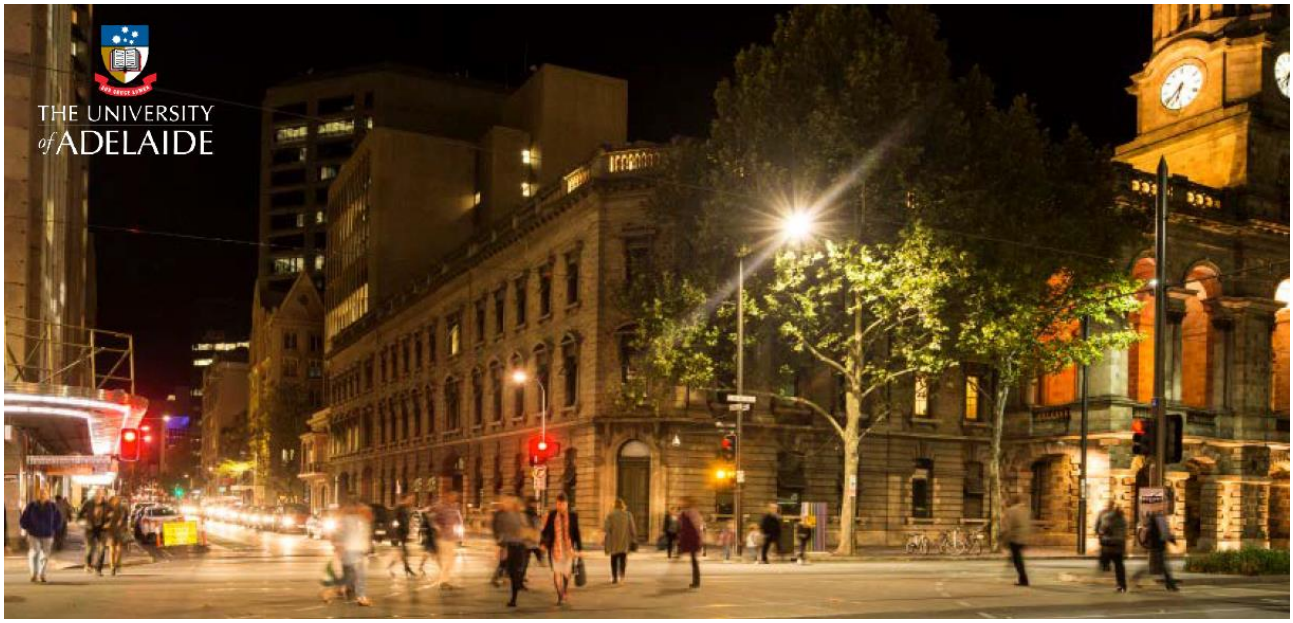

South Australian Centre for Economic Studies

Potential Economic Impact of Southern Launch's Proposed Civilian Launch Operations

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Background

An important trend in the space sector is the expanding range of uses for small and micro satellites (such as CubeSats) in low Earth orbits (also known as polar and sun-synchronous orbits). At a typical distance from the Earth of around 1,000 km above sea level these are significantly lower than the more traditional geosynchronous orbits which are typically around 36,000km above sea level. Low Earth orbits can be efficiently achieved from higher latitudes, whereas satellites which are being placed in geosynchronous orbits need to be launched from near the equator. Thus most existing launch sites are not well suited to launching the new smaller launch vehicles targeting this market. This makes the southern coast of South Australia, with its lack of population centres or major air routes or maritime transportation routes to its south an attractive potential launch site.

Southern Launch is proposing to take advantage of this emerging market by developing a launch facility on Whalers Way south of Port Lincoln. This launch facility would be made available to third party rocket manufacturers (subject to regulatory approvals) who would be responsible for securing their own payloads. Four potential clients have been identified whose launch vehicles are at an advanced state of development, with a further three potential future clients whose vehicles are earlier in the development cycle.

Should the launch facility be successfully established in South Australia it is possible that there will be spin-off benefits with one or more launch vehicle manufacturers relocating either final assembly, or their full manufacturing operations, to South Australia. It is not possible to assess the likelihood of this occurring and so these potential impacts are not included in the main analysis, however they are estimated in Appendices B and C respectively.

Approach

In order to understand the potential impacts of the proposed launch activities, Southern Launch has commissioned the SA Centre for Economic Studies to undertake an economic impact analysis. The data and key assumptions made around the potential activities associated with the launches, and associated visitor numbers, have been provided by Southern Launch and SACES is not in a position to undertake due diligence on the core data (although assumptions have been tested for plausibility). The modelling itself and the parameters chosen have been undertaken independently by SACES and reflect our considered view as to the most likely impacts given activities of the scale described in the inputs provided by Southern Launch.

The three forms of potential economic impact – Southern Launch's direct operations, the capital works required to establish a launch facility, and the potential visitor numbers associated with the launches – have been assessed individually.

Section 2 summarises the methodology and approach that is used to calculate the economic impacts. Section 3 presents the results of the economic analysis.

Appendix B explores the potential economic impact should a launch vehicle operator using the Port Lincoln launch facility choose to establish a final assembly and testing facility in South Australia, and Appendix C explores the potential impact should a launch vehicle operator establish its full manufacturing operations in South Australia.

The gross economic impact of the impact of Southern Launch's proposed activities on the South Australian economy has been assessed using an input-output (IO) model. The methodology employed involves estimating the total direct and indirect employment and gross state product (GSP) arising from the production operations and sustainment investment activities. (GSP is the state equivalent to gross domestic product.)

Findings – impact of the launch facility

The estimated ***gross*** direct and production impact of Southern Launch's own operation would be to **increase employment by 20.1 FTE position**s (see Table 3.2) in 2020/21, the first year of operations. In this first year with substantial activity contracted out (e.g. for safety and environmental assessments) direct employment only accounts for around 40 per cent of the total. By 2025/26 the impact is expected to reach 59.6 FTEs.

There are also one-off employment impacts in 2020/21 and 2021/22 as a result of the construction of the launch facility, with an expected impact of 9.1 FTEs in 2020/21.

Finally there will be on-going impacts from 2021/22 onwards associated with the spending by visitors associated with the launches, which are expected to result in a gross increase in employment of 6.9 FTEs in 2021/22.

The average gross impact on employment over the ten year analysis period (including one-off impacts and increased business visitors) is expected to be **59.7 FTE positions**.

The estimated ***gross*** on-going impact on economic activity of Southern Launch's on-going operations would be to *decrease* real GSP by -$0.3 million in 2020/21, the first year of operations (see Table 3.3) due to the loss Southern Launch is expecting to record in that year being greater than the expected GSP impact from its operations). In the following year with the first launches occurring, the gross impact on GSP from Southern Launch's on-going operations is expected to be $3.5 million and will increase in the later years of the analysis period.

There are also one-off impacts in 2020/21 and 2021/22 as a result of the capital expenditures associated with establishing the launch facilities in Port Lincoln.

Finally there will be on-going impacts from 2021/22 onwards associated with increased business visitor nights associated with staff of launch vehicle manufacturers both prior to and associated with the launches, with an expected annual contribution to GSP of $0.9 million in the first year of launches.

Assessed over the full ten year analysis period using South Australia Treasury's recommended real post-tax discount rate of 7 per cent, the gross impact on GSP (including the impact of capital works) has a present value of **$35.4 million** in 2018/19 values.

