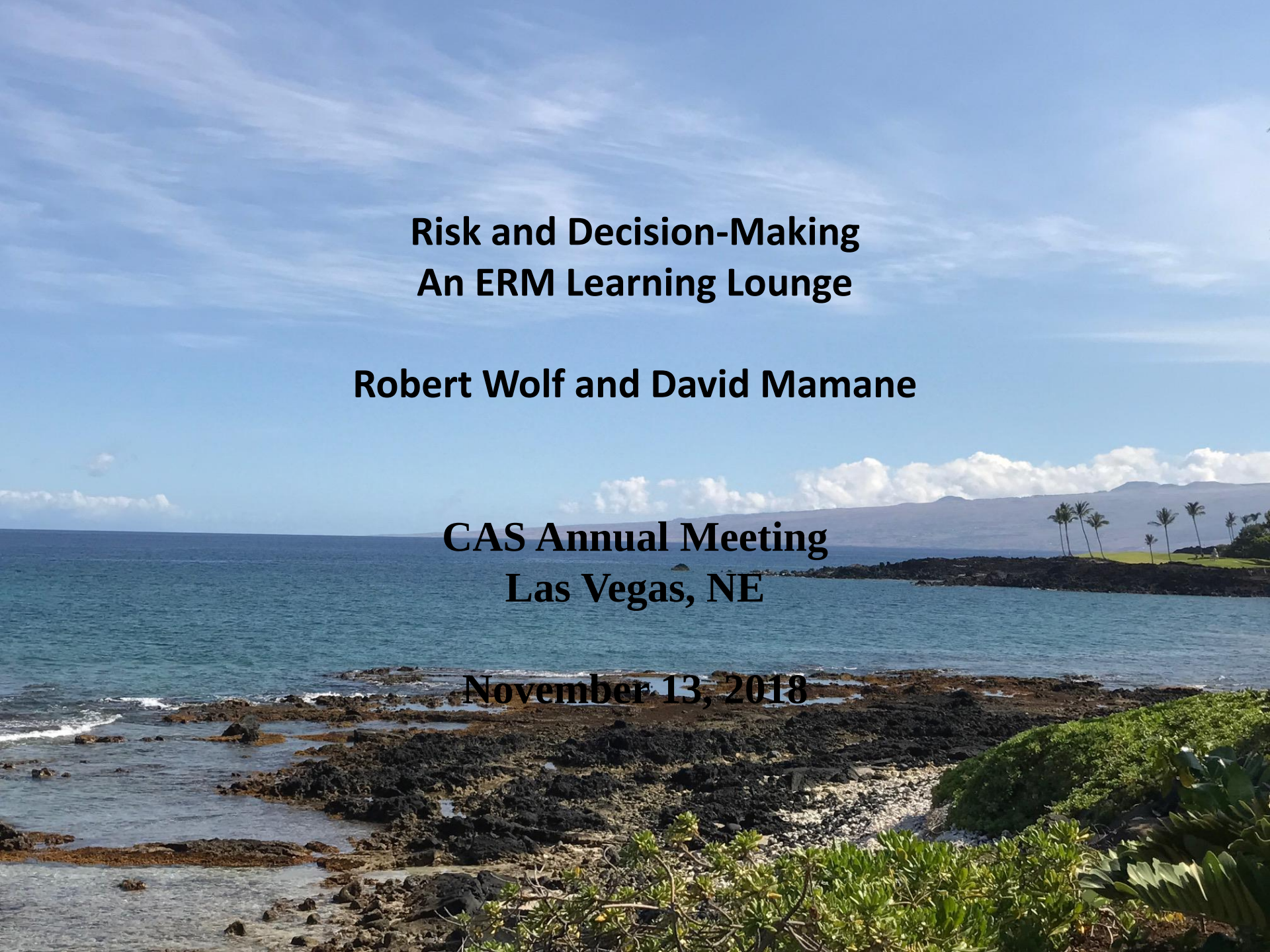


Risk and Decision-Making
An ERM Learning Lounge

Robert Wolf and David Mamane

CAS Annual Meeting
Las Vegas, NE

November 13, 2018

Decision to Make

To Race or Not to Race

Brothers John Carter and Jeff Carter

Chief Mechanic Tom Burns

Engine Mechanic Paul Edwards

First Year

Very Hard

Trying to make a name of itself

Ran in many small races

Need more successes and hence more sponsors

And…. The Luxury of Racing in the Major Events

Successful Season so Far

- But oh.. That Pocono Race Coming Up!!

