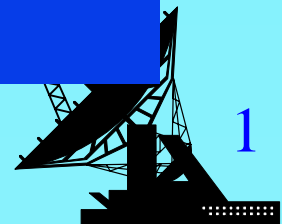
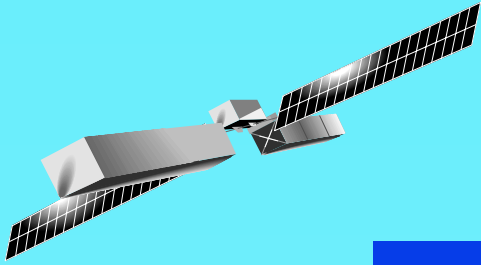


# **HOW ITU AND THE SATELLITE COMMUNITIES CONTRIBUTE TO EFFICIENT USE OF THE ORBIT/SPECTRUM RESOURCES**

**BILL LUTHER**

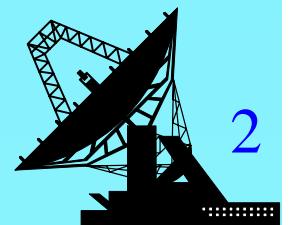
**CONSULTANT  
ASRC MANAGEMENT SERVICES  
OFFICE OF SPECTRUM MANAGEMENT  
RESTON, VIRGINIA**

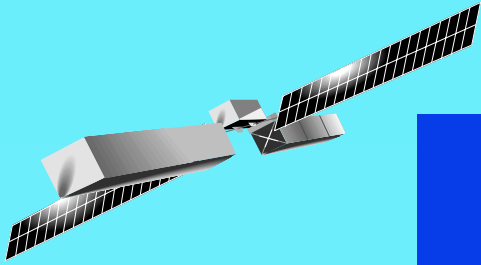




# MAJOR PRINCIPLES

- ◆ FREQUENCY ALLOCATIONS
- ◆ RIGHTS AND OBLIGATIONS TO ACCESS SPECTRUM/ORBIT (PLANS, OTHER PROCEDURES)
- ◆ INTERNATIONAL RECOGNITION (MIFR RECORDING)
- ◆ DETAILED REGULATIONS AND PROCEDURES IN THE RADIO REGULATIONS (RR)
- ◆ RR BINDING INTERNATIONAL TREATY





# ITU RADIOCOMMUNICATION SECTOR



Member States and Sector Members

STUDY GROUPS

WRC

RADIO REGULATIONS BOARD

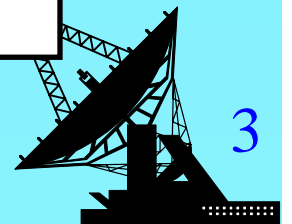
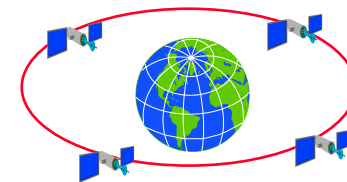
RADIOCOMMUNICATION BUREAU (BR)

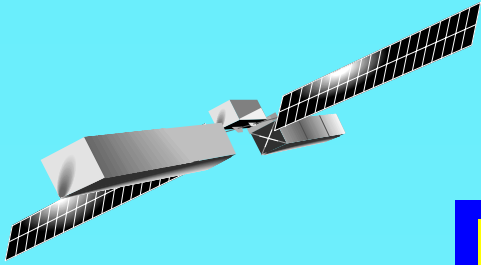
ITU-R Recommendations

Radio Regulations & Resolutions/Rec's

Rules of Procedures

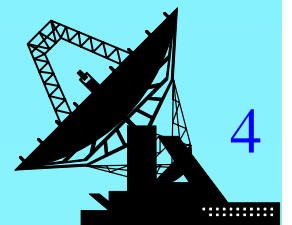
9kHz 300GHz

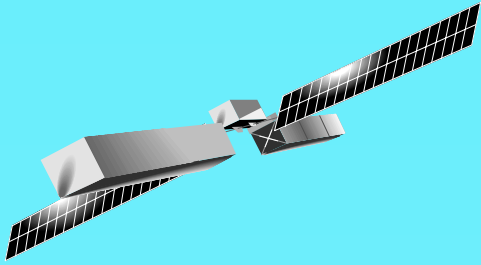




## **ITU-R STUDY GROUPS:**

- RECOMMEND PROTECTION CRITERIA
- RECOMMEND SHARING CRITERIA
- DRAFT TECHNICAL BASES FOR WRCs (TEXT FOR CPM)
- REGULARLY UPDATE PERFORMANCE STANDARDS
- RESPOND TO REQUESTS AND DIRECTION FROM WORLD RADIOCOMMUNICATION CONFERENCES
- DEVELOP SOFTWARE WITH THE BR





