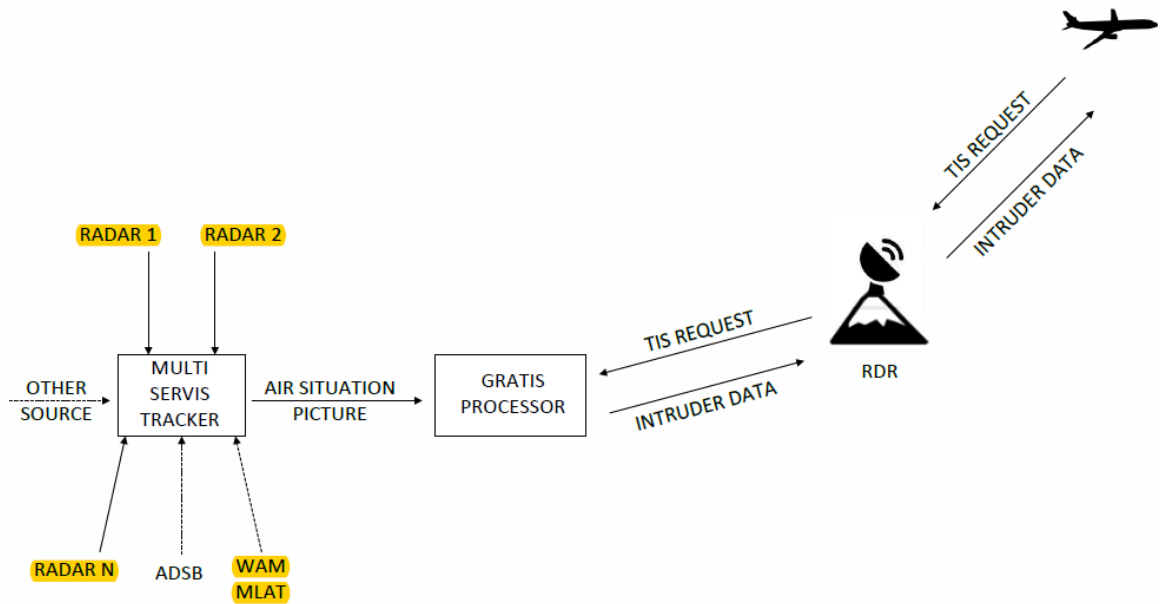# MODE-S TIS

1 Short Description

The Traffic Information Service (TIS) provides information to the cockpit via data link that is similar to VFR radar traffic advisories normally received over voice radio. TIS is intended to improve the safety and efficiency of "see and avoid" flight through an automatic display that informs the pilot of the nearby traffic and potential conflict situations. This traffic display is intended to assist the pilot in visual acquisition of these aircraft. TIS employs an enhanced capability of the Mode-S radar system, which contains the surveillance data, as well as the data link required to "uplink" this information to suitably-equipped aircraft (known as a TIS "client"). TIS provides estimated position, altitude, altitude trend, and ground track information for up to 8 intruder aircraft within 7 NM horizontally, +3,500 and -3,000 feet vertically of the client aircraft.

2 How it Works

1. Aircraft (client) sends via transponder a request for TIS service (if the aircraft already has a TCAS operational it does not send TIS connection request)

2. Radar receives and processes this request, and forwards it to Ground Datalink Processor (in our case named GRATIS)

3. Special purpose tracker receives air situation data from multiple sources (primary radar, secondary radar, Mode-S radar, ADSB, MLAT…) and creates a single system track for each individual aircraft

4. GRATIS receives system tracks of all aircraft and calculates up to eight intruder positions relative to the client position that are within TIS volume (Figure 1). It creates data packets and sends these packets back to radar.

