

PHILLIPS LAB—VTS

**Satellite Control and
Simulation Division**

**MAGIC Program —
*Multimission Advanced
Ground Intelligent Control***

**Lt George Schneiderman
PL/VTS, (505)846-8986 ext 337, DSN 246-8986
schneidg@plk.af.mil**

03/17/97

*

FALCON AFB—CCS



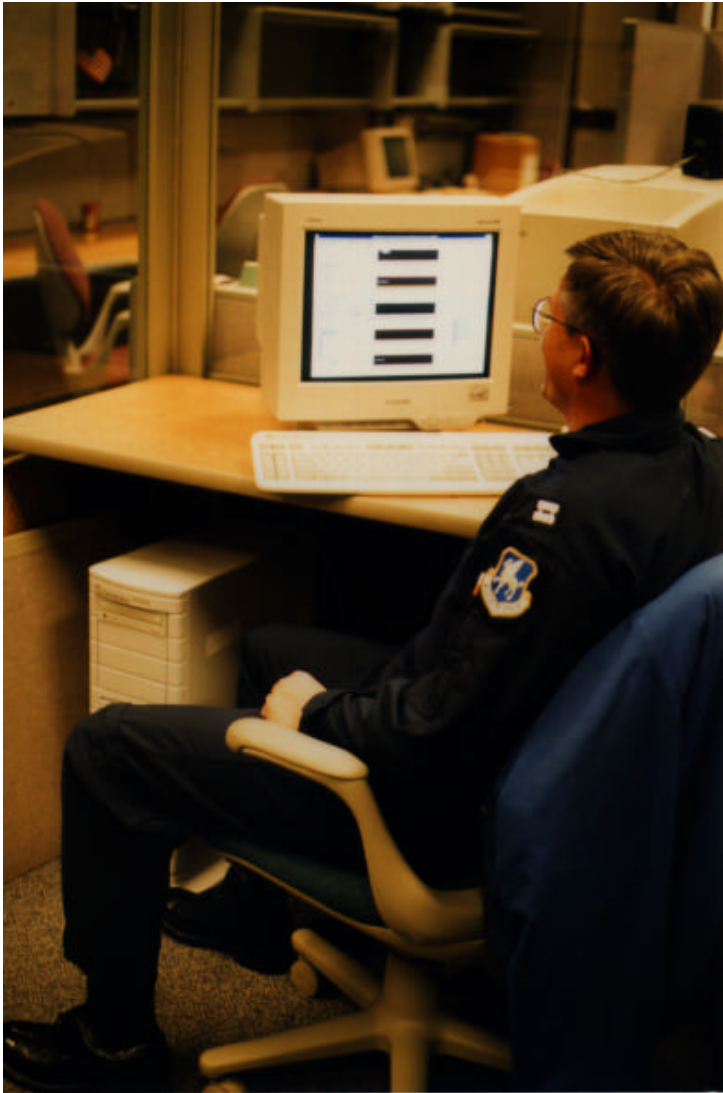
Current AFSCN Display Screen

```

8275      13 FEB 90      75077  2051:172      -77 PM  ACS  CONFIGURATION  V5M02 AD 10
ACE       B  ON      PR+WHL   ON  PSENSR  ES   UPDATE  16SEC          DW1A  10110100
ACEOFF    DIS      PR-WHL   ON  RSENSR  ES   STRCMD  ENA  BFNPRT A  ON  DW1B  01001010
TIMING    B  ON      PY+WHL   ON  YSENSR  R/YD  PATCH   ENEX
ACECMD    B  ON      PY-WHL
ACETLM    B  ON
RAM       A  ON      ES        B  ON  ELFSIG  ENA  RACCUP  ENA  M2XCMD  RSET
ROM       B  ON      ESOFF    A  EN
MUXA/D    B  ON      ESSEL     B  THRLOC  ENA  SUNACQ  R/S  MBRCE    A  DW3A  00011011
          TTRQMD  AUNL  EARTHACQ  DIS  M1XCE    A  DW3B  10001010
NUDET     B  ON      R+SS     B  CBHCTL  OVDS  LUNECL  INH  M2XCE    A  DW4A  00101101
PET       0        R-SS     B  DELTAV  TERM  FAILBMD  DIS          DW4B  10100001
HRAM      12345600  P+SS     B  E/WTHR  PITCH  MSGCMD  DIS  GDAPORT  OFF  DW4C  11100111
HRAMAP+   300     P-SS     B  NSOFFP  DIS  TLMFMT  NORM  GDACMD  RESET
          DW5A  00000000
BOARD     0000     SSDEGC   DIS  PTHR  A  EN  PCBH    A  EN  GDA-AZ  -4.39  DW5B  00000000
          RTHR  A  EN  RCBH    A  EN  GDA-EL  3.21  DW6A  00000000
SADA      OFF     SADPOT   B  YTHR  A  EN  YCBH    A  EN  GDAAZC  0.00  DW6B  01000100
SADB      ONPR    GYRO     OFF  NSTHR  LIS  NSCBH   DIS  GDAELC  -1.37

