INSERT 'A' HERE

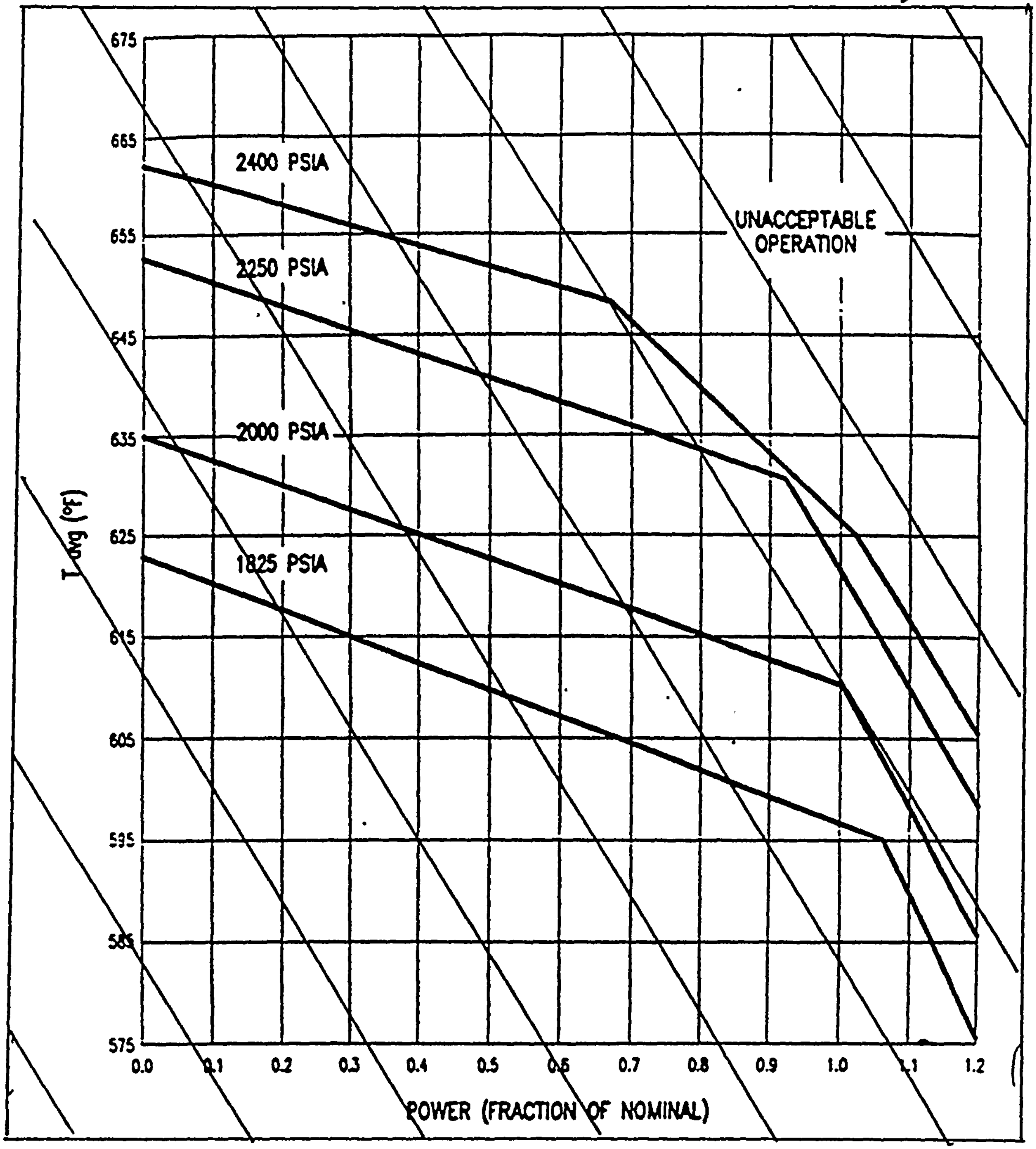

FIGURE 2.1-1

REACTOR CORE SAFETY LIMIT - THREE LOOPS IN OPERATION

INSERT A

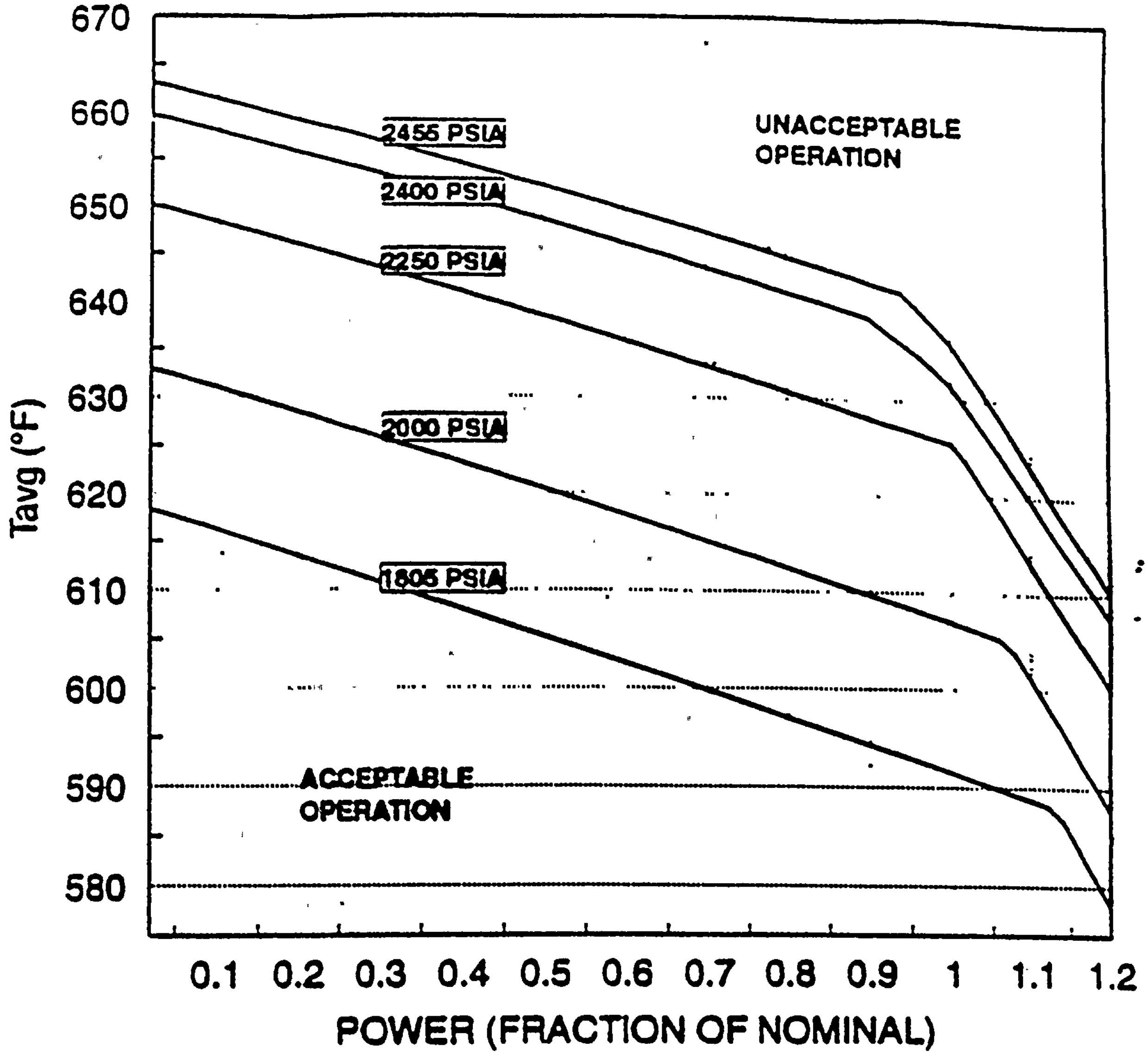

Figure 2.1-1

Reactor Core Safety Limit - Three Loops in Operatior

TABLE 2.2-1

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	ALLOWABLE VALUE	TRIP SETPOINT
1. Manual Reactor Trip	N.A	N.A.
2. Power Range, Neutron Flux		
a. High Setpoint	≤112.0% of RTP**	≤109% of RTP**
b. Low Setpoint	≤28.0% of RTP**	≤25% of RTP**
3. Intermediate Range, Neutron Flux	≤31.0% of RTP**	≤25% of RTP**
4. Source Range, Neutron Flux	≤1.4 X 10^5 cps	≤10^5 cps
5. Overtemperature ΔT	See Note 2	See Note 1
6. Overpower ΔT	See Note 4	See Note 3
7. Pressurizer Pressure-Low	≥1817 psig	≥1835 psig
8. Pressurizer Pressure-High	≤2403 psig	≤2385 psig
9. Pressurizer Water Level-High	≤92.2% of instrument span	≤92% of instrument span
10. Reactor Coolant Flow-Low	≥88.7% of loop design flow* (88.8%)	≥90% of loop design flow*
11. Steam Generator Water Level Low-Low	≥13.2% of narrow range instrument span (8.9%)	≥15% of narrow range instrument span (10%)

* Loop design flow = 89,500 gpm
** RTP = Rated Thermal Power

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	ALLOWABLE VALUE	TRIP SETPOINT
12. Steam/Feedwater Flow Mismatch Coincident With	Feed Flow $\leq$23.9% below rated Steam Flow	Feed Flow $\leq$20% below rated Steam Flow