- Important
  - Prize Money
  - Television Exposure

- Key Risk - Having Engine Failure on National Television

- The Carters Put in everything they owned invested in **this season**
- Finished in the top 5 in 12 of 15 races in season
- But They were -$57,000 in the hole
- But…then They Got Goldstone Tires as a Sponsor for $40,000 for the Race at Pocono
- Consideration for a full Sponsorship if finish in Top 5 at Pocono for $1,000,000

Success Partly due to…

- Unique turbo charging system
- More turbo pressure while maintaining constant fuel consumption

Engine Failure

"*These Engine Failures are a Pain in the Butt*".....

John Carter

Failed 7 Times in 24 Outings causing Various Damage to Engine and the Car

<u>Takes $20,000 to fix an engine + $15,000 of wasted entry fees</u>

- Paul Edward, Engine Mechanic

  "The problem is related to ambient air temperature. When its cold, the different expansion rates for the head and block were damaging the head gasket, hence causing our failures"

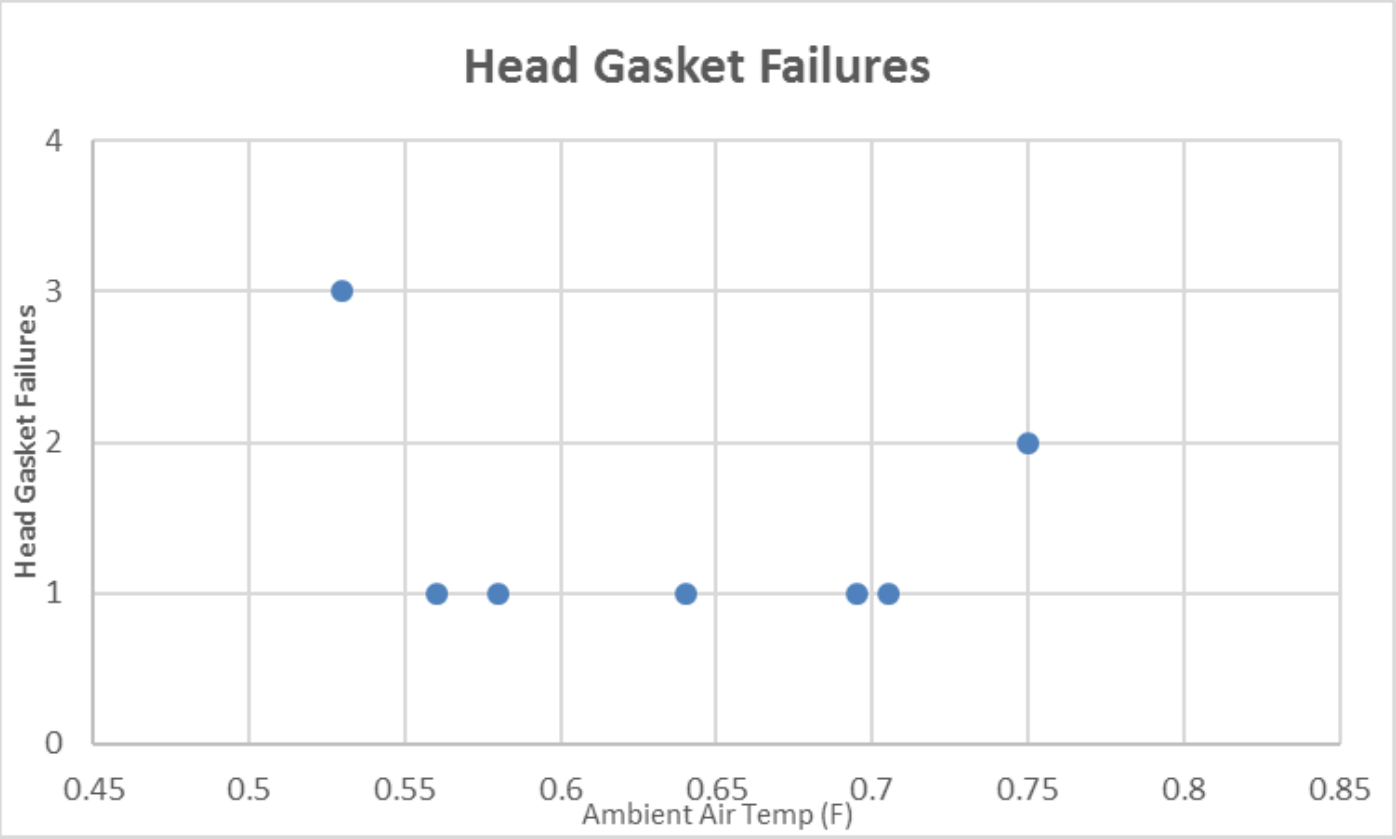
  "It was freezing last night. It's going to be a cold morning to start the race."

