The 7th International Symposium

Reducing the Costs of Spacecraft Ground Systems and Operations (RCSGSO)

11-15 June 2007
Space Research Institute (IKI)
Moscow, Russian Federation

Sponsored by
Space Research Institute (IKI)
Federal Space Agency of the Russian Federation (ROSCOSMOS)
European Space Agency (ESA)
CONTENTS

Opening Session

WELCOME ADDRESS
R. Nazirov

WELCOME ADDRESS
G. Winters

MORE RELIABLE, MORE EFFECTIVE, LESS EXPENSIVE
L. Zelenyi

ASTRONAUTICS FROM THE FIRST SATELLITE TILL NOW
G.M. Chernyavskiy

ON 50 YEARS OF THE COSMIC ERA: SHORT OVERVIEW
B. Rabinovich

Session 1A1: Cost Mission Operations Concept I
Chair: Peter Allan

COST EFFICIENT EVOLUTION OF THE ESA NETWORK IN THE SPACE ERA
P. Maldari & N. Bobrinsky

LOW-COST OPERATIONS CONCEPT FOR THE DSN
J.I. Statman, M.S. Gatti & D.S. Bagri

SESSION SUMMARY

Session 1A2: Cost Mission Operations Concept II
Chair: Mike Fawcett

CNES PROTEUS/MYRIADE LOW COST SATELLITE FAMILIES: LESSONS LEARNED AFTER 5 YEARS AND WITH 9 SATELLITES WORKING ON ORBIT AND FUTURE IMPROVEMENTS CONCERNING GROUND SEGMENT AND OPERATIONS
P. Lods

IMPLEMENTATION OF LOW-COST GROUND SEGMENT BY THE EXAMPLE OF INFORMATION SYSTEM FOR SOLAR SAIL MISSION
V. Nazarov, V. Gotlib, I. Bashe, V. Korotkov, Ya. Markov, R. Nazirov, A. Tretiyakov & V. Skorodumov

ELABORATION ON COST SAVINGS BY USING TECHNOLOGY DEMONSTRATION NANOSATELLITES
Yu.M. Urlichich, A.S. Selivanov & V.M. Vishnyakov

BIRD OPERATION DURING EXTENDED MISSION PERIOD
H. Wuesten & V. Wood

SESSION SUMMARY
Session 1B1: Ground Communications I  
**Chair:** Jean-Marc Soula

**COMMON GROUND SYSTEM ARCHITECTURE FOR MULTIPLE MISSIONS**  
G. Griffith, M. Mejia & J. Handiboe

**CONCEPT AND ACHIEVEMENTS OF JAXA GROUND NETWORK SYSTEM**  
T. Fuse, Y. Taromaru, N. Yagi & M. Ohta

**COMPUTING AND NETWORK RESOURCES SHARING FOR INFRASTRUCTURE COST REDUCTION**  
G. Buscemi, L. Fusco, M.E. Forcada Arregui & G. Chionchio

SESSION SUMMARY

Session 1B2: Ground Communications II  
**Chair:** Nathan Eismont

**GROUND NETWORK SUPPORT OF THE CONSTELLATION FLIGHT VEHICLES DURING PRE-LAUNCH, LAUNCH AND ASCENT**  

**SLE SENTRY: A COST-EFFECTIVE SECURITY APPROACH IN CROSS-SUPPORT SLE ENVIRONMENTS**  
M. Butkovic

SESSION SUMMARY

Session 1C1: New Technology for Operations I  
**Chair:** Leslie Deutsch

**COMPLEX FOR ESTIMATION OF STATUS OF NEAR-EARTH SPACE OBJECTS ON THE BASIS OF CORRELATION-PHASE LOCATOR AND NETWORK OF OPTOELECTRONIC MEANS**  
A.N. Kalchenko & G.Y. Harlamov

**THE QUICK ALMOST OPTIMAL MULTITHRESHOLD DECODERS FOR NOISY GAUSSIAN CHANNELS**  
V.V. Zolotarev, R.R. Nazirov & I.V. Chulkov