If consumption impacts from workers at Southern Launch and its supply chain are included then the average employment impact would be 76.2 FTE positions, with the present value of the impact on GSP being **$53.4 million** in 2018/19 values (see Appendix A).

Potential spin-off impacts

These potential impacts only relate to the operations of the launch facility itself and its associated supply chain. As noted above there is the potential for the existence of the launch facility to attract one or more of the launch vehicle operators using the facility to establish either a 'final assembly and testing' facility, or a full launch vehicle manufacturing facility. If this does occur it will significantly increase the benefits for the state from the launch facility.

Should a **final assembly and testing facility** be attracted to South Australia then there would be an additional increase in on-going employment of **142 FTE positions** once it is operational (assumed to be from 2022/23, see Table B.1).

The estimated gross on-going impact on economic activity of a launch vehicle manufacturer establishing their final assembly and testing operations in South Australia would be to **increase real GSP by $20 million** a year once it is operational.

Assessed over the full ten year analysis period using SA Treasury's recommended real post-tax discount rate of 7 per cent, the gross impact on GSP (assuming no change in the scale of the R&D operation) has a **present value of $90.2 million** in 2018/19 values. As was the case with the employment impacts, this likely somewhat understates the potential impact of final assembly of a launch vehicle as its activities are only captured in 8 of the 10 years of the Southern Launch analysis period.

The potential impact of a **launch vehicle manufacturer** being attracted to South Australia is still larger, with on-going employment in the manufacturer and its South Australian supply chain expected to be **568 FTE positions** once the manufacturing facility were fully operational (assumed to be from 2023/24, see Table C.1).

This additional economic activity of a full manufacturing facility should it be attracted to South Australia, would **increase real GSP by $79 million** per year once it was fully operational.

Assessed over the full ten year analysis period using SA Treasury's recommended real post-tax discount rate of 7 per cent, the gross impact on GSP (assuming no change in the scale of the R&D operation) has a **present value of $318.4 million** in 2018/19 values. As was the case with the employment impacts, this likely somewhat understates the potential impact of final assembly of a launch vehicle as the full manufacturing operations are only captured in 8 of the 10 years of the Southern Launch analysis period.

1. Introduction

An important trend in the space sector is the expanding range of uses for small and micro satellites (such as CubeSats) in low Earth orbits (also known as polar and sun-synchronous orbits). At a typical distance from the Earth of around 1,000 km above sea level these are significantly lower than the more traditional geosynchronous orbits which are typically around 36,000km above sea level. Low Earth orbits can be efficiently achieved from higher latitudes, whereas satellites which are being placed in geosynchronous orbits need to be launched from near the equator. Thus most existing launch sites are not well suited to launching the new smaller launch vehicles targeting this market. This makes the southern coast of South Australia, with its lack of population centres or major air routes or maritime transportation routes to its south an attractive potential launch site.

Southern Launch is proposing to take advantage of this emerging market by developing a launch facility on Whalers Way south of Port Lincoln. This launch facility would be made available to third party rocket manufacturers (subject to regulatory approvals) who would be responsible for securing their own payloads. Four potential clients have been identified whose launch vehicles are at an advanced state of development, with a further three potential future clients whose vehicles are earlier in the development cycle.

Should the launch facility be successfully established in South Australia it is possible that there will be spin-off benefits with one or more launch vehicle manufacturers relocating either final assembly, or their full manufacturing operations, to South Australia. It is not possible to assess the likelihood of this occurring and so these potential impacts are excluded from the main analysis, however they are estimated in Appendices B and C respectively.

In order to understand the potential impacts of the proposed launch activities, Southern Launch has commissioned the SA Centre for Economic Studies to undertake an economic impact analysis. The data and key assumptions made around the potential activities associated with the launches, and associated visitor numbers, have been provided by Southern Launch and SACES is not in a position to undertake due diligence on the core data (although assumptions have been tested for plausibility). The modelling itself and the parameters chosen have been undertaken independently by SACES and reflect our considered view as to the most likely impacts given activities of the scale described in the inputs provided by Southern Launch.

The three forms of potential economic impact - Southern Launch's direct operations, the capital works required to establish a launch facility, and the potential visitor numbers associated with the launches – have been assessed individually.

Section 2 summarises the methodology and approach that is used to calculate the economic impacts. Section 3 presents the results of the economic analysis. Appendix A extends the main analysis to include the potential consumption impacts that could arise as a result of the additional economic activity in South Australia.

Appendix B explores the potential economic impact should a launch vehicle operator using the Port Lincoln launch facility chose to establish a final assembly and testing facility in South Australia, and Appendix C explores the potential impact should a launch vehicle operator establish it full manufacturing operations in South Australia.

2. Method and Approach

2.1 Method

The gross economic impact of the impact of Southern Launch's proposed activities on the South Australian economy has been assessed using an input-output (IO) model. The methodology employed involves estimating the total direct and indirect employment and gross state product (GSP) arising from the production operations and sustainment investment activities. (GSP is the state equivalent to gross domestic product.)

An input-output table describes the linkages between sectors of the economy based on their patterns of purchase and supply. For each of the sectors in the economy (e.g. agriculture, pipe manufacturing, utilities, transport and storage etc.) it details the inputs the sector uses (to produce output in the case of producing sectors; for consumption in the case of "consumer" sectors), and what sectors it sells its output to.

The intuition of the input-output approach is best illustrated by example. Suppose a hotel operator spends $10,000 on IT support from a South Australian firm. That IT firm then uses the $10,000 to purchase inputs from "primary" and "intermediate" suppliers. "Primary" suppliers are employees, providers of capital, indirect taxation, and "imports" from suppliers of goods and services located outside of South Australia. Primary income payments are therefore labour compensation (wages), profits to owners, indirect taxes (net of subsidies) and imports. The IT firm will also purchase intermediate inputs (e.g. office cleaning, stationary, electricity etc.) from intermediate suppliers in South Australia which, by and large, are other businesses. Payments to those business enterprises then flow to those businesses' own primary incomes and intermediate suppliers. And this process carries on repeatedly, with ultimately all of the payments flowing to primary incomes. The input-output table lets us trace through, and aggregate, this chain of impacts.

There are two types of impacts which are commonly considered, differing in terms of the flow-ons which are accounted for. The first, having a narrower extent, is the "production impact". The production impact is the impact of the initial expenditure upon primary factor incomes and employment, derived by tracing through the chain of intermediate usage (i.e. supply chain effects). However, no allowance is made for expenditure of primary incomes. The second, with a broader coverage, encompasses production and "consumption" impacts. The consumption impact arises when primary factors (e.g. households) in receipt of wage income spend the incomes they receive.

The gross production and consumption impacts arising from the output of an industry can be calculated using coefficients and multipliers derived from the input-output tables. The concept of input-output multipliers is discussed in Box 2.1. In addition to the overall impact, multipliers can show separately the production and consumption impacts described above. Multipliers can be derived to show how a change in output for an industry affects a particular economic variable, such as output, value added (i.e. GSP), income or employment.

The IO modelling process generates estimates of gross impact in the sense that the IO model does not incorporate any displacement of other activities. This will be strictly valid only if all of the resources that are required for the activity being modelled are freely available without diverting them from other uses within the regional economy of interest or changing their prices. It will rarely be the case that this requirement is met strictly, but for small regions with sufficient underutilised labour and capital suitable for the new activity it may be met approximately, with the IO model thus generating estimates that are approximately right. Given the extent of underemployment in South Australia, and the continued net interstate migration of younger more skilled individuals out of South Australians, there is considerable scope for additional economic activity without substantial displacement.

