Reliability Animal Detection System

US Hwy 191 in Yellowstone NP, MT

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Whisper Camel &
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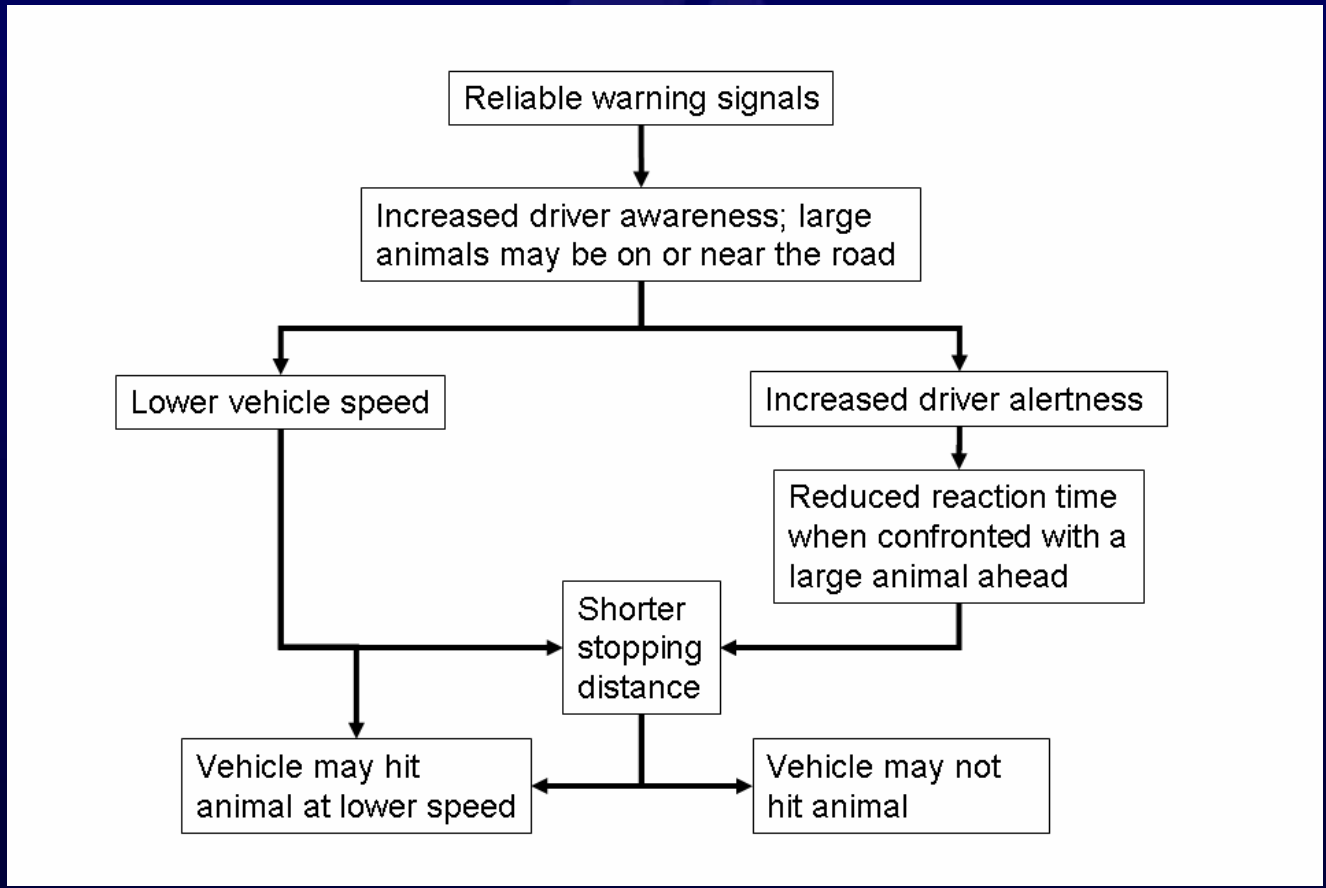
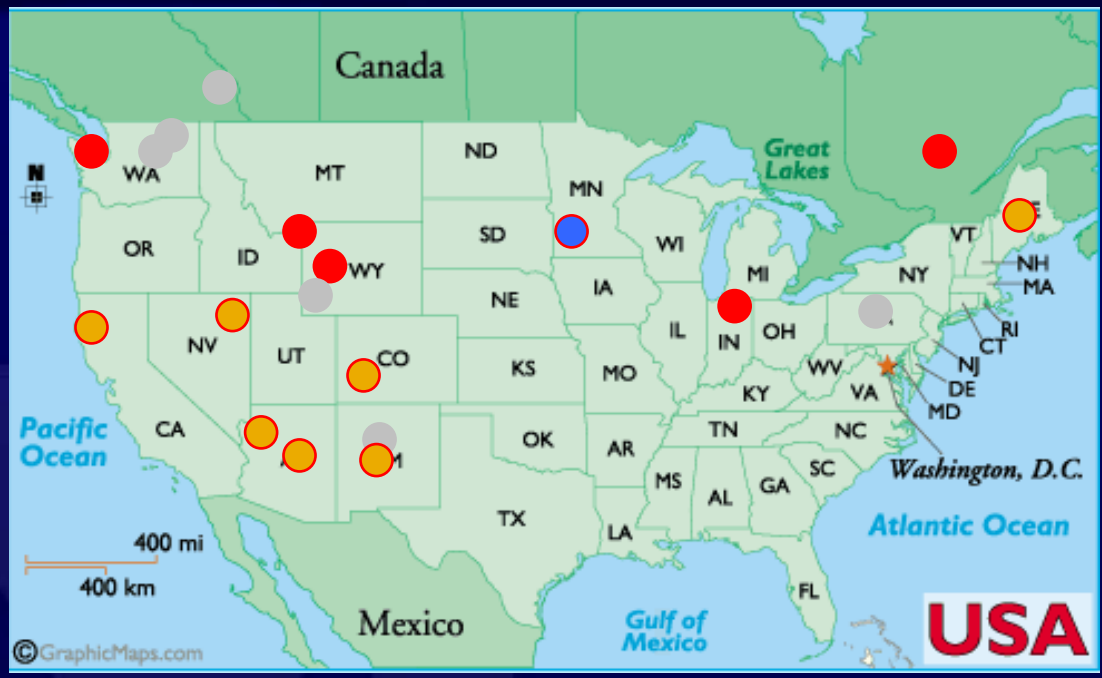
Animal detection system and driver response