5. In the next radar sweep, these data packets are transferred to the client aircraft transponder for presentation on MFD in the cockpit

6. This process is repeated until the client aircraft either flies out of radar coverage, client transponder sends disconnect request, or aircraft flies out of the predefined GRATIS area

MODE-S TIS
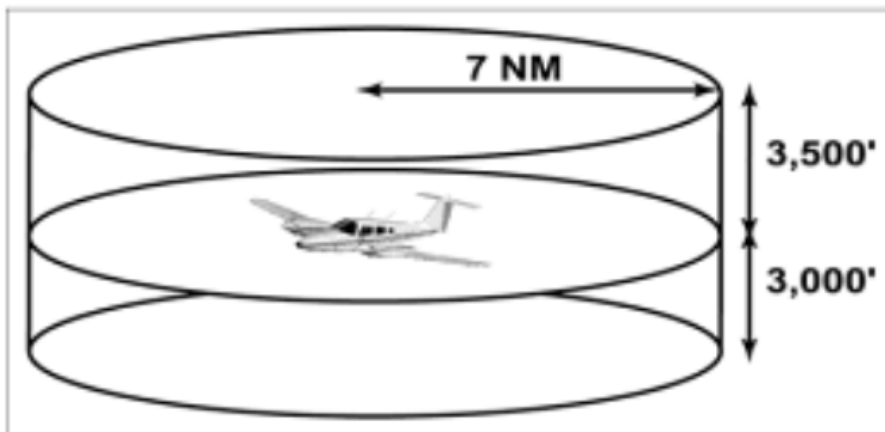

Data Flow Schematic Presentation

Figure 1: TIS Volume

MODE-S TIS

3 Differences between TIS and TCAS

TIS provides traffic advisories similar to those of Traffic Alert and Collision Avoidance System Version1 (TCAS-I), but does not provide resolution advisories. The major functional difference between TIS and TCAS is the source of surveillance data. TCAS uses an airborne interrogator with 1 second update rate, while TIS uses Ground tracker surveillance data with about 3-5 second update and Mode-S radar serving as Data Link media.

4 Limitations of System

1. The TIS data link function is intended to improve the safety and efficiency of "see and avoid" flight by providing automatic display to the pilot of the nearby traffic and warnings of any potentially threatening conditions. **It is not intended to provide avoiding actions and shall also not be used for providing or maintaining self-separation** (if client is under ATC control it shall as usually follow their instructions)

2. Intruder positions are updated once per radar scan (in our case every 4 sec.).

3. Due to processing of air situation picture, radar rotation, MFD presentation data can be delayed by several seconds. During sharp manoeuvres, position of intruders might be wrongly presented on its MFD.

4. Due to the limited number of information bits that are available for transfer to the client as standard protocol, the position, vertical rate and heading have reduced accuracy compared to the Ground tracker used by ATC.

Currently Slovenia Control TIS Service is limited to the VRH radar availability, (radar position coordinates Lat. 45.930900°N and Lon. 14.298103°E) radar coverage and TIS volume area.

