



***ICG-12 Kyoto Japan
November 2017***

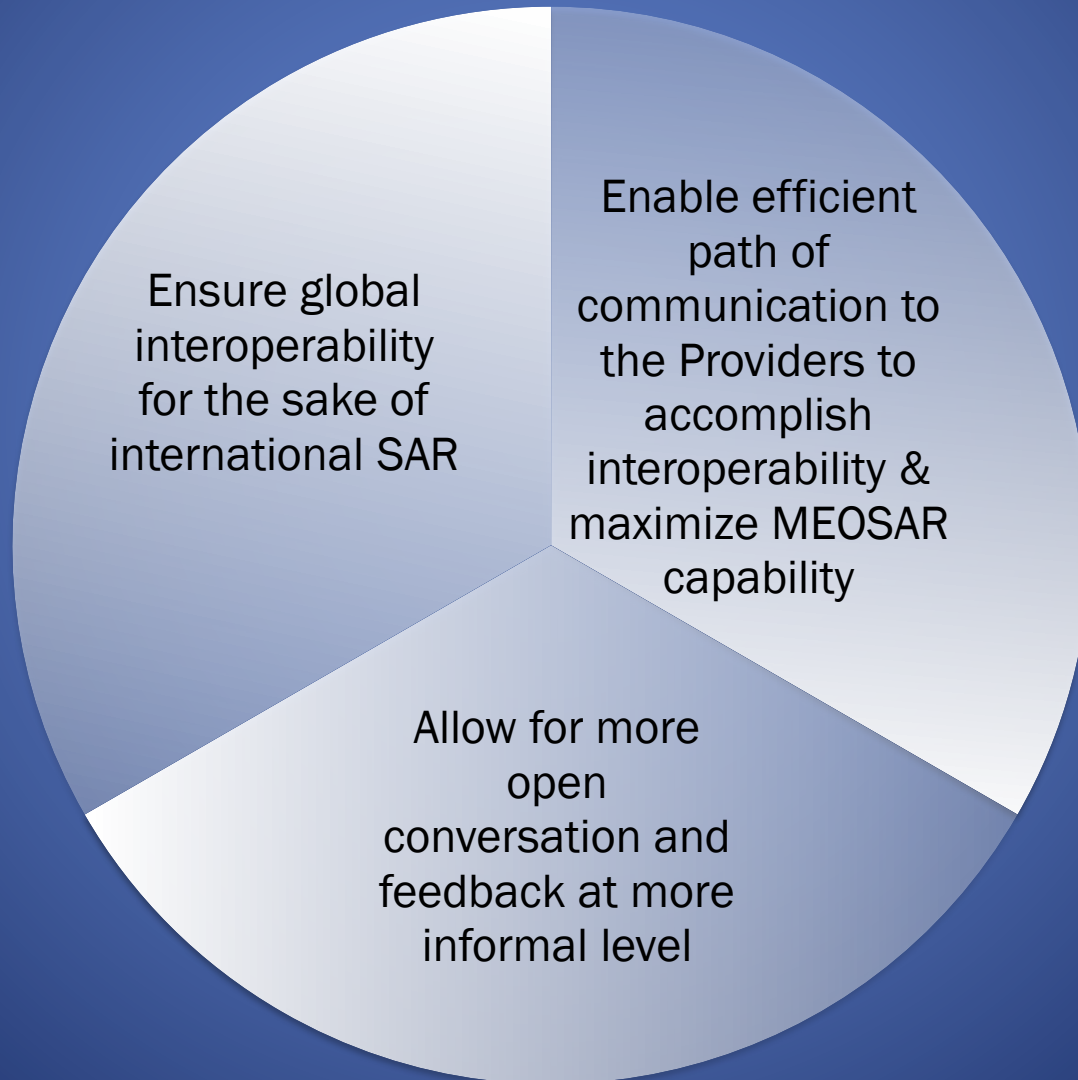
Dr. Lisa Mazzuca

SEARCH AND RESCUE



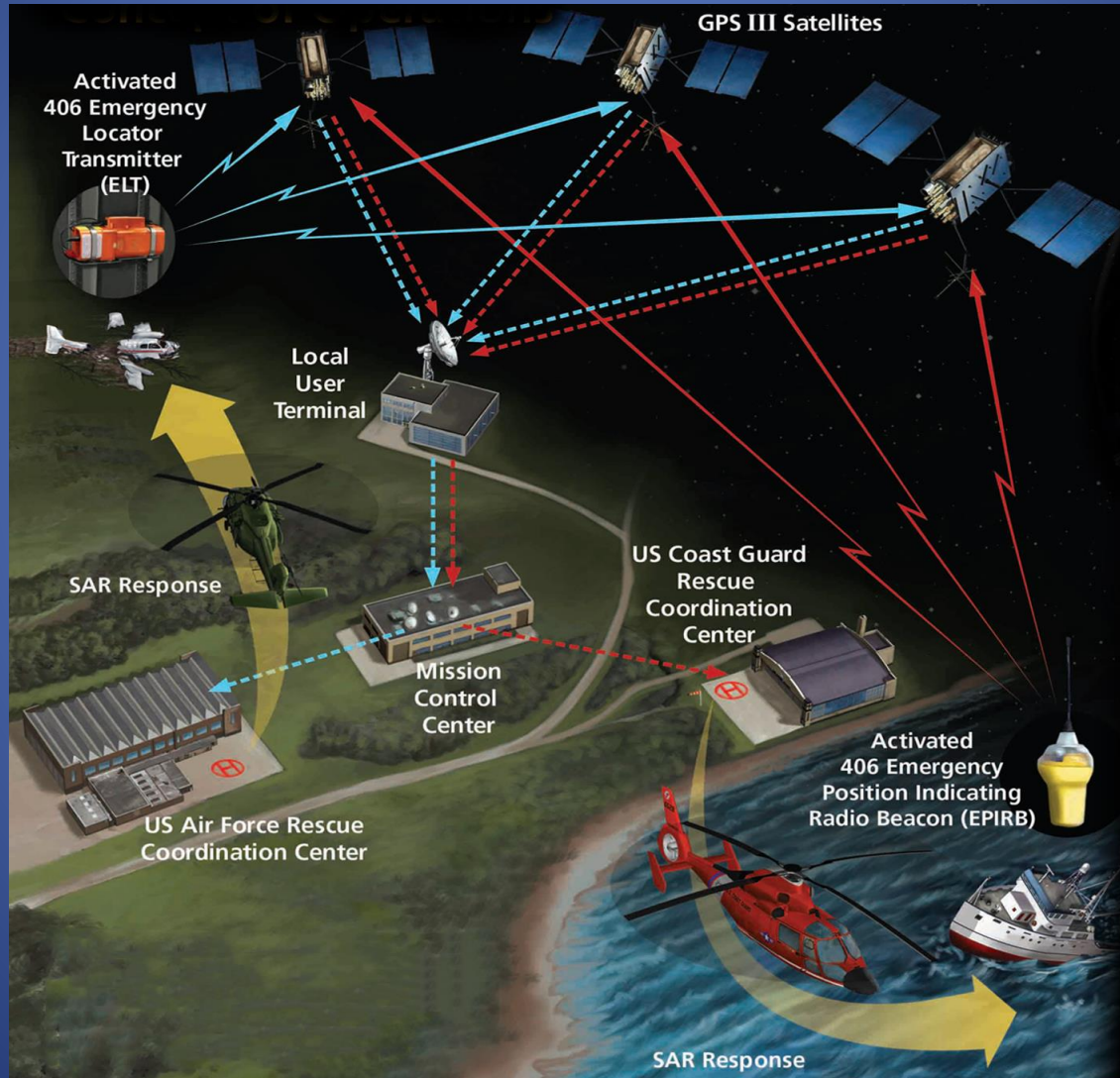


MEOSAR: ICG Goals





MEOSAR: CONCEPT OF OPERATIONS





MEOSAR: NEXT GENERATION OF SATELLITE-AIDED SAR



- *Based on the use of SAR Repeaters carried onboard GNSS constellations*
- *Benefits...*
 - *Multiple satellites in view of the beacon anywhere in the world at all times*
 - *Advanced location process using time and frequency measurements of beacon signal to triangulate its location*
- *Near instantaneous beacon detection and location, globally, at all times*
- *Mitigates terrain blockage because of multiple look angles from multiple moving satellites*
- *Simple space segment repeater allows for development of higher performance beacon signal*