- Operational animal detection system
- Non-operational animal detection system
- Planned animal detection system
- Dismantled animal detection system

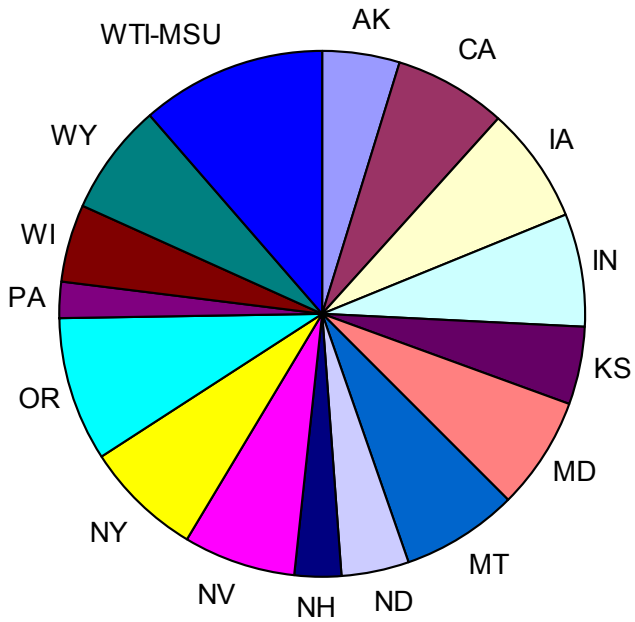


Location and status animal detection systems

Mountains & Minds

This talk:

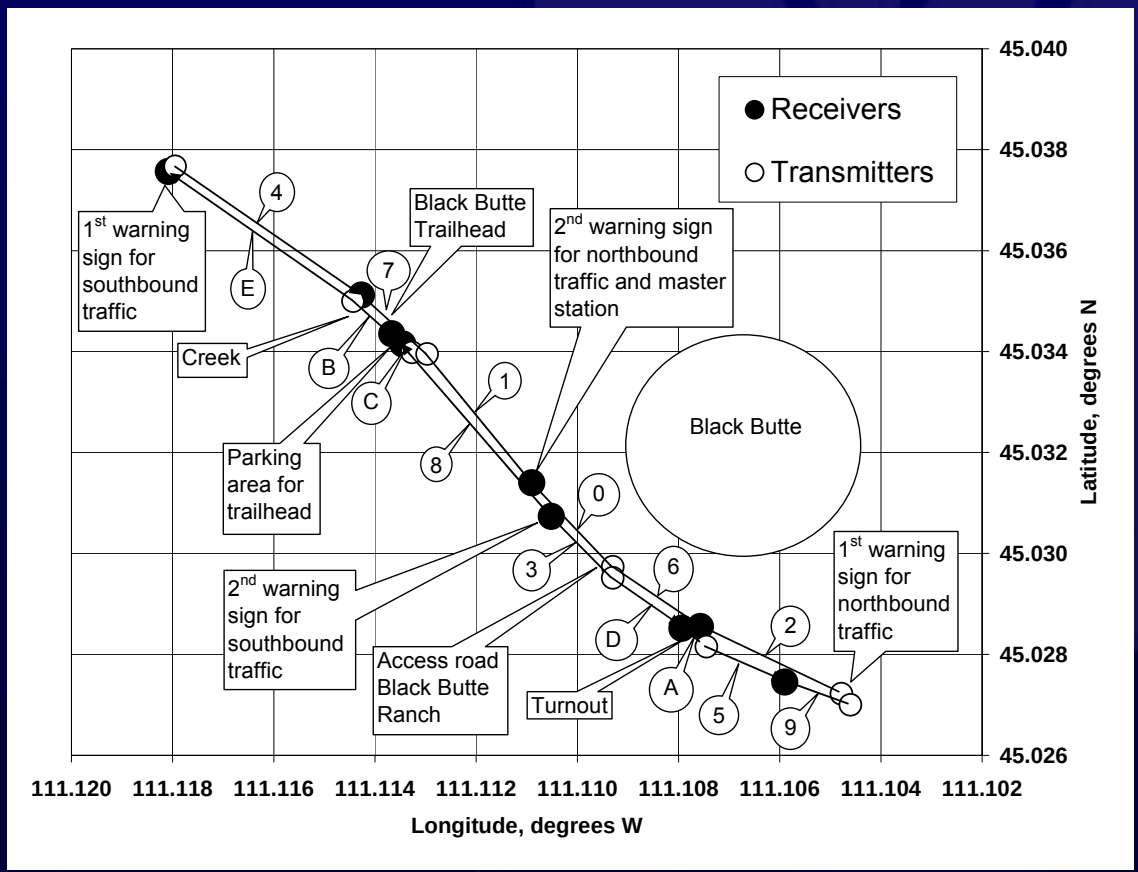
- Reliability
- Cost - benefit



Funding $1,065,000

Mountains & Minds

Reliability: Yellowstone NP, MT

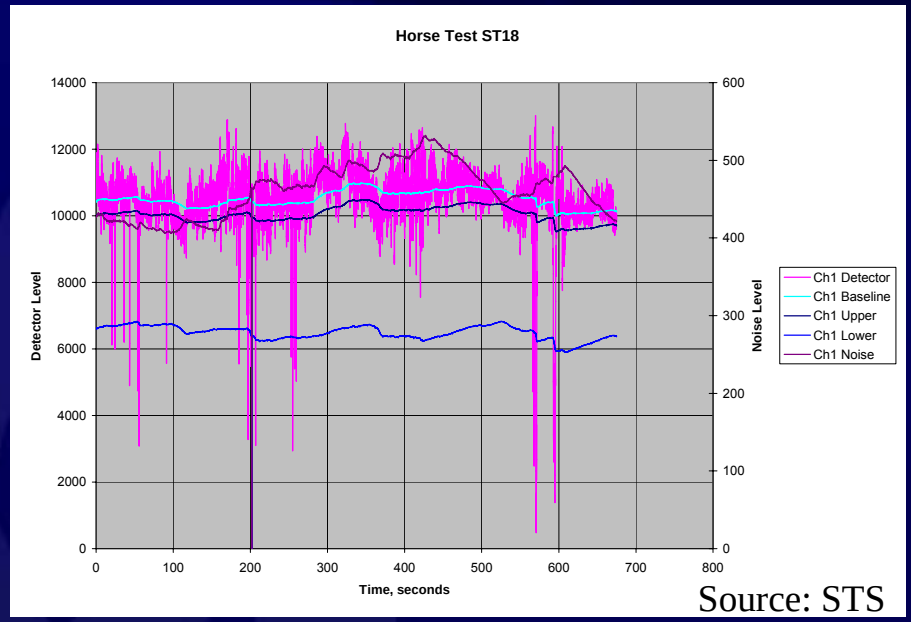


Problems … and solutions

Snow and ice

Sleeves

Problems … and solutions



Source: STS

Photo: Lloyd Salsman, STS

Mountains & Minds

Landscape aesthetics

Yellowstone NP, MT, USA

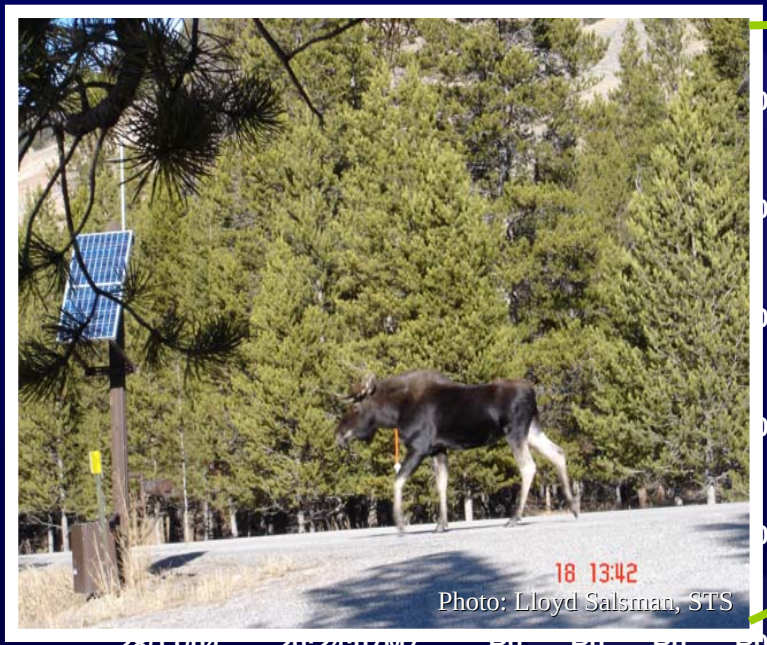
Thompsontown, PA, USA

Reliability

- Detection data patterns
- Snow tracking
- Compare detections – snow tracking

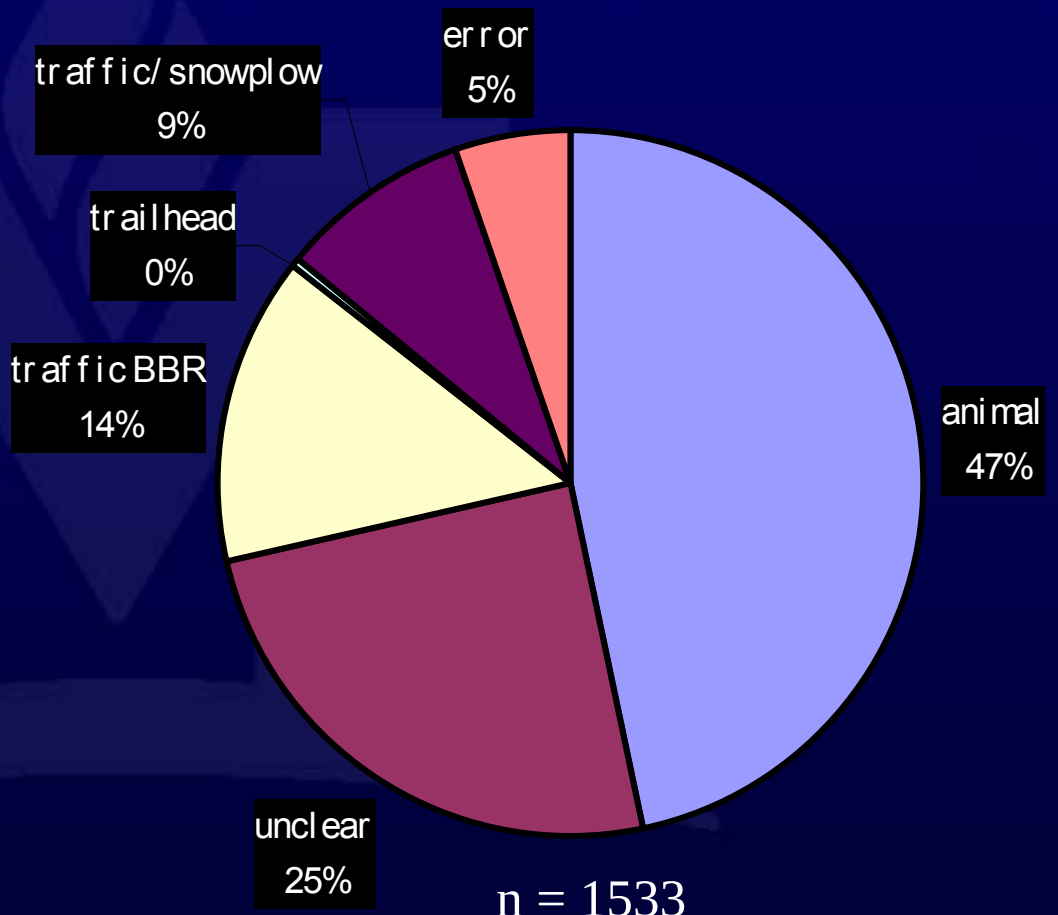
- Test for blind spots

