



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL ENVIRONMENTAL SATELLITE, DATA,  
AND INFORMATION SERVICE  
Washington, D.C. 20233

# FAX TRANSMITTAL SHEET

DATE: 30 January 98

FROM: David F. McGinnis

Office of Systems Development

TO: Alex Roytblat

FCC

25-sat-95  
76-sat-95  
79-sat-96  
151-sat-96  
7-547-97

TELEPHONE NO: 301 457 5125

TELEPHONE NO: \_\_\_\_\_

FAX NO: 301 420 0932

FAX NO: 202 418 0765

Number of Pages Sent (Including This Cover Sheet) : 23

Comments:

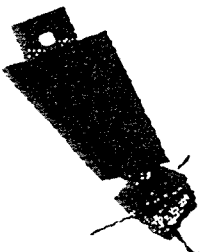
Alex,

Attached is the summary and charts of the analysis performed by CSC regarding the FAI "old vs. "hybrid" systems. Please let me know if you (or Harry) have any questions.

Regards,

*Dave*  
Dave

P.S. I tried to send an e-mail message, but it was returned. I sent it to [aroytblat@fcc.gov](mailto:aroytblat@fcc.gov). Have all the FCC e-mail addresses changed, since Harry's message was also returned?



TO: Frank Eng

FROM: Bill Daniels

INFO TO: Dave McGinnis

SUBJECT: Graphs on the Visibility of Final Analysis Satellites

## INTRODUCTION

Final Analysis has proposed to share with NOAA weather data downlinks by shutting off their transmitters when their coverage area overlaps that of NOAA. They have proposed recently to change their constellation by increasing the number of satellites and reducing the inclination of all but two of them.

The accompanying graphs display data generated by the SFCG program and show the occurrence of coverage overlap of the NOAA and Final Analysis satellite coverage. They are intended as a means to evaluate the impact of the proposed changes in the Final Analysis constellation. A hybrid constellation was also simulated to observe the impact of changing the inclination only.

## DATA ANALYZED

The constellations are simulated to determine their overlapping coverage. The received interference power was not considered, therefore only orbital parameters are relevant. The table below shows the input orbital parameters of the three systems analyzed.

Input Values for the Computer Analysis

Item	Old Constellation		New Constellation		Hybrid Constellation	
Number of Satellites	26		32		26	
Orbital Altitude (km)	1000		1000		1000	
Number of Planes	4	2	6	2	4	2
Satellites per Plane	6	1	5	1	6	1
Inclination (degrees)	66	83	51	83	51	83
Right Ascension (degrees)	0,45,90, 135	0,90	0,60,120, 180,240, 300	0,90	0,45,90, 135	0,90
Mean Anomaly (degrees)	0,60,120, 180,240, 300	0	0,72,144, 216,288	0	0,60,120, 180,240, 300	0

The hybrid constellation has the same number of satellites as the old constellation but the inclination is changed from 66 degrees to 51 degrees.

## FIGURES

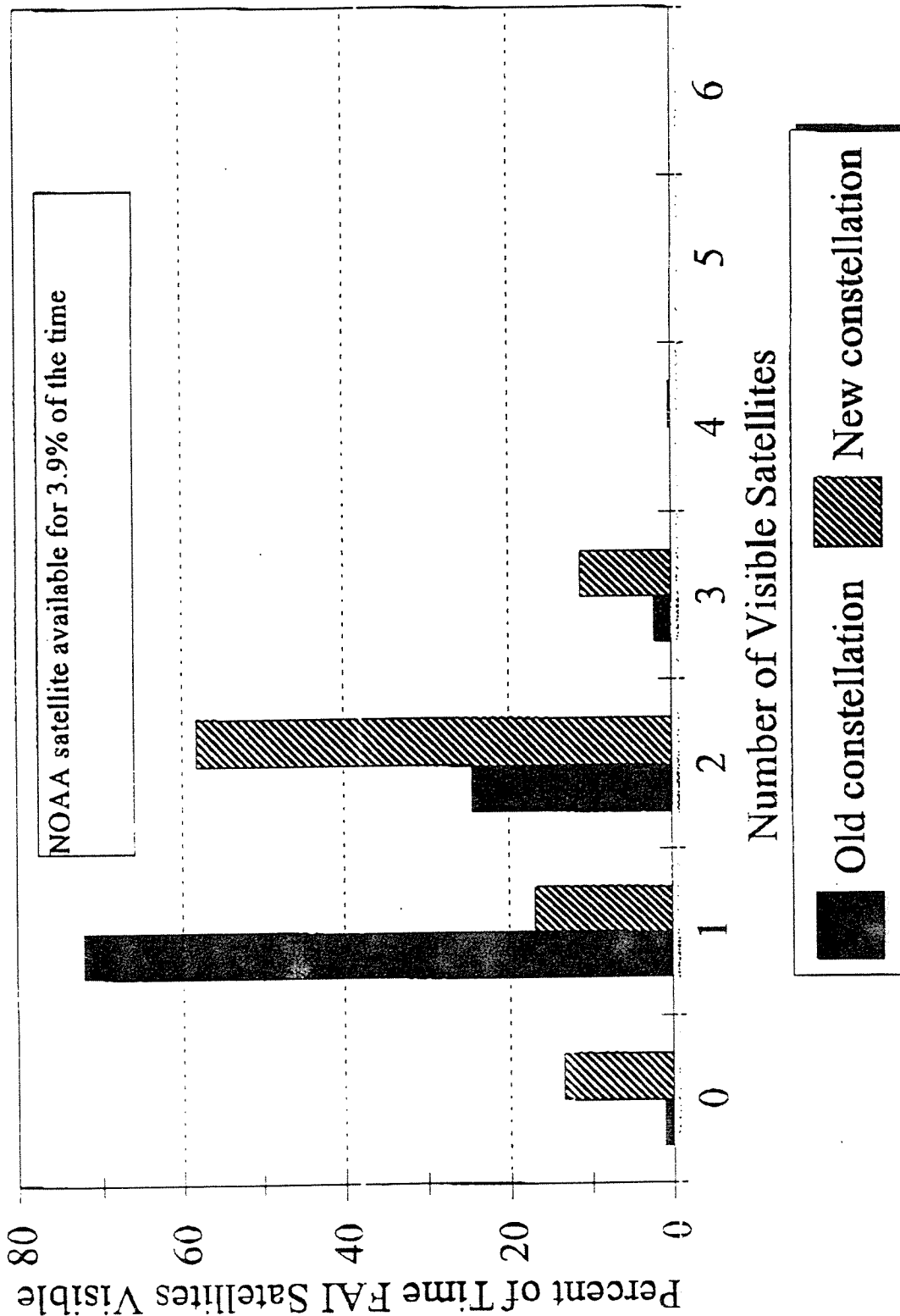
The results are presented in two sets of figures with ten figures per set. One set shows the comparison of the new and old Final Analysis constellations. The second set shows the comparison of the old constellation with a "Hybrid" constellation. The graphs within each set differ by latitude from 0 degrees (the equator) to 90 degrees (the pole.) The latitude is the location of an earth station.

The figures represent the percent of time that zero, one or more Final Analysis satellites are visible to the earth station provided that the NOAA satellite is also visible. The simulation output provides the fraction of time that potentially interfering satellites are visible to the earth station when the desired satellite is visible plus the percentage of time that the desired satellite is visible. The plotted values are normalized by dividing the Final Analysis satellite visibility by the NOAA satellite visibility.

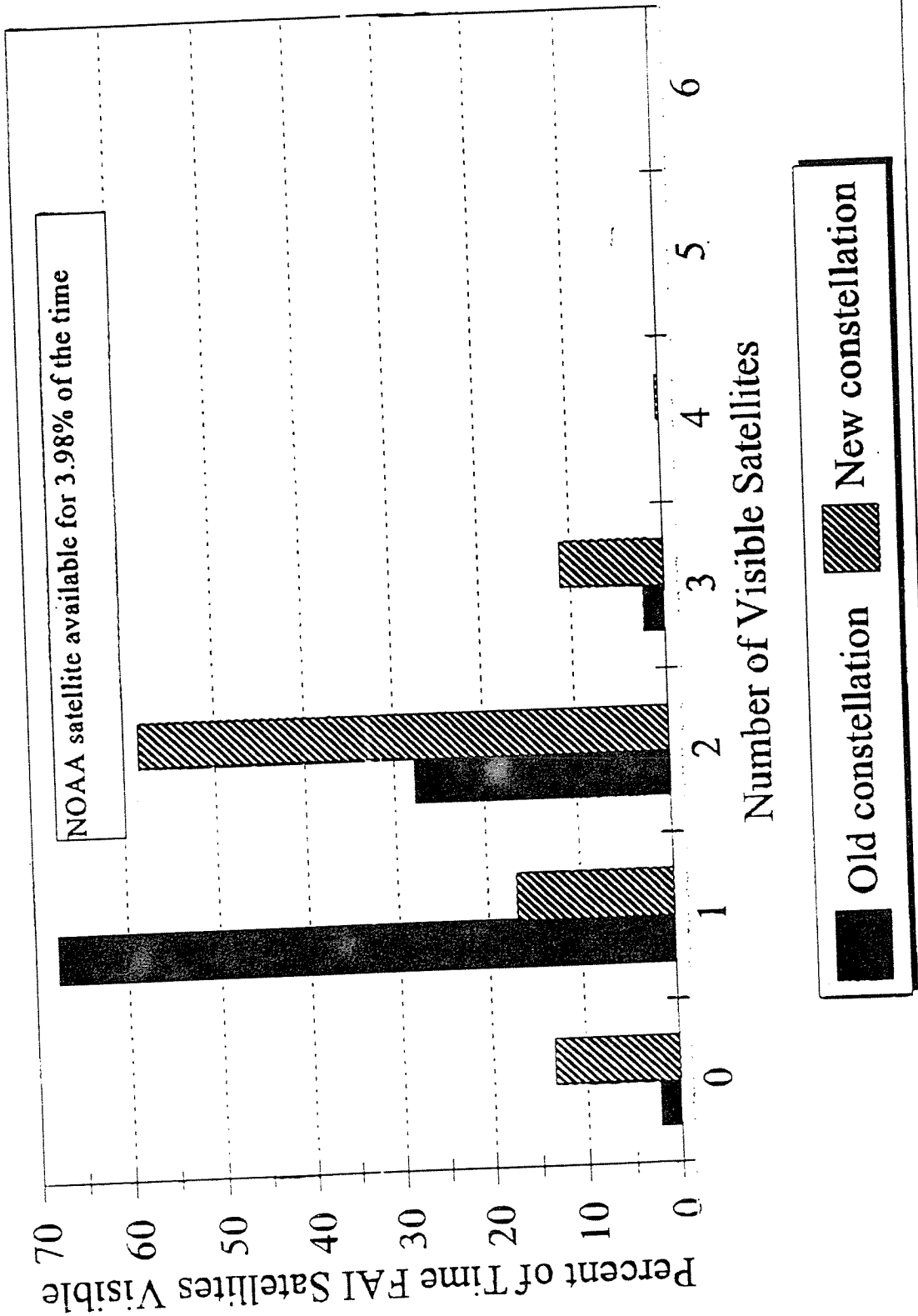
Each graph shows the number of simultaneous visible satellites on the X-axis and the normalized visibility percentage on the Y-axis. The values for each satellite should add to 100.