**ARCHIVA: NEW GENERATION TELEMETRY ARCHIVING AND VISUALIZATION**  
J.-C. Gil, S. Reguera, P. Honold & T. Morel

SESSION SUMMARY

Session 1C2: New Technology for Operations II  
**Chair:** Paolo Maldari

**REGATES – A NEW GENERATION OF AUTOMATED MONITORING & CONTROL (M&C) SYSTEM**  
P. Landrodie, A. Carlier, T. Racaud, J. Anesi & O. Cormerais

**MONO-POINT SYSTEM OF MONITORING A STATUS OF MULTY-PURPOSE SPACE VEHICLES**  
G.Y. Harlamov & M.N. Meshkov

SESSION SUMMARY
**Session 2A1: Low Cost Mission Operations Concept III**  
*Chair: James Costrell*

**TRAFFIC PLANNING AND CAPACITY OPTIMIZATION FOR FLEXIBLE SERVICE IN TELECOMMUNICATION SATELLITE SYSTEMS**  
*S. Robichez & S. Bares*

**IMPROVING THE PERFORMANCE AND PRODUCTIVITY OF EUROPEAN SCIENTIFIC PAYLOAD SYSTEMS**  
*P.A. Chaizy, P.M. Allan, T.G. Dimbylow, C.H. Perry, M.A. Hapgood, M.G. Hutchinson & A.F. Chadwick*

**CATDS : SMOS GROUND SEGMENT L3/L4 DATA PROCESSING GROUND SEGMENT**  
*R. Moreno, Y. Kerr & F. Bermudo*

**SESSION SUMMARY**

**Session 2A2: Low Cost Mission Operations Concept IV**  
*Chair: Paolo Maldari*

**OPERATIONS MODELING FOR THE HUBBLE SPACE TELESCOPE MISSION**  
*M. Prior & N. Wright*

**GIOVE-A: LOW COST OPERATIONS FOR ESA’S FIRST GALILEO SATELLITE**  
*C. Jackson, A. Brown, G. Gatti & M. Manteiga Bautista*

**COST EFFECTIVE OPERATIONS – AT WHAT COST?**  
*Z. Mounzer, P. Bearman & D. Salt*

**SESSION SUMMARY**

**Session 2B1: Flight Dynamics & Navigation I**  
*Chair: Leslie Deutsch*

**OUTLOOK FOR THE EPHemeris AND TIME DATA SERVICE DEVELOPMENT OF THE INTERNATIONAL GLOBAL NAVIGATION SATELLITE SYSTEM GLONASS**  
*A.V. Zabokritsky, V.V. Pasyukov, E.V. Titov, A.V. Kruglov, M.S. Leonov, V.A. Romanyuk & V.M. Vatutin*

**JAXA NEW FLIGHT DYNAMICS SYSTEM DEVELOPMENT AND ITS PURPOSE**  
*H. Kazama, M. Miyoshi, Y. Taromaru, S. Taniguchi, S. Kawazoe & K. Shinozaki*

**RE-ENTRY OF GEOSTATIONARY SATELLITE TO THE EARTH USING LUNAR GRAVITY ASSIST**  
*V.V. Ivashkin*

**SESSION SUMMARY**

**Session 2B2: Standardisation I**  
*Chair: Kaneaki Narita*

**GROUND SYSTEMS STANDARDIZATION AND COMMONALITY: RESULTS FROM WORKING GROUP AT GROUND SYSTEMS ARCHITECTURE WORKSHOP (GSAW) 2007**  
*M.H. Nadel*

**SECURITY AT ANY COST? - INTRODUCING A COST-AWARE AND INTEROPERABLE SECURITY REFERENCE ARCHITECTURE**  
*D. Fischer, T. Engel & M. Merri*

**TOWARDS THE FUTURE SPACECRAFT MONITORING AND CONTROL CCSDS STANDARDS AT CNES**  
*E. Poupart & P.A. Cros*

**SESSION SUMMARY**
Session 2C1: Global Networks for Space Operations I
Chair: Nathan Eismont

NASA’S GROUND NETWORK COST REDUCTION STRATEGY AND INITIATIVES
J.T. Jackson & H. Schenk

APPLICATION OF TELECOMMUNICATION SYSTEM “GLOBALSTAR” FOR NANOSATELLITE CONTROL

SESSION SUMMARY

Session 2C2: Autonomous Mission Operations I
Chair: Peter Allan

JWST: MAXIMIZING EFFICIENCY AND MINIMIZING GROUND SYSTEMS
I. Dashevsky & V. Balzano