Interpretation animal crossings



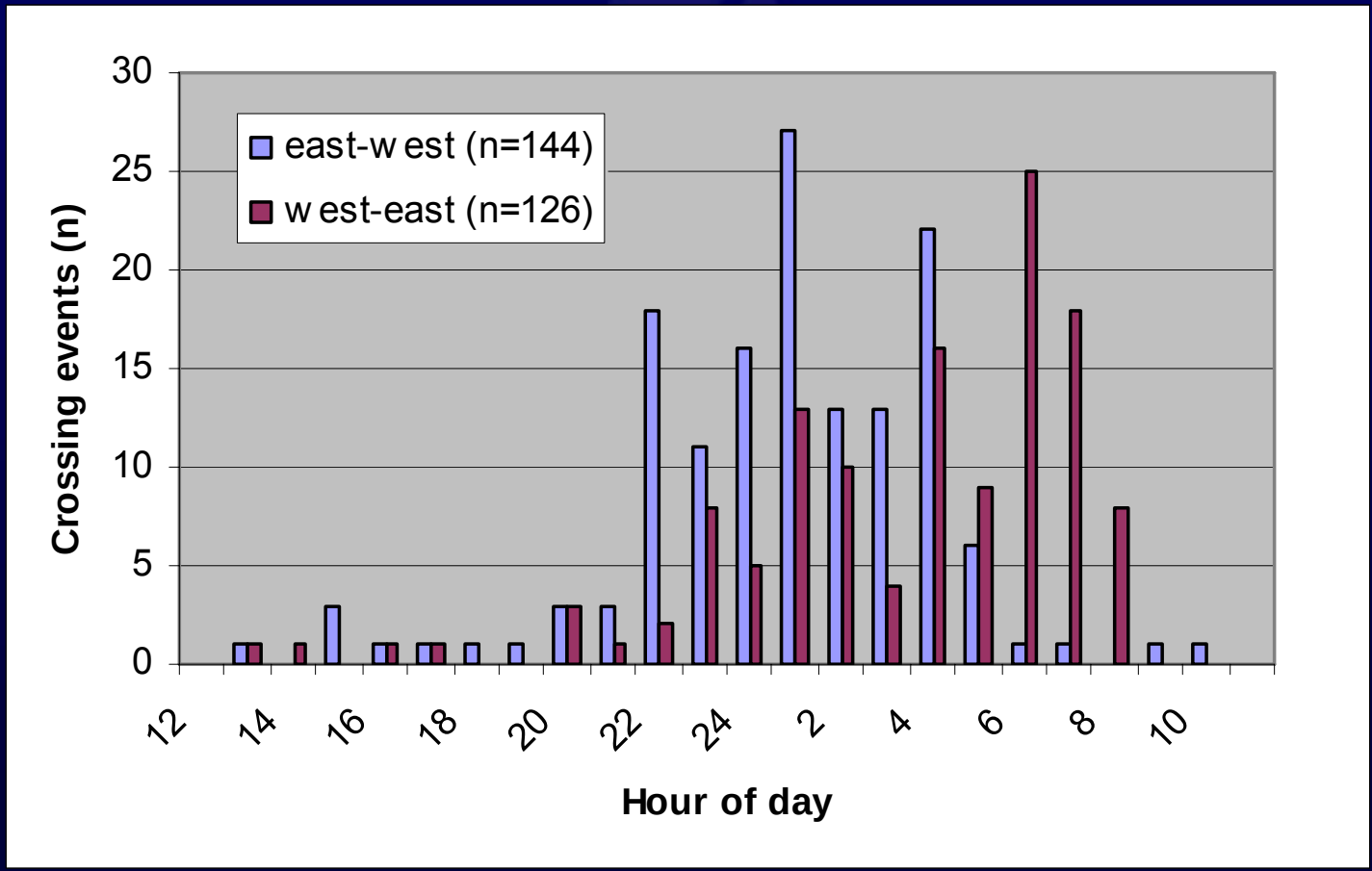
						30	80	C0	B0	E0	41	70	10	0	60	20
						30	80	C0	B0	E0	40	70	10	0	60	20
						30	80	C0	B0	E1	40	70	10	0	60	20
						30	80	C0	B0	E0	40	70	10	0	60	20
						30	80	C0	B0	E0	41	70	10	0	60	20
28/11/04	20:24:07M7	R0	R0	R0	R0	R0	R0	R0	B0	E0	40	70	10	0	60	20
28/11/04	20:25:47M7	90	50	A0	D0	30	80	C0	B0	E1	40	70	10	0	60	20
28/11/04	20:25:53M7	90	50	A0	D0	30	80	C0	B0	E0	40	70	10	0	60	20
28/11/04	21:25:16M7	R0	R0	A0	D0	30	80	C0	B0	E0	41	70	10	0	60	20
28/11/04	21:25:28M7	90	50	A0	D0	30	80	C0	B0	E0	40	70	10	0	60	20