The graphs collectively provide a visual means to observe the shift of distribution of overlapping satellites for changes in the Final Analysis constellation. Observations of the shift within a graph and between graphs both provide information on the effect of constellation changes.

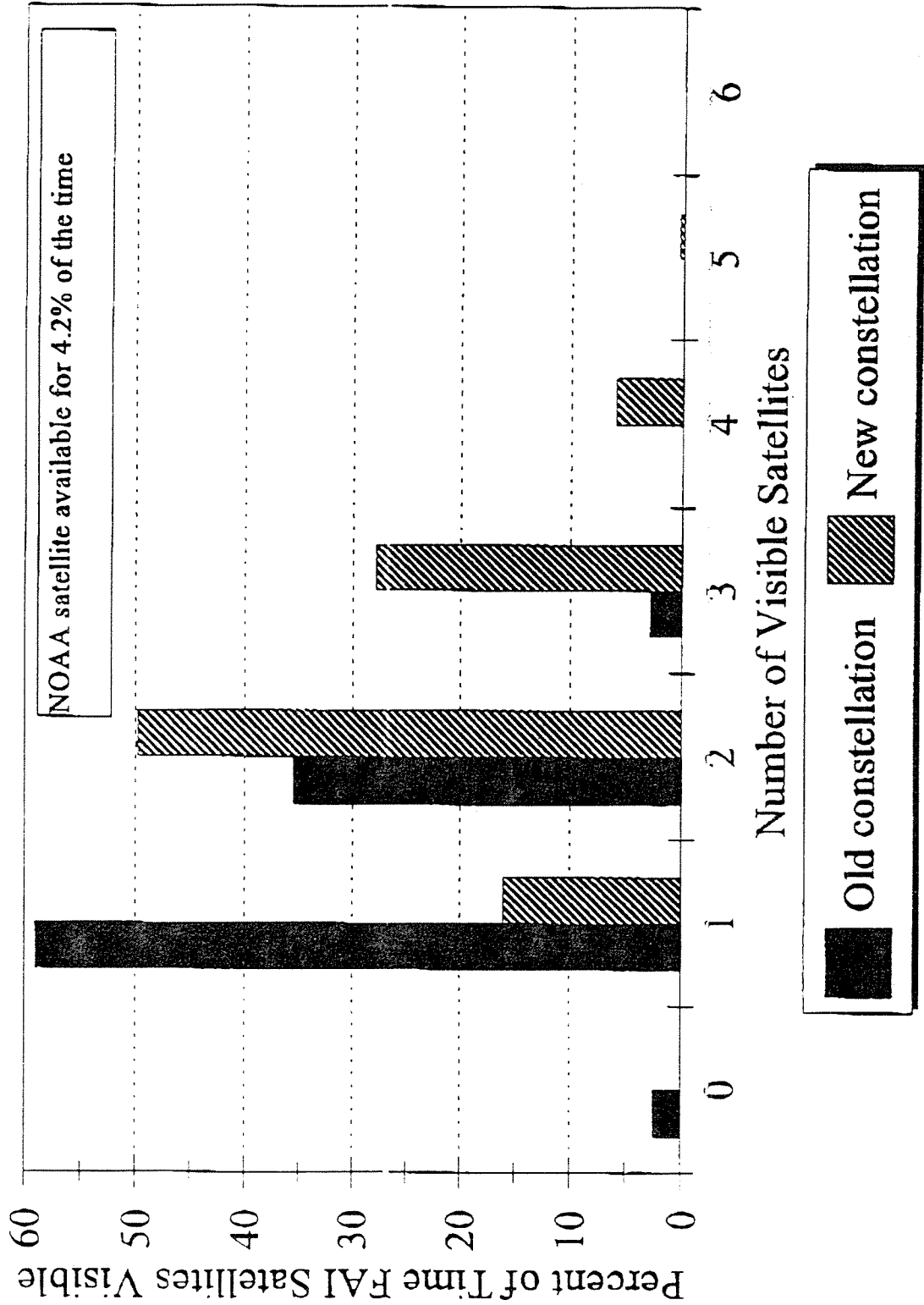
# Comparison of Old & New Constellations for Final Analysis at 0 deg North



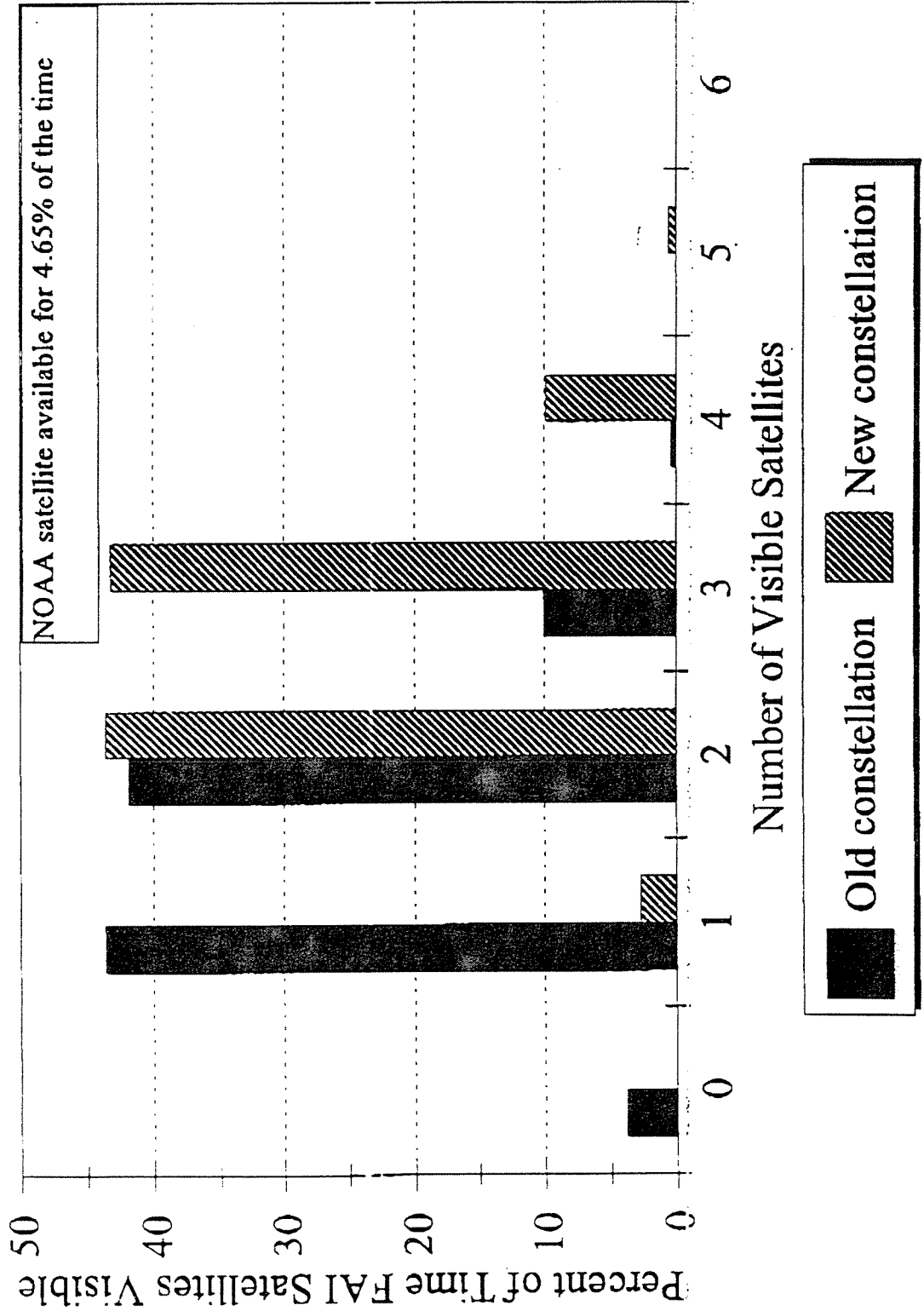
# Comparison of Old & New Constellations for Final Analysis at 10 deg North