2.2 Input output table modifications and assumptions

The economic impacts were estimated using financial information, and estimates of the scale of potential international visitor numbers associated with the staff of the launch vehicle operator, provided by Southern Launch and multipliers derived from an input-output table for the South Australian economy. We used a 60 industry sector input-output table for South Australia developed by SACES from a range of sources including the national input output tables for 2018/19 (ABS 2019a), data on interregional trade and production derived from the TERM-Australia multiregional economic model of Australia (TERM-Australia is a computable general equilibrium framework developed by the Centre of Policy Studies at Victoria University), the ABS Labour Force Survey, the ABS National Accounts, and the 2016 Census.

Box 2.1 Input-output multipliers

An increase in the output of one industry will (at least in gross terms) lead to increased outputs in other sectors due to the purchases of intermediate inputs for production, and the spending of a proportion of the capital and labour income locally. A multiplier measures the total change across the entire economy arising from a unit change in the final demand for the output of an industry (the initial "shock" to the model). Multipliers can be calculated for a range for economic variables, such as individual and business income, gross value added, and employment, according to one's interest.

In some cases the interest in the model results will be restricted to Type I impacts, also known as the "production impact". This is the impact of the initial expenditure traced through the chain of intermediate goods and services usage for the relevant industry sectors. No allowance is made in this calculation for the expenditure of primary incomes (e.g. increases in local wage and capital income arising from the change in production). The total impact of an output change is derived from the production and consumption impacts. The consumption impact arises when primary factors − e.g. households in receipt of wage income − spend the incomes that they receive. These combined production and consumption impacts are known as Type II impacts. We call these "total impact" multipliers.

This model has been adjusted to make allowance for wage inflation over the analysis period, as the number of employees per dollar of output produced tends to decline over time as wages increase. The base year of the IO Table is 2015/16, the employment to output ratios in the input-output table were adjusted to allow for actual changes in wage costs between this period and the current year (i.e. 2018/19).

These adjustments were based on the change in the ABS (2019b) Wage Price Index between 2015/16 and 2018/19, and an assumed change in the nominal price of wages of 2.5 per cent over the remainder of the analysis period.

The South Australian input output tables were ultimately transformed via matrix manipulation to derive input-output multipliers in respect of output, gross state product (GSP) and employment for each industry sector. Two types of multipliers were produced: "production impact" multipliers and "total impact" multipliers. The nature of these multipliers is summarised in Box 2.1.

2.3 Limitations of input output models

There are some important limitations associated with input-output models that should be considered when interpreting the results of the input-output analysis.

Certain limitations are practical consequences of the substantial data needs and complexity involved in constructing an input output table. The input output model is ultimately based on data that can only approximate the actual industrial linkages in the South Australian economy. The tables are compiled from a variety of data sources which are themselves subject to various forms of measurement error. In addition, due to the extensive nature of data required, input output tables tend to be compiled from data that is relatively dated.

More importantly, the results of input-output models represent the ***gross*** impacts in the absence of capacity constraints. In reality, except in economic downturns where there is substantial unused labour and capital, anything that boosts one form of economic activity is likely to increase wages and returns to capital to attract the additional resources it needs. This, in turn, leads to reduced economic activity in other sectors or regions. At the national level, the ***net*** impact of any new project on employment is likely to only be a small fraction of the gross impact when the national economy is close to full employment, with the benefits coming through increased wages and increased returns to capital. At the regional level (particularly for small regions) net impacts can be much closer to gross impacts as labour and capital can be drawn in from surrounding regions.

The implication of the above limitations is that the raw results obtained from the input output 'impact analysis' will tend to overestimate the potential economic impacts associated with Southern Launch operations. However, there are reasonable grounds to think that the 'gross' impacts calculated from the input output table do indeed approximate the actual 'net' impacts in the current context. The engineering construction sector is currently experiencing relatively subdued demand as major State Government infrastructure projects are completed or move closer to completion. Furthermore, in South Australia's current environment of relatively high unemployment and underemployment, including sluggish wages growth, the expected increase in direct labour demand will likely only have a muted impact on wages, which in turn would mean that the estimated gross impacts would more closely approximate the net impacts.

Finally, in interpreting the modelling impact on employment it should be noted that employment impacts may in some cases be realised through increases in the hours worked by existing employees rather than the creation of new positions.

3. Results of the Economic Analysis

3.1 Direct impact of Southern Launch

The direct impacts of Southern Launch establishing a rocket launch facility in Port Lincoln have been modelled based on data provided by the firm. There are three sources of the expected benefits for the state from their direct operations:

- Capital works to establish the launch facility;
- The on-going operations of the launch facility; and
- The increased number of international and interstate visitor days associated with launches and preparatory works (e.g. staff from launch firms visiting SA).

It is also possible that the presence of suitable launch facilities in the state will encourage one or more of the launch vehicle manufacturers to shift either their final assembly operations or their complete manufacturing operations to South Australia. The probability of this occurring cannot be assessed at this stage of the proposal and so these impacts have not been included in the modelling.

Southern Launch will also potentially be managing defence launches from Woomera, and operating an engine testing facility for launch vehicle manufacturers, but these activities are also out of scope for this assessment.

Capital works (including approvals processes) to establish the launch facility will be undertaken over the first 16 months of the analysis period. Capital works spending has been adjusted slightly from the values provided by the proponent, with some expenses re-allocated to operating expenses.

Financial data has been provided by the proponent covering the first thirty six months of operations, with employment projections provided for the first six years. The current projected timeline has activity commencing in July 2020. The key data provided by the project proponent are set out in Table 2.1.

Please note that the table below only reports employment directly with Southern Launch; the Southern Launch business plan reports total employment of 35 FTEs by year 5 of operations, (in other words 2025/26 if the schedule remains unchanged) but only 31 FTEs of this are directly with the firm with the remainder employed by subcontractors. In our analysis this employment within subcontractors is captured in the production impacts, as the OPEX data used in the modelling includes the payments to those firms which will have subcontracted employees working on site. For our purposes therefore the estimated direct employment needs to be restricted to only those employees employed directly by Southern Launch as we would be otherwise double counting the impact of the subcontracted employees.

Table 3.1 Forecast SA employment, turnover and capital expenditures by Southern Launch's civilian launch operations

Financial year	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Expected capital expenditure ($'million)	2.5	0.8				
Projected operating expenditures ($'million)	4.2	4.7	4.5	np	np	np
Projected revenues ($'million)	0	4.5	4.2	np	np	np
Projected number of launches	5	7	8	np	np	np
Projected employment (FTEs)	8.0	11.0	17.0	20.0	28.0	31.0

Note: np Estimate not provided by firm.
Source: Southern Launch, personal communication, undated

Since the provision of financial data by Southern Launch, the Whalers Way Orbital Launch Complex has been deemed a Major Project by the SA State Government and it is expected that this will result in higher costs associated with the approvals and construction process (and therefore larger potential economic impacts) than were modelled in this report.