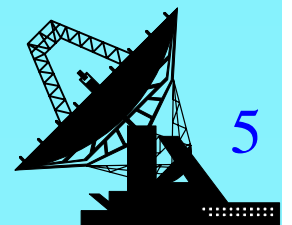
**RADIOCOMMUNICATION CONFERENCE PROPOSALS AND STUDY GROUP WORK ARE GENERATED BOTTOM-UP FROM ADMINISTRATIONS AND OPERATORS...**

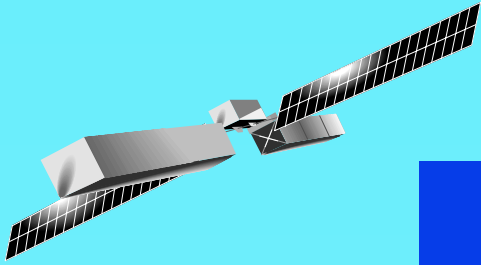
**WITH FEEDBACK FROM**

**- THE RADIOCOMMUNICATION BUREAU**

**AND**

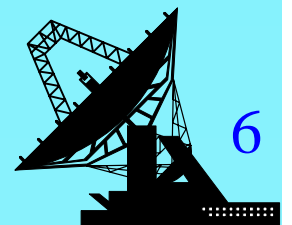
**- THE RADIO REGULATIONS BOARD**

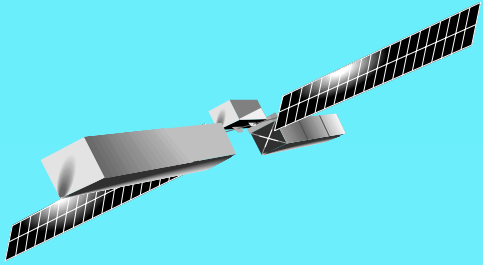




# RADIO REGULATORY PROCEDURES

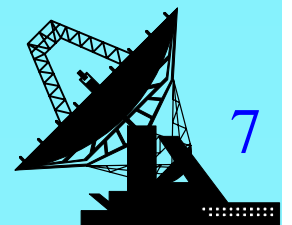
- ◆ DEVELOPED BY WORLD RADIO CONFERENCES
- ◆ TWO MAJOR MECHANISMS:
  - COORDINATION PROCEDURES ENABLE EFFICIENCY OF ORBIT/SPECTRUM USE
  - A PRIORI PLANNING PROCEDURES GUARANTEEING EQUITABLE ACCESS

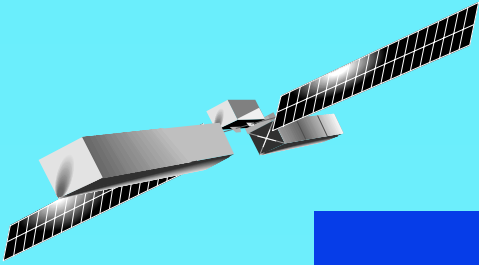




## EQUITABLE ACCESS

- ◆ **FREQUENCY/ORBITAL POSITION PLANS GUARANTEE EQUITABLE ACCESS TO THE SPECTRUM/ORBIT RESOURCES**
  - SPECTRUM SET ASIDE IN EACH REGION FOR FUTURE USE BY ALL COUNTRIES
  - PREDETERMINED ORBITAL POSITION + FREQUENCY SPECTRUM

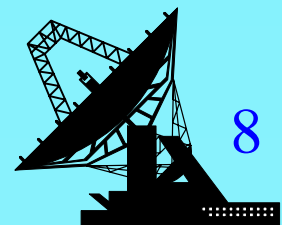




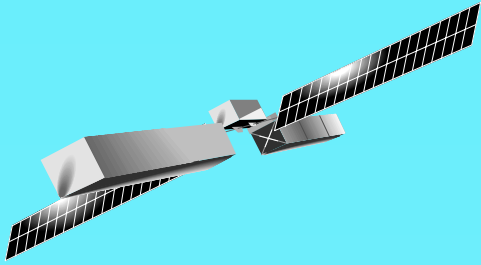
# PLANS

## ◆ Appendices 30, 30A, 30B

- PLANS FOR BSS + FEEDER-LINKS & FSS
- ORBITAL POSITION / PREDETERMINED ARC (PDA)
- FREQUENCY SPECTRUM (CHANNELS)
- NATIONAL SERVICE AREA & TECHNICAL PARAMETERS
- IMPLEMENTATION PROCEDURES
- AP30 and AP30A PLANS FOR REGIONS 1 AND 3 REVIEWED BY WRC-97, WRC-2000, and WRC-2003
- AP30B PLAN REVIEWED BY WRC-2007