- Tom Burns, Chief Mechanic

“I don’t agree with you Paul. We had 10 head gasket failures and they occurred over the entire temperature range “

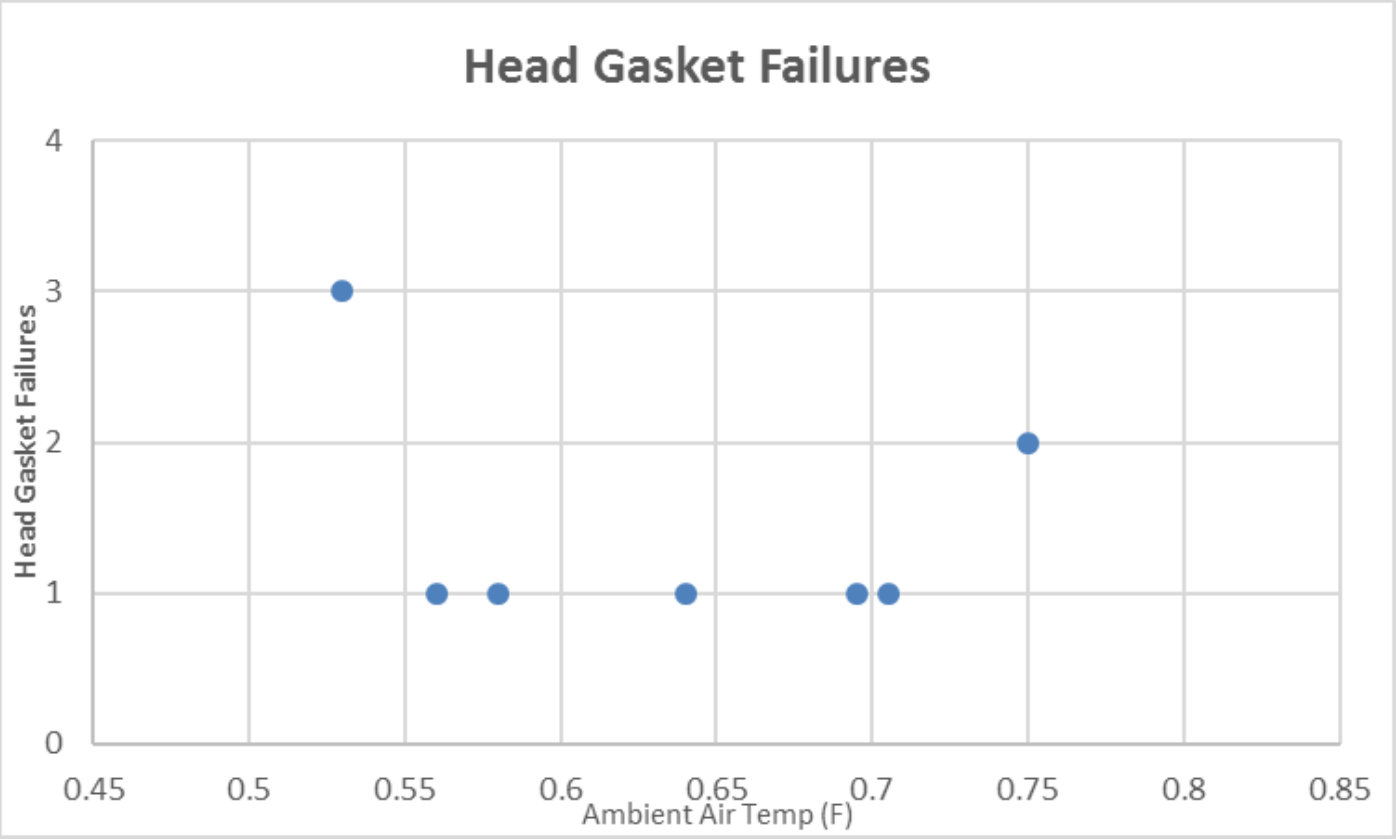
Tom Burns

" Look …..I think Paul is prudent looking into this but look at the below. Temperature is not our problem "



Tom Burns

" I tested the data for correlation between temperature and gasket failures and found no relationship.



Tom Burns, Chief Mechanic

"Also in comparing other teams. We've done very well. We're finishing 62.5% of our races. When we do finish, we have finished in the top 5 80% of the time. Our rate of blown engines is 29% of the time, but we're going fast here. I expect some difficulties from time to time."