3.2 Estimated economic impact of Southern Launch's civilian launch operations

The economic impact of Southern Launch was modelled using the 60 industry sector South Australian Input Output tables developed by SACES, modified to adjust for actual and projected changes in the compensation of employees by sector. Only the civilian launch operations were included in the analysis, with the defence launches and engine testing out of scope.

Only production impacts were included in the main analysis (e.g. the impact of South Australian based suppliers to Southern Launch purchasing goods and services from other South Australian firms, and then those firms purchasing inputs from local suppliers and so on). Appendix A reports estimates of the consumption impacts associated with the project.

Estimated turnover was provided by the proponent for the first 36 months. Beyond 2022/23 it was assumed that turnover would grow with projected employment for the next three years and then at a rate consistent with keeping employment constant at the 2025/26 level.

The operations of Southern Launch were allocated to the (modified) sector 'Professional, scientific and technical services' due to the skilled labour intensive nature of the proposed operations.

One-off expenditures related to capital expenditures required to establish the launch facilities have been allocated to the sector 'Construction – other'. Capital expenditures are split between 2020/21 and 2021/22 based on data provided by the proponent.

The final form of economic impact expected from Southern Launch is additional business visitor nights (and associated spending) in the state associated with the launches. These primarily related to employees of the launch vehicle manufacturers visiting to undertake preparatory work, and then to undertake the launch. Estimated spending per visitor night was taken from Tourism Research Australia (2017) estimates of the spending by 'Business visitors' visiting South Australia ($146 per visitor night) and Southern Launch's estimate of the number of visitor nights associated with each launch and their projected number of launches. Allocation of the between sectors was based on data on the tourism sector included in the input output tables.

The estimated impact on gross value added has been adjusted to real 2018/19 values based on the actual changes in the GDP deflator (ABS 2019a), and SACES projections for the growth of GSP over the remainder of the analysis period.

The estimated ***gross*** direct and production impact[1] of Southern Launch's own operation would be to **increase employment by 20.1 FTE position**s (see Table 3.2) in 2020/21, the first year of operations. In this first year with substantial activity contracted out (e.g. for safety and environmental assessments) direct employment only accounts for around 40 per cent of the total. By 2025/26 the impact is expected to reach 59.6 FTEs.

There are also one-off employment impacts in 2020/21 and 2021/22 as a result of the construction of the launch facility, with an expected impact of 9.1 FTEs in 2020/21.

Finally there will be on-going impacts from 2021/22 onwards associated with the spending by visitors associated with the launches, which are expected to result in a gross increase in employment of 6.9 FTEs in 2021/22.

Table 3.2 Estimated gross additional employment impact of Southern Launch, full time equivalent (FTE) employees

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
On-going operations										
Direct employment (FTE)[a]	8.0	11.0	17.0	20.0	28.0	31.0	31.0	31.0	31.0	31.0
Production impacts (FTE)	12.1	15.4	16.4	19.0	26.2	28.6	29.2	28.6	28.6	28.6
Sub-total, on-going operations	20.1	26.4	33.4	39.0	54.2	59.6	60.2	59.6	59.6	59.6
Impact of other expenditures										
Capital spending, direct and indirect impacts (FTE)	9.1	3.0								
Launch vehicle staff spending, direct and indirect impacts		6.9	9.2	10.3	14.1	15.2	15.0	14.5	14.2	13.9
Total gross impact on employment (FTE)	**29.3**	**36.3**	**42.6**	**49.3**	**68.3**	**74.8**	**75.2**	**74.1**	**73.8**	**73.4**
Average employment impact over period (FTE)	**59.7**									

Note: [a] Direct employment only includes those employed directly by Southern Launch, with employees of subcontractors employed on the launch site included in the Production Impacts, this is why our estimate of direct employment from 2023/24 is 31.0 FTEs rather than the 35 FTEs reported in the Southern Launch business case.

The average gross impact on employment over the ten year analysis period (including one-off impacts and increased business visitors) is expected to be **59.7 FTE positions**.

[1] Production effects refer to the second order impacts flowing from South Australian based firms which supply Southern Launch purchasing goods and services from other South Australian based firms as inputs into their supply to Southern Launch, and so on down the supply chain.

The estimated ***gross*** on-going impact on economic activity of Southern Launch's on-going operations would be to ***decrease*** **real GSP by -$0.3 million** in 2020/21, the first year of operations (see Table 3.3) due to the loss Southern Launch is expecting to record in that year being greater than the expected GSP impact from its operations). In the following year with the first launches occurring, the gross impact on GSP from Southern Launch's on-going operations is expected to be $3.5 million and will increase in the later years of the analysis period.

There are also one-off impacts in 2020/21 and 2021/22 as a result of the capital expenditures associated with establishing the launch facilities in Port Lincoln.

Finally there will be on-going impacts from 2021/22 onwards associated with increased business visitor nights associated with staff of launch vehicle manufacturers both prior to and associated with the launches, with an expected annual contribution to GSP of $0.9 million in the first year of launches.

Assessed over the full ten year analysis period using South Australia Treasury's recommended real post-tax discount rate of 7 per cent, the gross impact on GSP (including the impact of capital works) has a present value of **$35.4 million** in 2018/19 values.

Table 3.3 Estimated gross direct and production impacts on economic output of Southern Launch ($'million)

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
GSP impact of ongoing operations ($million)	-0.3	3.5	3.3	3.8	5.1	5.6	5.5	5.5	5.5	5.5
GSP impact of one-off construction costs ($ million)	2.0	0.6								
GSP impact of launch vehicle staff expenditures ($ million)		0.9	1.2	1.4	1.9	2.0	2.0	1.9	1.9	1.9
Total gross impact on Gross State Product ($ million)	1.6	5.1	4.5	5.2	7.0	7.6	7.5	7.5	7.4	7.4
Present value of GSP impact over period ($ million)	35.4									

Note: Impact on Gross State Product is expressed in real 2018/19 values.

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Appendix A

Potential Impacts if Consumption Impacts are Included

It is possible to extend the input output analysis to include what is known as 'consumption' impact. As well as the direct and production impacts discussed above, consumption impacts also include the impact on South Australia from local spending of any additional labour and capital income received by South Australians as a result of the project.

These consumption impacts need to be interpreted with a degree of caution as it is even more difficult to identify the extent to which they are truly additional to what would have happened had the project not gone ahead. This is because it is *not only* necessary to assess the extent to which any economic activity resulting directly or indirectly from the project is truly additional[2] (as is the case with direct and production impacts) but also to assess the extent to which any increase in spending is going to be additional. This is more difficult, as even if all of the additional labour and capital income was truly additional it will not translate fully into increase spending. This is because households may have access to income replacement benefits when unemployed or underemployed, and can use other resources to smooth income such as depleting savings and increasing debt. This means that spending does not decrease by quite as much as labour incomes falls during unemployment or underemployment, and does not increase by the full amount when labour incomes increase. As such the share of household incomes spent in SA will be less than 100 per cent.

There are several other factors which lower the share of incomes spent locally:

- Many owners of capital will be resident outside of South Australia. For larger, ASX listed firms only about 5 per cent of the capital is held by South Australians. For small businesses the majority of the capital is locally owned.
- Not all household consumption spending is on local goods and services.
- Some household income will be lost to the state through income taxes and to savings.
- Some labour hired for projects will be from residents of other states.