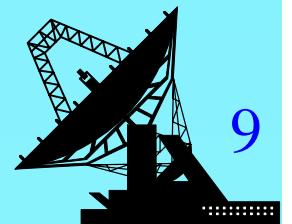


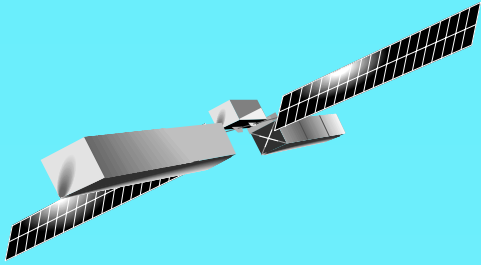




## **REGULATORY STEPS FOR ITU REGISTRATION OF FREQUENCY ASSIGNMENTS**

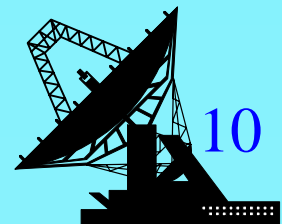
- 1 - SUBMIT ADVANCE PUBLICATION INFORMATION TO ITU**
- 2 - SUBMIT COORDINATION REQUEST TO ITU**
- 3 - OBTAIN COORDINATION AGREEMENTS (IF POSSIBLE)**
- 4 - SUBMIT NOTIFICATION FOR ENTRY IN ITU'S MIFR AS ASSIGNMENTS BROUGHT INTO USE**