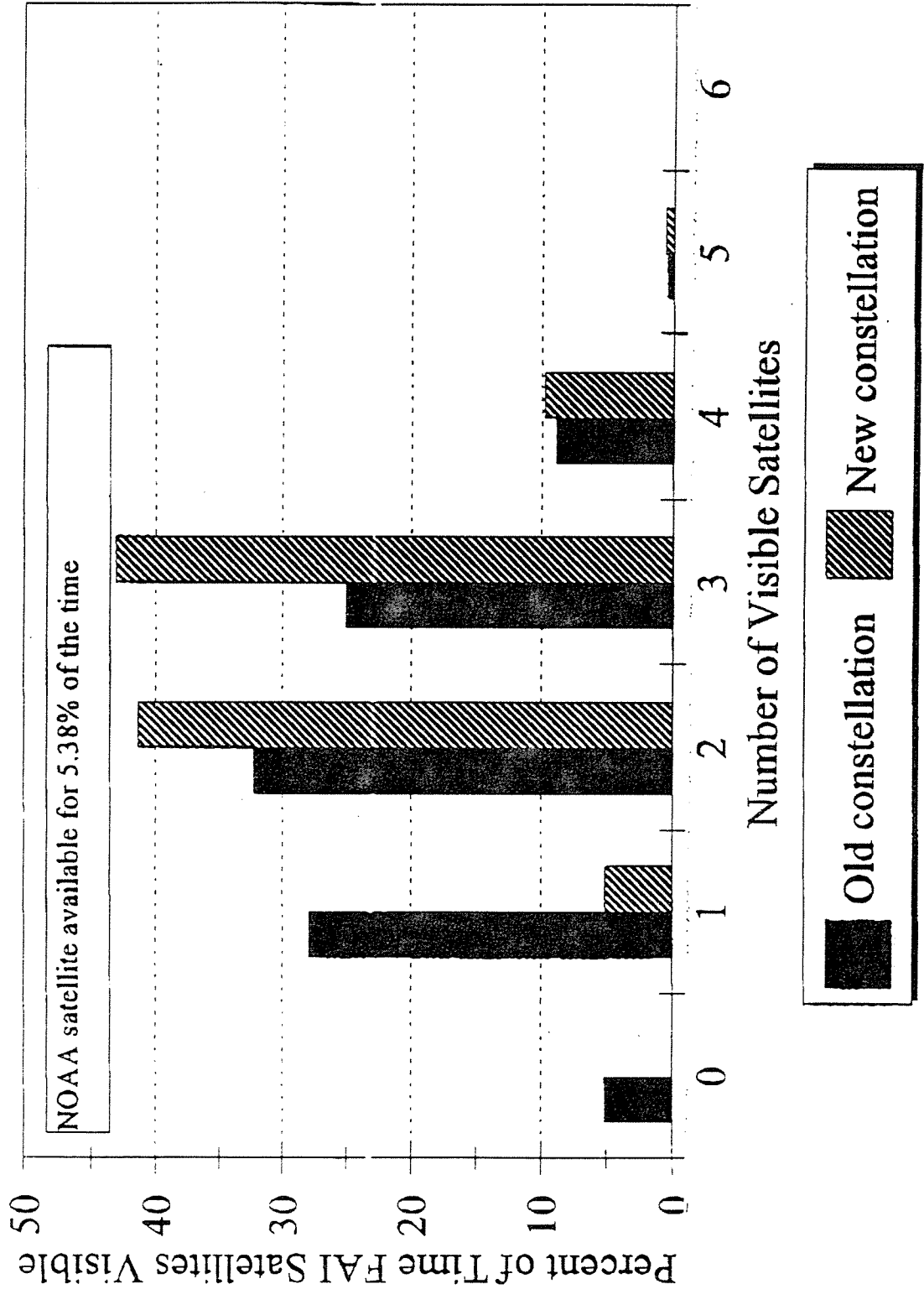
# Comparison of Old & New Constellations for Final Analysis at 20 deg North