It is not possible to precisely identify the appropriate share of factor incomes to treat as South Australian household incomes. Typically we would assume that the proportion of factor income attributable to South Australian residents was 0.5. This is broadly consistent with 40 per cent of capital income and 95 per cent of labour income accruing to South Australian households; 20 per cent of that South Australian wage and business income being lost to Commonwealth income taxes; 10 per cent of post-tax income saved, and 5 per cent of consumption spending spent outside of the state.

The estimated ***gross*** direct and production impact of Southern Launch's own operation would be to **increase employment by 20.1 FTE position**s (see Table A.1) in 2020/21, the first year of operations. Including consumption impacts increases the estimated impact of the on-going operations by a further 8.1 FTE positions.

Table A.1 Estimated gross additional employment impact of Southern Launch's civilian launch operations, direct, production and consumption impacts, FTE employees

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
Direct and production impacts										
On-going operations	20.1	26.4	33.4	39.0	54.2	59.6	60.2	59.6	59.6	59.6
One-off construction	9.1	3.0								
Launch vehicle staff expenditure		6.9	9.2	10.3	14.1	15.2	15.0	14.5	14.2	13.9
Consumption impacts										
On-going operations	8.1	8.8	8.4	9.7	13.3	14.4	14.6	14.4	14.4	14.4
One-off construction	4.9	1.6								
Launch vehicle staff expenditure		2.2	3.0	3.3	4.5	4.9	4.8	4.7	4.5	4.4
Total gross impact on employment (FTE) incl. consumption impacts	42.3	48.9	54.0	62.3	86.1	94.1	94.6	93.2	92.7	92.2
Average employment impact over period (FTE) incl. consumption impacts	**76.1**									

[2] E.g. That it would not have occurred as a result of some other activity if the project had not gone ahead.

There are also impacts arising from capital expenditures in the first two years, with the direct and production impacts of the construction work expected to generate 9.1 FTEs in 2020/21, with the impact increasing by an additional 4.9 FTEs if consumption impacts are considered.

The expenditures arising from the additional business visitor nights by staff of launch vehicle manufacturers is expected to have a direct and production impact of 6.9 FTEs in 2021/22, the first year in which launches are expected to occur, with consumption impacts potentially increasing the impact by a further 2.2 FTEs.

The average gross impact on employment from direct, production and consumption impacts (including from one-off costs) over the ten year analysis period is estimated to be **76.1 FTE positions**.

The estimated ***gross*** on-going impact on economic activity of Southern Launch's on-going operations would be to ***decrease*** **real GSP by -$0.3 million** in 2020/21, the first year of operations due to the loss Southern Launch is expecting to record in that year (see Table A.2). If consumption impacts are included then the estimated impact of Southern Launch would be **$1.6 million** higher in 2020/21. Once Southern Launch achieves profitability in 2021/22 the direct and production impacts are expected to be $3.5 million, with consumption impacts potentially contributing a further $1.7 million.

There are also impacts arising from capital expenditures in the first two years, with the direct and production impacts of the construction work expected to increase GSP by $1.6 million in 2020/21, with the impact increasing by an additional $0.9 million if consumption impacts are considered.

The additional business visitor expenditures by staff of launch vehicle manufacturers is expected to have a direct and production impact of $0.9 million on GSP in 2021/22 the first year of launches, with consumption impacts potentially increasing the impact by a further $0.4 million.

Assessed over the full ten year analysis period using South Australia Treasury's recommended real post-tax discount rate of 7 per cent, the gross impact on GSP when consumption impacts are included has a present value of **$53.4 million** in 2018/19 values.

Table A.2 Estimated impacts on economic output of Southern Launch's civilian launch operations, direct, production and consumption impacts, $million

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
Direct and production impacts										
GSP impact of ongoing operations ($million)	-0.3	3.5	3.3	3.8	5.1	5.6	5.5	5.5	5.5	5.5
GSP impact of construction costs ($million)	2.0	0.6								
GSP impact of business visitor expenditure ($million)		0.9	1.2	1.4	1.9	2.0	2.0	1.9	1.9	1.9
Consumption impacts										
GSP impact of ongoing operations ($million)	1.6	1.7	1.5	1.8	2.4	2.6	2.6	2.6	2.6	2.6
GSP impact of construction costs ($million)	0.9	0.3								
GSP impact of business visitor expenditure ($million)		0.4	0.6	0.6	0.9	1.0	0.9	0.9	0.9	0.9
Total gross impact on Gross State Product ($million) incl. consumption impacts	**4.1**	**7.4**	**6.7**	**7.6**	**10.3**	**11.2**	**11.0**	**11.0**	**10.9**	**10.8**
Present value of GSP impact over period ($million) incl. consumption impacts	**53.4**									

Note: Impact on Gross State Product is expressed in real 2018/19 values.

Appendix B

Potential Impacts of a Launch Vehicle Manufacturer Undertaking Final Assembly in South Australia

B.1 The potential investment

One potential spin-off benefit of a rocket launch facility being established in South Australia is that one or more of the launch vehicle operators would locate either their final launch vehicle assembly facilities in South Australia, or would re-locate their entire manufacturing operations to South Australia. In each case the rationale would be to reduce the potential impact of delays in launch vehicles reaching the launch facility or damage of vehicles in transit, and to enable any last minute adjustments or alterations to the vehicles.

This Appendix explores the potential impact of an assembly facility being established, with Appendix C outlining the potential impact were a full manufacturing facility be established in the state.

It is assumed that assembly operations would commence in 2019/20.

Information from the proponent indicates that if a vehicle assembly facility were established in South Australia it would require:

- 100 FTE South Australian based staff;
- 4000 m^2 factory; and
- Office fitout for 40 staff.

No potential data on local turnover is available and so for the purposes of the analysis turnover was imputed by assuming that the ratio of employment to turnover would match the sectoral average for 'Other machinery and equipment manufacturing'.

The uncertainties around the potential capital costs of establishing the facility are even greater and so they have not been included in the analysis.

B.2 Estimated economic impact of launch vehicle assembly

The economic impact of a launch vehicle manufacturer undertaking their final assembly and testing in South Australia was modelled using the detailed (78 industry sector) South Australian Input Output tables developed for the Department of Premier and Cabinet (Rippin and Morison, 2013), modified to adjust for actual and projected changes in the compensation of employees by sector. See Chapter 3 for a discussion of the limitations of that analytical approach.

Only production impacts were included in the main analysis (e.g. the impact of South Australian based suppliers to the launch vehicle manufacturer purchasing goods and services from other South Australian firms, and then those firms purchasing inputs from local suppliers and so on). Section B.3 reports estimates of the consumption impacts associated with the potential investment.

There are insufficient details available on the construction and fit-out activity that would be required and so that has not been included in the analysis.

No estimate of turnover was available and so this has been imputed by the average ratio of turnover to employment for the sector.

The estimated impact on gross value added has been adjusted to real 2018/19 values based on the actual changes in the GDP deflator (ABS 2019a), and SACES projections for the growth of GSP over the remainder of the analysis period.

The estimated ***gross*** production impact of a launch vehicle manufacturer undertaking final assembly and testing in South Australia would be to **increase employment by 142 FTE position**s in 2022/23 (see Table B.1), the first year in which assembly is expected to occur. The estimated direct employment by the launch vehicle manufacturer would account for the majority of the impacts at 100.0 FTEs, with the remaining employment arising from production effects.