```

FALCON AFB—MAGIC



- One operator, one screen
- PC / NT-based
- Intuitive graphical interface
- Expert System
- Expandable

VISTA Realtime Analysis

File Pass Replay Help

Iron: 9940 TCSEG: R Type: Replay Start: 22:07:40 Current: 22:36:59

ACS

Comm

EPDS

Extras

Prop

SCT

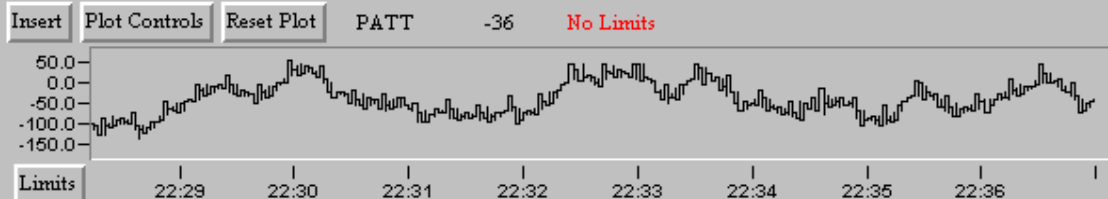
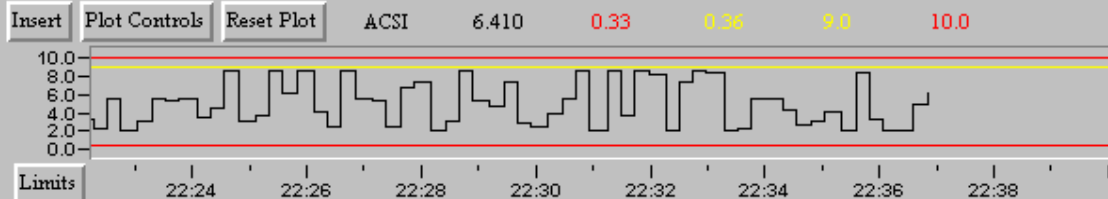
Struct

TTC

Therm

- Mnemonics**
- .
 - A138LK
 - A1GAFT
 - A200AT
 - A200BT
 - A200LK
 - A200P
 - A24GAFT
 - A32BAT
 - A5MHZAJ

- Presets**
- ..
 - 8979
 - 9940
 - 9940-2
 - 9940-3
 - 9940-all
 - Just_One
 - all
 - PATT
 - just
- Save Delete



Events

* RDSSD 22:08:00 A
** A704STR 22:08:27

Delete Suppress

Delete Previous

Values

ACECMD
ESSEL

Insert Delete

MAGIC

Attributes

- **Multimission - contains knowledge and data on multiple constellations and block releases**
- **Intelligent**
 - customize environment for each mission
 - enable operator to manage multiple missions
 - increase operator capabilities within each mission
- **Extensible - easily expanded for new major functionality (e.g. constellations/block releases)**
- **Portable to multiple platforms**
- **Maintainable - easily modifiable to accommodate new in scope functionality**
- **User friendly**
- **COTS plug and play - highly vendor independent**

MAGIC Technical Scope

- **Develop ground station technologies to lower costs and increase capabilities of satellite control**
- **Use artificial intelligence (AI) and best software practices to do telemetry, tracking, and commanding by exception:**
 - **Add AI to increase level of automation**
 - **Lower software lifecycle costs by insisting on open architectures, portability, and high standards**

MAGIC Technical Goals

- **Enhance operational capability**
- **Reduce USAF satellite O & M costs**
- **Support new operations concept (i.e., front room / back room)**
- **Improve satellite operator effectiveness**

MAGIC

Technical Challenges

- **COTS integration, done well, is not trivial**
 - **Issue of user interfaces**
 - **Issue of functional utility, overkill, underkill**
 - **Actual integration via middleware**
 - **Cost driver: open architecture vs. profit motive**
- **Integration of intelligent tools is a design choice**
 - **Intelligent systems have high life-cycle costs/ payoffs**
 - **AI is increasingly cost effective**
 - **“what to automate” for high bang for the buck**

MAGIC

Technical Accomplishments

- **Telemetry analysis system now records all DSCS III health & status data in a relational database, significantly enhancing analysis capabilities**
- **System supported anomaly resolution in at least three cases to date**
- **Demonstrated the utility of automatic telemetry monitoring via an expert system that performs health & status checks (80% supports)**

MAGIC

Technical Accomplishments

(continued)

- **Demonstrated automated pass plan tool that cuts the run time for a pass plan to 1/4 of the time currently required**
- **Demonstrated online hypertext documentation such as satellite operations handbooks, training manuals, and the help system**
- **Demonstrated graphical resource scheduling tools**

MAGIC

COTS Components

- **Maximize use of “little COTS” components**
 - small components
 - do a single isolated task
 - communicate through messages
- **Little COTS components are easily replaceable**
 - No or little impact on other components in the system
 - Key is single isolated task and well defined interfaces
- **MAGIC used many small components, commercial standards, and standard PC computer hardware to achieve lost cost and flexibility**