# Comparison of Old & New Constellations for Final Analysis at 30 deg North

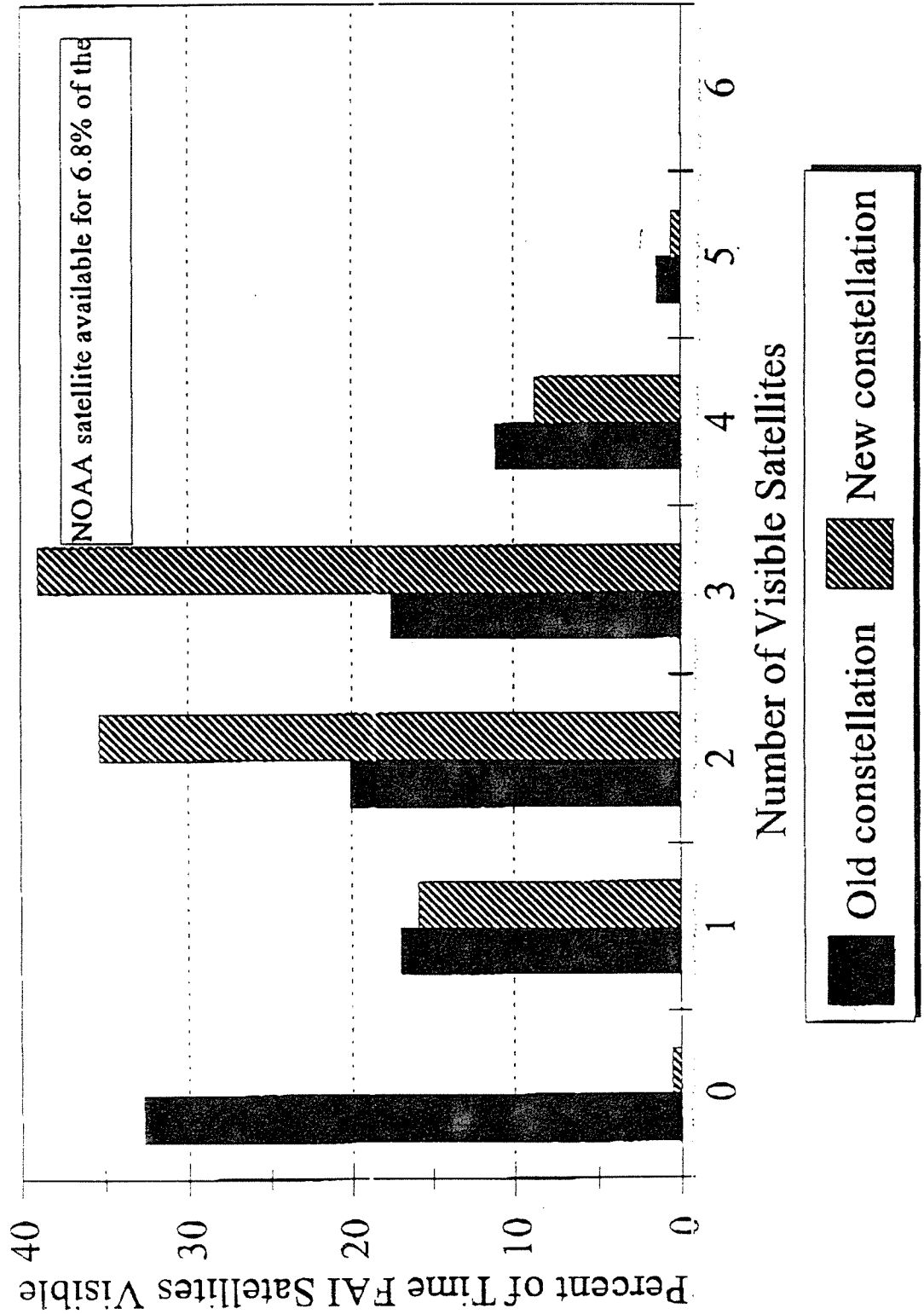


# Comparison of Old & New Constellations for Final Analysis at 40 deg North

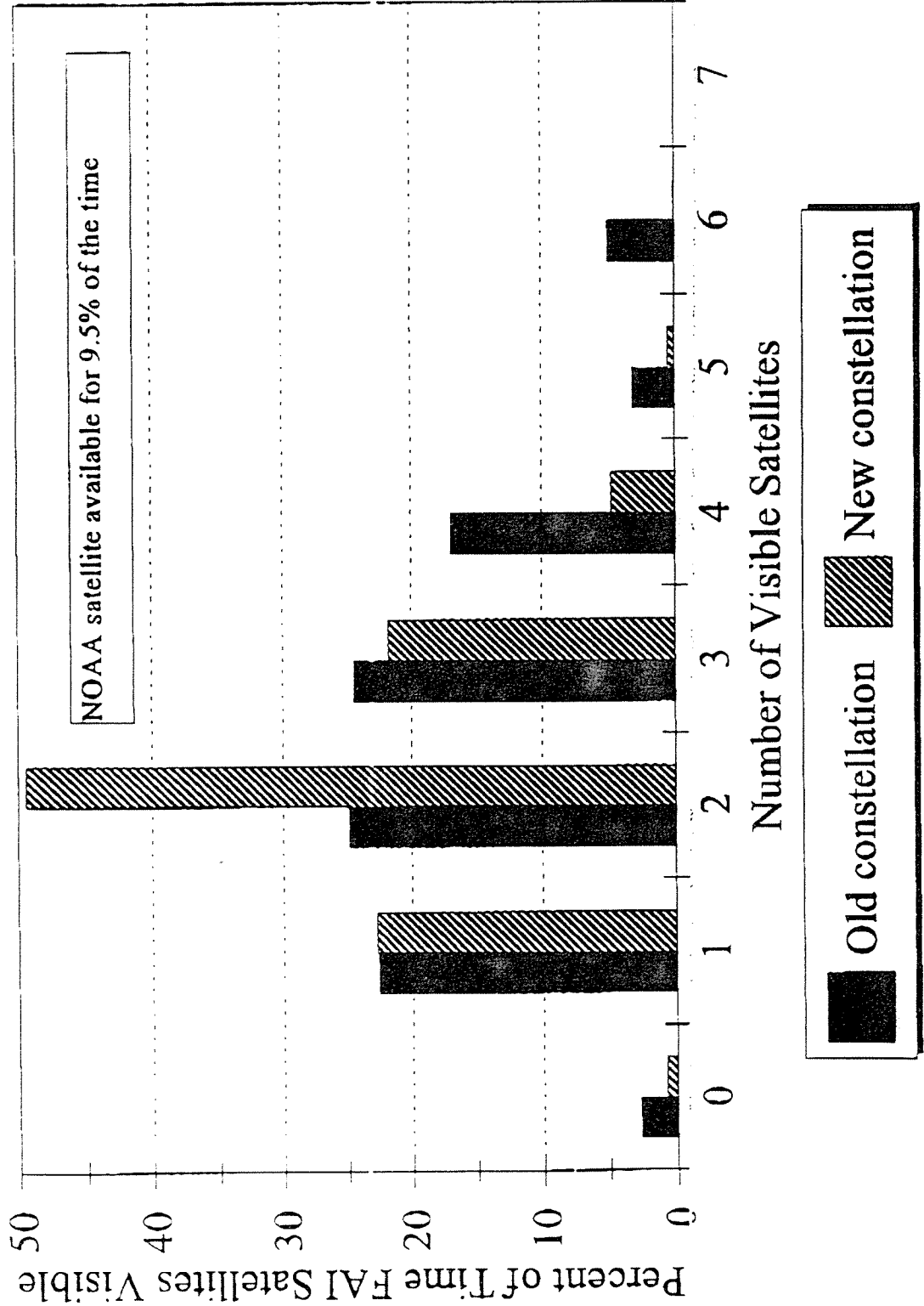




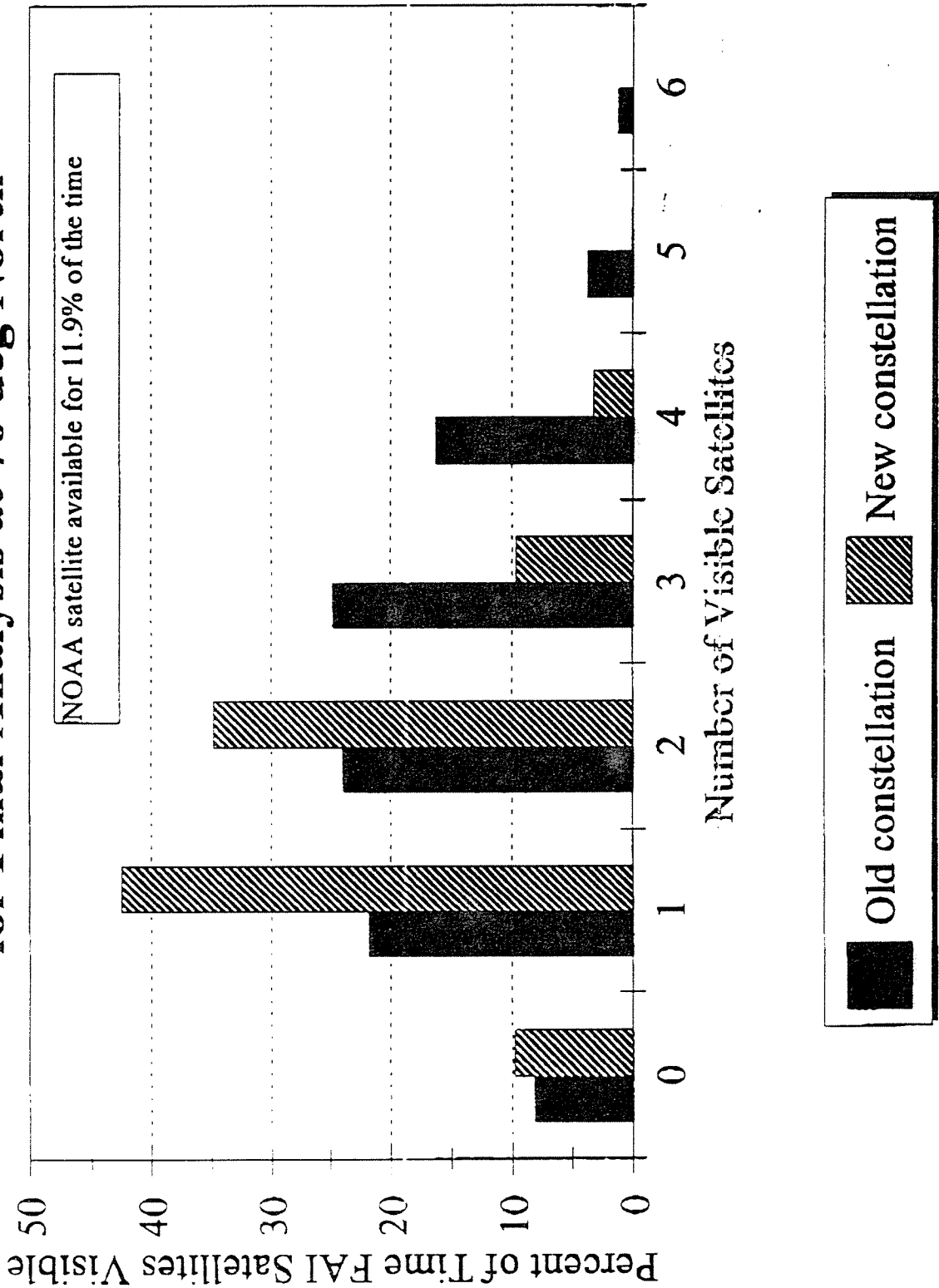
# Comparison of Old & New Constellations for Final Analysis at 50 deg North



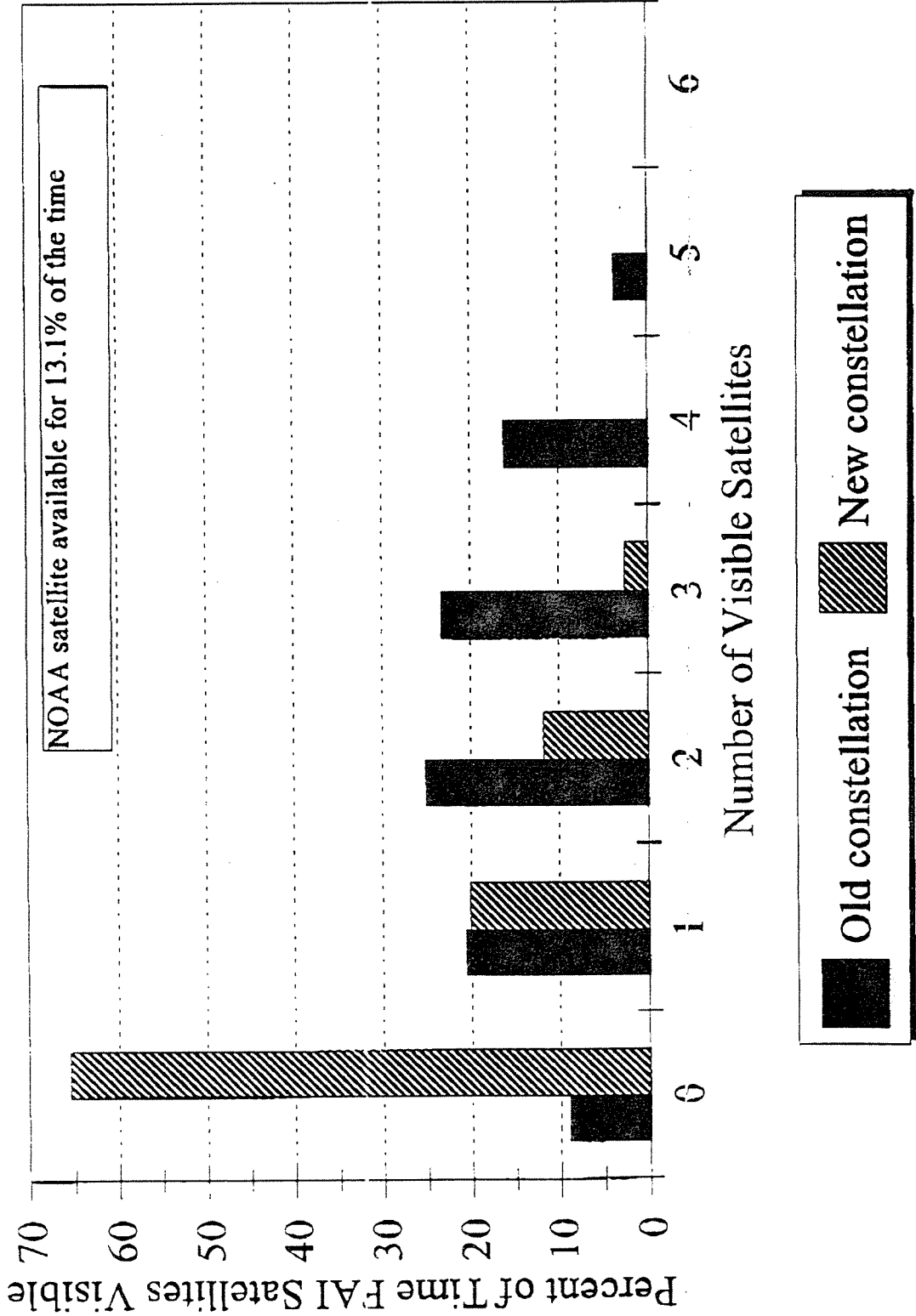
# Comparison of Old & New Constellations for Final Analysis at 60 deg North



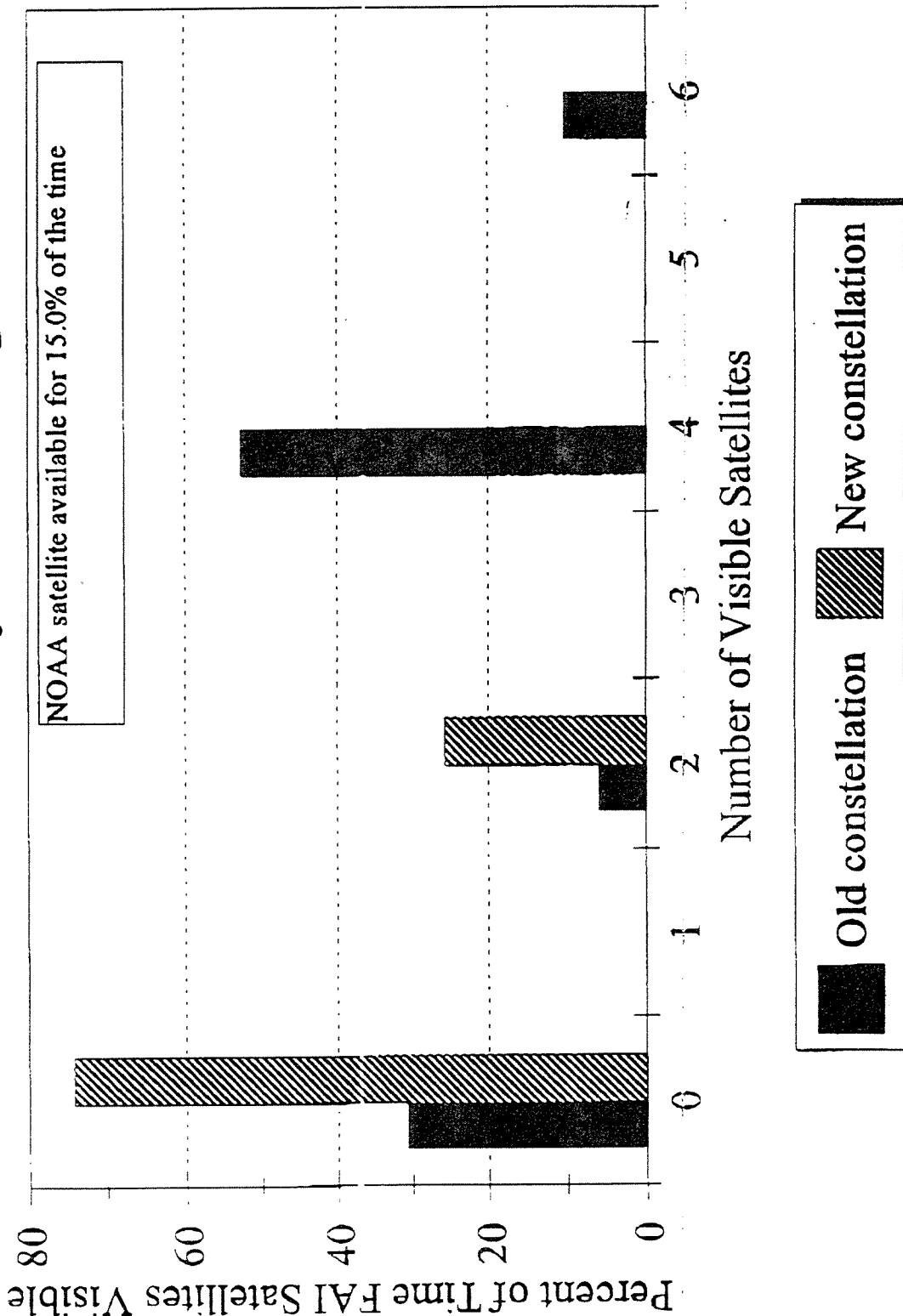
# Comparison of Old & New Constellations for Final Analysis at 70 deg North