SOME ASPECTS OF OPERATIONS AND CONTROL FOR SYSTEM OF FOUR SATELLITES IN INTERBALL PROJECT
G. Zastenker, N. Eismont, V. Prokhorenko, R. Kovrazhkin, L. Chesalin & I. Tserenin,

A. SHEIKHET, A. SELIVANOV, V. STEPANJANTSC, P. TRISKA & JA. VOJTA
SENSOR WEB TECHNOLOGIES: A NEW PARADIGM FOR OPERATIONS
R. Sherwood & S. Chien

EOS OPERATIONS SYSTEMS: EDOS IMPLEMENTED CHANGES TO REDUCE OPERATIONS COSTS
G. Cordier, C. Gomez-Rosa & B. McLemore

SESSION SUMMARY

Session 3A1: Low Cost Mission Operations Concept V
Chair: Luca Salotti

INTEGRATED INSTUMENTS FOR SPACECRAFT AUTONOMOUS NAVIGATION
G.A. Avanesov, A.A. Forsh, R.V. Bessonov, Ya.L. Ziman & M.I. Kudelin

SESSION SUMMARY

Session 3A2: Low Cost Mission Operations Concept VI
Chair: Kaneaki Narita

40TH ANNIVERSARY OF THE GROUND STATION PANSKA VES
F. Hruska, J. Chum, J. Vojta & D. Shklyar

BUILDING THE SCISAT MISSION OPERATIONS CENTRE ON A SHOESTRING BUDGET
P. Hogan

SESSION SUMMARY
Session 3A3: Low Cost Mission Operations Concept VII
Chair: Patrick Hogan

MINI AND MICRO SATELLITES GROUND SEGMENT MODELIZATION AND OPTIMIZATION
J. Faure, A. Cabarbaye, J.-L. Mestre, R. Laulheret & N. Giraudon

EARTH OBSERVATION INTEGRATED FAMILY OF MISSIONS CONCEPT: A COST EFFECTIVE APPROACH TO MISSION OPERATIONS PREPARATION AND EXECUTION
P.P. Emanuelli & N. Mardle

REDUCING DEVELOPMENT AND OPERATIONS COST USING NASA’S “GMSEC” SYSTEMS ARCHITECTURE
D. Smith, J. Bristow & P. Crouse

SESSION SUMMARY

Session 3A4: Low Cost Mission Operations Concept VIII
Chair: Patrick Hogan

AUTOMATING GROUND SYSTEM TO REDUCE MULTI-SATELLITE OPERATIONS COST

REDUCING OPERATIONS COSTS THROUGH SPACE NETWORKING
L.J. Deutsch, R.J. Doyle, E.J. Wyatt & L.P. Clare

SESSION SUMMARY

Session 3B1: SW Development & Maintenance I
Chair: Gennadiy Y. Harlamov

REPEATABLE AUTOMATED DEPLOYMENT OF GROUND SYSTEMS
L.-P. Durocher & L. Hartman

EPOCH FOR THE METOP SPACECRAFT
J. Byrne & J. Consiglio

SESSION SUMMARY

Session 3B2: SW Development & Maintenance II
Chair: Paolo Maldari

TECHNOLOGY OF AUTOMATED SATELLITE DATA ARCHIVING AND REPRESENTING SYSTEMS DEVELOPMENT
M. Bourtsev, E. Loupian, A. Mazurov, R. Nazirov, E. Flitman & A. Proshin

EVOLUTION OF THE POLDER SCIENTIFIC GROUND SEGMENT TOWARDS A MULTI-MISSION PARASOL/POLDER CENTER
E. Orsal, P. Bourrousse & F. Bailly-Poirot

SESSION SUMMARY
Session 3B3: Flight Dynamics & Navigation II
Chair: Joseph Statman

REDUCING FLIGHT DYNAMICS COSTS BY AUTOMATING AN EXISTING SYSTEM
L. Lorda & C. Fremeaux

REDUCING RISK AND COST ON SATELLITE FLIGHT DYNAMICS OPERATIONS: OPERATIONS AUTOMATION
F.M. Martínez Fadrique & M.A. Molina Cobos