Steam Generator Water Level-Low	$\geq$13.2% [8.9%] of narrow range instrument span	$\geq$15% [10%] of narrow range instrument span
13. Undervoltage - 4.16 kV Busses A and B	$\geq$69% bus voltage	$\geq$70% bus voltage
14. Underfrequency - Trip of Reactor Coolant Pump Breaker(s) Open	$\geq$55.9 Hz	$\geq$56.1 Hz
15. Turbine Trip		
a. Auto Stop Oil Pressure	$\geq$42 psig	$\geq$45 psig
b. Turbine Stop Valve Closure	Fully Closed***	Fully Closed***
16. Safety Injection Input from ESF	N. A.	N.A.
17. Reactor Trip System Interlocks		
a. Intermediate Range Neutron Flux, P-6	$\geq 6.0\times10^{-11}$ amps	Nominal 1×10^{-10} amp

*** Limit switch is set when Turbine Stop Valves are fully closed.

TABLE 2.2-1 (Continued)
TABLE NOTATIONS

NOTE 1: OVERTEMPERATURE ΔT

$$\Delta T \left\{\frac{1+\tau_1 S}{1+\tau_2 S}\right\} \left(\frac{1}{1+\tau_3 S}\right) \leq \Delta T_0 \left\{K_1 - K_2 \frac{(1+\tau_4 S)}{(1+\tau_5 S)} \left[T \left(\frac{1}{1+\tau_6 S}\right) - T'\right] + K_3(P - P') - f_1(\Delta I)\right\}$$

Where: ΔT = Measured ΔT by RTD Instrumentation

$\frac{1+\tau_1 S}{1+\tau_2 S}$ = Lead/Lag compensator on measured ΔT; τ_1=0s, τ_2 =0s

$\frac{1}{1+\tau_3 S}$ = Lag compensator on measured ΔT; τ_3 = 0s

ΔT_0 = Indicated ΔT at RATED THERMAL POWER

K_1 = ~~1.095~~; 1.25

K_2 = ~~0.0107~~/°F; 0.016

$\frac{1+\tau_4 S}{1+\tau_5 S}$ = The function generated by the lead-lag compensator for T_{avg} dynamic compensation;