Detection data patterns

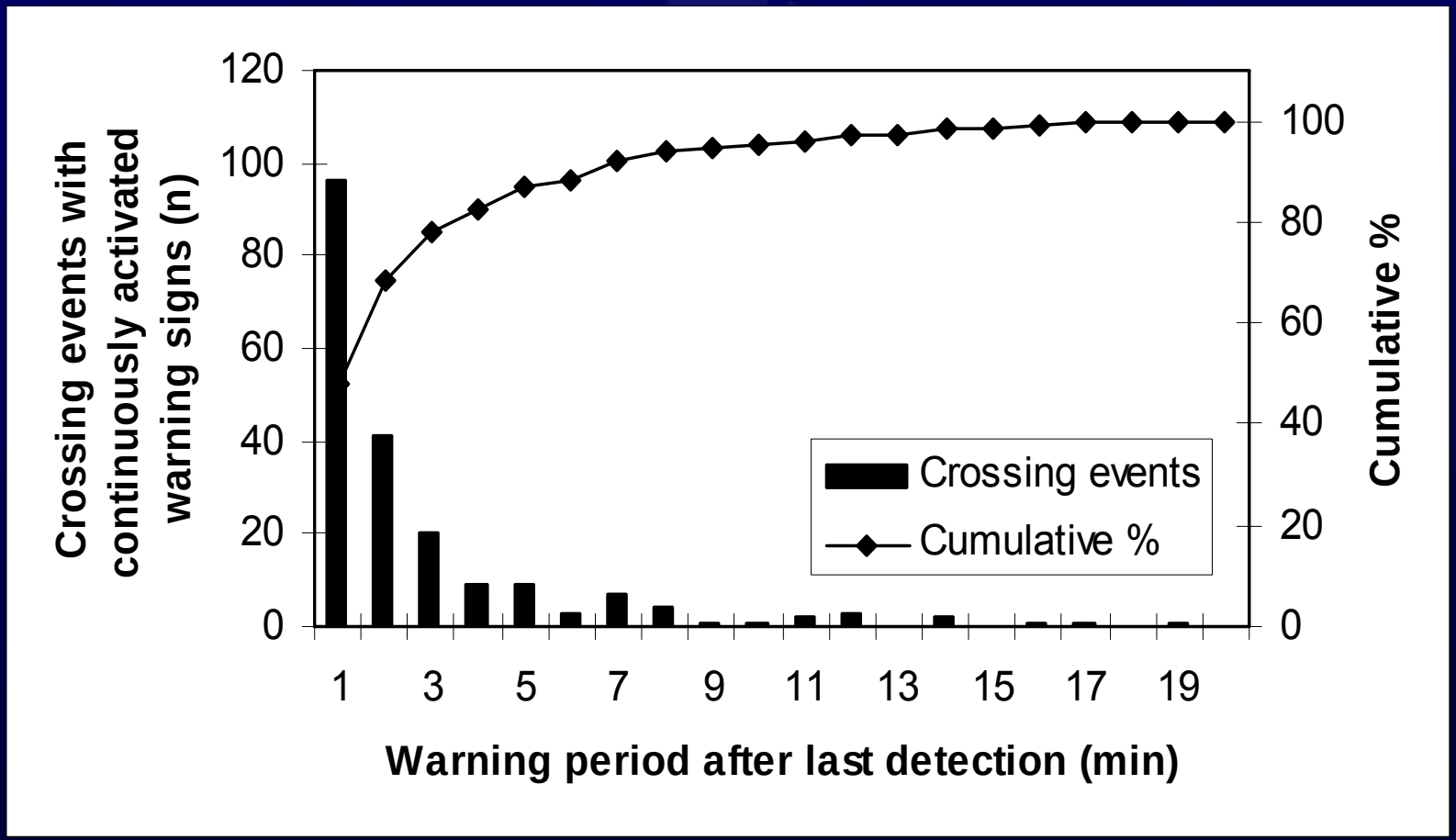


n = 1533

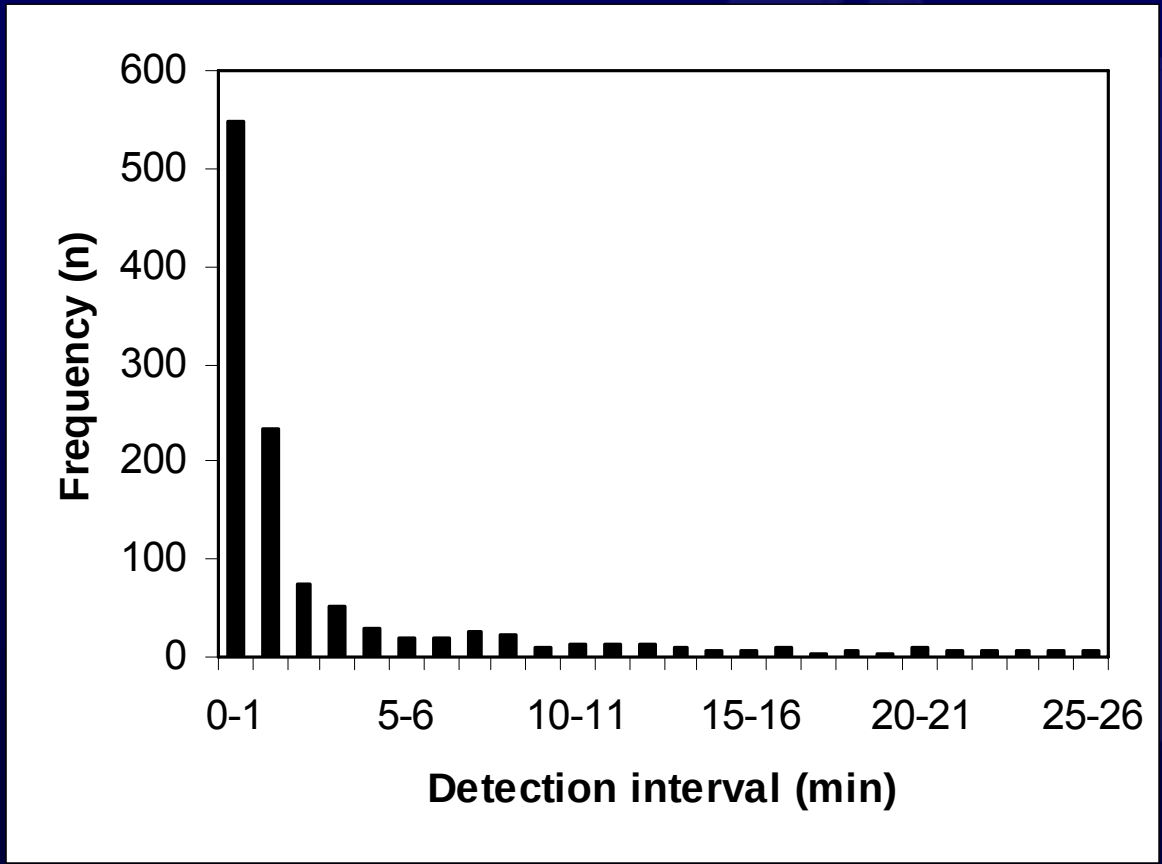
Detection data patterns



Duration warning signals



Detection interval

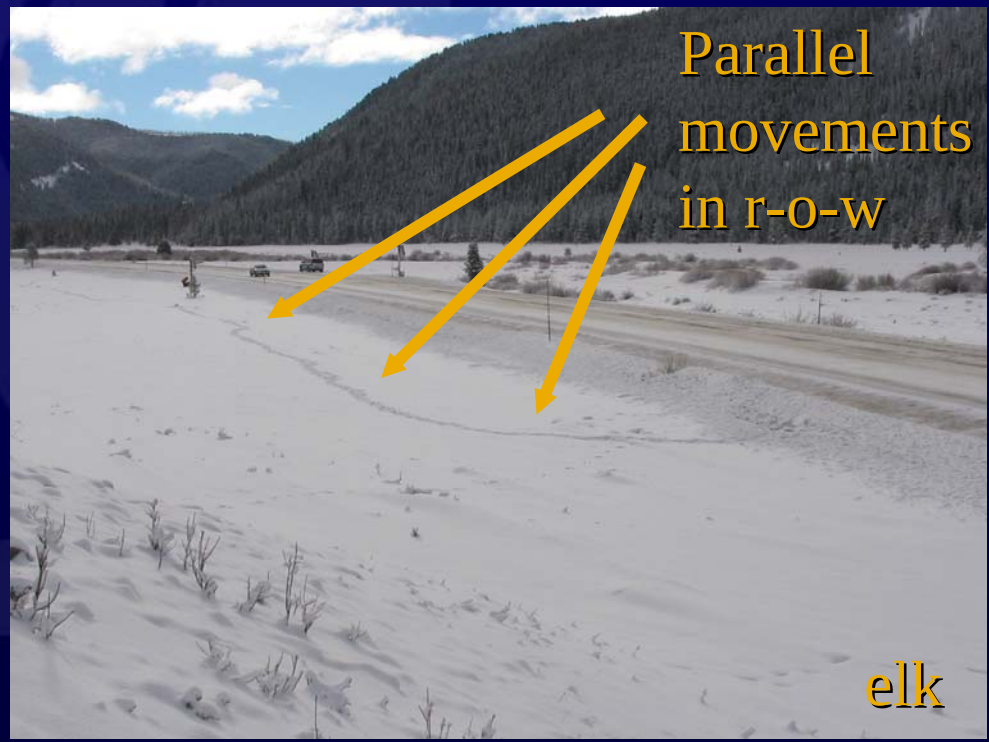


Median 47 detections/24 h

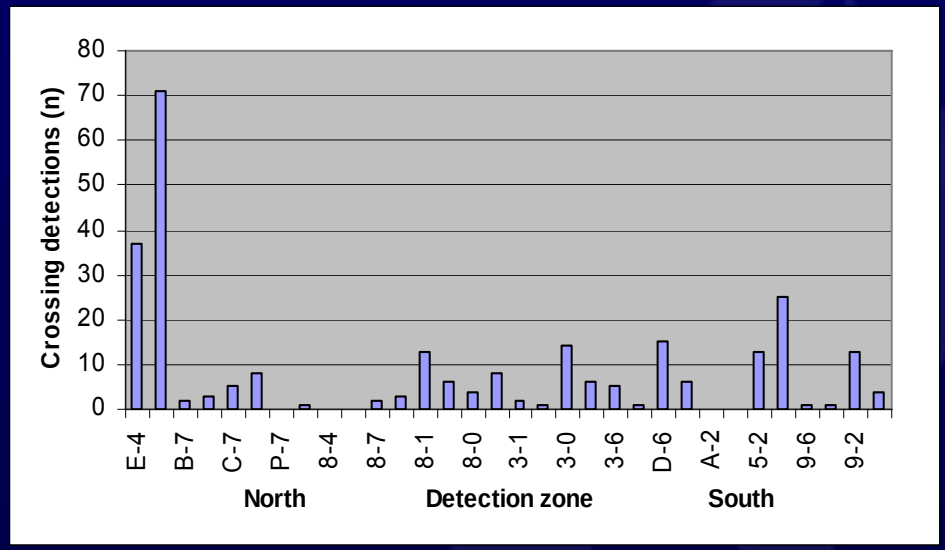
= 1:13 h flashing/24 h

Snow tracking