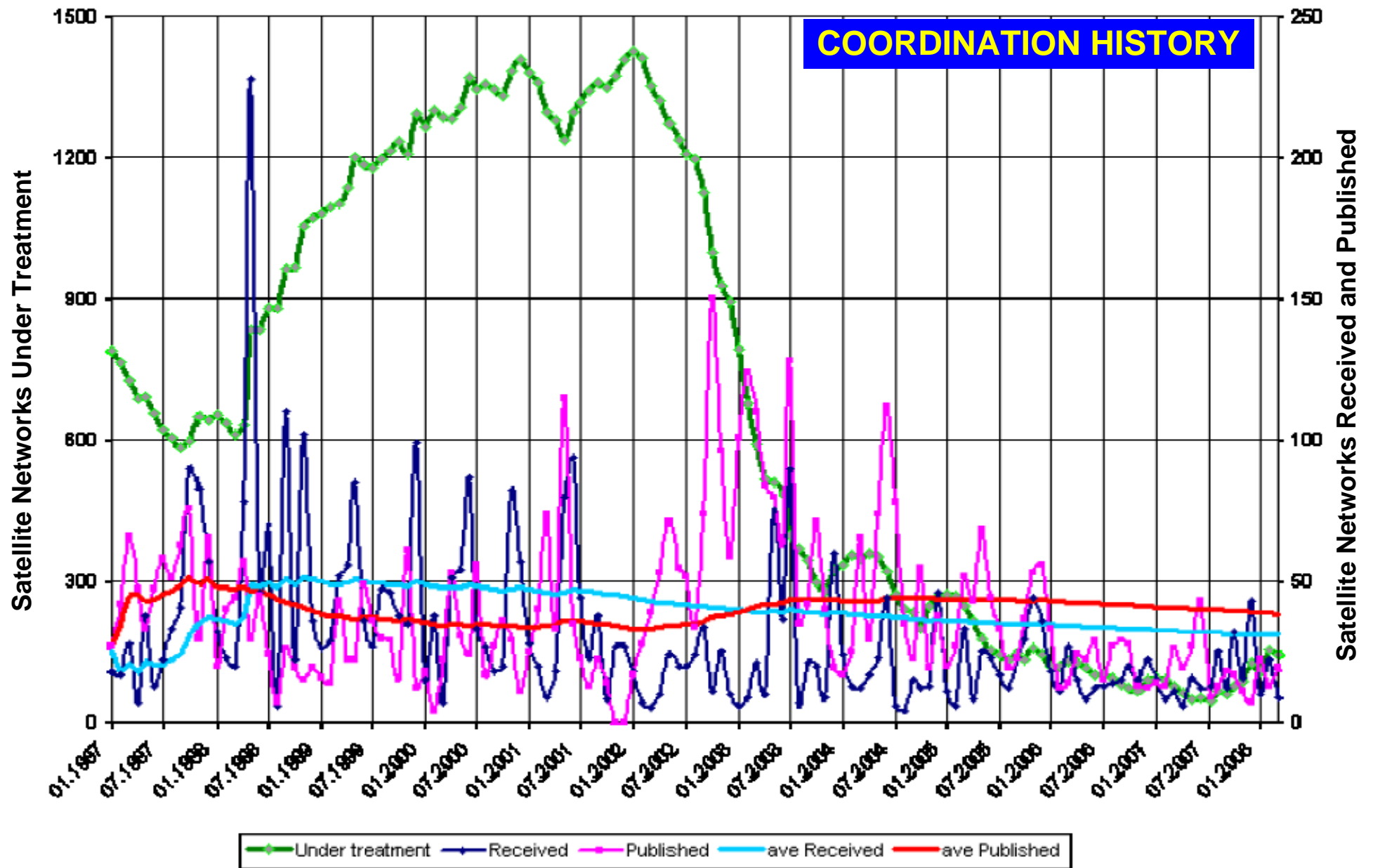


## ITU-BR WORKLOAD

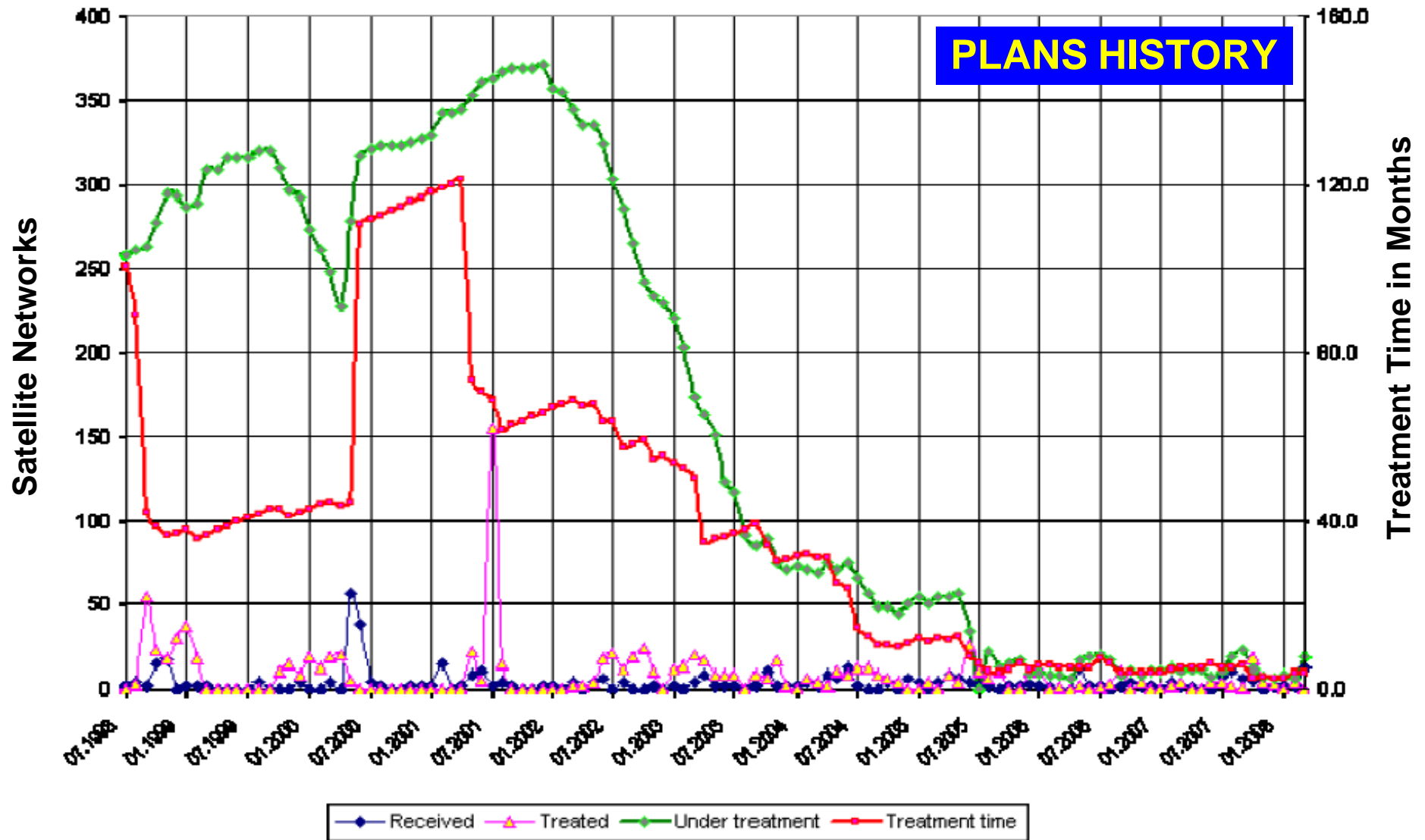
- Since the 1950s, the ITU-BR has Advance Published over 5,400 GSO and more than 600 NGSO network filings.
- 44% of the GSO filings for APIs have reached the Notification stage; 92% of the NGSO API filings have gone to Notification.
- 66% of the GSO coordination filings have reached Notification.