τ_4, τ_5 = Time constants utilized in the lead-lag compensator for T_{avg}, τ_4 = 25s, τ_5 = 3 s;

T = Average temperature, °F;

$\frac{1}{1+\tau_6 S}$ = Lag compensator on measured T_{avg}; τ_6 = 0s

T' ≤ 574.2°F (Nominal T_{avg} at RATED THERMAL POWER);

K_3 = ~~0.000453~~/psig; 0.0011

P = Pressurizer pressure, psig;

TABLE 2.2-1 (Continued)

TABLE NOTATIONS (Continued)

NOTE 1: (Continued)

P' $\geq$ 2235 psig (Nominal RCS operating pressure);

S = Laplace transform operator, s^{-1};

and f_1 (ΔI) is a function of the indicated difference between top and bottom detectors of the power-range neutron ion chambers; with gains to be selected based on measured instrument response during plant startup tests such that:

(1) For $q_t - q_b$ between ~~- 14%~~ −46% and ~~+ 10%~~ +2%, f_1 (ΔI) = 0, where q_t and q_b are percent RATED THERMAL POWER in the top and bottom halves of the core respectively, and $q_t + q_b$ is total THERMAL POWER in percent of RATED THERMAL POWER;

(2) For each percent that the magnitude of $q_t - q_b$ exceeds ~~- 14%,~~ −46% the ΔT Trip Setpoint shall be automatically reduced by 1.5% of its value at RATED THERMAL POWER; and

(3) For each percent that the magnitude of $q_t - q_b$ exceeds ~~+ 10%,~~ +2% the ΔT Trip Setpoint shall be automatically reduced by ~~1.5%~~ 2.3% of its value at RATED THERMAL POWER.