MEOSAR: SPACE SEGMENT



GALILEO CONSTELLATION ⁽¹⁾					
Names	C/S ID	Pay Load Status	Downlink Frequency	Comments	Launch Date
GSAT-0101	411	N/A	L-band	Should not be tracked as not equipped with SAR repeater. However, will be used for the Galileo RLS.	21-Oct-2011
GSAT-0102	412	N/A	L-band	Should not be tracked as not equipped with SAR repeater. However, will be used for the Galileo RLS.	21-Oct-2011
GSAT-0103	419	F	L-band	Used for signal validation.	12-Oct-2012
GSAT-0104	420	F	L-band	Payload power problem beginning 27-May-2014 led to permanent loss of E5 and E6 transmissions, E1 transmission restored.	12-Oct-2012
GSAT-0201	418	F	L-band	Launched into incorrect orbit; moved to usable orbit in December 2014. Sends test signals.	22-Aug-2014
GSAT-0202	414	F	L-band	Launched into incorrect orbit; moved to usable orbit in March 2015. Sends test signals.	22-Aug-2014
GSAT-0203	426	F	L-band	Available from 03-Dec-2015.	27-Mar-2015
GSAT-0204	422	F	L-band	Available from 04-Dec-2015.	27-Mar-2015
GSAT-0205	424	F	L-band	Available from 28-Jan-2016.	11-Sep-2015
GSAT-0206	430	F	L-band	Available from 28-Jan-2016.	11-Sep-2015
GSAT-0208	408	F	L-band	Available from 22-Apr-2016.	17-Dec-2015
GSAT-0209	409	F	L-band	Available from 22-Apr-2016.	17-Dec-2015
GSAT-0210	401	IOC	L-band	Declared IOC Status on 08-Dec-2016.	24-May-2016
GSAT-0211	402	IOC	L-band	Declared IOC Status on 08-Dec-2016.	24-May-2016
GSAT-0212	403	IOC	L-band	Declared IOC Status on 01 August 2017	17-Nov-2016
GSAT-0213	404	IOC	L-band	Declared IOC Status on 09 August 2017	17-Nov-2016
GSAT-0214	405	IOC	L-band	Declared IOC Status on 02-June-2017.	17-Nov-2016
GSAT-0207	407	IOC	L-band	Declared IOC Status on 02-June-2017.	17-Nov-2016



MEOSAR: SPACE SEGMENT



GPS CONSTELLATION ⁽²⁾					
Names	C/S ID	Pay Load Status	Downlink Frequency	Comments	Launch Date
GPS BIIR-7	318	IOC	S-band	Experimental payload (DASS).	30-Jan-2001
GPS BIIR-8	316	IOC	S-band	Experimental payload (DASS).	29-Jan-2003
GPS BIIR-11	319	IOC	S-band	Experimental payload (DASS).	20-Mar-2004
GPS BIIR-12	323	IOC	S-band	Experimental payload (DASS).	23-Jun-2004
GPS BIIR-13	302	IOC	S-band	Experimental payload (DASS).	06-Nov-2004
GPS BIIRM-1	317	IOC	S-band	Experimental payload (DASS).	26-Sep-2005
GPS BIIRM-3	312	IOC	S-band	Experimental payload (DASS).	17-Nov-2006
GPS BIIRM-4	315	IOC	S-band	Experimental payload (DASS).	17-Oct-2007
GPS BIIRM-5	329	IOC	S-band	Experimental payload (DASS).	20-Dec-2007
GPS BIIF-2	301	IOC	S-band	Experimental payload (DASS).	16-Jul-2011
GPS BIIF-3	324	IOC	S-band	Experimental payload (DASS).	04-Oct-2012
GPS BIIF-4	327	IOC	S-band	Experimental payload (DASS).	15-May-2013
GPS BIIF-5	330	IOC	S-band	Experimental payload (DASS).	21-Feb-2014
GPS BIIF-6	306	IOC	S-band	Experimental payload (DASS).	17-May-2014
GPS BIIF-7	309	IOC	S-band	Experimental payload (DASS).	02-Aug-2014
GPS BIIF-8	303	IOC	S-band	Experimental payload (DASS).	29-Oct-2014