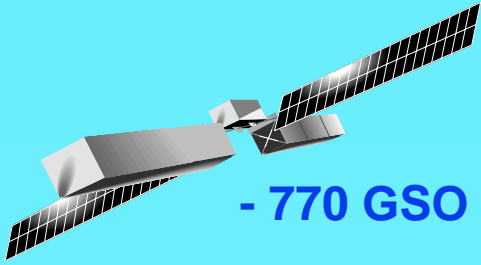


# Coordination requests publication (CR/C) for satellite networks (Trends from 01.01.1997)



# Processing of satellite networks submitted under Paragraph 4.1.3/4.2.6 of Article 4 of Appendices 30/30A (Trends from 01.07.1998)





## THE CURRENT SITUATION

- 770 GSO SATELLITE NETWORKS ARE IN THE NOTIFICATION STAGE

- 270 NGSO SATELLITE NETWORKS ARE IN NOTIFICATION

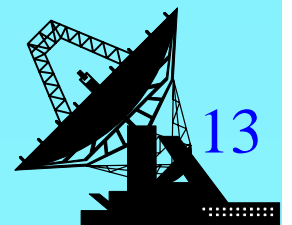
- AS A RESULT OF 1) INFORMATION FROM ADMINISTRATIONS ON OPERATION CESSATION; 2) APPLICATION OF REGULATORY TIME LIMITS FOR BRINGING INTO USE; 3) LACK OF RESPONSE FROM ADMINISTRATIONS:

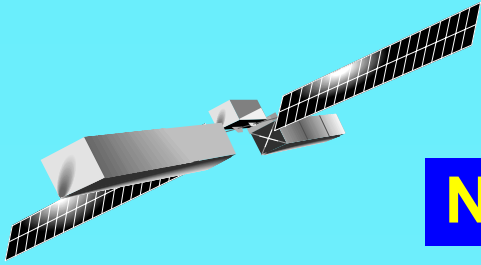
-- 116 GSO NOTIFICATIONS HAVE BEEN SUPPRESSED/CANCELLED

-- 120 NGSO NOTIFICATION FILINGS HAVE BEEN SUPPRESSED AND CANCELLED

- BACKLOGS AT THE BR IN PROCESSING APIs, COORDINATION REQUESTS, NOTIFICATIONS AND AP30/30A FILINGS HAVE BEEN GREATLY REDUCED

- ONLY THE TREATMENT OF AP30B FILINGS CONTINUES TO BE A LENGTHY PROCESS BECAUSE OF SEQUENTIAL PROCESSING AND UPDATING OF THE REFERENCE SITUATION



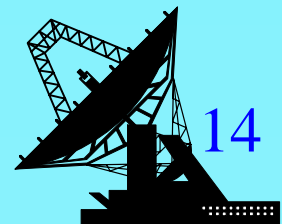


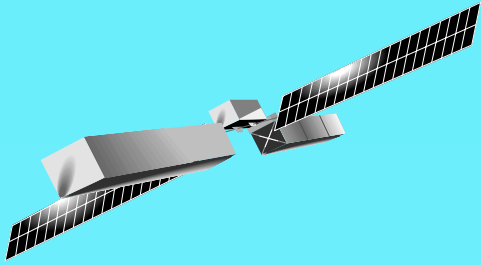
## **Notified Region 2 BSS Plan Assignments**