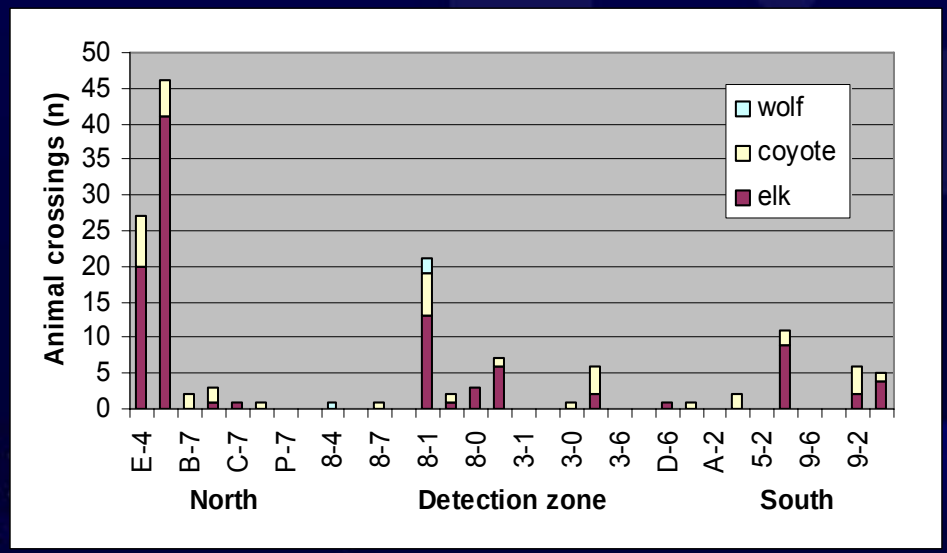
Snow tracking



Comparison



Detection data



Snow tracking data

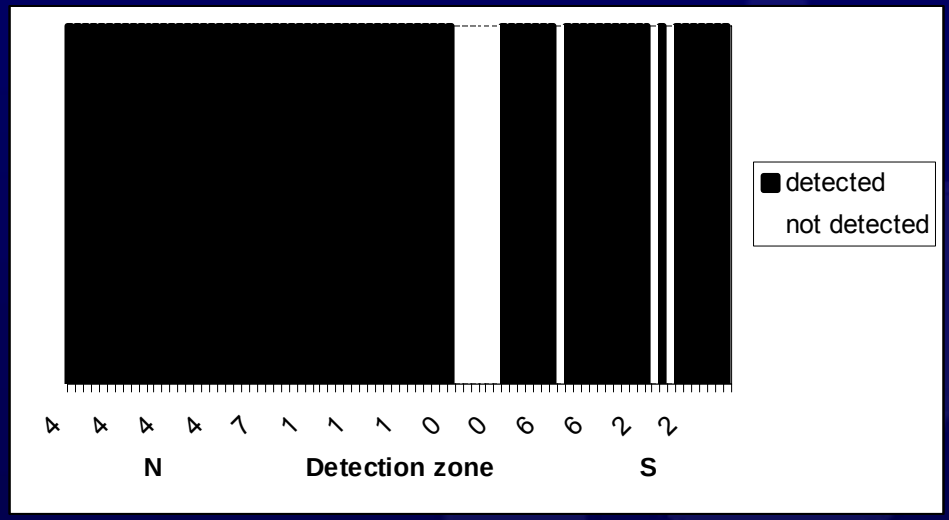
Comparison

Species	Snow track crossings (n)	Detected (n)	Detected (%)
Elk	**104**	**90**	**86.5**
Coyote	**41**	**1**	**2.4**
Wolf	**3**	**0**	**0**

Blind spots

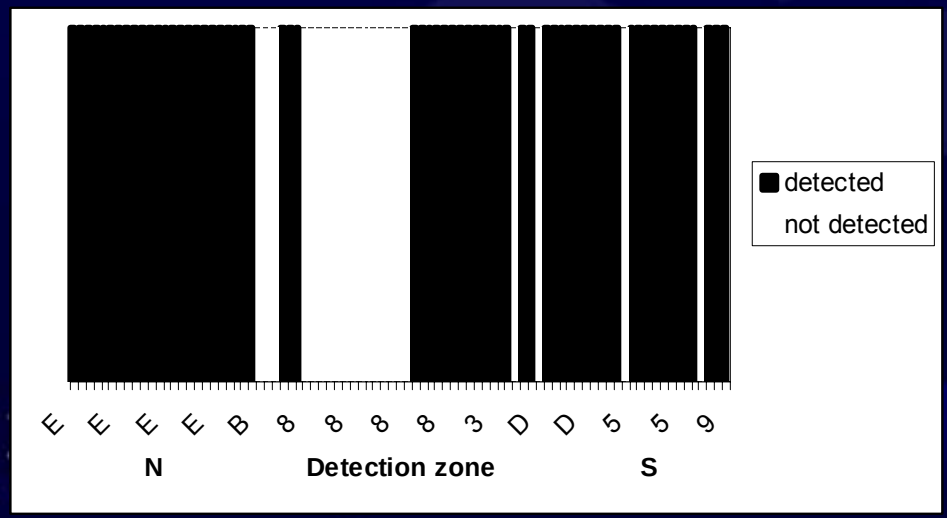