THE CONTROL OF JAMAL-200 ATTITUDE USING ANGULAR MOTION MATHEMATICAL MODEL
Yu.R. Banit, N.N. Sevastianov, V.N. Branets, M.Yu. Belyaev, D.A. Zavalishin, V.N. Platonov & V.V. Sazonov

SESSION SUMMARY

Session 3B4: Flight Dynamics & Navigation III
Chair: Joseph Statman

DEVELOPMENT OF AUTONOMOUS ORBIT DETERMINATION SPACECRAFT’S CONTROL SYSTEM FOR SCIENTIFIC RESEARCH EXPERIMENTS
E.L. Akim, V.A. Stepaniants, A.G. Tuchin, D.A. Tuchin, V.C. Yaroshevsky, R.V. Bakiko, A.P. Astahov & V.P. Polshikov

OPERATIONAL APPROACH OF THE METOP FLIGHT DYNAMIC FACILITY
P.L. Righetti, F. Sancho, A. Damiano & P. Garcia

DETERMINATION AND PREDICTION OF ISS MOTION BY USING MEASUREMENTS OF SATELLITE NAVIGATION SYSTEMS
M.Yu. Belyaev, D.N. Rulev, E.S. Medvedev, M.V. Mikhailov, V.N. Branets & V.V. Sazonov

SESSION SUMMARY

Session 3C1: Autonomous Mission Operations II
Chair: Kaneaki Narita

LIGHTS OUT AUTONOMOUS OPERATION OF AN EARTH OBSERVING SENSORWEB

COST EFFECTIVE GROUND OPERATIONS AT ESA: THE MATURITY OF THE CONCEPTS
O. Camino, E. Montagnon, A. Accomazzo, M. Denis, J. Volpp & P. Ferri

ON-BOARD REAL-TIME IMAGE PROCESSING TO SUPPORT LANDING ON PHOBOS
B. Zhukov, G. Avanesov, V. Grishin & E. Krasnopevitsva

SESSION SUMMARY

Session 3C2: Autonomous Mission Operations III
Chair: Mike Fawcett

EXPERIENCE FROM DEVELOPING AN AUTONOMOUS MULTI MISSION DATA CAPTURE SYSTEM
E. Grande, A. Nyland & H. Gamst

REDUCING COST USING A RELIABLE DOWNLINK PROTOCOL (CFDP) AND AN ONBOARD FILE SYSTEM
D. Sibol, W. Stratton, J. Harrison & A. Calloway

SESSION SUMMARY
**Session 3C3: New Technology for Operations III**  
*Chair: Gennadiy Y. Harlamov*

**AUTOMATED PLANNING OF ESA’S TRACKING NETWORK SERVICES**  
*M. Niézette, M. Götzelmann & G.P. Calzolari*

**INTELLIGENT SYSTEMS FOR ADVANCED MISSION OPERATIONS**  
*D. Korsmeyer & E. Smith*

**SOME ASPECTS OF GROUND SEGMENT FOR PROSPECTIVE SCIENCE SPACE MISSIONS**  
*R. Nazirov, N. Eismont & V. Nazarov*

**SESSION SUMMARY**

**Session 3C4: New Technology for Operations IV**  
*Chair: Mike Fawcett*

**ADVANCED TECHNOLOGY INFUSION IN SUPPORT OF MISSION OPERATIONS: THE ESOC EXPERIENCE**  
*A. Donati, J. Martinez-Heras & A. Baumgartner*

**VIRTUAL CONTROL CENTERS AS A MEANS OF LOWERING SPACECRAFT OPERATIONS COSTS**  
*C. Corsten, D. Croenne, F. Lang, J. Pattinson, T. Tomlinson, S. Turco & P. Yotova*

**MOVING OF SPACECRAFT GROUND SYSTEMS INTO SPACE AS A TOOL FOR REDUCING OPERATIONS COST**  
*R. Nazirov, N. Eismont, V. Nazarov & V. Gotlib*

**SESSION SUMMARY**

**Session 4A1: Multi-Mission Support I**  
*Chair: James Costrell*

**SINGLE GROUND CONTROL SYSTEM FOR MULTI-MISSION SATELLITE OPERATIONS – COST EFFECTIVE CASE OF MULTI-MISSION SUPPORT**  
*S.-F. Lin, J. Wang & R. Chao*