MEOSAR: SPACE SEGMENT



Names	C/S ID	Pay Load Status	Downlink Frequency	Comments	Launch Date
GPS BIIF-9	326	IOC	S-band	Experimental payload (DASS).	25-Mar-2015
GPS BIIF-10	308	IOC	S-band	Experimental payload (DASS).	15-Jul-2015
GPS BIIF-11	310	IOC	S-band	Experimental payload (DASS).	31-Oct-2015
GPS BIIF-12	332	IOC	S-band	Experimental payload (DASS).	05-Feb-2016
GPS III S-Band			S-Band	Experimental payload (DASS); first 8 satellites will provide DASS	Planned mid 2018
GPS III L-Band			L-Band	Equipped with Canadian MEOSAR L-band repeaters, delivery for the first repeaters for late 2021.	Planned not earlier than 2023



MEOSAR: SPACE SEGMENT



GLONASS CONSTELLATION					
Names	C/S ID	Pay Load Status	Downlink Frequency	Comments	Launch Date
Glonass-K1 No.1	501	A	L-band	Can be used for detection testing only. Glonass-K1 No.1 is not included in the Glonass navigation-satellite constellation and is not transmitting navigational signals nor ephemerides constantly.	26-Feb-2011
Glonass-K1 No.2	502	A	L-band	Can be used for detection and location testing. Possibility to be used in the operational constellation navigation satellite. Glonass-K1 No.2 is expected to be included in the Glonass navigation-satellite constellation in the future and is transmitting navigational signals and ephemerides.	30-Nov-2014
Glonass-K1 No.3					Planned 2018 Q3

Legend:

A Available for ground segment testing



MEOSAR: SPACE SEGMENT



BDS & Cospas-Sarsat: C-S JC-31 (Oct 2017) China Working Papers

*BDS 406 MHz MEOSAR
REPEATER TECHNOLOGY
STATUS
(JC31-9/2)*

Executive Summary

This document describes the Beidou 406 MHz MEOSAR repeater onboard BDS technology status including repeater configuration, modes of operation and performance characteristics

*DEVELOPMENT PLAN
FOR BDS MEOSAR
PAYLOAD SYSTEM
(JC31-9/3)*

Executive Summary

This document presents the launch plan of BDS MEO satellites carrying MEOSAR payloads



MEOSAR: SPACE SEGMENT



BDS & Cospas-Sarsat

C-S JC-31 Splinter Group Considerations

Conclusions, Recommendations and Action Items:

- 1) The attached draft inserts to C/S R.012 be accepted by the TWG and offered to the Joint Committee for consideration and recommendation to CSC-59 for inclusion in R.012 should Council decide proceed with the integration of the SAR/Beidou system into the C/S MEOSAR System;
- 2) The TG consider the following action items to invite:
 - a. EC, China and other interested Space Segment providers to address the proposed Beidou downlink being at precisely the same frequency but opposite polarity as the Galileo downlink;
 - b. interested space segment providers, China and the Secretariat to further develop changes to C/S R.012 and other C/S documentation for CSC-59 and future meetings; and
 - c. Space Segment providers to start collaborating with China on coordination matters and to provide progress updates at CSC-59 and future meetings.



MEOSAR: SPACE SEGMENT



BDS & Cospas-Sarsat

C-S JC-31 General Comments

- Inclusion of the BDS MEOSAR Payload System into the Cospas-Sarsat constellation would require interactions at the programmatic and technical levels:
 - *Programmatic*: an instrument of cooperation would need to be agreed between China and the Cospas-Sarsat Council to lay a formal foundation document for the BDS space segment contribution
 - *Technical*: exchange of information would need to be organized between technical experts of China and other Space Segment providers to ensure that the BDS contribution is compatible and interoperable with Cospas-Sarsat and, in particular, does not present a radio-frequency interference risk to other Cospas-Sarsat space segments



MEOSAR SPACE SEGMENT: NEXT STEPS



- Amend terms of reference of the MEOSAR Space Segment Correspondence Working Group or to set up a dedicated Task Group to review the MEOSAR space segment interoperability parameters in order to adapt to the evolution of MEOSAR since the interoperability parameters were originally adopted in CS R.012 at JC-21/CSC-40 (2007)
- Demonstration and Evaluation of the MEOSAR system continues to progress
 - Phase III (last phase) is testing system performance with only L-Band payloads; all based on Galileo SAR payloads
 - Data collection began Feb 2017; second set of data to be collected in early 2018