POINT PAPER ON SIR-B

HIGH RESOLUTION MODE

- o Proposed Concept
  - Modify SIR-B payload to operate in HI-RES (~3M) SAR mode
  - Collect imagery for digital processing
  - Provide result to Intelligence Community for analysis
- o Background
  - SIR-B is follow-on to SEASAT and SIR-A (flown on STS-2), developed for NASA by JPL
  - Baseline characteristics of SIR-A and SIR-B are in Table I
  - SIR-B is programmed by NASA to fly on the Shuttle in August 1984
  - A "Spotlight" capability, presently being considered by NASA for SIR-B, would not improve range resolution (currently about 25m) but would reduce azimuth resolution to about 2 to 6m
  - Cost of SIR-A was $6M; estimate for SIR-B is $11-12M
  - NASA has not yet defined cost for the SIR-B "Spotlight" modification, but it is expected to be minimal, probably within NASA reprogramming authority
  - NASA briefed [redacted] on the SIR-B concept and three options for HI-RES, shown with cost data in Table II, all of which exceed the current SIR-B design and "Spotlight" feature capability (b)(1) (b)(3)
- o Utility Considerations
  - Both SIR-A and SIR-B are short duration experimental missions and, therefore, have virtually no foreign intelligence utility
  - Intelligence utility for medium resolution (~3M) radar imagery during peace-through-SIOP execution is low
  - Requirement exists for medium resolution radar imagery during post-SIOP and reconstitution, but SIR-B approach lacks credibility in this environment

[redacted]

- SIR-B unsatisfactory for MC&G
  - -- Insufficient resolution and metric accuracy
  - -- JPL SAR interferometer concept being evaluated separately
- SIR-B product may have potential experimental utility in community assessments [redacted]

o Security Considerations

- [redacted] public knowledge of the experiment and exposure of results is virtually certain
- Public and foreign outcry on HI-RES also virtually certain without security protection
- If NASA proceeds with proposed concept, approval to operate SIR-B in "Spotlight" or HI-RES (3M or less) mode must be acquired IAW NSDD-42 (SIG Space issue)

o Conclusions

- High probability of C^3I hidden agenda
  - -- Seeking cheap sensor alternative to [redacted]
  - -- Seeking cheap sensor alternative to REIS/SEIS for medium resolution radar imagery during post-SIOP/reconstitution period?
  - -- Seeking cheap alternative for satisfying MC&G terrain mapping requirements?
- Intelligence and MC&G community interest insufficient to fund any SIR-B HI-RES or "Spotlight" modifications
- [redacted] (b)(1) (b)(3)
- Due to low cost of the "Spotlight" modification and apparent NASA interest in fully exploiting SIR-B capability, NASA may decide to implement the "Spotlight" mode without external support

o Options

- Let NASA justify, fund, sponsor NSDD approval, operate and process data; DCI/DOD evaluate civil system product
- [redacted]

[redacted]

o Recommendations

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- If SIR-B flown by NASA in HI-RES or "Spotlight" mode:

  -- Insure NSDD-42 approval is acquired

  -- Encourage DCI and DMA to evaluate exploitability of SIR-B imagery (b)(1) (b)(3)

- If DOD sponsors SIR-B HI-RES or "Spotlight" mode:

  -- DOD pays (outside the DRSP MC&G support element)

  -- Preferred methodology

    --- Classify operation to conceal intelligence purpose

    --- No public knowledge of HI-RES or "Spotlight" experiment

    --- No public dissemination of product

    --- NPIC/DMA evaluation of radar imagery utility

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TABLE I

SIR-B FUNCTIONAL DESIGN REVIEW

BASELINE CHARACTERISTICS

	SIR-A	SIR-B
FREQUENCY	L-BAND	L-BAND
PEAK POWER (kW)	1	1
BANDWIDTH (MHz)	6	12
INCIDENT ANGLE	50°	15° TO 60°
RANGE RESOLUTION (M)	38	55 TO 15
AZIMUTH RESOLUTION (M)	38	25
SWATH WIDTH (km)	50	30 TO 55
NUMBER OF LOOKS	6	4
ANTENNA	FIXED	FOLD AND TILT
DATA HANDLING	OPTICAL	DIGITAL AND OPTICAL
DIGITIZATION (BITS PER SAMPLE)	N/A	6-3
DATA COLLECTION	FILM	VIA TDRSS AND FILM
BIT RATE (mbps)	N/A	46
DATA PROCESSING	OPTICAL	DIGITAL AND OPTICAL
DATA COLLECTION TIME (hrs)	8	25 DIGITAL AND 8 OPTICAL
MODES AND CONFIGURATION CONTROL	BY COMMAND OR PROGRAMMING	

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TABLE II

IMAGING RADAR RESOLUTION IMPROVEMENT

Presented in July [redacted] (b)(1) (b)(3) Jim Welch/NASA

IMAGING RADAR RESOLUTION IS IMPROVED BY

- Increasing Bandwidth
- Increasing Incidence Angle

EXAMPLES

MISSION	BANDWIDTH	INCIDENCE ANGLE	RESOLUTION	ADDITIONAL COST	SCHEDULE	COMMENTS
SEASAT (1978)	18 MHZ	20°	25m	-	-	-
SIR-A (1981) SIR-B	6 MHZ	50°	37m	-	-	-
1. Baseline	~~6~~ 12 MHZ	15°	110m	0	June, 1984	-
		65°	30m 15m			
2. Option 1	18 MHZ	15°	37m	$2M	June, 1984	Use 18 MHZ SAW Modulator, no antenna mod. req.
		65°	10m			
3. Option 2	50 MHZ	15°	13m	$9M	June, 1984	Use 50 MHZ SAW Modulator; antenna and ADC mods required
		65°	4m			
4. Option 3	100 MHZ	15°	7m	$12M	Nov., 1984	Use active coding in ADC; major antenna mod. required
		65°	2m			