The average gross impact on employment over the ten year analysis period used for the broader analysis of Southern Launch's impacts is expected to be **113.8 FTE positions**. This likely somewhat understates the potential impact of final assembly of a launch vehicle as its activities are only captured in 8 of the 10 years of the Southern Launch analysis period.

Table B.1 Estimated gross employment impact of final assembly and testing by a launch vehicle manufacturer, full time equivalent (FTE) employees

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
On-going operations										
Direct employment (FTE)	0.0	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Indirect effect (FTE)	0.0	0.0	42.1	42.1	42.1	42.1	43.1	42.2	42.2	42.2
Sub-total, on-going operations	0.0	0.0	142.1	142.1	142.1	142.1	143.1	142.2	142.2	142.2
Capital expenditures										
Direct and indirect effects (FTE)	np	np								
Total gross impact on employment (FTE)	0.0	0.0	142.1	142.1	142.1	142.1	143.1	142.2	142.2	142.2
Average employment impact over period (FTE)	113.8									

Note: np = data not provided by proponent.

The estimated ***gross*** on-going impact on economic activity of a launch vehicle manufacturer establishing their final assembly and testing operations in South Australia would be to **increase real GSP by $20 million** in 2022/23, the first year in which assembly is likely to take place.

Table B.2 Estimated gross direct and production impacts on economic output of final assembly and testing by a launch vehicle manufacturer ($'million)

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
GSP impact of ongoing operations ($million)	0.0	0.0	19.8	19.8	19.8	19.8	19.7	19.8	19.8	19.8
GSP impact of one-off set up costs ($million)	np	np								
Total gross impact on Gross State Product ($million)	0.0	0.0	19.8	19.8	19.8	19.8	19.7	19.8	19.8	19.8
Present value of GSP impact over period ($million)	90.2									

Note: Impact on Gross State Product is expressed in real 2018/19 values.
np = data not provided by proponent.

Assessed over the full ten year analysis period using SA Treasury's recommended real post-tax discount rate of 7 per cent, the gross impact on GSP (assuming no change in the scale of the R&D operation) has a present value of **$90.2 million** in 2018/19 values. As was the case with the employment impacts, this likely somewhat understates the potential impact of final assembly of a launch vehicle as its activities are only captured in 8 of the 10 years of the Southern Launch analysis period.

Potential net impacts

An important question to consider is the extent to which these gross impacts would translate into net benefits for the state. This depends upon the extent to which there is currently unemployed (or under employed) labour and capital that the project could draw on (or which could be recruited by any incumbent firms who lose employees to the new entrant), or where suitable workers could be convinced to move to the state from interstate or overseas. This is because the increase in employment demand from the new activity being modelled is likely to, all other things being equal, increase wages, which in turn will lead to some current activities no longer being competitive, displacing some existing employment. The same process can occur for those capital inputs that need to be sourced domestically such as land and structures. At the regional level net impacts can be much closer to gross impacts if labour and capital can be drawn in from other regions, or if there are sufficient unemployed persons in the region with relevant skills.

Although there is a degree of uncertainty around the exact composition of an assembly and testing workforce, it is likely to be a mix of advance manufacturing and engineering employees.

The final closure of GM-Holden's assembly line in late 2017, with its associated impacts on the supply chain, resulted in a large number of individuals with relevant skills and experience in advanced manufacturing being underemployed, or employed in another sector that does not fully make use of their skills. This suggests

that any advanced manufacturing employment generated in a launch vehicle manufacturer is unlikely to generate wage pressures that will offset the direct employment impacts.

The potential engineering and technical employees of a launch vehicle manufacturer will be predominantly highly skilled and mobile, and very specialised, with strong employment prospects. This means that they are very unlikely to be unemployed and so the launch vehicle manufacturer would only be able to fill their positions from those already employed, or to a lesser extent from those entering (or re-entering) the workforce. To the extent that these individuals are attracted from other South Australian employers then the gross impacts of the launch vehicle manufacturer will be wholly or partially offset by increases in wages in the sectors, and associated decreases in employment elsewhere. If the employees are attracted from interstate or overseas, or if the opportunities with the launch vehicle manufacturer encourage South Australians to remain in the state rather than move interstate or overseas, or if the opportunities encourage South Australian's to re-enter the labour force, then there would not be an offsetting reduction elsewhere in the South Australian labour market. And as the range and depth of a local labour market for a specialisation can drive the location decisions of skilled employees, the opportunities available through the launch vehicle manufacturer could have an indirect impact on increasing supply for skilled employees for the defence and aerospace sectors more broadly.

These countervailing forces mean that it is difficult to identify *a-priori* whether the net impacts on engineering employment are likely to be well below the gross impacts (if poaching from other South Australian firms predominates) or whether net impacts are likely to be close to the gross impacts (if increasing labour supply predominates). However our understanding of the labour pool from which a potential launch vehicle manufacturer is likely to draw is likely to be primarily located interstate or overseas, or have a high likelihood of relocating interstate or overseas in the absence of suitable opportunities in the space or aerospace sectors. Hence the net impacts should be reasonably similar to the estimated gross impacts.

Looking more broadly at the indirect jobs induced from a launch vehicle manufacturer's likely purchases of goods and services from local firms, our judgment is that, given the generally weak state of the South Australia labour market, the net impacts are likely to be close to the gross impacts over the next 3 to 5 years. Over the medium to long term, as the South Australian labour market is expected to gradually improve, net impacts would be expected to fall relative to gross impacts. However we do not foresee any changes in overall economic conditions that would lead to the net impact of the proposal falling close to zero. And indeed our expectations about the South Australia labour market over the next ten years suggest that it is likely that the net benefits would still remain a substantial fraction of the gross benefits over the entire analysis period.

B.3 Estimated consumption Impacts of launch vehicle assembly

It is possible to extend the input output analysis to include what is known as 'consumption' impact. As well as the direct and production impacts discussed above, consumption impacts also include the impact on South Australia from local spending of any additional labour and capital income received by South Australians as a result of the project.

Table B.3 Estimated gross additional employment impact of final assembly and testing by a launch vehicle manufacturer, direct, production and consumption impacts, FTE employees

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
Direct and production impacts										
On-going operations	0.0	0.0	142.1	142.1	142.1	142.1	143.1	142.2	142.2	142.2
One-off construction	np	np								
Consumption impacts										
On-going operations	0.0	0.0	44.2	44.2	44.2	44.2	44.9	44.2	44.2	44.2
One-off construction	0.0	0.0								
Total gross impact on employment (FTE) incl. consumption impacts	0.0	0.0	186.2	186.3	186.3	186.3	187.9	186.4	186.4	186.4
Average employment impact over period (FTE) incl. consumption impacts	**149.2**									

As noted in Appendix A these consumption impacts need to be interpreted with a degree of caution as it is even more difficult to identify the extent to which they are truly additional to what would have happened had the project not gone ahead. This is because it is *not only* necessary to assess the extent to which any economic activity resulting directly or indirectly from the project is truly additional[3] (as is the case with direct and production impacts) but also to assess the extent to which any increase in spending is going to be additional.

[3] E.g. That it would not have occurred as a result of some other activity if the project had not gone ahead.

The assumptions underpinning the calculation of the consumption impact of the potential locating of a launch vehicle manufacturers final testing and assembly facility in South Australia are the same as those set out in Appendix A.