NOTE 2: The channels maximum trip setpoint shall not exceed its computed setpoint by more than ~~1.5%~~ 0.73% of instrument span.

TABLE 2.2-1 (Continued)

TABLE NOTATIONS (Continued)

NOTE 3: OVERPOWER ΔT

$$\Delta T \left\{\frac{1 + \tau_1 S}{1 + \tau_2 S}\right\} \left(\frac{1}{1 + \tau_3 S}\right) \leq \Delta T_o \left\{K_4 - K_5 \left(\frac{\tau_7 S}{1 + \tau_7 S}\right) \left(\frac{1}{1 + \tau_6 S}\right) T - K_6 \left[T \left(\frac{1}{1 + \tau_6 S}\right) - T''\right] - f_2 (\Delta I)\right\}$$

Where:

ΔT	=	As defined in Note 1,
$\frac{1 + \tau_1 S}{1 + \tau_2 S}$	=	As defined in Note 1,
$\frac{1}{1 + \tau_3 S}$	=	As defined in Note 1,
ΔT_o	=	As defined in Note 1,
K_4	$\leq$	~~1.09~~, 1.10
K_5	$\geq$	0.02/°F for increasing average temperature and 0 for decreasing average temperature,
$\frac{\tau_7 S}{1 + \tau_7 S}$	=	The function generated by the rate-lag compensator for T_{avg} dynamic compensation,
τ_7	=	Time constants utilized in the rate-lag compensator for T_{avg}, $\tau_7 \geq 10$ s,
$\frac{1}{1 + \tau_6 S}$	=	As defined in Note 1,

TABLE 2.2-1 (Continued)

TABLE NOTATIONS (Continued)

NOTE 3: (Continued)

K_6 = ~~0.00068~~ 0.00232/°F for T > T"
  = 0 for T ≤ T",

T = As defined in Note 1,

T" = Indicated T_{avg} at RATED THERMAL POWER (Calibration temperature for ΔT instrumentation, ≤ 574.2°F),

S = As defined in Note 1, and

f_2 (ΔI) = 0 for all ΔI

NOTE 4: The channel's maximum trip setpoint shall not exceed its computed trip setpoint by more than ~~1.4~~ 0.4% of instrument span.

3/4.2.5 DNB PARAMETERS

LIMITING CONDITION FOR OPERATION

3.2.5 The following DNB-related parameters shall be maintained within the following limits:

a. Reactor Coolant System T_{avg} $\leq$ 576.6°F

b. Pressurizer Pressure $\geq$ 2209 psig*, and

c. Reactor Coolant System Flow $\geq$277,900 gpm

APPLICABILITY: MODE 1.

ACTION:

With any of the above parameters exceeding its limit, restore the parameter to within its limit within 2 hours or reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

INSERT 'B' HERE

4.2.5.1 ~~Each of the parameters shown above shall be verified to be within its limits at least once per 12 hours~~.

(3) 4.2.5.~~2~~ The RCS flow rate indicators shall be subjected to a CHANNEL CALIBRATION at least once per 18 months.

(4) 4.2.5.~~3~~ ~~The RCS flow rate shall be demonstrated by measurement once per 18 months~~.

INSERT (C) HERE

*Limit not applicable during either a THERMAL POWER ramp in excess of 5% of RATED THERMAL POWER per minute or a THERMAL POWER step in excess of 10% of RATED THERMAL POWER.

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INSERT (B)

Reactor Coolant System T_{avg} and Pressurizer Pressure shall be verified to be within their limits at least once per 12 hours.

