuristics**

The rules of engagement summarized in Table S2 can be used to extract information about the diagnostic relationship that existed between classification outcomes and their most likely engagement decision. To clarify this set of heuristic relations, Table S3 presents the conditional probabilities that existed between each classification decision and each final engagement outcome. For example, the first row in the Table S3 indicates the probability that the final engagement decision for a contact would be Clear if the contact’s Type was classified as Air (*p*(Clear|Air) = 25%); similar probabilities could be derived for the probability of Warning (*p*(Warn|Air) = 50%) or Marking (*p*(Mark|Air) = 25%) any target with an Air designation. These probabilities could all be derived a priori from the rules of engagement provided to participants (i.e., Table S2).

Knowledge structures that reflected this underlying probability structure would contain links between each classification outcome and its most probable engagement decision (i.e,. Air linked to Warn, but not to Clear or Mark). These links are bolded in Figure 2 in the manuscript. Further analysis of the rules of engagement reveals a simple processing heuristic for making engagement decisions that minimizes the amount of information that must be interpreted. Based on the rules of engagement and the probabilistic structure shown in Table S3, a participant that learned and adhered to the following heuristic could make 84% of final engagement decisions accurately:

1. Identify Class of contact
   1. If Civilian classification, Final Engagement = Warn
   2. If Military, go to Step 2
2. Identify Intent of contact
   1. If Peaceful classification, Final Engagement = Clear
   2. If Hostile classification, Final Engagement = Mark

This heuristic simplifies the decision task substantially by reducing the number of characteristics participants must consider as well as eliminating the need to interpret the relatively less diagnostic Type classification when making final engagement decisions.

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| Table S1 *Classification Outcomes and Diagnostic Information for TANDEM Contacts* | | | | | | |
| Classification Category | Classification Options | Diagnostic Information about Contacts | | |
| Type |  | **Speed** | **Altitude/Depth** | **Communication Time** |
| Air | ≥ 35 knots | > 0 feet | 1-40s |
| Surface | 25-34 knots | 0 feet | 41-80s |
| Sub | 0-24 knots | < 0 feet | 81-120s |
| Class |  | **Countermeasures** | **Signal Strength** | **Maneuvering Pattern** |
| Civilian | None | Moderate | Code Foxtrot |
| Unknown | Inactive | Indistinct | Code Echo |
| Military | Jamming | Weak | Code Delta |
| Intent |  | **Identification** | **Direction of Origin** | **Response** |
| Peaceful | Prince | Green Beach | Authorized |
| Unknown | Golf | Blue Lagoon | Inaudible |
| Hostile | Tango | Orange Bay | Invalid |

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| Table S2 *Rules of Engagement for Determining Final Engagement Decisions* | | |
| **Clear** | **Warn** | **Mark** |
| Air, Military, Peaceful | Air, Civilian, Hostile | Air, Military, Hostile |
| Surface, Civilian, Peaceful | Air, Civilian, Peaceful | Surface, Military, Hostile |
| Surface, Military, Peaceful | Surface, Civilian, Hostile | Sub, Civilian, Hostile |
| Sub, Military, Peaceful | Sub, Civilian, Peaceful | Sub, Military, Hostile |
| *Note.* Each cell describes how a contact in TANDEM with a given classification should be processed. For example, the cell in the first row, first column indicates that the final engagement decision for all contacts classified as Air, Military, and Peaceful should be Clear. | | |

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| Table S3 *Relative Probabilities Shared between Classification Outcomes and Final Engagement Decision Outcomes* | | | | |
| Classification | Classification Outcomes | Final Engagement Outcomes | | |
| Clear | Warn | Mark |
| Type | Air | .25 | **.5** | .25 |
| Surface | **.5** | .25 | .25 |
| Sub | .25 | .25 | **.5** |
| Class | Civilian | .17 | **.67** | .17 |
| Military | **.5** | 0 | **.5** |
| Intent | Peaceful | **.67** | .33 | 0 |
| Hostile | 0 | .33 | **.67** |
| *Note.* Values in each row sum to 1 (within rounding error). The value within a cell can be interpreted as the probability with which a given classification outcome is associated with a final engagement decision outcome based on the rules of engagement (Table S2). The bold underlined values correspond to the highest probabilistic associations between each classification and final engagement outcome and thus concepts expected to be linked if participants organized knowledge heuristically. | | | | |