The estimated ***gross*** production impact of a launch vehicle manufacturer undertaking final assembly and testing in South Australia would be to increase employment by 142 FTE positions in 2022/23, the first year in which assembly is expected to occur. Including consumption impacts increases the estimated impact of the on-going operations by a further 44 FTE positions.

The average gross impact on employment from direct, production and consumption impacts (including from one-off costs) over the ten year analysis period is estimated to be **149.2 FTE positions**. As was the case with the direct and production impacts, this likely somewhat understates the potential impact of final assembly of a launch vehicle as its activities are only captured in 8 of the 10 years of the Southern Launch analysis period.

The estimated ***gross*** on-going impact on economic activity of a launch vehicle manufacturer establishing their final assembly and testing operations in South Australia would be to **increase real GSP by $20 million** in 2022/23, the first year of launch operations. If consumption impacts are included then the estimated impact of would be **$8 million** higher in 2022/23.

Assessed over the full ten year analysis period using South Australia Treasury's recommended real post-tax discount rate of 7 per cent, the gross impact on GSP when consumption impacts are included has a present value of $127.5 million in 2018/19 values.

Table B.4 Estimated impacts on economic output of final assembly and testing by a launch vehicle manufacturer, direct, production and consumption impacts, $million

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
Direct and production impacts										
GSP impact of ongoing operations ($million)	0.0	0.0	19.8	19.8	19.8	19.8	19.7	19.8	19.8	19.8
GSP impact of construction costs ($million)	np	np								
Consumption impacts										
GSP impact of ongoing operations ($million)	0.0	0.0	8.2	8.2	8.2	8.2	8.1	8.2	8.2	8.2
GSP impact of construction costs ($million)	0.0	0.0								
Total gross impact on Gross State Product ($million) incl. consumption impacts	**0.0**	**0.0**	**28.0**	**28.0**	**28.0**	**28.0**	**27.8**	**28.0**	**28.0**	**28.0**
Present value of GSP impact over period ($million) incl. consumption impacts	**127.5**									

Note: Impact on Gross State Product is expressed in real 2018/19 values.

Appendix C

Potential Impacts of a Launch Vehicle Being Manufactured in South Australia

C.1 The potential investment

The second potential spin-off benefit of a rocket launch facility being established in South Australia is that one or more of the launch vehicle operators using the facility would re-locate their entire manufacturing operations to South Australia. The rationale would be to reduce the potential impact of delays in launch vehicles reaching the launch site and to reduce the risk of damage to vehicles in transit, and to enable any last minute adjustments or alterations to the vehicles.

This Appendix explores the potential impact of such a manufacturing operation being established in South Australia with Appendix B setting out the potential impacts of an assembly and testing facility.

Southern Launch have indicated that if a manufacturing operation were to be relocated to South Australia it is most likely that in the first year of operations (assumed to be 2022/23) the firm would establish an assembly and testing facility of the type assessed in Appendix B, with the complete manufacturing operations being relocated in the following year.

Assumptions for the scale of the assembly and testing facility are as set out in Appendix B.

Information from the proponent (based on the scale of Rocket Lab's activities in New Zealand) indicates that if a launch vehicle manufacturing facility were established in South Australia it would require:

- 400 FTE South Australian based staff;
- 18,000 m^2 factory; and
- Office fitout for 250 staff.

No potential data on local turnover is available and so for the purposes of the analysis turnover was imputed by assuming that the ratio of employment to turnover would match the sectoral average for 'Other machinery and equipment manufacturing'.

The uncertainties around the potential capital costs of establishing the facility are even greater than those for a potential assembly facility and they have not been included in the analysis.

C.2 Estimated economic impact of launch vehicle manufacturing

The economic impact of a launch vehicle manufacturer relocating their manufacturing to South Australia was modelled using the detailed (78 industry sector) South Australian Input Output tables developed for the Department of Premier and Cabinet (Rippin and Morison, 2013), modified to adjust for actual and projected changes in the compensation of employees by sector. See Chapter 3 for a discussion of the limitations of that analytical approach.

Only production impacts were included in the main analysis (e.g. the impact of South Australian based suppliers to the launch vehicle manufacturer purchasing goods and services from other South Australian firms, and then those firms purchasing inputs from local suppliers and so on). Section C.3 reports estimates of the consumption impacts associated with the potential investment.

There are insufficient details available on the construction and fit-out activity that would be required and so that has not been included in the analysis.

No estimate of turnover was available and so this has been imputed by the average ratio of turnover to employment for the sector.

The estimated impact on gross value added has been adjusted to real 2018/19 values based on the actual changes in the GDP deflator (ABS 2019a), and SACES projections for the growth of GSP over the remainder of the analysis period.

The estimated ***gross*** production impact of a launch vehicle manufacturer relocating to South Australia would be to **increase employment by 142 FTE position**s (see Table C.1), in 2022/23, the first year of local operations when the operation is expected to consist of only final assembly and testing. In the following year when the full manufacturing operation is relocated to South Australia the impact would reach 568 FTEs. The estimated direct employment by the launch vehicle manufacturer would account for the majority of the impact at 400 FTEs, with the remaining employment arising from production effects.

The average gross impact on employment over the ten year analysis period used for Southern Launch is expected to be **412.6 FTE positions**. This likely somewhat understates the potential impact of final assembly of a launch vehicle as the full manufacturing activity is only captured in 7 of the 10 years of the Southern Launch analysis period.

Table C.1 Estimated gross employment impact of a launch vehicle manufacturer relocating to South Australia, full time equivalent (FTE) employees

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
On-going operations										
Direct employment (FTE)	0.0	0.0	100.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0
Indirect effect (FTE)	0.0	0.0	42.1	168.3	168.4	168.5	172.3	168.7	168.8	168.9
Sub-total, on-going operations	0.0	0.0	142.1	568.3	568.4	568.5	572.3	568.7	568.8	568.9
Capital expenditures										
Direct and indirect effects (FTE)	np	np	np							
Total gross impact on employment (FTE)	0.0	0.0	142.1	568.3	568.4	568.5	572.3	568.7	568.8	568.9
Average employment impact over period (FTE)	412.6									

Note: np = data not provided by proponent.

The estimated ***gross*** on-going impact on economic activity of a launch vehicle manufacturer establishing their final assembly and testing operations in South Australia would be to **increase real GSP by $20 million** in 2022/23, the first year of local operations when it consists of only assembly and testing. In the following year when the full manufacturing operation is relocated the impact is expected to rise to $79 million.

Table C.2 Estimated gross direct and production impacts on economic output of a launch vehicle manufacturer relocating to South Australia ($'million)

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
GSP impact of ongoing operations ($million)	0.0	0.0	19.8	79.2	79.2	79.2	78.9	79.2	79.3	79.3
GSP impact of one-off set up costs ($million)	np	np	np							
Total gross impact on Gross State Product ($million)	0.0	0.0	19.8	79.2	79.2	79.2	78.9	79.2	79.3	79.3
Present value of GSP impact over period ($million)	318.4									

Note: Impact on Gross State Product is expressed in real 2018/19 values.
np = data not provided by proponent.

Assessed over the full ten year analysis period using SA Treasury's recommended real post-tax discount rate of 7 per cent, the gross impact on GSP (assuming no change in the scale of the R&D operation) has a present value of **$318.4 million** in 2018/19 values. As was the case with the employment impacts, this likely somewhat understates the potential impact of final assembly of a launch vehicle as the full manufacturing operations are only captured in 7 of the 10 years of the Southern Launch analysis period.