- 27 filings
- 24 networks
- 18 orbital positions

## **Notified Regions 1 & 3 BSS Plan Assignments**

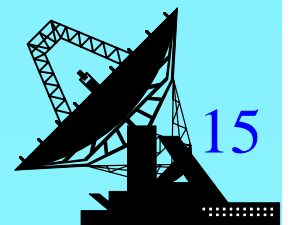
- 65 filings
- 55 networks
- 28 orbital positions

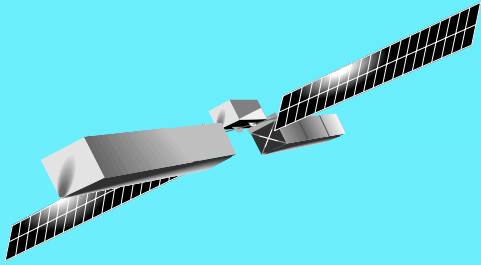




## TECHNICAL PROGRESS

- Study Groups are refining recommended antenna radiation patterns, performance standards, protection criteria and sharing criteria
- Use of higher frequencies permitting smaller antennas and spot beams
- Increased use of spot beams
- Use of digital modulation and compression
- Interference mitigation techniques
- Converging uses of a single satellite for multiple radio service purposes

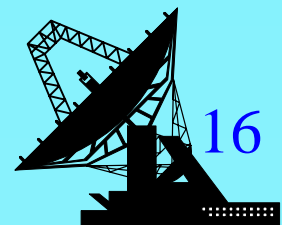




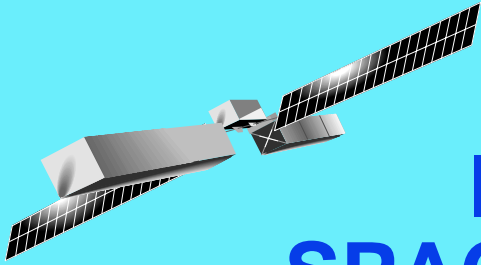
## **INCREASE UTILIZATION?**

**Technical changes that would increase orbit/spectrum utilization are not without effects on existing systems and infrastructures**

**The following is an example of such effects:**

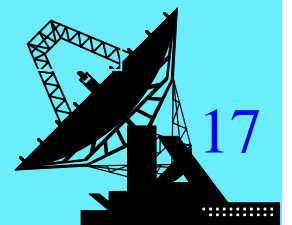


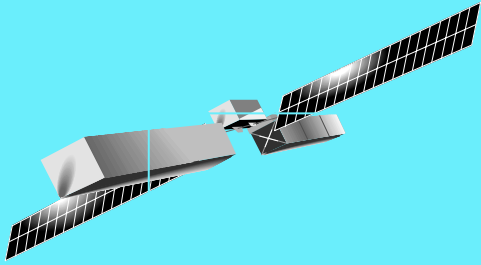




# IMPACT OF BSS REDUCED SPACING ON EXISTING NETWORKS

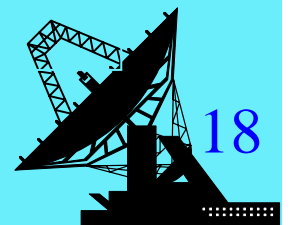
- Increased interference levels possible
- Decreased potential for future growth at current orbital locations
- Potential reduction in capacity of existing systems
- Potential change-out of receiving antennas (impact on tens of millions of customers).

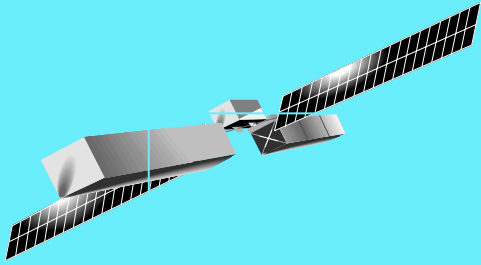




# What could be done?

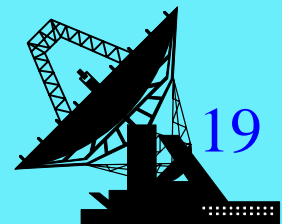
- **Coordinate coverage areas between new systems and the existing ones.**
  - **Spot beam systems could be aligned.**
  - **Decreases potential for future adjustments in coverage.**
  - **Spot beams can cause more interference due to higher peak powers.**
  - **Spot beams more susceptible to interference due to lower edge of coverage power.**

