

EMERGING TECHNOLOGIES – REVIEW TABLE – Ships’ Air Draft Remote Measurement Technology (SADRMT)

Submitted to DTEC02

	Question	Technology Candidate Response		Working Group Response	<div> <div>Green</div> <div>Amber</div> <div>Red</div> </div>
		Infrastructure	User		Status
1.	Where has the referral come from?	China MSA, as a potential user of the technology, had been provided with information on the capability and performance detail of the candidate technology, and then convey relevant information to the IALA.	The manager of the Zhoudai bridge, and the local VTS authority would access the system to be a user in the near future.	Noted	
2.	Name of technology and product name	ships’ air draft remote measurement technology (SADRMT)		No specific product – using existing products to provide the air draft measurement in real time.	
3.	Functional description	The SADRMT is a typical technical concept of multiple sensing devices and data combination analysis. The system tracks ship targets and accurately measures the ship's air draft through image analysis, and timely give an early warning if the	Can be used for the 24-hour remote measurement of vessels’ air draft and traffic monitoring within a certain range of a bridge to support traffic organization service	Updated presentation to be provided	

	Question	Technology Candidate Response		Working Group Response	<div> <div>Green</div> <div>Amber</div> <div>Red</div> </div>
		Infrastructure	User		Status
		air draft of a target which is intend to cross the bridge was detected of exceeding the safety vertical clearance of the navigation hole of a bridge.	delivery and passage planning.		
4.	Proposed user group	Currently can be specially used on the sea-crossing bridge to monitor and remotely measure the air draft of ships which are intend to cross the bridge to give an early warning for ship-bridge collision prevention, specially to prevent the accident that was caused by the ship's air draft exceeding the safety vertical clearance of the navigation hole of a bridge.	Authorities in charge of marine safety, VTS, and companies of bridge managers or owners.	<p>Outcome of the technology is currently being used by the manager of the Zhoudai Bridge, the local VTS operator has not access any data yet. [Provider – who?] gives access to the data using internal network</p> <p>Pilot company could use to assist in transit</p>	
5.	What are its Key limitations?	The SADRMT system, which is still in the prototype testing stage, has a maximum operating range of 9,555 meters, which may not sufficient for some very large	The performance will be various and may also be limited by the frontend sensor equipment, the nature of the bridge,	<p>Has been approved for Zhoudai bridge application – to be updated at DTEC02</p> <p>Requires equipment to be placed on the bridge.</p> <p>Note errors – for sensors on the bridge</p>	

	Question	Technology Candidate Response		Working Group Response	<div> <div>Green</div> <div>Amber</div> <div>Red</div> </div>
		Infrastructure	User		Status
		vessels for their safe maneuvering once there is an unforeseen situation. Besides, error sources may also include mechanical error, vibration, weather condition.	etc.	Calculations would be affected, as they depend on the input from the sensors.	
6.	Where is it currently used (geographic and/or industry)?	It's a new technology that hasn't been widely deployed on bridges. However, its component equipment has been maturely used in other fields, such as the high-precision electro-optical sensor terret has been maturely utilized in the military field.	Zhoudai bridge in Zhoushan city, China.	Noted	
7.	How is it currently used?	The technology has not yet been widely applied in practical cases, but the prototype system test results of the bridge field show that it can be used for 24-hour remote monitoring and measurement of vessels' air draft within a range of nearly	The application of SADRMT on Zhoudai bridge had received a preliminary acceptance and approval, related sensors and devices had been installed	Noted (updated presentation to be provided at DTEC02)	