4.2.5.2 RCS flow rate shall be monitored for degradation at least once per 12 hours.

INSERT (C)

4.2.5.4 After each fuel loading, and at least once per 18 months, the RCS flow rate shall be determined by precision heat balance after exceeding 90% RATED THERMAL POWER. The measurement instrumentation shall be calibrated within 90 days prior to the performance of the calorimetric flow measurement. The provisions of 4.0.4 are not applicable for performing the precision heat balance flow measurement.

TABLE 3.3-3 (Continued)

ENGINEERED SAFETY FEATURES ACTUATION SYSTEM
INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	ALLOWABLE VALUE	TRIP SETPOINT
5. Feedwater Isolation (Continued)		
c. Steam Generator Water Level High-High	≤81.9% of narrow range instrument span	≤80% of narrow range instrument span
6. Auxiliary Feedwater (3)		
a. Automatic Actuation Logic and Actuation Relays	N.A.	N.A.
b. Steam Generator Water Level--Low-Low	≤13% [handwritten: ≥8.9%] of narrow range instrument span.	≥15% [handwritten: 10%] of narrow range instrument span.
c. Safety Injection	See Item 1. above for all Safety Injection Allowable Values.	See Item 1. above for all Safety Injection Trip Setpoints.
d. Bus Stripping	See Item 7. below for all Bus Stripping Allowable Values.	See Item 7. below for all Bus Stripping Trip Setpoints.
e. Trip of All Main Feedwater Pump Breakers	N.A.	N.A.
7. Loss of Power		
a. 4.16 kV Busses A and B (Loss of Voltage)	N.A.	N.A.

3/4.2.4 QUADRANT POWER TILT RATIO

The QUADRANT POWER TILT RATIO limit assures that the radial power distribution satisfies the design values used in the power capability analysis. Radial power distribution measurements are made during STARTUP testing and periodically during power operation.

The limit of 1.02, at which corrective action is required, provides DNB and linear heat generation rate protection with x-y plane power tilts. A limit of 1.02 was selected to provide an allowance for the uncertainty associated with the indicated power tilt.

The 2-hour time allowance for operation with a tilt condition greater than 1.02 but less than 1.09 is provided to allow identification and correction of a dropped or misaligned control rod. In the event such action action does not correct the tilt, the margin for uncertainty on F_Q (Z) is reinstated by reducing the maximum allowed power by 3% for each percent of tilt in excess of 1.

For purposes of monitoring QUADRANT POWER TILT RATIO when one excore detector is inoperable, the movable incore detectors or incore thermocouple map are used to confirm that the normalized symmetric power distribution is consistent with the QUADRANT POWER TILT RATIO. The incore detector monitoring is done with a full incore flux map or two sets of four symmetric thimbles. The two sets of four symmetric thimbles is a unique set of eight detector locations. These locations are C-8, E-5, E-11, H-3, H-13, L-5, L-11, N-8.

3/4.2.5 DNB PARAMETERS

The limits on the DNB-related parameters assure that each of the parameters are maintained within the normal steady-state envelope of operation assumed in the transient and accident analyses. The limits are consistent with the initial FSAR assumptions and have been analytically demonstrated adequate to maintain a minimum DNBR above the applicable design limits throughout each analyzed transient. The indicated T_{avg} value of 576.6°F and the indicated pressurizer pressure value of 2209 psig correspond to analytical limits of 578.2°F and 2185 psig respectively, with allowance for measurement uncertainty.

The indicated RCS flow value of 277,900 gpm corresponds to an analytical limit of 268,500 gpm which is assumed to have a 3.5% measurement uncertainty. The above measurement uncertainty estimates assume that these instrument channel outputs are averaged to minimize the uncertainty.

The 12-hour periodic surveillance of these parameters through instrument readout is sufficient to ensure that the parameters are restored within their limits following load changes and other expected transient operation.

INSERT 'D' HERE

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INSERT (D)

The 18-month periodic measurement of the RCS total flow rate is adequate to ensure that the DNB-related flow assumption is met and to ensure correlation of the flow indication channels with measured flow. Six month drift effects have been included for feedwater temperature, feedwater flow, steam pressure, and the pressurizer pressure inputs. The flow measurement is performed within ninety days of completing the cross-calibration of the hot leg and cold leg narrow range RTDs. The indicated percent flow surveillance on a 12-hour basis will provide sufficient verification that flow degradation has not occurred. A change in indicated percent flow which is greater than the instrument channel inaccuracies and parallax errors is an appropriate indication of RCS flow degradation.