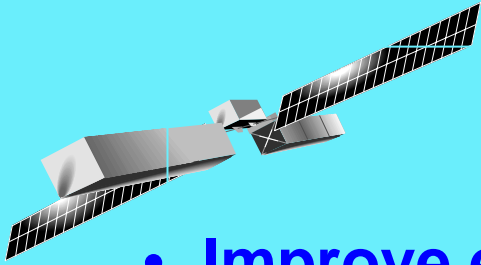




# What could be done?

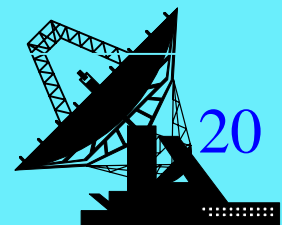
- Lower “power” levels for Reduced-Spacing Satellites
  - To be “competitive” would require state of art modulation and error correction coding techniques.
  - Trade off is either **Larger Dish** or **Lower Data Rates**.
  - Must be weighed vs. \$300 Million cost of new satellite system.
  - New Entrant could make adjustments at start.

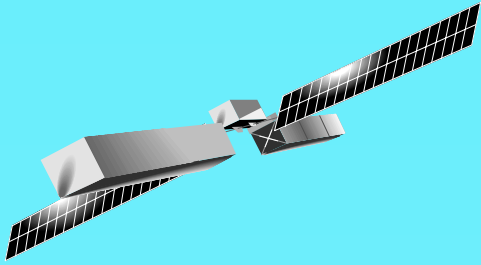




# What could be done?

- **Improve existing equipment**
  - For existing customer base, increase dish size and update transmission techniques.
  - Extent of impact: **TENS OF MILLIONS** of antennas and **BILLIONS** of \$\$\$\$ boxes.
  - Likely that current units will be changed-out in time because of HD, but high cost and time required.
  - Multi-feed antenna characteristics may be less able to discriminate signals.
  - Who Pays? Should new entrant cover costs?
  - What pace should be used for the change-out?



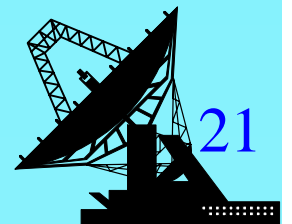


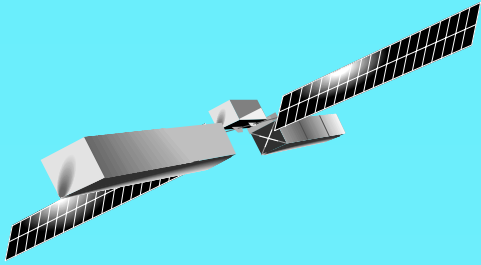
# Two Predominant Methods for Determining Which Networks or Administrations Need to be Taken into Account in the Coordination Process

**1 - The Coordination Arc Approach (CAA)**

**2 –  $\Delta T/T$  Calculation - Ap8 of the Radio Regs**

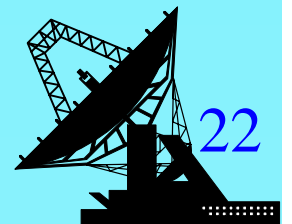
(Method of calculation for determining if coordination is required Between geostationary-satellite networks sharing the same frequency bands)

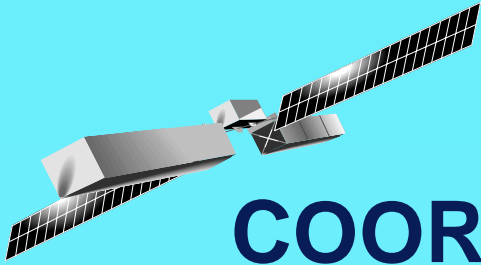




## $\Delta T/T$ was found to be

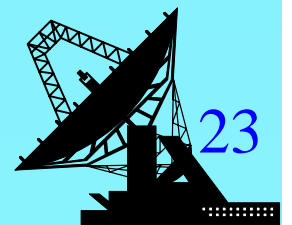
- the simplest and the most conservative form of assessing the effects of interference
- that is why it has been used to determine if (and with what Administrations) coordination is required
- coordination threshold value of  $\Delta T/T$  set to 6% for non-planned GSO satellites