	Question	Technology Candidate Response		Working Group Response	<div> <div>Green</div> <div>Amber</div> <div>Red</div> </div>
		Infrastructure	User		Status
		10 km. The system is observative enough, and the measurement error of all targets' air draft within a range of 5 km can be less than 1 meter.	on the site in December of 2023, the system was still under trial run, there is not yet enough data to judge the overall performance of its system.		
8.	How could it be used within the maritime sector?	To a certain extent, as a supplement means for VTS authorities to monitor and obtain the actual air draft information of vessels in the vicinity of a bridge to support traffic organization service delivery and bridge passage planning.	The users in the maritime sector are associated with marine safety, VTS, and bridge managers or owners.	<p>Linked to 4 – proposed user group</p> <p>There could be operational requirement for certain classes of vessels to use (note – similar to the use of dynamic UKC management systems)</p>	
9.	Who developed it?	The technical concept and prototype were presented by Shanghai Maritime University in November 2021 during the test. Several organizations and companies also claim to have the capability to develop the technology.		[more information required]	

	Question	Technology Candidate Response		Working Group Response	<div> <div>Green</div> <div>Amber</div> <div>Red</div> </div>
		Infrastructure	User		Status
10.	Is it commercial, non-commercial, or military?	The technology is now available commercially.	Users can customize the required frontend sensor and data processing system, there are some providers could be chosen in China.	[need more information – is the technology being marketed / by whom?]	
11.	Is there an existing technology that meets the same requirements? If so, what makes this different?	A similar means named VHD Ship's Air Draft Measurement System (VHD refers to video high density) which is also based on the principle of visual imaging had been applied at Tsingma Bridge in Hong Kong for vessels' air draft remote measurement for several years with the assistance of its starlight camera. However, it can only manually select target vessels for remote tracking and measurement other than real-time automatic target capture.		Noted – automatic target selection	

	Question	Technology Candidate Response		Working Group Response	<div>Green</div> <div>Amber</div> <div>Red</div>
		Infrastructure	User		Status
12.	Ease of implementation?	Requires high end equipment and may need to lay additional network routes depending on the location of the bridge and the effectiveness of the local communication infrastructure, and the system deployment is relatively complicated.	User accesses data from a website / intranet (secure)	<p>Equipment required to be installed on the bridge:</p> <p>High quality optical sensor (day/night, infrared)</p> <p>Maritime X-band radar (will depend on the user – solid state, FMCW, etc.)</p> <p>Calculations carried out and then data presented to the user (i.e. VTSS / Pilot)</p>	
13.	What are the constraints for implementation?	Installation and application of the system may require the approval of the bridge owner and local regulatory authorities. At the same time, the frontend equipment of the system must be installed on the outside of the bridge with an additional installation bracket, which may not have been considered at the beginning of the bridge design and construction. But it is undeniable that once the system is established, it will		<p>High end equipment</p> <p>Need to install and maintain equipment</p> <p>Weather, vibration, etc (as noted previously)</p>	

	Question	Technology Candidate Response		Working Group Response	<div> <div>Green</div> <div>Amber</div> <div>Red</div> </div>
		Infrastructure	User		Status
		bring great convenience to vessel traffic monitoring near the bridge.			
14.	what is the capability of the technology? (i.e. nominal range; data throughput; support for audio / video?)	The detailed technical capability of the system has been described in the input paper. The measurement error of all targets' air draft within a range of 5 km can be less than 1 meter.		Noted	
15.	What is the scalability of the technology?	Yes, the system has been designed with multiple data interfaces, which can access tide and hydrometeorological data as needed for users to grasp the real-time natural environmental condition in the bridge water.	The system could also be used for ship identification to monitor smuggling.	Appears to be very scalable with the offsite calculations and updates of equipment. Identified additional uses.	
16.	Is the technology backward compatible?	Yes, with extensive backward compatibility, the data processing and analysis software of this system is an open platform, which can be accessed by a variety of		Note	