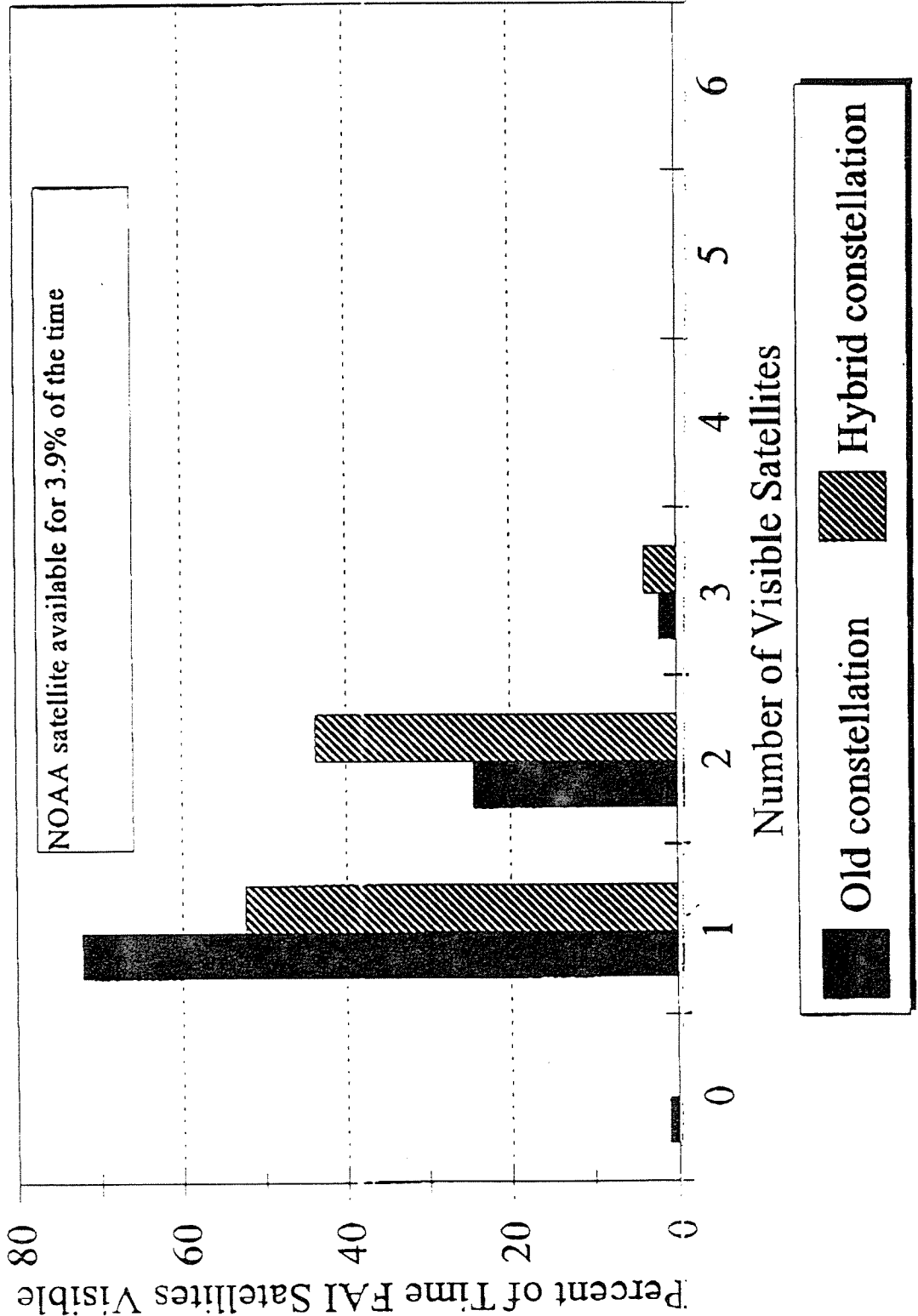
# Comparison of Old & New Constellations for Final Analysis at 80 deg North



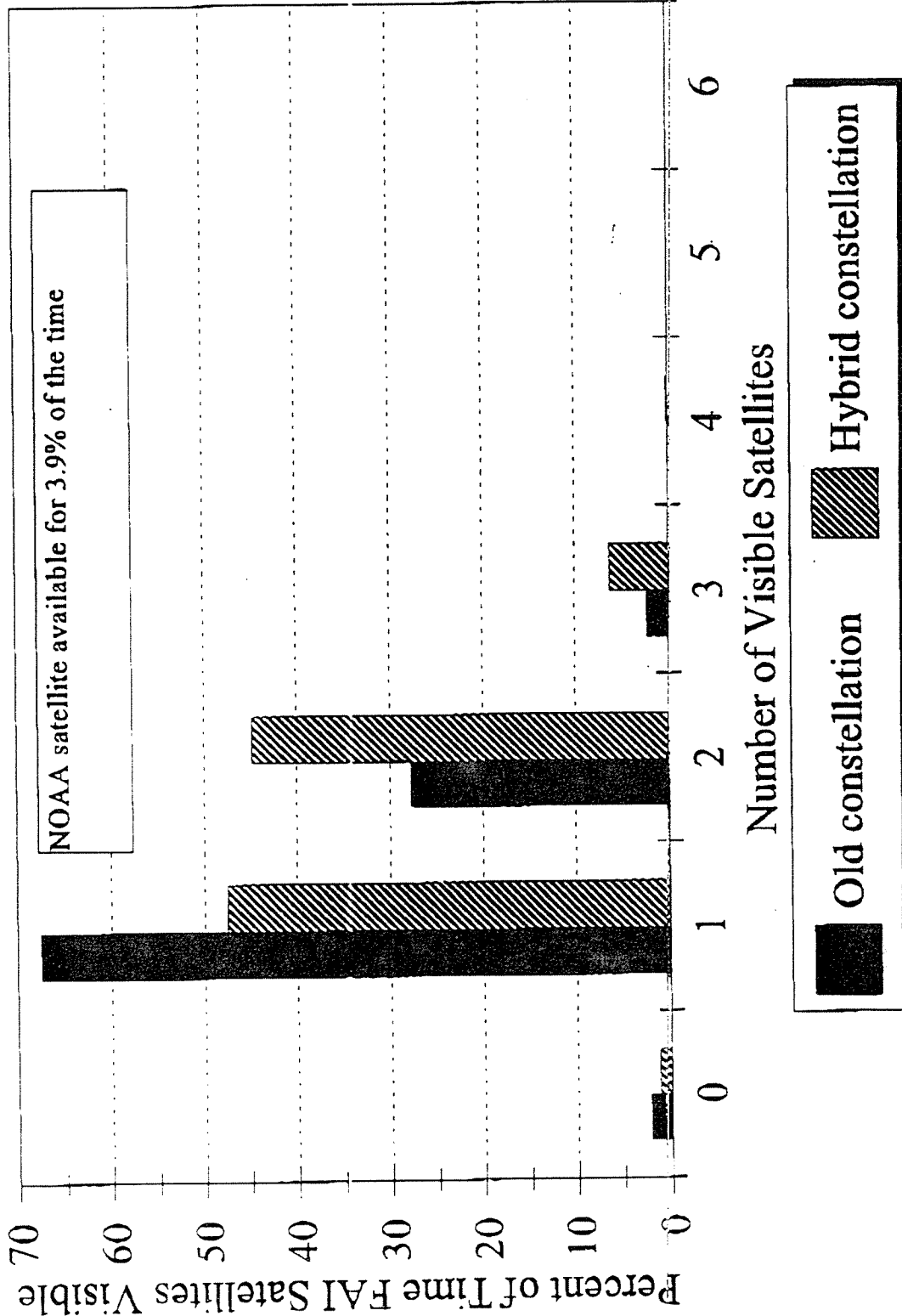
# Comparison of Old & New Constellations for Final Analysis at 90 deg North



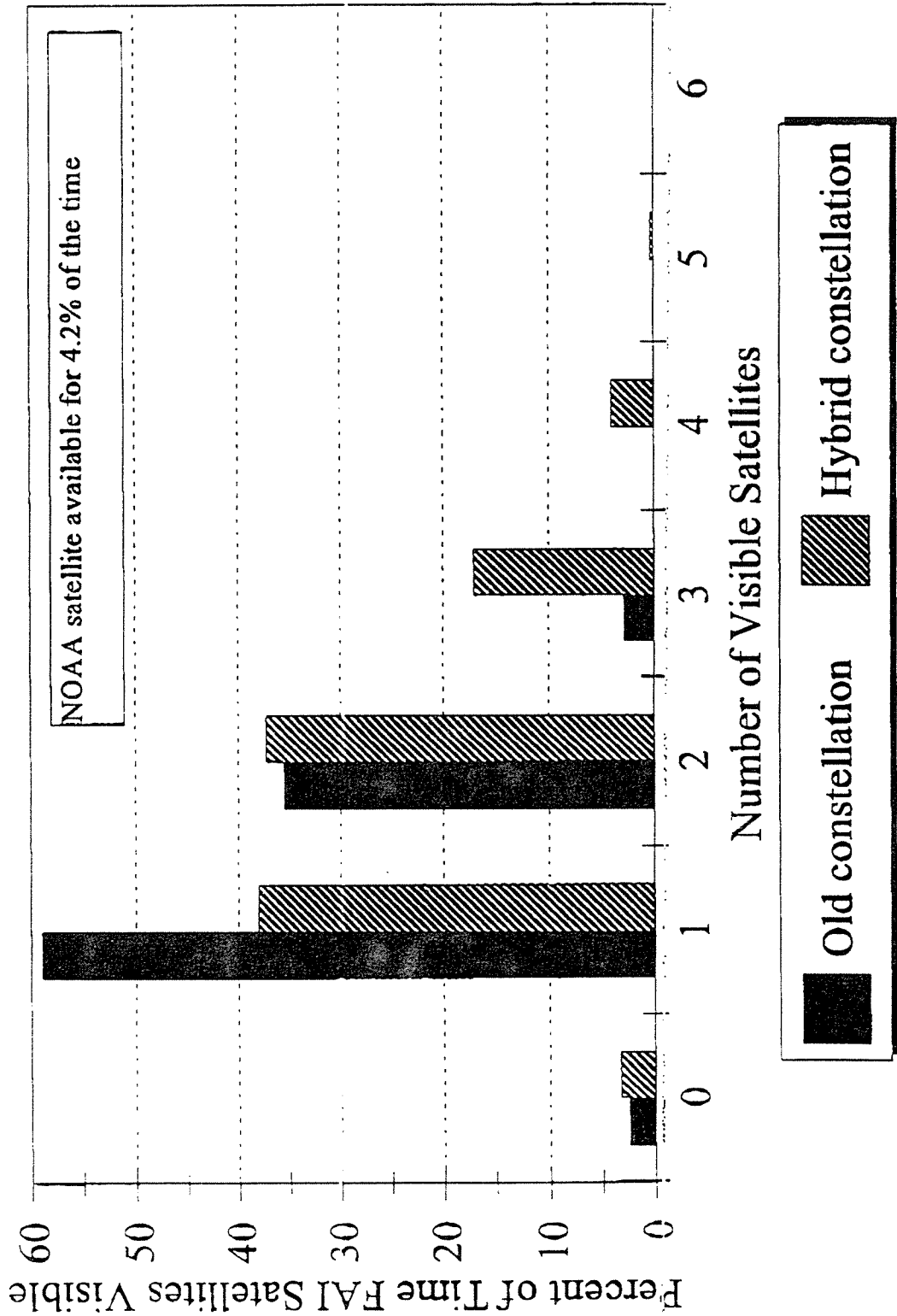
# Comparison of Constellations for Final Analysis at 0 deg North