**INTEROPERABILITY, EXPANDABILITY AND MULTI-SENSORIALITY (IEM): THE COSMO-SKYMED KEY POINTS FOR A COST-EFFECTIVE BROAD ACCESS TO EO PRODUCTS**  
*G. Casonato, G.F. De Luca, G. Marano, M. Piemontese, B. Versini, F. Caltagirone, A. Coletta & L.G. Ciffo*

**SEQUENCE CONSTRAINT CHECKING IN A MULTI-MISSION ENVIRONMENT**  
*B.A. McLaughlin*

**SESSION SUMMARY**

**Session 4A2: Multi-Mission Support II**  
*Chair: Leslie Deutsch*

**INTEGRATED LOGISTICS SUPPORT AND OPERATIONS: THE COSMO-SKYMED APPROACH FOR OPERATIONAL COSTS REDUCTION OPTIMISING SYSTEM PERFORMANCES**  
*F.Covello, G.F. De Luca, G. Marano, M. De Carlo, A. Pullara & P. De Simone*

**THE GMES SENTINELS FLIGHT OPERATIONS SEGMENT**  
*P. Bargellini, P.P. Emanuelli, K. Nergaard & J.L. Pellon-Bailon*

**THE MULTIMISSION OPERATIONS CONCEPT AT THE GERMAN SPACE OPERATIONS CENTER**  
*M. Schmidhuber & T. Kuch*

**SESSION SUMMARY**
Session 4A3: Multi-Mission Support III  
Chair: Luca Salotti

ENHANCING THE ESA’S MMFI WITH AN AUTOMATIC CONFIGURATION SYSTEM  
A. Tornatore & G.M. Pinna

AUTOMATION AND RESOURCE MANAGEMENT FOR MULTI-ANTENNA GROUND STATIONS  
F.J. Barreiro, D. Firre & K.-J. Schultz

LOWERING THE COST OF MULTI-MISSION SUPPORT FOR SPACE ROBOTICS SIMULATIONS IN MOTS (THE MSS OPERATIONS AND TRAINING SIMULATOR)  
S. Rondeau

SESSION SUMMARY

Session 4B1: SW Development & Maintenance III  
Chair: Peter Allan

LONG-LIFE SPACE OBSERVATORY S/W EXPERIENCES APPLIED TO ON-DEVELOPMENT MISSIONS: LESSONS LEARNED FOR DISTRIBUTED MISSIONS  
J.C. Vallejo & R. Vazquez

A SYSTEM FOR REMOTE CONTROL AND OPERATION MANAGEMENT FOR NETWORK OF SATELLITE DATA CENTERS  
E. Flitman, M. Burcev, E. Loupian, A. Mazurov & A. Proshin

SESSION SUMMARY

Session 4B2: SW Development & Maintenance IV  
Chair: Joseph Statman

EGOS - ESA GROUND OPERATION SOFTWARE  
N. Peccia, Y. Doat, C.R. Haddow, S. Moulin & M. Pecchioli

SOFTWARE RE-USE REVIEW: THE BENEFITS AND FUTURE OF THE COMMON GROUND APPROACH  
D. Sibol, P. McKerracher, R.M. Furrow & W. Stratton

SESSION SUMMARY

Session 4B3: SW Development & Maintenance V  
Chair: Gennadiy Y. Harlamov

AN IMPROVED APPROACH TO SIMULATOR PROCUREMENT  
A.P. Williams

PAIR-PROGRAMMING: A WAY TO REDUCE TIME AND COSTS IN THE DEVELOPMENT OF OPERATIONAL SOFTWARE  
J.A. Martínez-Heras, M. Pantoquilho & A. Donati

IMPROVEMENTS FOR PAYLOAD CONTROL AND DATA CENTRES DEVELOPMENT  
G. Pradels & T. Guinle

PROVEN METHOD TO ELIMINATE GROUND SYSTEM OBSOLESCENCE  
D. Cruickshank, S. Daughtridge, M. Schmitt & A. Aparicio