MODE-S TIS

Figure 2: Example of MFD Presentation
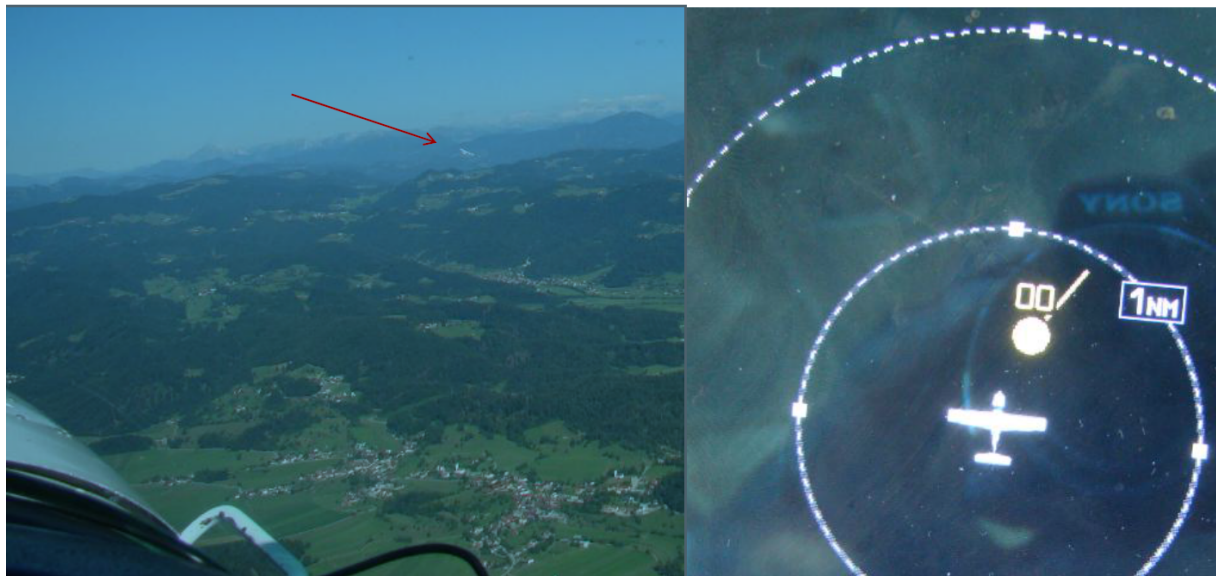
Slovenia TIS test
(August 23rd 2016, Transponder Trig TT31, Display Garmin GPS695)