# Comparison of Constellations for Final Analysis at 10 deg North

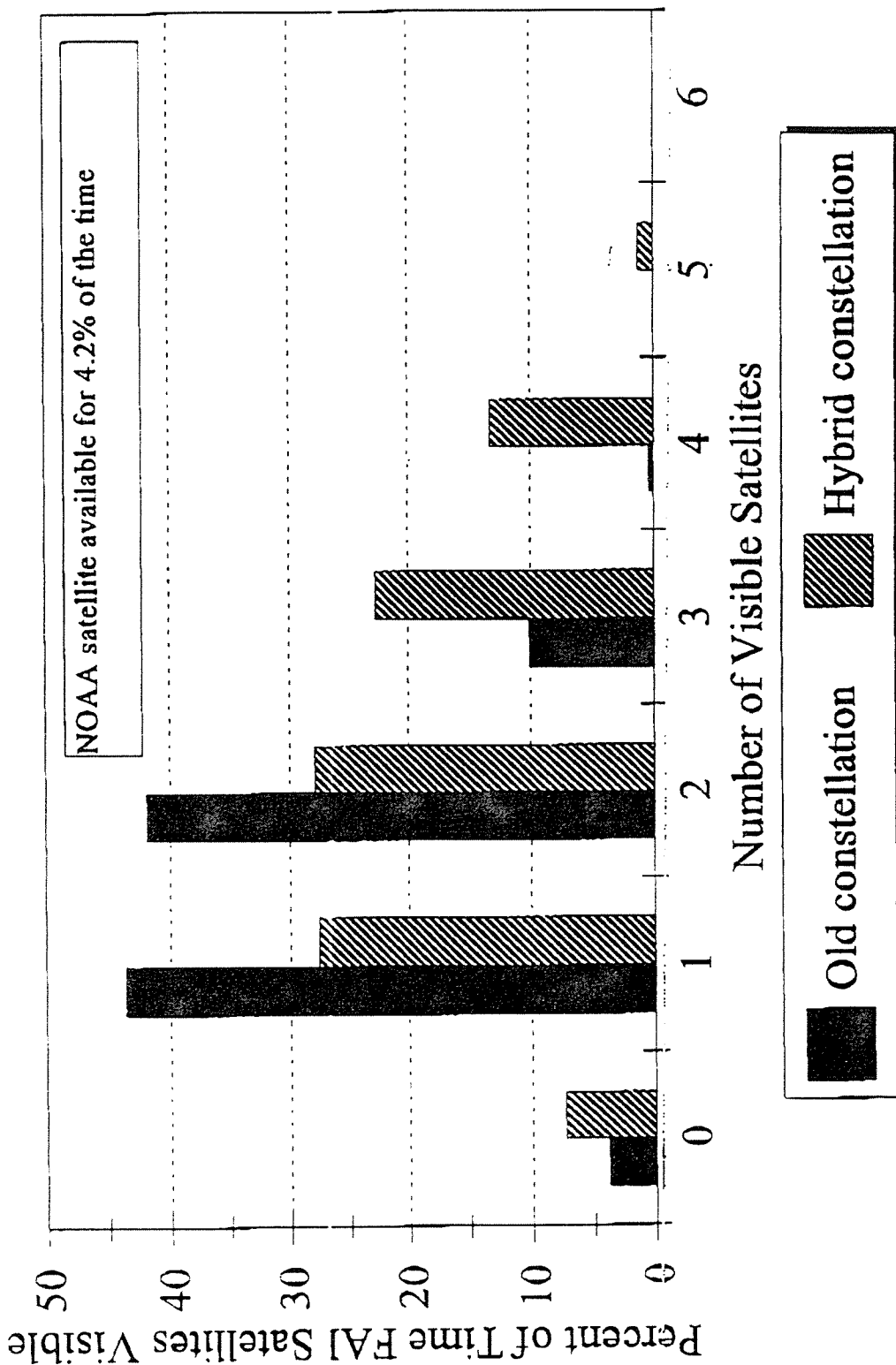


# Comparison of Constellations for Final Analysis at 20 deg North

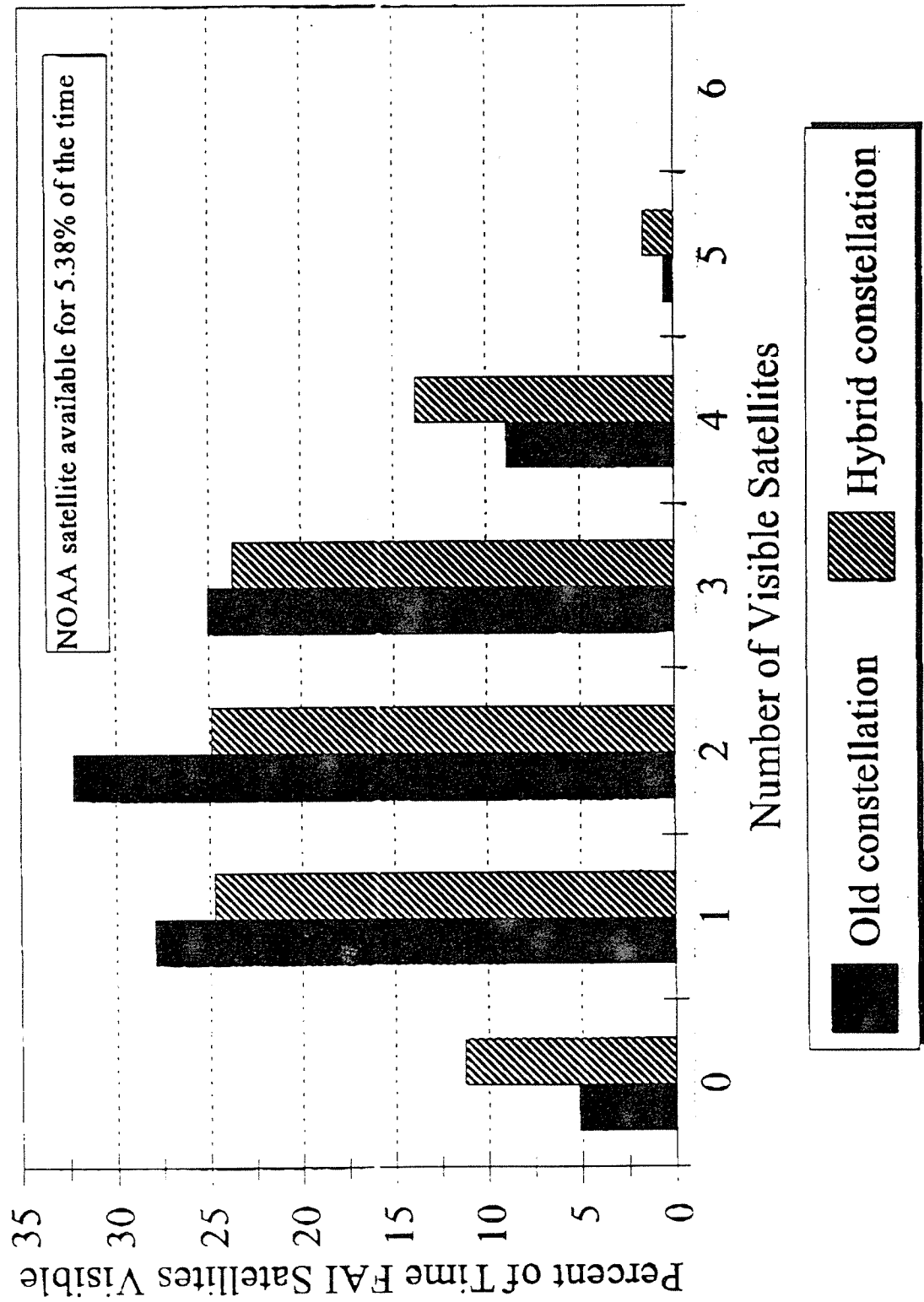




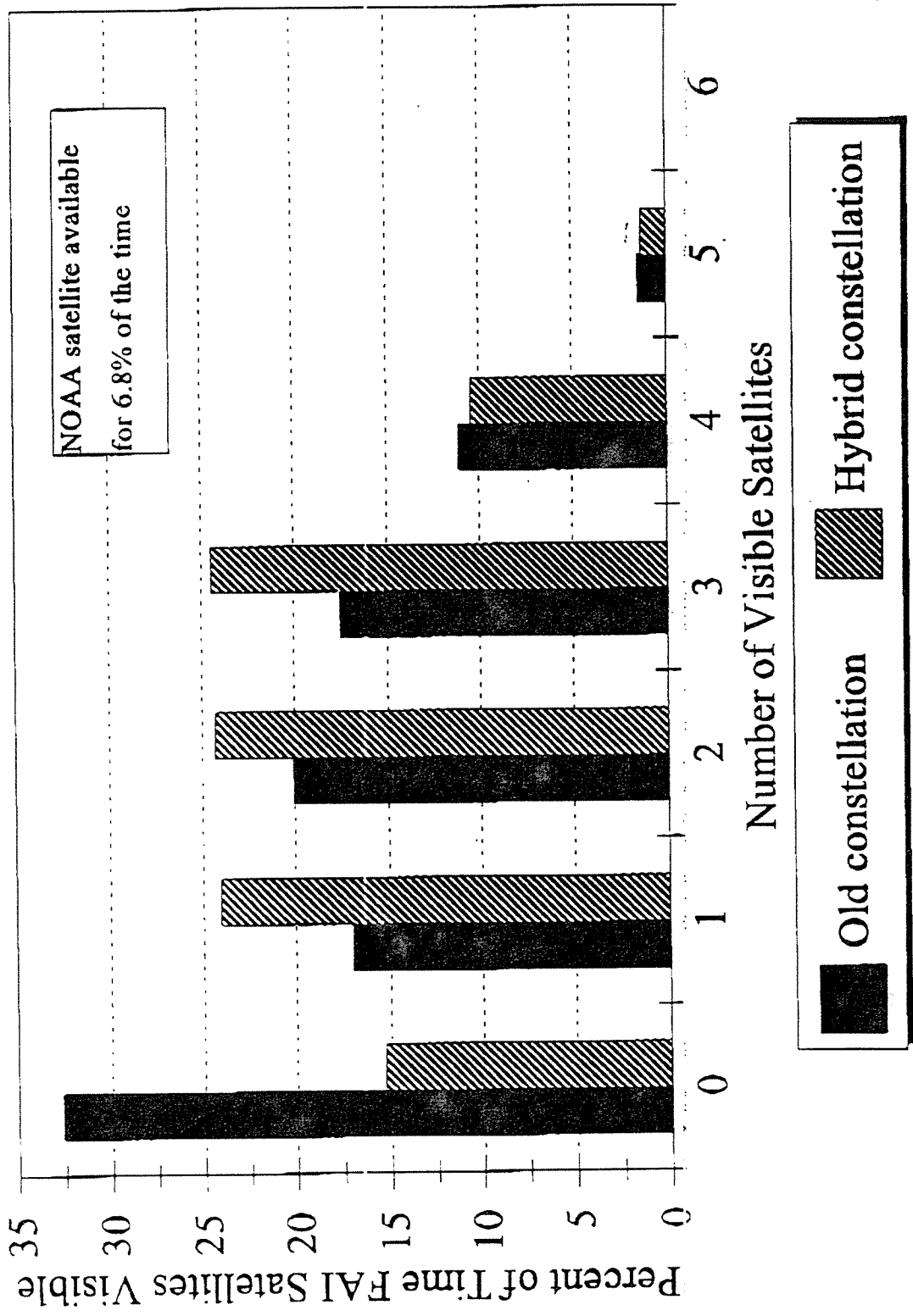