SESSION SUMMARY
Session 4C1: TT&C Systems I
Chair: L. Salotti

UNIFIED ADVANCED TELEMETRY TRACKING AND CONTROL SYSTEM TO CONTROL SATELLITES OF SCIENTIFIC AND SOCIO-ECONOMIC DESIGNATIONS
V.M. Vatutin, M.S. Leonov, A.V. Kruglov, S.A. Ezhov, V.v.N. Naumov, S.V. Smirnov & Y.I. Poltavets

SMALL-SIZED MOBILE TELEMETRY STATION (MTS)
E.G. Chistov, K.G. Sukhanov & K.E. Chistov

SESSION SUMMARY

Session 4C2: TT&C Systems II
Chair: Jean-Marc Soula

THE GROUND RADIO-TECHNICAL FACILITIES TO CONTROL DEEP-SPACE SPACECRAFT AS AN INSTRUMENT FOR THE SPACE EXPLORATION THROUGH REMOTE SENSING
E.P. Molotov, A.V. Kruglov & V.M. Vatutin

EXTENDING DSN CAPABILITY WITH CROSS-SUPPORT SERVICE FROM THE AUSTRALIA TELESCOPE COMPACT ARRAY
T. Pham, M. Marina, W. Wilson, B. Geldzahler, K. Knights & A. Odea

GROUND SEGMENT TO CONTROL ORBITAL CONSTELLATION THAT COMPRISSES CIVIL COMMUNICATIONS AND BROADCASTING SATELLITES OF STATE DESIGNATION
M.S. Leonov, A.V. Kruglov, V.M. Vatutin, V.N. Naumov, V.M. Snegiryov & S.V. Smirnov

SESSION SUMMARY

Session 4C3: Mission Planning I
Chair: James Costrell

HIGH-PRECISION DETERMINATION OF THE SRT ORBIT IN "RADIOASTRON" MISSION
E.L. Akim, Yu.N. Ponomarev, V.A. Stepanyans, A.G. Tuchin & A.I. Sheikhet

ADM-AEOLUS: REDUCING OPERATIONAL EFFORT BY INNOVATIVE OPERATIONAL CONCEPTS AND MISSION PLANNING
K. Adamson, P. Bargellini, H. Nett & C. Caspar

FLEXPLAN – DEPLOYMENT OF THE MISSION PLANNING SYSTEM FOR THE SMOS MISSION
J. Tejo & F.J. Colmenero

SESSION SUMMARY

Session 5A1: Mission Planning II
Chair: Natan Eismont

A NEW MODEL AND ALGORITHM OF MULTI-OBJECTIVE UNITED IMAGING SCHEDULING
J.Wang, J. Li, N. Jing, X.S. Jin & Y.H. Guo

EXTENDING EKLOPS: NEW APPLICATIONS OF THE MISSION PLANNING KERNEL

EXECUTIVE PLANNING AND REALIZATION OF TRANSPORT OPERATIONS IN THE INTERNATIONAL SPACE STATION PROGRAM
T. Matveeva

SESSION SUMMARY
Session 5B1: SW Development & Maintenance VI  
Chair: Patrick Hogan

GENERIC DESIGN FOR COST REDUCTION IN THE EARTH EXPLORER FAMILY MISSION  
CONTROL SYSTEM!  
V. Reggestad, D. Guerrucci, M. Merri & P.P. Emanuelli  

SESSION SUMMARY

Session 5C1: TT&C Systems IV  
Chair: Jean-Marc Soula

ADVANCED ONBOARD PROCESSING OF TELEMETRY AND TELECOMMANDS  

THE KAZSAT GROUND CONTROL SEGMENT  
M.S. Leonov, A.V. Kruglov, V.M. Vatutin, V.N. Naumov, V.M. Snegiryov & S.V. Smirnov  

QUALITY ASSURANCE/PRODUCT ASSURANCE CONTRIBUTION TO COST REDUCTION (ESOC EXPERIENCE)  
A. Mantino, S. Scaglioni & E. Vicari  

SESSION SUMMARY

CONFERENCE HIGHLIGHTS  
R. Nazirov

CONFERENCE SUMMARY  
P. Maldari

LIST OF PARTICIPANTS

Additional Material  
PHOTO GALLERY  
JAZZ BAND VIDEO