	Question	Technology Candidate Response		Working Group Response	<div> <div>Green</div> <div>Amber</div> <div>Red</div> </div>
		Infrastructure	User		Status
		digital objects based on data protocols. And this system can also be used as a subsystem for others.			
17.	Is the technology dependent on another technology?	The concept framework of this technology is completely independent of other technologies, but the performance of the system may be affected by the capability of equipment selected such as radar, electro-optical sensor turret, etc. And the data processing relies on the image identification and analysis technology.		Noted – this is a combined use of different technologies.	
18.	Can the technology be demonstrated?	Yes. A preliminary test and error data collection in Zhoudai Bridge water had been conducted.		Noted (updated presentation for DTEC02)	
19.	Are there any results and test bed? Please List	The prototype test was conducted and the first application had recently received a preliminary		Noted (amend based on discussion / DTEC02 presentation)	

	Question	Technology Candidate Response		Working Group Response	<div> <div>Green</div> <div>Amber</div> <div>Red</div> </div>
		Infrastructure	User		Status
		acceptance and approval for ongoing trail run.			
20.	Is there a compliance summary?	<p>There is no quality evaluate or certification for the overall system at the present stage, however the design and operation of the system comply with the following mandatory national standards of China:</p> <p>GB/T 37417 (IEC62065) Maritime navigation and radiocommunication equipment and systems track control systems operational and performance requirements, methods of testing and required test results</p> <p>GB/T 25444.1(IEC61892) Mobile and fixed offshore units' electrical installations--Part 1: General requirements and conditions</p>		[to confirm – is the combination of the sensors / calculations and presentation included in any quality monitoring or quality management approach]	
	Are there legal issues	No. The system uses		To be discussed further following DTEC02	

	Question	Technology Candidate Response		Working Group Response	<div> <div>Green</div> <div>Amber</div> <div>Red</div> </div>
		Infrastructure	User		Status
21.	associated with the implementation of the technology?	existing technology. The implementation of the technology could result in requirement for use in operational procedures.		presentation.	
22.	Are there any intellectual property rights (essential patents) associated with the technology?	There is no patent at the moment, a patent for the computer algorithm is applying.		At this moment, no idea/possibility to export further. The approach takes existing equipment and combines with standard formula to identify air draft clearance.	
23.	Is the technology safe to use?	Yes.		Noted	
24.	Does the use of the technology require extra training?	No, the system UI is very easy for users to operate, no additional training is required. And a user manual is under development.		Noted	
25.	Are there environmental considerations with the technology?	No environmental impacts, no noise and light pollution will be produced though it hasn't been marine or environmental qualified. Compliance matter has also been mentioned in item 20.		Technology does not cause concern for environmental considerations, but it is affected by environmental changes (vibration, weather, etc.)	

	Question	Technology Candidate Response		Working Group Response	<div> <div>Green</div> <div>Amber</div> <div>Red</div> </div>
		Infrastructure	User		Status
26.	What are the financial considerations for implementation and use?	A periodical comprehensive maintenance may be required once the system is deployed so that a dedicated funds is required. Also, the cost of the first deployment of the system has been mentioned in item 12.		Initial cost of high-end equipment Maintenance	
27.	Is the technology secure (i.e. protected against hacking; privacy of data)?	Yes, it's safe and reliable, since the system data transmission was designed through a dedicated line or LAN encryption network, also can be customized.		System in use in China is on an intranet (secure, internal) system. If provided outside this system would require additional cyber security assessment.	
28.	Readiness (EU Technology Readiness level - TRL) (level of maturity of technology)	The system can be deemed as TRL 7- 8, since an application test and technical demonstration had been conducted and the first application project case was basically completed.		Noted – based on existing equipment Newer approach is the combination of equipment with the formula for SADRMT, also the presentation of the information to the user.	
29.	Can you provide independent references?	Yes, to be supplied separately. Detailed information has been			

	Question	Technology Candidate Response		Working Group Response	Green	Amber	Red	
		Infrastructure	User		Status			
		contained in the input paper. News information (Chinese language): https://mp.weixin.qq.com/s/K5tPu2DCh6qBhNHS-o-IHg						