Potential net impacts

An important question to consider is the extent to which these gross impacts would translate into net benefits for the state. This depends upon the extent to which there is currently unemployed (or under employed) labour and capital that the project could draw on (or which could be recruited by any incumbent firms who lose employees to the new entrant), or where suitable workers could be convinced to move to the state from interstate or overseas. This is because the increase in employment demand from the new activity being modelled is likely to, all other things being equal, increase wages, which in turn will lead to some current activities no longer being competitive, displacing some existing employment. The same process can occur for those capital inputs that need to be sourced domestically such as land and structures. At the regional level net impacts can be much closer to gross impacts if labour and capital can be drawn in from other regions, or if there are sufficient unemployed persons in the region with relevant skills.

Although there is a degree of uncertainty around the exact composition of launch vehicle manufacturing workforce, it is likely to be a mix of advance manufacturing and engineering employees.

The final closure of GM-Holden's assembly line in late 2017, with its associated impacts on the supply chain, is likely to have resulted in a large number of individuals with relevant skills and experience in advanced manufacturing being underemployed, or employed in another sector that does not fully make use of their skills.

This suggests that any advanced manufacturing employment generated in a launch vehicle manufacturer is unlikely to generate wage pressures that will offset the direct employment impacts.

The potential engineering and technical employees of a launch vehicle manufacturer will be predominantly highly skilled and mobile, and very specialised, with strong employment prospects. This means that they are very unlikely to be unemployed and so the launch vehicle manufacturer would only be able to fill their positions from those already employed, or to a lesser extent from those entering (or re-entering) the workforce. To the extent that these individuals are attracted from other South Australian employers then the gross impacts of the launch vehicle manufacturer will be wholly or partially offset by increases in wages in the sectors, and associated decreases in employment elsewhere. If the employees are attracted from interstate or overseas, or if the opportunities with the launch vehicle manufacturer encourage South Australians to remain in the state rather than move interstate or overseas, or if the opportunities encourage South Australian's to re-enter the labour force, then there would not be an offsetting reduction elsewhere in the South Australian labour market. And as the range and depth of a local labour market for a specialisation can drive the location decisions of skilled employees, the opportunities available through the launch vehicle manufacturer could have an indirect impact on increasing supply for skilled employees for the defence and aerospace sectors more broadly.

These countervailing forces mean that it is difficult to identify *a-priori* whether the net impacts on engineering employment are likely to be well below the gross impacts (if poaching from other South Australian firms predominates) or whether net impacts are likely to be close to the gross impacts (if increasing labour supply predominates). However our understanding of the labour pool from which a potential launch vehicle manufacturer is likely to draw is likely to be primarily located interstate or overseas, or have a high likelihood of relocating interstate or overseas in the absence of suitable opportunities in the space or aerospace sectors. Hence the net impacts should be reasonably similar to the estimated gross impacts.

Looking more broadly at the indirect jobs induced from a launch vehicle manufacturer's likely purchases of goods and services from local firms, our judgment is that, given the generally weak state of the South Australia labour market, the net impacts are likely to be close to the gross impacts over the next 3 to 5 years. Over the medium to long term, as the South Australian labour market is expected to gradually improve, net impacts would be expected to fall relative to gross impacts. However we do not foresee any changes in overall economic conditions that would lead to the net impact of the proposal falling close to zero. And indeed our expectations about the South Australia labour market over the next ten years suggest that it is likely that the net benefits would still remain a substantial fraction of the gross benefits over the entire analysis period.

C.3 Estimated consumption impacts of launch vehicle manufacturing

It is possible to extend the input output analysis to include what is known as 'consumption' impact. As well as the direct and production impacts discussed above, consumption impacts also include the impact on South Australia from local spending of any additional labour and capital income received by South Australians as a result of the project.

As noted in Appendix A these consumption impacts need to be interpreted with a degree of caution as it is even more difficult to identify the extent to which they are truly additional to what would have happened had the project not gone ahead. This is because it is *not only* necessary to assess the extent to which any economic activity resulting directly or indirectly from the project is truly additional[4] (as is the case with direct and production impacts) but also to assess the extent to which any increase in spending is going to be additional.

The assumptions underpinning the calculation of the consumption impact of the potential locating of a launch vehicle manufacturers manufacturing facility in South Australia are the same as those set out in Appendix A.

The estimated ***gross*** production impact of a launch vehicle manufacturer relocating to South Australia would be to increase employment by 142 FTE positions, in 2022/23, the first year when it consists of final assembly only, and to then increase in the subsequent year to 568 FTEs. Including consumption impacts increases the estimated impact of the on-going operations by a further 44 FTE positions in 2019/20, rising to 177 FTEs in 2020/21.

[4] E.g. That it would not have occurred as a result of some other activity if the project had not gone ahead.

The average gross impact on employment from direct, production and consumption impacts (including from one-off costs) over the ten year analysis period is estimated to be **541.0 FTE positions**. As was the case with the direct and production impacts, this likely somewhat understates the potential impact of launch vehicle manufacture as its activities are only captured in 7 of the 10 years of the Southern Launch analysis period.

Table C.3 Estimated gross additional employment impact of a launch vehicle manufacturer relocating to South Australia, direct, production and consumption impacts, FTE employees

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
Direct and production impacts										
On-going operations	0.0	0.0	142.1	568.3	568.4	568.5	572.3	568.7	568.8	568.9
One-off construction	0.0	0.0								
Consumption impacts										
On-going operations	0.0	0.0	44.2	176.7	176.8	176.8	179.5	176.8	176.8	176.8
One-off construction	0.0	0.0								
Total gross impact on employment (FTE) incl. consumption impacts	0.0	0.0	186.2	745.1	745.2	745.3	751.8	745.5	745.6	745.7
Average employment impact over period (FTE) incl. consumption impacts	**541.0**									

The estimated ***gross*** on-going impact on economic activity of a launch vehicle manufacturer relocating to South Australia would be to **increase real GSP by $20 million** in 2022/23, when they will only comprise final assembly, increasing to **$79 million** in the following year when the full manufacturing operations are relocated. If consumption impacts are included then the estimated impact would be **$8 million** higher in 2022/23, increasing to **$33 million** in the following year.

Assessed over the full ten year analysis period using South Australia Treasury's recommended real post-tax discount rate of 7 per cent, the gross impact on GSP when consumption impacts are included has a present value of $450.2 million in 2018/19 values.

Table C.4 Estimated impacts on economic output of a launch vehicle manufacturer relocating to South Australia, $million

Financial year	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
Direct and production impacts										
GSP impact of ongoing operations ($million)	0.0	0.0	19.8	79.2	79.2	79.2	78.9	79.2	79.3	79.3
GSP impact of construction costs ($million)	0.0	0.0								
Consumption impacts										
GSP impact of ongoing operations ($million)	0.0	0.0	8.2	32.9	32.9	32.9	32.4	32.9	32.9	32.9
GSP impact of construction costs ($million)	0.0	0.0								
Total gross impact on Gross State Product ($million) incl. consumption impacts	**0.0**	**0.0**	**28.0**	**112.0**	**112.1**	**112.1**	**111.3**	**112.1**	**112.1**	**112.1**
Present value of GSP impact over period ($million) incl. consumption impacts	**450.2**									

Note: Impact on Gross State Product is expressed in real 2018/19 values.