Tom Burns, Chief Mechanic

“ I don’t like the engine issues we’ve had either but I’ll take our 4 1st Place finishes and being in the money 50% of the time any day over 7 engines. We continue to run like this, we’ll have a pick our sponsors. “

Tom Burns……

"…In Racing you are pushing the limits of what is known"

My 1st Law in Racing –

"No one has ever won a race in the pits"

The Carters

“ Look, we have another hour to decide. Before we got the Goodstone $40,000 sponsorship for this race, we were -$57,000 in the hole, if we back out we can get back half of the $15,000 entry fee and of course……we’ll lose Goodstone and they’ll want $25,000 of the money back. We’ll end the season -$50,000 in the hole.”

The Carters

"But if we finish in the top 5, we have Goodstone in our pocket and we can get another car next year."

"I don't need to tell you however that if we run and lose another engine, we're at square one. We will probably lose our tire sponsorship and oil contract. That oil contract at $500,000, we cannot live without."

Need a decision in an hour. "

Audience Discussion

It’s 43 degrees (F) at 9:23 AM

The Carters

“Look Paul….The data that Tom put together indicates that temperature is not the problem. I want your direct assessment. I know we chewed this over so many times. At Riverside, the temperature was 75 degrees and we still lost the gasket and the engine”

Paul Edward, Engine Mechanic

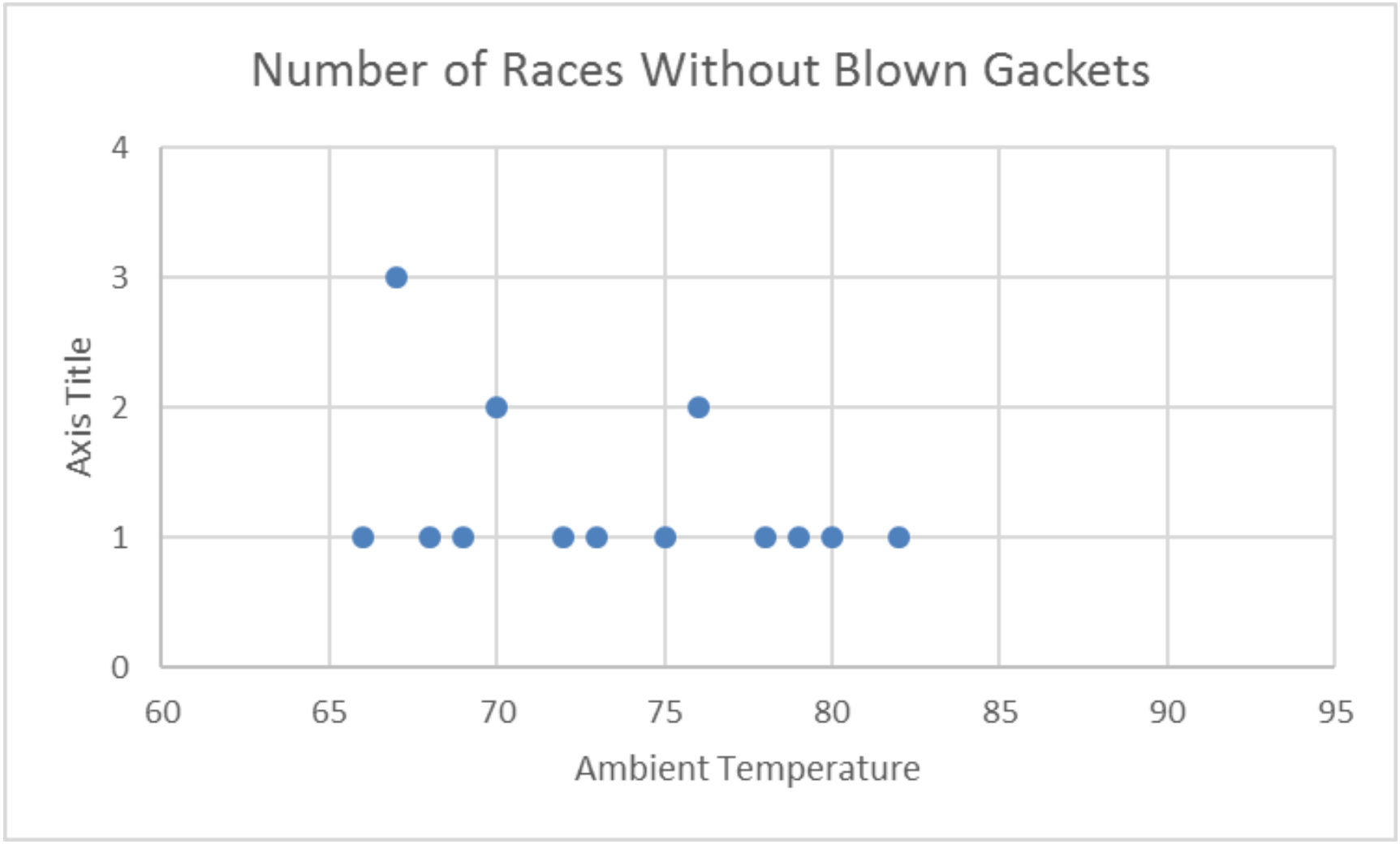
I am not sure what happened at Riverside. I am not sure that temperature is the problem but it's the only thing I can figure out. I know it is the gaskets that are blowing out and causing the engine to go