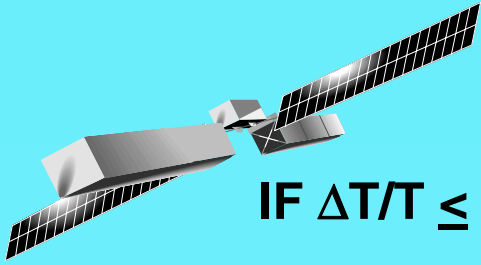




# COORDINATION ARC APPROACH (CAA)

- **COORDINATION IS TRIGGERED WITHOUT  $\Delta T/T$  CALCULATIONS WHEN INCOMING AND EXISTING GSO NETWORKS:**
  - **BOTH USE THE ELIGIBLE SERVICE ALLOCATIONS (FSS or BSS) AND HAVE CO-DIRECTIONAL FREQUENCY OVERLAP;**
  - **ARE LOCATED WITHIN PRE-DETERMINED GSO ARC AS INDICATED IN APPENDIX 5 (TECHNICAL CONDITIONS FOR COORDINATION)**
  
- **ORIGINAL AIM OF CAA WAS TO REDUCE COORDINATION BURDEN ON ADMINISTRATIONS IN MOST-USED FREQUENCY BANDS WHERE THE MOST NOTICES ARE RECEIVED BY THE RADIOCOMMUNICATION BUREAU**





**IF  $\Delta T/T \leq 6\%$  - NO POTENTIAL FOR HARMFUL INTERFERENCE.**

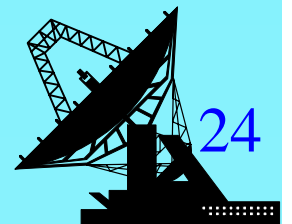
**IF  $\Delta T/T > 6\%$  - HARMFUL INTERFERENCE MAY, BUT NEED NOT, EXIST. SHOULD BE STUDIED IN DETAIL THROUGH COORDINATION.**

**SOLVING THE WORST CASE  $\Delta T/T$  OR C/I WILL NOT NECESSARILY ESTABLISH COMPLETE COMPATIBILITY BETWEEN TWO NETWORKS.**

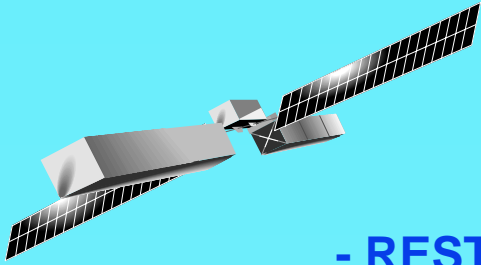
**OTHER COMBINATIONS OF ASSIGNMENTS MAY STILL PRODUCE  $\Delta T/T$  OR C/I THAT DO NOT MEET LIMITS.**

**TO ESTABLISH COMPATIBILITY, IT IS NECESSARY TO CONSIDER COMPREHENSIVELY ALL POSSIBLE INTERACTIONS BETWEEN TWO NETWORKS, NOT JUST THE WORST CASE.**

**COORDINATION ARC APPROACH HAS REDUCED THE COORDINATION WORKLOAD ON ADMINISTRATIONS.**

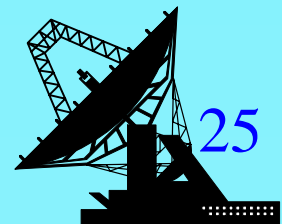


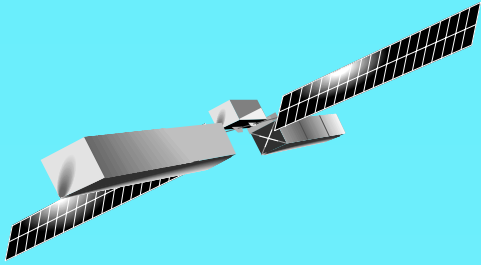




## **EFFICIENT USE**

- RESTS WITH ADMINISTRATIONS AND OPERATORS
- ITU SYSTEM IS A COOPERATIVE ONE AMONG ADMINISTRATIONS
- COORDINATION IS STRICTLY A BILATERAL PROCESS BETWEEN ADMINISTRATIONS
- DECISIONS ON HOW MANY FILINGS AN OPERATOR CAN MAKE, WHAT COVERGING SERVICES CAN USE THE SAME FREQUENCIES, AND MECHANISMS FOR IMPLEMENTING THEM (POSTING BONDS, CONVERGENCE, ETC.) MUST BE MADE BY EACH ADMINISTRATION
- ELIMINATION OF THE 6-MONTHS DELAY BETWEEN FILING OF APIs AND COORDINATION REQUESTS IS ONE EXAMPLE TO THWART THE GAMING OF ITU PROCEDURES
- ADMINISTRATIONS MUST COOPERATE





**THANK YOU**  
**QUESTIONS?**

**[William.luther@asrcms.com](mailto:William.luther@asrcms.com)**