# Comparison of Constellations for Final Analysis at 30 deg North



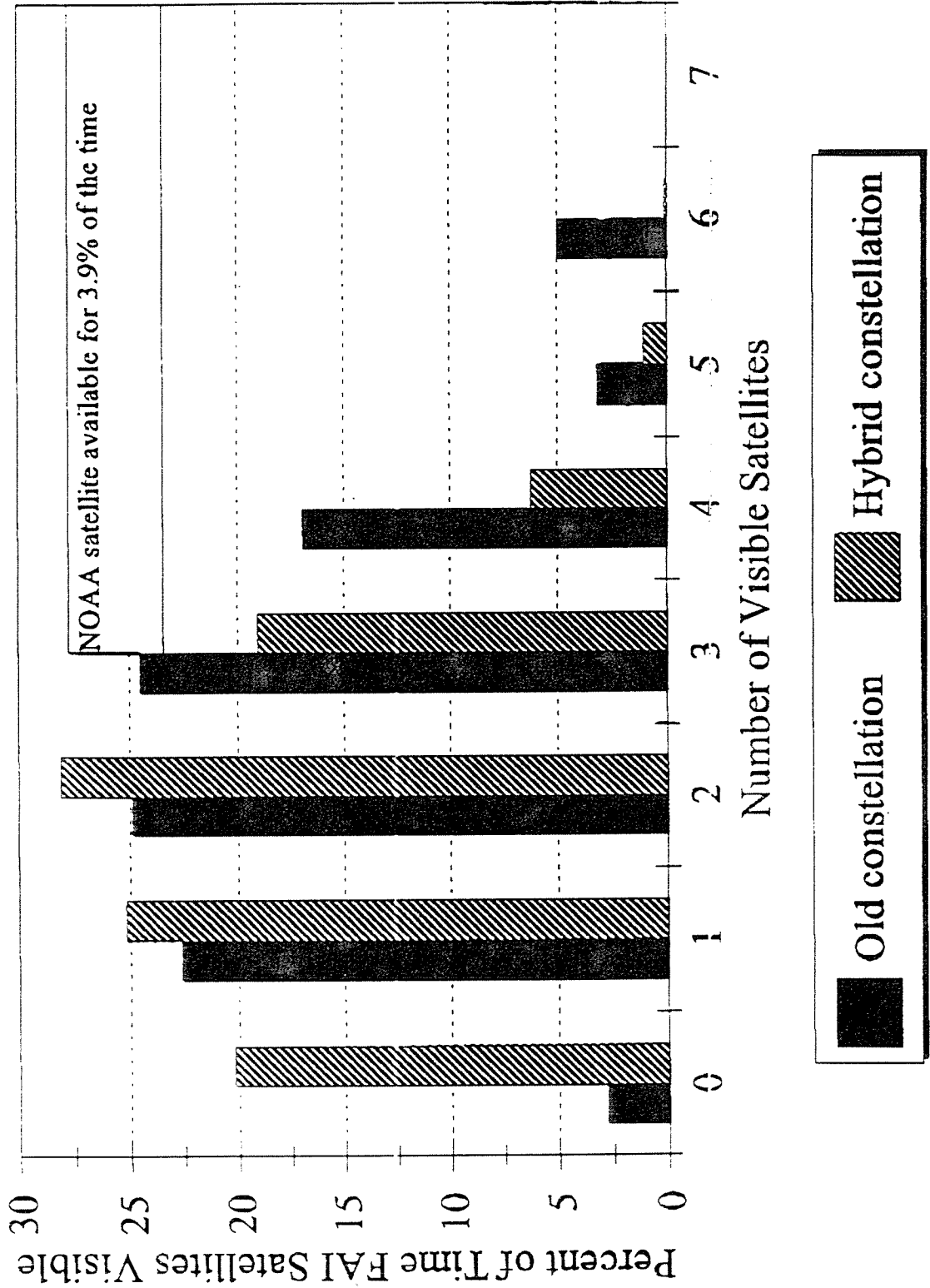
# Comparison of Constellations for Final Analysis at 40 deg North



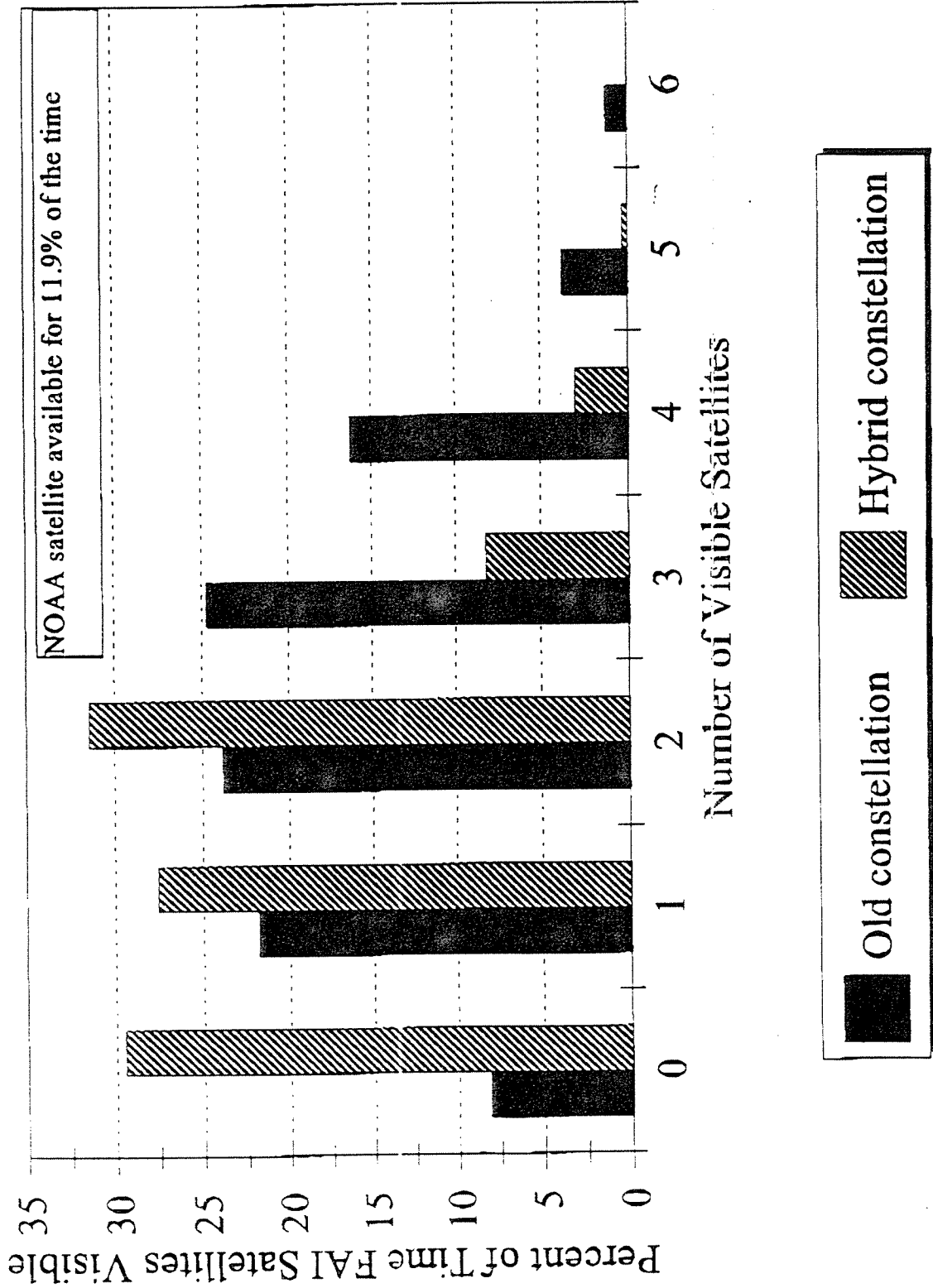
# Comparison of Constellations for Final Analysis at 50 deg North