10 minutes to go

“Tom, can you give the temperatures in the races that we didn’t have gasket issues” …..the Carters

“*What do you need them for?”* Tom Burns

“Call it idle Curiosity”…… The Carters


Number of Races Without Blown Gackets
Axis Title
4
3
2
1
0
60
65
70
75
80
85
90
95
Ambient Temperature

Audience Discussion

Race or not race

Probabilities Expected Values

Decision		Current Finances	Expenses		Revenues		Outcome	Based on 24 races Probability	Expected Value
Race	In the Money	-$57,500	-$15,000	Entry Fee	$1,040,000	Goodstone			
					$500,000	Oil	$1,467,500	0.50	$733,750
	Out of the Money	-$57,500	-$15,000	Entry Fee	$40,000	Goodstone			
					$500,000	Oil	$467,500	0.13	$60,775
	Blown Engine	-$57,500	-$15,000	Entry Fee	$40,000	Goodstone			
			-$20,000	Engine		Oil	-$52,500	0.29	-$15,225
	Not finish (other)	-$57,500	-$15,000	Entry Fee	$40,000	Goodstone			
					$500,000	Oil	$467,500	0.08	$37,400
	Subtotals								
								1.00	$816,700

Decision	Current Finances	Expenses		Revenues		Outcome	Probability	Expected Value
Not race	-$57,500	-$15,000	Entry Fee	$40,000	Goodstone			
		-$25,000	Goodstone	$500,000	Oil			
				$7,500		$450,000	1	$450,000

Temperature	# Gasket Failures	# Races	%
Less than 65	4	4	100
65-70	2	10	20
71-75	1	6	16
76-85	0	6	6

Enterprise Risk Management

Strategic Decisions

- Dependent on information provided by others

Tom Burns

- Common Mistake
  - Sampling on the Dependent Variable
  - Incorrect inference about gasket failures and ambient temperature
  - No relationship
  - Probabilities of past rates of success

Same Situational Characteristics of Challenger Disaster

- Time Pressure
- Extreme Public Scrutiny
- Lots of Smart People
- Numbers vs Intuition

Same Data Points

- Temperature and O-ring Failure
  - Same sampling on the dependent variable
  - Analysis of the Challenger Accident
    - 1986 Academy of management Meetings
    - “Structural Secrecy and Organizational Misconduct’ NASA and the Space Shuttle Challenger”)

Behavioral Heuristics

- Framing
  - Another Delay is a Financial Loss
  - Therefore not risk averse
- Availability
  - Easy to Remember the last 24 events, all successes
- Representativeness
  - Little credence to Paul Edwards
- Anchor
  - Fixed on Initial Choice to Launch
- Overconfidence
  - Managers essentially scoffed at engineers' information that something could go wrong

- Escalation of Commitment
  - Postponed 3 times before
  - Tied top presidential address
- Confirmation
  - Didn’t seek potentially disconfirming evidence
- Managerial Preference for Action, not inaction

ERM Strategy- Decision-making

- Understand Decision Biases and Our Predilection to be Influenced by them
- As decision makers, we all deviate from rationality
- We are influenced by the format of information
- Heuristics are useful but open us up for biased decisions

- Appendix

QUESTION

- The U.S. is preparing for the outbreak of a deadly disease that is expected to kill 600 people. Two alternative programs are being considered. Which do you favor?
  - Program A: 200 people will be saved
  - Program B: 1/3 all be saved, 2/3 all will die

MOST COMMON ANSWER

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QUESTION

- The U.S. is preparing for the outbreak of a deadly disease that is expected to kill 600 people. Two alternative programs are being considered. Which do you favor?
  - Program A: 400 people will die
  - Program B: 1/3 probability no one will die, 2/3probability all will die

MOST COMMON ANSWER

- The U.S. is preparing for the outbreak of a deadly disease that is expected to kill 600 people. Two alternative programs are being considered. Which do you favor?
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AVAILABILITY HEURISTIC

- Vivid Events, Easily Imagined, Consistent with Memory Structures are Judged to be more likely than equally probably events.