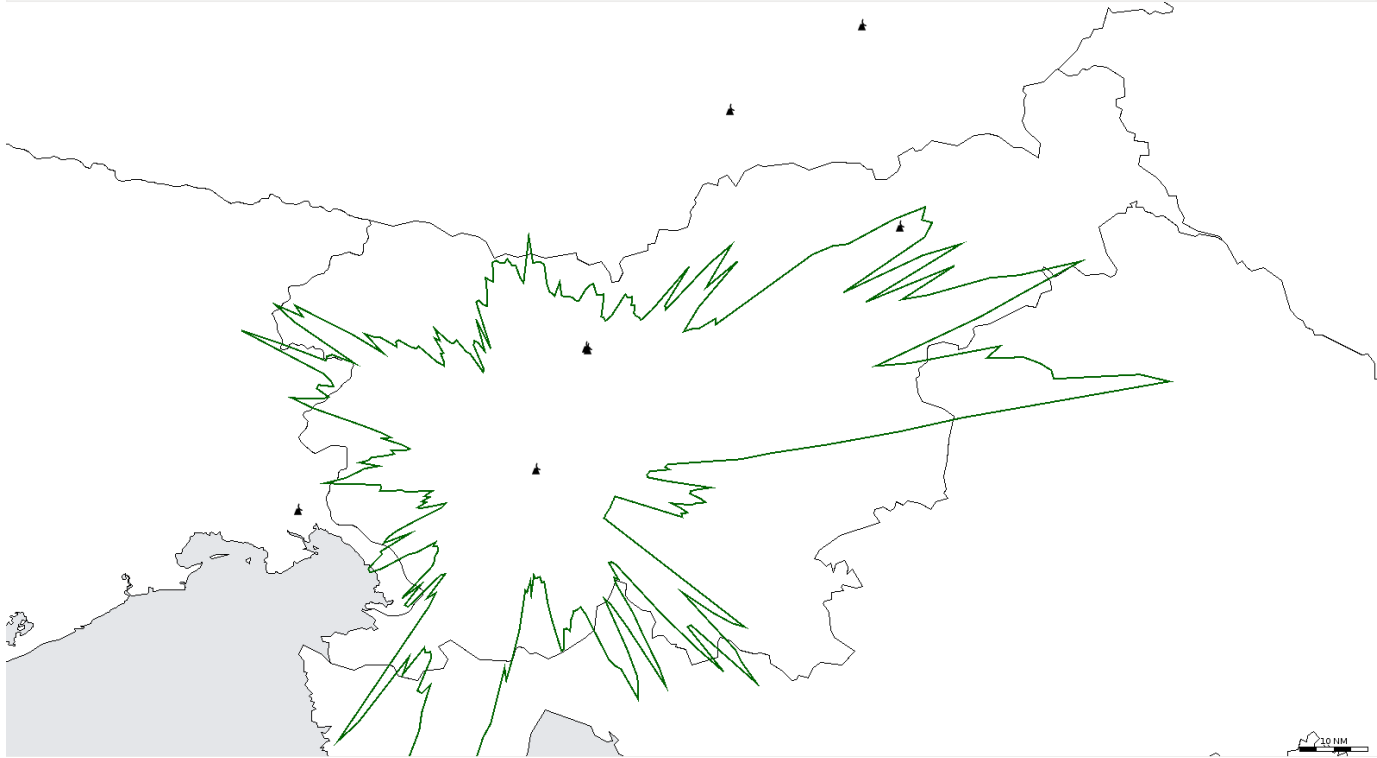
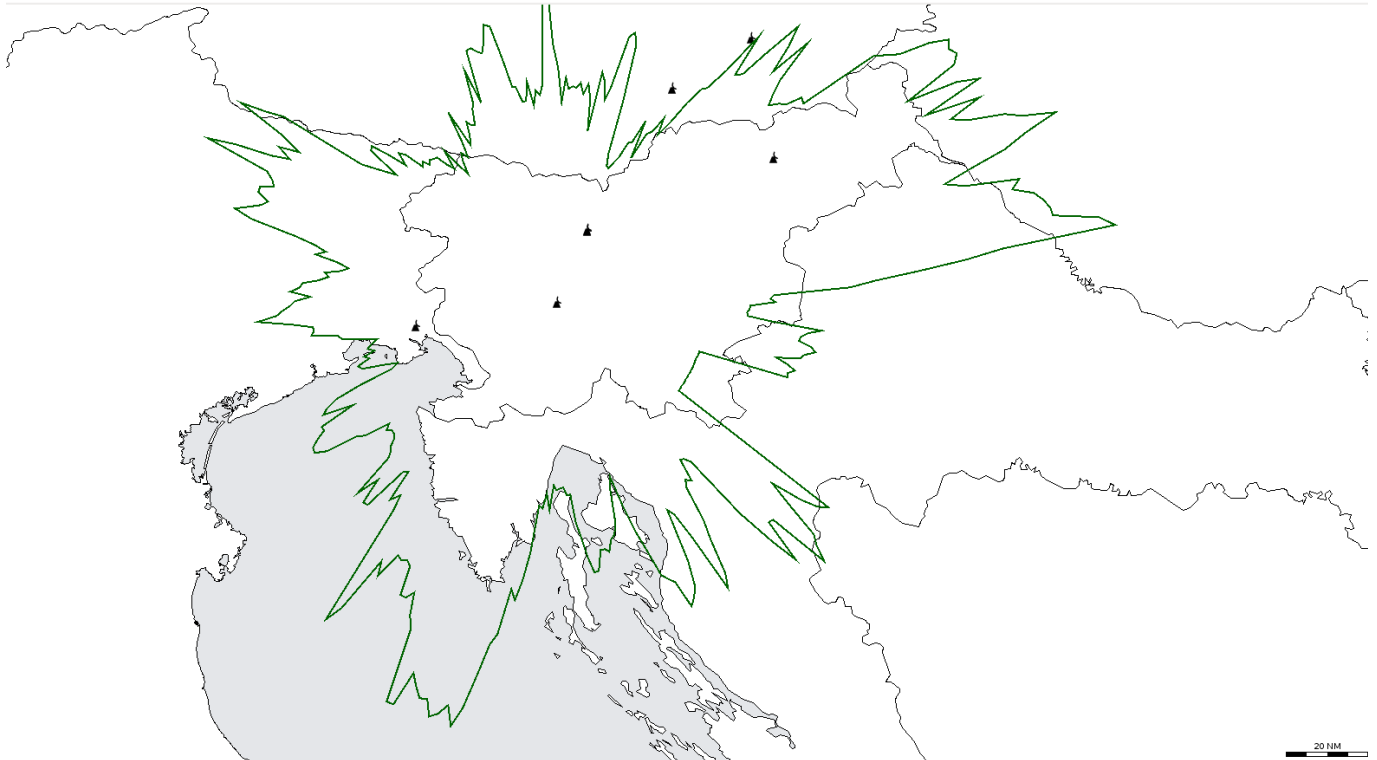Figure 3: Example of MFD Presentation

Figure 4: Radar VRH Coverage @ 5kFt

Figure 5: Radar VRH Coverage @ 10kFt