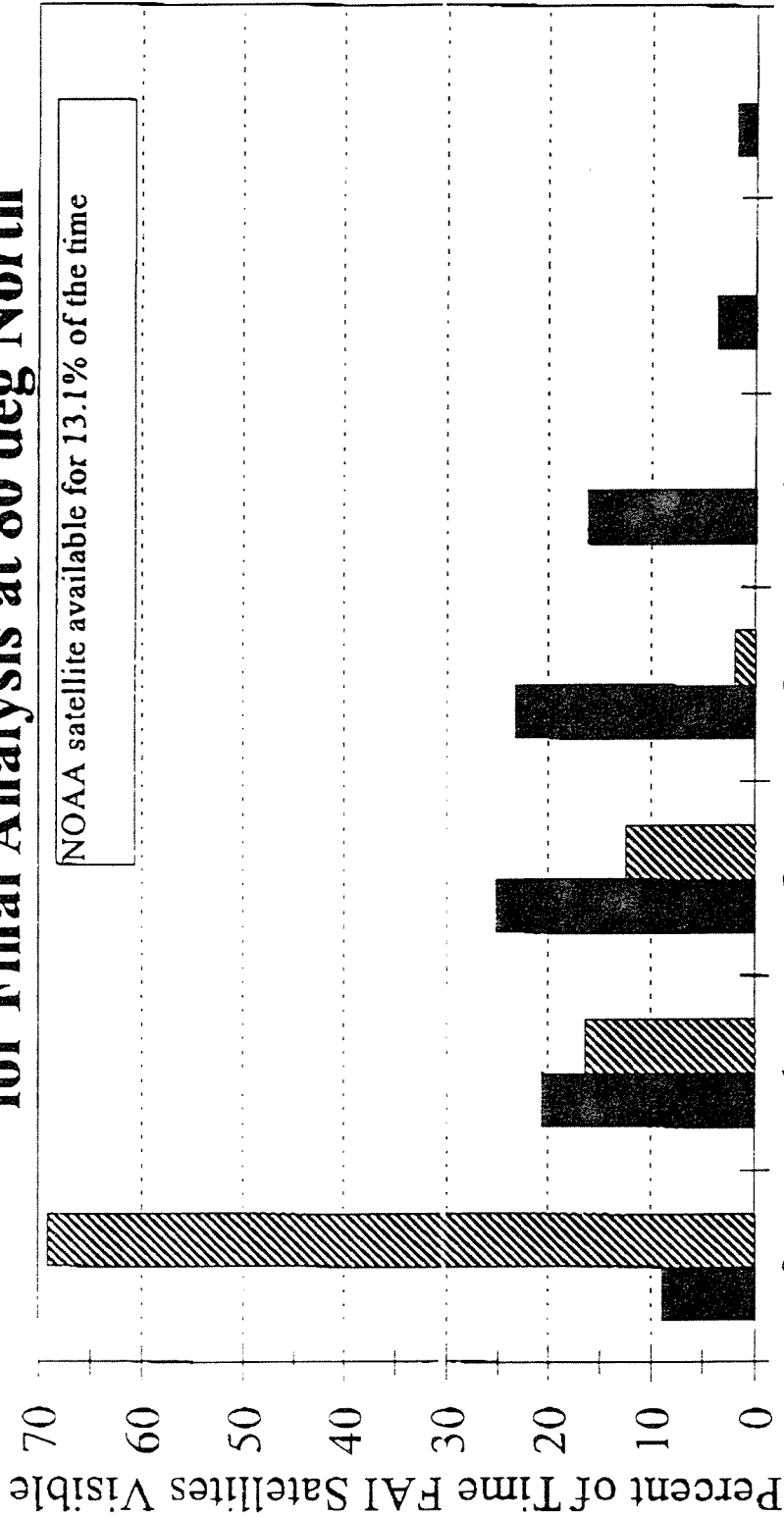
# Comparison of Constellations for Final Analysis at 60 deg North



# Comparison of Constellations for Final Analysis at 70 deg North



# Comparison of Constellations for Final Analysis at 80 deg North

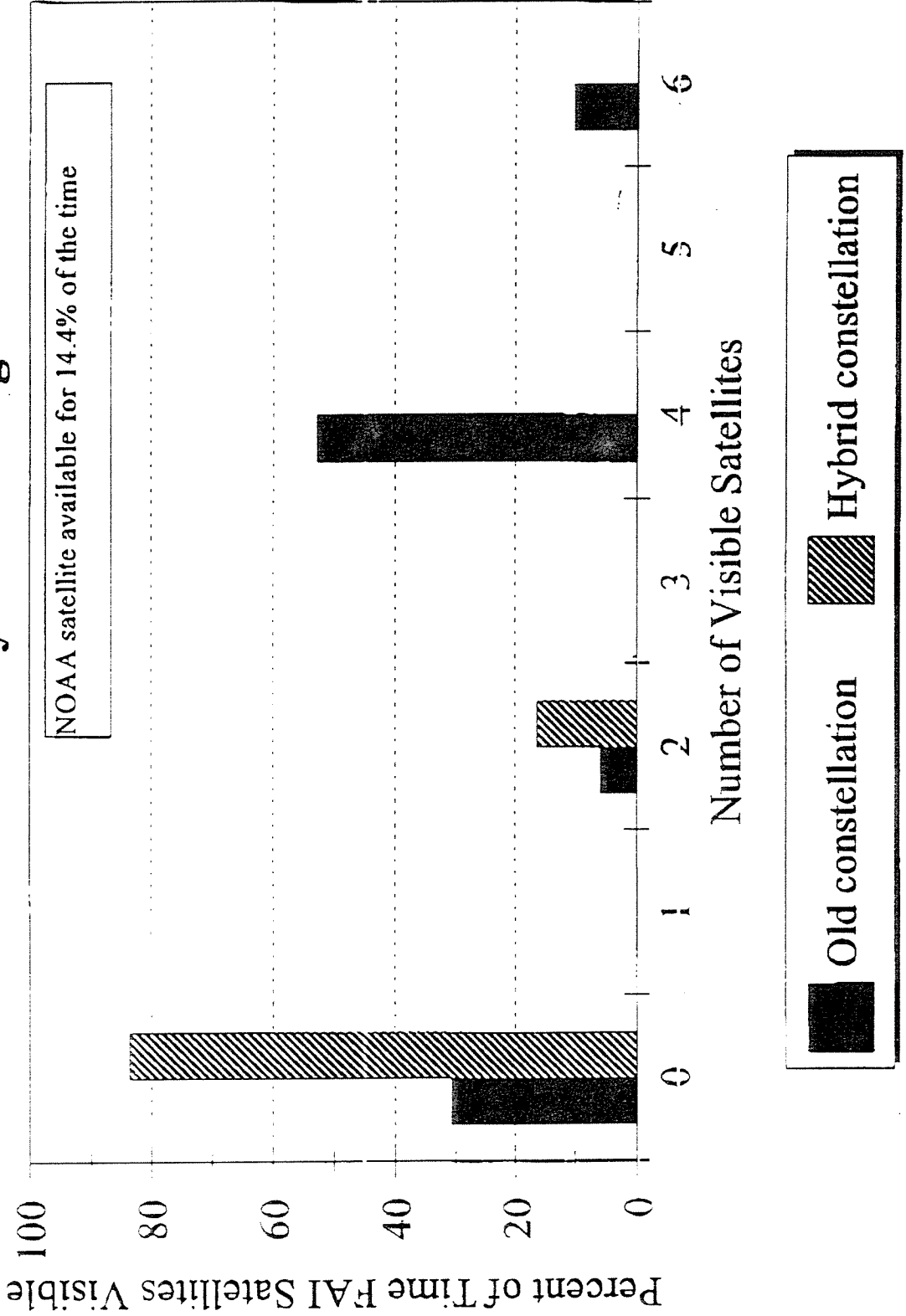


Number of Visible Satellites

Legend:

- Old constellation
- Hybrid constellation

# Comparison of Constellations for Final Analysis at 90 deg North



*Alex  
FYI  
H*



Office of Spectrum Management

25. SAT-P/LA-95  
76. SAT-AMEND-95  
79. SAT-AMEND-96  
151. SAT-AMEND-96  
7. SAT-AMEND-97

MEMORANDUM

December 29, 1997

TO: Harry Ng  
FROM: Jim Vorhies *JV*  
SUBJECT: Review of Little Leo Amended Applications

Review of the three amended applications to date point out the following:

E-Sat

pdf calculation method (i.e. average over 130 KHz) needs to be checked  
Ref. E-sat amended application  
Reply Comments of E-Sat Systems December 12, 1997

Final Analysis

Out-of-band emission in the 400 MHz band. The effect of raising the carrier power on adjacent band operations needs to be analyzed.  
Final Anaisis Reply Comments, December 15, 1997

Change in number and inclination of satellites means more interference potential. See Attachment  
Ref. FAI Amended Application  
Petition to Deny of LEO One, page 10

Leo One

Appears to meet the requirements in the Report and Order



## ATTACHMENT

To: D. McGinnis  
From: F. Eng  
Subject: Comments on FAI Amended Filing

CSC has reviewed Final Analysis Inc.'s (FAI's) latest amended filing dated October 30, 1997. We have some concern that the proposed changes significantly increase the probability of APT/LRPT interference in the more important, lower latitudes (e.g. below 50°). We recognize that under the present time sharing agreement, FAI is obligated to cease transmissions to avoid this interference, however we also recognize that this cessation of transmissions is dependent on the successful operation of a string of events including: 1) the transmission of appropriate commands to the FAI spacecraft, 2) the receipt and processing of the command, and 3) the successful execution of the command. In general, this string of events must be successfully completed for each "overlap" of NOAA and FAI satellite footprints. The number of overlaps is significantly increased at the lower latitudes by this latest FAI amendment, thereby increasing the probability of interference. If all FAI systems operated perfectly as planned there would be no grounds for concern, however, in the real world there is always a finite chance of faulty operations. The overall risk of interference is therefore expected to increase with this expansion of potential interfering events (i.e., satellite footprint overlaps at lower latitudes).

To: D. McGinnis

15 December 1997

From: F. Eng

Subject: Additional Comments on FAI Amended Filing

My 4 December 1997 memo presented concerns about the increased potential of interference resulting from FAI's amended filing (October 30, 1997). Since there will always be some finite potential for interference from a time sharing system, we strongly recommend that FAI be required to establish and operate a systematic capability to continuously monitor the EIRP of each satellite sharing the NOAA spectrum. NOAA should require that this monitoring function be able to identify any EIRP malfunction (i.e., transmitting when in view of Metsat polar spacecraft) within two hours of its initial occurrence. NOAA should further require that FAI be able to cease transmissions from the malfunctioning

satellite within two hours of its initial identification.