Trigger system
at 20 m intervals

Blind spots



East side road

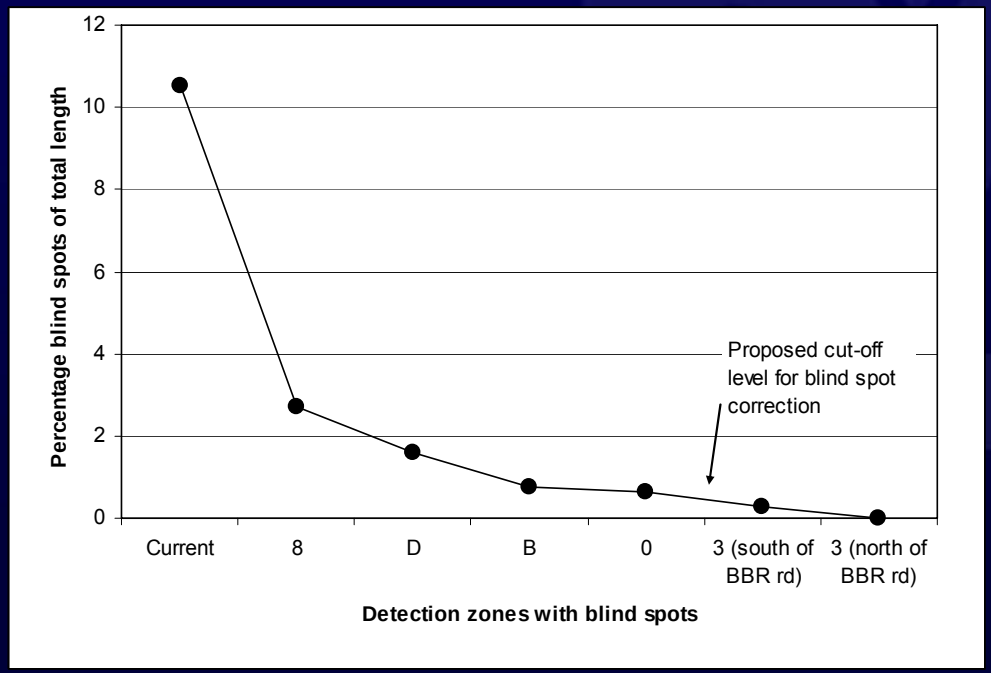
Road



West side road

Blind spots

- Curves
- Slopes



Cost-Benefit analyses
Assumptions and estimates

- Property damage: deer 92%, elk 100%, moose 100%
- Vehicle repair costs: deer $2,000, elk $3,000, moose $4,000

- Chance human injuries: deer 5%, elk 10%, moose 20%
- Costs associated with human injuries: $50,000

- Chance human fatalities: deer 0.05%, elk 0.20%, moose 0.40%
- Costs associated with human fatality: $3,000,000

- Planning for ADS: $30,000
- Purchase ADS for 1 mi: $65,000
- Installation ADS: $30,000
- Operation and maintenance: $20,000 / yr

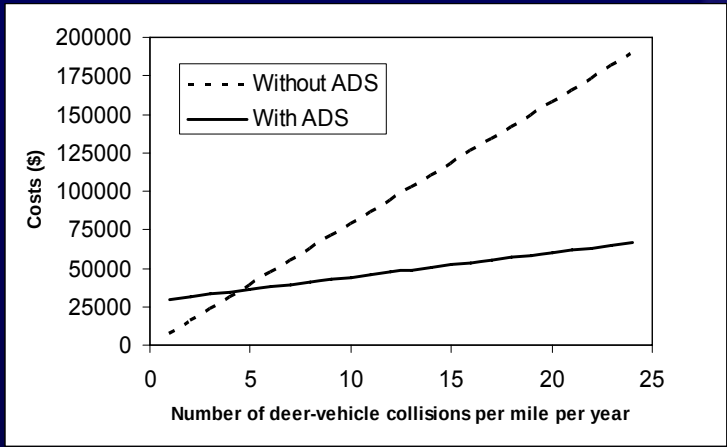
- Life span ADS: 15 yrs
- Effectiveness: 80% reduction in collisions

Cost estimates

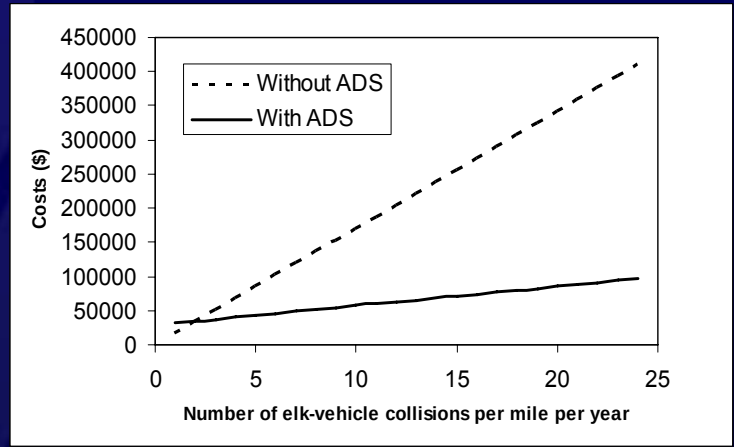
Description	Deer	Elk	Moose
Vehicle repair costs / collision	$1,840	$3,000	$4,000
Human injuries / collision	$2,500	$5,000	$10,000
Human fatalities / collision	$1,500	$6,000	$12,000
Monetary value animal / collision	$2,000	$3,000	$2,000
Carcass removal and disposal / collision	$50	$100	$100
Animal detection system costs / yr	$28,333	$28,333	$28,333

Cost–Benefit analyses

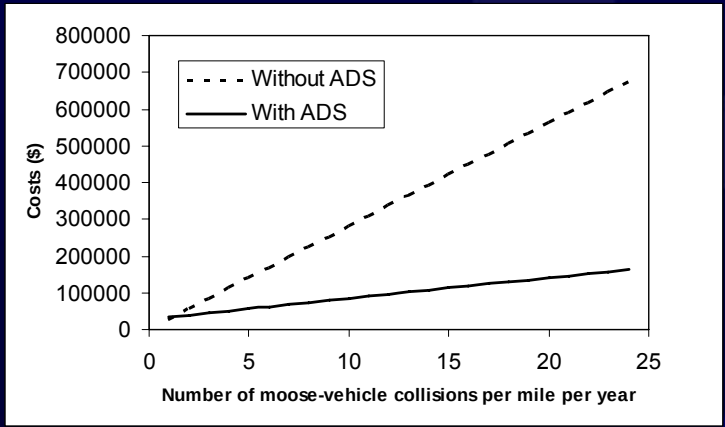
deer



elk



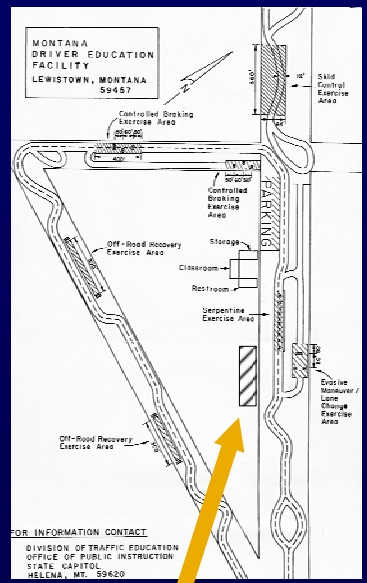
moose



- ≥ 5 deer / mi / yr
- ≥ 3 elk / mi / yr
- ≥ 2 moose / mi / yr

Conclusions

- System detects large animals reliably
- Benefits can outweigh costs quickly
- Careful design and site survey



Test bed,

Lewistown, MT

Remaining questions:

- Reliability standards
- Additional system types and vendors
- Signing and liability
- Effectiveness
- Maintenance
- Less obtrusive equipment

Field visit

- Meet at 12:45 in lobby
- Bus leaves 1:00 pm

- 45 min drive
- ±1 hr at site

- Back at 3:30 pm

"Guides":
- Marcel Huijser (WTI-MSU)
- Lloyd Salsman (STS)
- Gerald Bilby (Vikon International)